

1999 Well Installation Report, Project Shoal Area, Churchill County, Nevada



Revision No.: 0

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PROJECT SHOAL AREA,
CHURCHILL COUNTY, NEVADA**

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**1999 WELL INSTALLATION REPORT,
PROJECT SHOAL AREA,
CHURCHILL COUNTY, NEVADA**

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List of Acronyms and Abbreviations

| | |
|-----------------------------------|--|
| AEC | U.S. Atomic Energy Commission |
| bgs | Below ground surface |
| CAIP | Corrective Action Investigation Plan |
| CAU | Corrective Action Unit |
| cm | Centimeter(s) |
| Colog | Colog, Inc. |
| CsCl | Cesium chloride |
| D ₂ O | Deuterium oxide |
| DoD | U.S. Department of Defense |
| DOE | U.S. Department of Energy |
| DRI | Desert Research Institute |
| FFACO | Federal Facility Agreement and Consent Order |
| FMP | Fluid Management Plan |
| ft | Foot (feet) |
| gpm | Gallon(s) per minute |
| HASP | Health and Safety Plan |
| in. | Inch(es) |
| ITLV | IT Corporation, Las Vegas Office |
| Lang | Lang Exploratory Drilling |
| LiBr | Lithium bromide |
| Lice | Lithium chloride |
| mg/L | Milligram(s) per liter |
| mi | Mile(s) |
| mm | Millimeter(s) |
| MSDS | Material Safety Data Sheets |
| NaF | Sodium fluoride |
| NaH ¹³ CO ₃ | Carbon-13 enriched sodium bicarbonate |
| NaI | Sodium iodide |
| NaOH | Sodium hydroxide |
| NDEP | Nevada Division of Environmental Protection |

List of Acronyms and Abbreviations (Continued)

| | |
|----------------|--------------------------------------|
| NDWS | Nevada Drinking Water Standards |
| OD | Outside diameter |
| pCi/L | Picocurie(s) per liter |
| PFBA | Perfluoro benzoic acid |
| PRG | Powder River Group |
| PSA | Project Shoal Area |
| PVC | Polyvinyl chloride |
| RC | Reverse circulation |
| SSHASP | Site-specific Health and Safety Plan |
| H ³ | Tritium |

1.0 Introduction

This preliminary data report presents the field data collected by IT Corporation (IT) between June 15, 1999 and December 6, 1999, as part of the implementation of the *Corrective Action Investigation Plan (CAIP) for Corrective Action Unit (CAU) 447: Project Shoal Area (PSA), Nevada Subsurface Site* (DOE/NV, 1998a) and *Addendum to the CAIP for CAU 447: Project Shoal Area, Nevada Subsurface Site* (DOE/NV, 1999a). These CAIPs are part of an ongoing U.S. Department of Energy (DOE)-funded project for the investigation of CAU 447, at the PSA. All work performed on this project was conducted in accordance with the *Federal Facility Agreement and Consent Order (FFACO)* (1996), the *Industrial Sites Quality Assurance Project Plan* (DOE/NV, 1996), and all applicable Nevada Division of Environmental Protection (NDEP) policies and regulations.

The PSA is located in the Sand Springs Mountains in Churchill County, Nevada about 30 miles (mi) southeast of Fallon, Nevada ([Figure 1-1](#)). Project Shoal was part of the Vela Uniform Program, which was conducted to improve the United States' ability to detect, identify, and locate underground nuclear detonations. The PSA was active in the early to mid-1960s as the site of a single underground nuclear test, Project Shoal. Project Shoal consisted of detonating a 12-kiloton nuclear device at a depth of 1,211 feet (ft) below the ground surface (bgs) in granitic rock to determine whether seismic waves produced by an underground nuclear test could be differentiated from naturally occurring seismic waves. The test was a joint effort conducted by the U.S. Atomic Energy Commission (AEC) and the U.S. Department of Defense (DoD) in October 1963 (AEC, 1964).

1.1 Purpose

Potential groundwater contamination at PSA is associated with the installation and detonation of the nuclear test device. The purpose of the subsurface investigation of CAU 447 was to provide input to a groundwater model and to determine if contamination exists within groundwater proximal to and/or downgradient of the Shoal test.

The previous subsurface investigation, conducted in 1996, included the installation of four groundwater monitoring wells in the area of the underground nuclear test, Wells HC-1, HC-2, HC-3, and HC-4. The wells were drilled to depths approximately 1,300 ft bgs and cased above

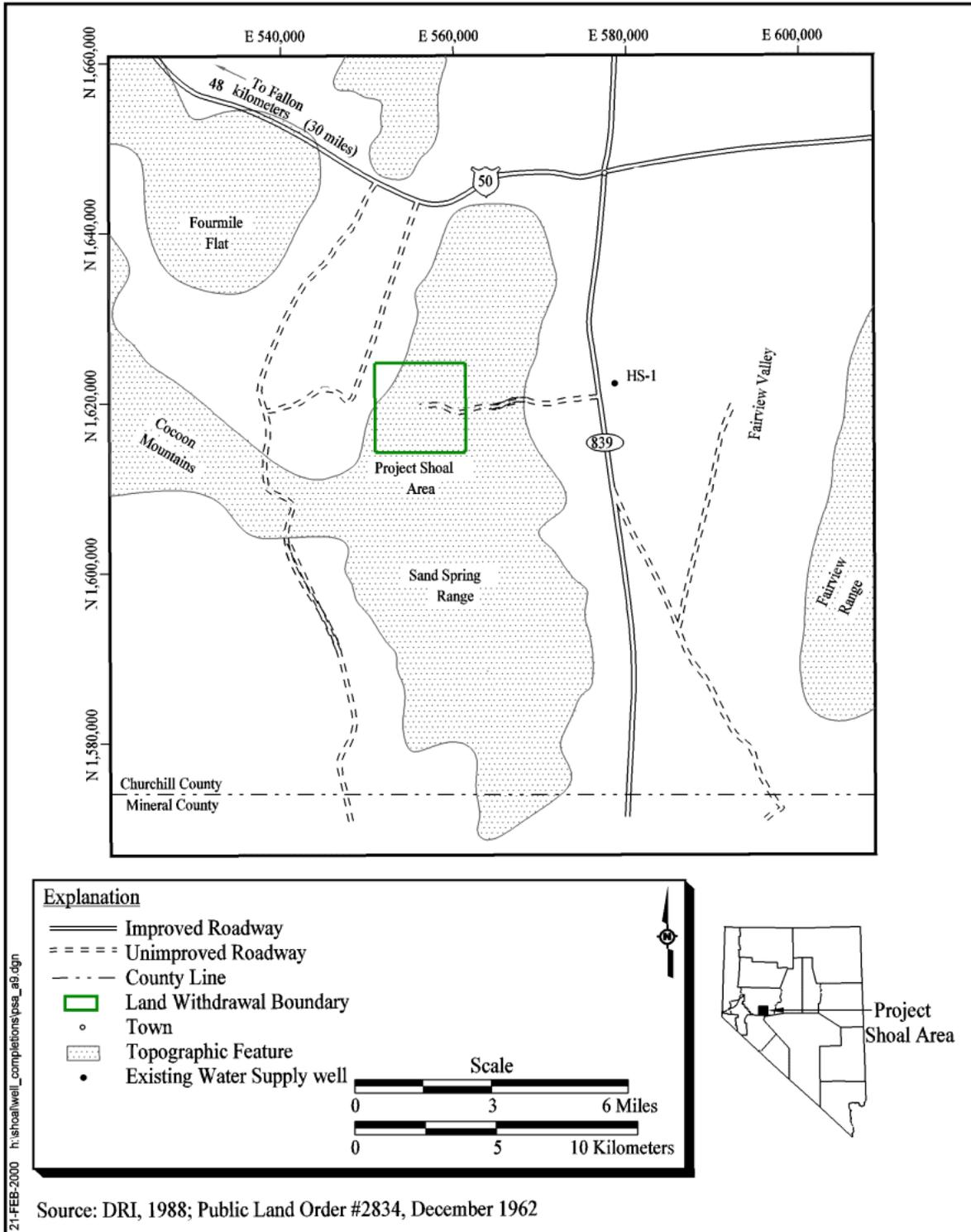


Figure 1-1
Project Shoal Area Location Map

the water table to depths of approximately 950 to 1,100 ft bgs. The location of these wells is shown on [Figure 1-2](#).

The purpose of the subsurface investigations of CAU 447, as described in Appendix VI of the FFACO (1996), was to evaluate groundwater flow and potential contaminant transport from the PSA test cavity in the Sand Springs Mountains. This was accomplished by the drilling and hydrogeologic modeling tasks that were conducted in 1996 and 1997. However, an evaluation of the groundwater model results indicated that further delineation of subsurface conditions is required to reduce the uncertainties in the model input parameters. In accordance with the FFACO (1996), a new CAIP (DOE/NV, 1998a) and CAIP Addendum (DOE/NV, 1999a) were prepared detailing this PSA subsurface investigation, which consisted of the drilling and installation of four additional wells, Wells HC-5, HC-6, HC-7, and HC-8, and hydrologic testing.

The CAIP Addendum presents the data decision and data collection recommendations. Nine uncertain model input parameters were identified and twenty one possible field activities that could provide information on those uncertain parameters were discussed. Each activity was ranked based on its reduction of model uncertainty. A cost-benefit analysis was performed by combining the uncertainty reduction estimates for the field activities with preliminary cost estimates.

1.2 Scope of Work

Two field activities were proposed in the CAIP Addendum (DOE/NV, 1999a) based on the data decision analysis: (1) a two-well tracer test, and (2) an environmental tracer/deep-well hydraulic characterization test. The activities included the installation and testing of two water-table wells for tracer testing, one intermediate depth well, and one deep well for environmental tracer/deep-well hydraulic characterization. The placement and construction of these wells were designed to optimize the collection of hydrogeologic data needed to reduce model uncertainty. One additional activity, vadose zone modeling, was also proposed in the CAIP Addendum, but will not be addressed in this report.

The objective of the two-well forced-gradient tracer test was to determine subsurface hydraulic parameters, including effective porosity. As proposed, a tracer would be injected into the fractured granite at the up-gradient well installed in the upper portion of the aquifer, while monitoring and pumping a second, down-gradient well also installed in the upper portion of the aquifer, approximately 100 ft away. The objective was accomplished by the installation, hydrologic testing, and sampling of two water-table wells (Wells HC-6 and HC-7).

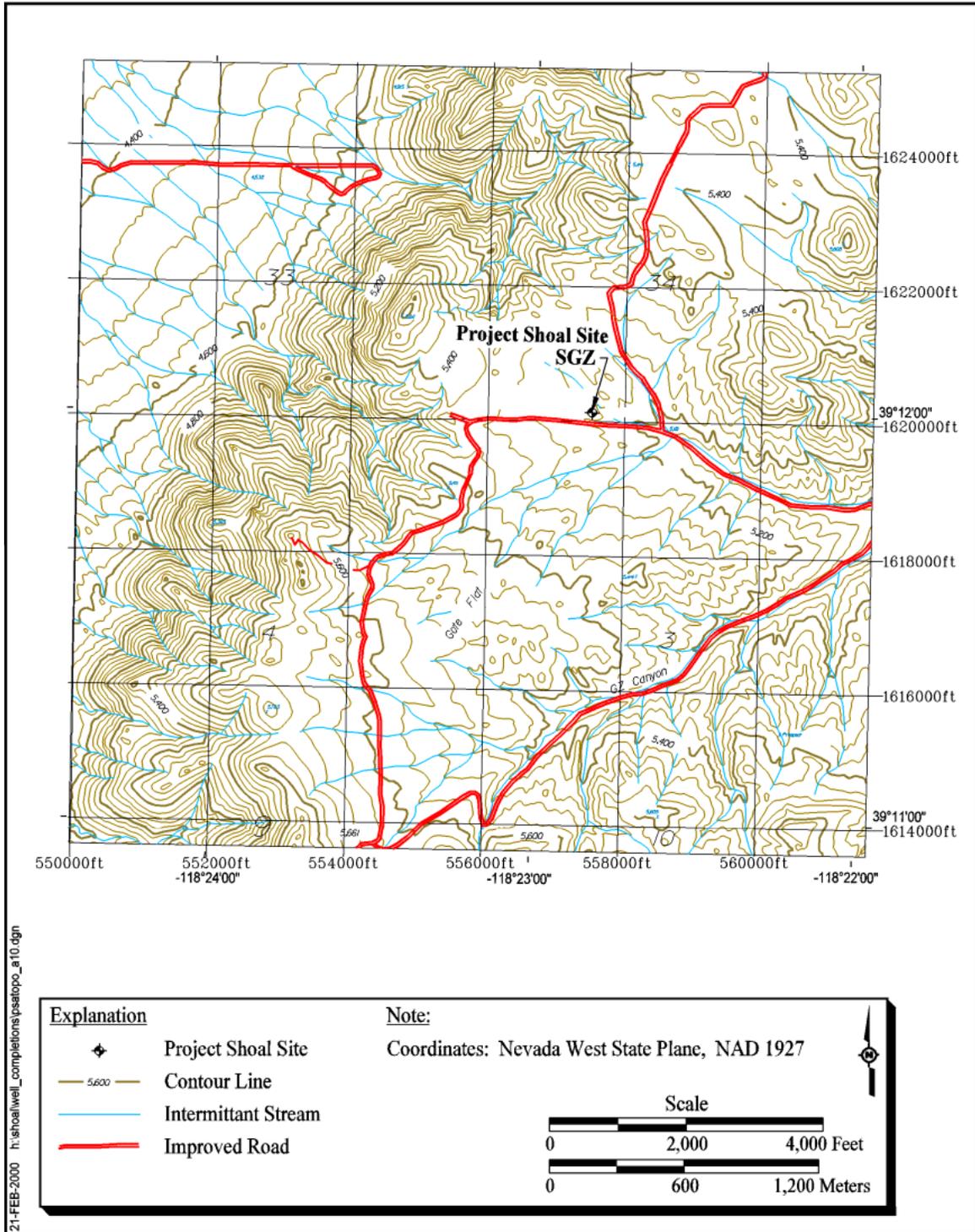


Figure 1-2
 Generalized Topographic Map of the Project Shoal Area

The environmental tracer/deep-well hydraulic characterization test had multiple objectives: (1) provide samples from several depths in the groundwater-flow system for groundwater velocity determinations using environmental tracers; (2) measure hydraulic head variation with depth; (3) specifically, determine head in the first zone of saturation to address uncertainties raised by the water-level history of Well HC-3; (4) document fracture frequency with depth and other characteristics (strike, dip, aperture), if possible; (5) determine fracture continuity between the boreholes; and (6) measure hydraulic conductivity as a function of depth. These objectives were accomplished by the installation, and hydrologic testing of a well field with two water table wells, Wells HC-6 and HC-7, an intermediate depth well, Well HC-8, and a deep well, Well HC-5. [Figure 1-3](#) shows the location of these wells.

The scope of the work for the investigation included: (1) constructing drill pads and lined fluid storage sumps for drilling, (2) drilling four appropriately sized boreholes to the required depths, (3) collecting hydrogeologic data during drilling, (4) monitoring drilling effluents for radionuclides, (5) collecting downhole geophysical data, (6) constructing the four wells, (7) developing and testing the wells, and (8) monitoring development and testing effluent for radionuclides and well development parameters.

The scope of work was accomplished by a team of IT Corporation, Las Vegas Office (ITLV) and Desert Research Institute (DRI) scientists and technicians, ITLV subcontractors Lang Exploratory Drilling (Elko, Nevada), Buttar's Mining (Carlin, Nevada), Colog, Inc. (Boulder, Colorado), Paragon Analytics Inc. (Fort Collins, Colorado), and Safety Kleen (Sparks, Nevada), and DRI subcontractor Powder River Group (Cedar City, Utah).

The ITLV staff had the responsibility for Health and Safety, Environmental Compliance/Waste Management, and Drilling Oversight. All ITLV subcontractor operations were directly supervised and approved by on-site ITLV personnel. The ITLV roles and responsibilities are included in *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT, 1999). The DRI had the responsibility for collecting specific hydrogeologic data, collecting certain downhole geophysical data, providing technical support, and orchestrating development/test pumping to achieve the scientific goals of the program. The DRI field operations were included in *Project Shoal Area, Field Characterization Plan, Two-Well Tracer Test, Deep-Well Characterization and Monitoring* (DRI, 1999).

The data collected during well installation and hydrologic testing supports further refinement of the PSA groundwater flow and transport model.

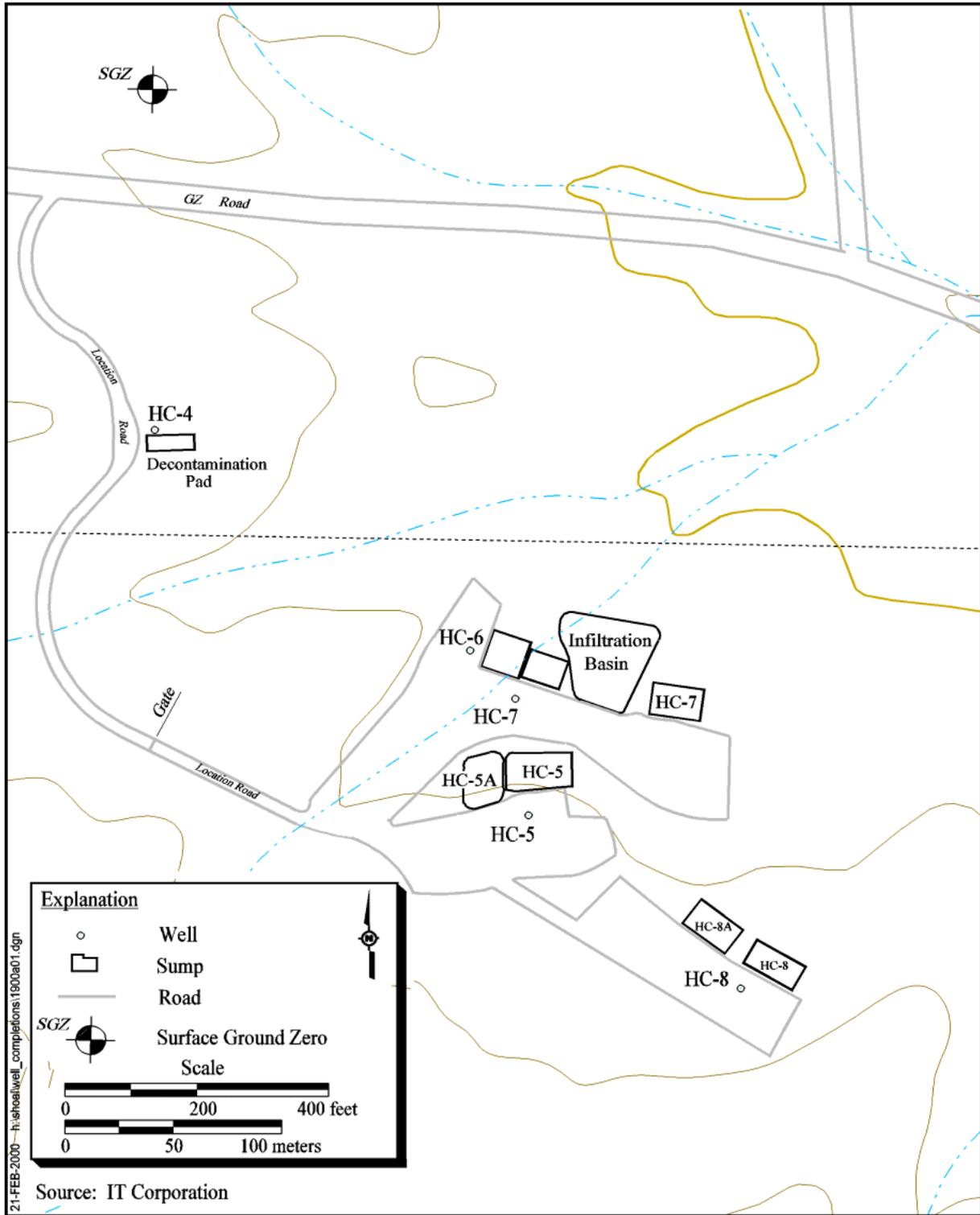


Figure 1-3
Project Shoal Area Site Layout

1.3 Drill Site and Sump Construction

Five drill site locations were prepared to facilitate the installation of the PSA wells. Beginning in early June 1999, drilling locations, access roads, and fluid sumps were constructed at the sites specified in the CAIP Addendum (DOE/NV, 1999a) and the DRI Field Characterization Plan (DRI, 1999) by Buttar's Mining of Carlin, Nevada, a subcontractor under direct supervision of the ITLV site manager. Installation of the liner materials in the excavated storage sumps was completed by ITLV personnel.

One additional fluid sump was constructed by Lang personnel, with the aid of ITLV personnel, in early August to accommodate solids and fluids produced during the drilling of Well HC-5. Additional drilling locations, access roads, and fluid sumps were constructed in mid-September by ITLV personnel to facilitate the relocation of the two water-table wells, HC-6 and HC-7 (see discussion in [Sections 3.0 and 4.0](#)).

The drilling pads were constructed of sufficient size to accommodate all of the expected equipment and materials. Sumps were constructed to be nominally five times the volume of the material displaced from the borehole. These sump volumes were insufficient for the intermediate Well HC-8 and the deep Well HC-5, requiring the use of a second lined sump at these locations. The layout of the constructed sites is depicted in [Figure 1-3](#).

1.4 Summary of Well Drilling and Completion Activities

The wells are located down-gradient of the nuclear test ([Figure 1-2](#)). The configuration of the wells, as installed, was modified from the proposed configuration, based on hydrogeologic data collected during the well installation process. The wells are spaced in a triangle to facilitate the spatial correlation of fractures. Suites of downhole geophysical data were collected to further determine hydrogeologic conditions in the wells. Each well has a single completion with 116 to 146 ft of screen at or near its total depth. The wells were designed based on hydrogeologic data collected during drilling and downhole geophysical data. The wells were constructed by installing 5 1/2-inch (in.) fiberglass and/or steel casing with an appropriate screened interval in a filter-pack envelop and completing the well with the installation of sanitary seals. [Table 1-1](#) presents the borehole and well construction details.

Well development was performed to remove drilling-related fluids from the wells which might influence the results of environmental tracer sampling. Test pumping was conducted to determine the hydraulic characteristics of the aquifers.

**Table 1-1
PSA Borehole and Well Construction Details**

| Well Identifier | Collar Location Easting (ft) | Collar Location Northing (ft) | Collar Elevation (ft msl) | Proposed Depth (ft) | Total Drilled Depth (ft) | 20-in. Conductor Casing Interval (ft) | 13 3/8-in. Intermediate Casing Interval (ft) | Production Borehole Diameter (in.) | Steel Casing Interval (ft) | Fiberglass Casing Interval (ft) |
|-----------------|------------------------------|---------------------------------|--|--------------------------|--------------------------|---------------------------------------|--|------------------------------------|----------------------------|---------------------------------|
| HC-5 | 558,315.11 | 1,619,056.07 | 5,247.38 | 4,050 | 3,565 | 0 - 100 | 0 - 1,200 | 12 1/4 | 0 - 879.03 | 879.03 - 3,560.76 |
| HC-6 | 558,222.53 | 1,619,312.58 | 5,228.72 | 1,330 | 1,240 | 0 - 100 | na | 10 | na | 0 - 1,233.7 |
| HC-7 | 558,291.68 | 1,619,237.29 | 5,229.73 | 2,790 | 1,240 | 0 - 100 | na | 10 | na | 0 - 1,225.1 |
| HC-8 | 558,642.54 | 1,618,789.06 | 5,259.91 | 1,330 | 2,530 | 0 - 100 | na | 10 | 0 - 811.18 | 811.18 - 2,441.3 |
| Well Identifier | Collar Elevation (ft msl) | Approximate Depth to Water (ft) | Approximate Water Level Elevation (ft msl) | Grout Seal Interval (ft) | 20/40 Sand Interval (ft) | 6/9 Sand Interval (ft) | 3/8-in. Gravel Interval (ft) | Slotted Interval (ft) | Bottom of Well Casing (ft) | Total Drilled Depth (ft) |
| HC-5 | 5,247.38 | 1,366 | 3,881 | 0 - 3,295.5 | 3,295.5 - 3,310 | 3,310 - 3,335 | 3,335 - 3,565 | 3,385.03 - 3,530.63 | 3,560.76 | 3,565 |
| HC-6 | 5,228.72 | 980 | 4,249 | 0 - 66 | na | 975 - 1,105 | 970 - 975 1,105 - 1,240 | 1,115.98 - 1,232.3 | 1,233.7 | 1,240 |
| HC-7 | 5,229.73 | 979 | 4,251 | 0 - 66 | na | 980 - 1,100 | 1,100 - 1,240 | 1,106.47 - 1,223.6 | 1,225.1 | 1,240 |
| HC-8 | 5,259.91 | 1,367 | 3,893 | 0 - 2,200 | 2,200 - 2,222 | 2,222 - 2,247 | 2,247 - 2,448 | 2,294.44 - 2,410.92 | 2,441.3 | 2,530 |

msl = Mean sea level
na = Not applicable

The wells were drilled and constructed in the following order: HC-5, HC-8, HC-6, and HC-7 between June 18 and October 8, 1999. A total of 113 days were spent drilling and completing the wells. Operations were conducted 24 hours per day and 7 days a week throughout the duration of the project, with the exception of brief suspensions while waiting for drilling or fishing tools and while waiting for repairs to the water supply Well, HS-1. [Table 1-2](#) presents a general schedule of drilling, well construction, and development/test pumping activities.

Well locations and depths were revised based on data collected during the well installation program. [Figure 1-3](#) shows the proposed well and actual locations of the wells installed. The as-built depths and proposed well depths are presented, with the well construction details, on [Table 1-1](#).

Well HC-8 was proposed as the downgradient well of the two-well tracer test well pair. However, hydrogeologic data collected while drilling the HC-8 borehole suggested that the borehole had crossed a significant structural feature which appeared to act as a hydraulic barrier. The implications of this interpretation were that the upgradient well, as proposed, would be installed in a structurally (and hydraulically) distinct block. Additionally, water level data collected while advancing the borehole suggested that little water was entering the borehole in the proposed completion interval of a water table well (i.e., the formation was too tight to yield reasonable inflows to the well). Therefore, Well HC-8 was completed as the intermediate depth well and Wells HC-6 and HC-7 were designated as the tracer test well pair and the locations revised to an area thought to be free of structural complications.

Borehole stability and associated problems contributed to the decision to build the intermediate well, HC-8, and the deep well, HC-5, short of the proposed depths. The water table was encountered at shallower than expected depths. Therefore, the water table wells, HC-6 and HC-7, were completed at shallower than proposed depths.

All wells were installed with 20-in. diameter conductor casing extending from the surface to 100 ft bgs. The conductor casing was installed in a 24-in. borehole drilled by conventional, mud-rotary techniques using water and bentonite as the drilling fluid. The conductor casing was cemented in place.

Only Well HC-5 was installed with a 13 3/8-in. diameter intermediate casing string. The intermediate casing string was installed from the surface to approximately 1,200 ft bgs in a 17 3/4-in. borehole drilled by a combination of air, reverse-circulation (RC) techniques and flooded (fluid), RC techniques. A downhole percussion hammer or a tricone bit was used during air, RC drilling and a tricone bit was used during flooded, RC drilling. Drilling fluids consisted of: (1) water, EZ Mud[®],

**Table 1-2
History of Drilling, Well Construction and Development/Test Pumping Activities**

| Well Identifier | Drilling | Well Construction | Development and Test Pumping | Development Method |
|------------------------|-------------------------------|--------------------------------|-------------------------------------|--|
| HC-5 | June 18 - August 6, 1999 | August 15 - 18, 1999 | August 19 - 20, 1999 | Conventional Airlift Well |
| | | | September 30 - October 1, 1999 | Eductor Airlift Well |
| | | | October 4 - 8, 1999 | Phase I Development/Test Pumping |
| | | | October 9 - 10, 1999 | Miscellaneous Development/Test Pumping |
| | | | October 11 - 27, 1999 | Phase II Development/Test Pumping |
| | | | October 30 - November 3, 1999 | Phase III Development/Test Pumping |
| | | | November 11 - 12, 1999 | Phase IV Development/Test Pumping |
| | | | November 15 - 22, 1999 | Phase V Development/Test Pumping |
| | | | November 30 - December 6*, 1999 | Phase VI Development/Test Pumping |
| | | | | |
| HC-6 | September 24 - 28, 1999 | September 30 - October 1, 1999 | September 28 - 29, 1999 | Airlift Borehole with Drill String |
| | | | October 2 - 4, 1999 | Development/Test Pumping |
| | | | | |
| HC-7 | October 3 - 6, 1999 | October 7 - 8, 1999 | October 6, 1999 | Airlift Borehole with Drill String |
| | | | October 27 - 28, 1999 | Phase I Development/Test Pumping |
| | | | October 28 - November 29*, 1999 | Phase II Development /Test Pumping |
| | | | | |
| HC-8 | August 21 - September 9, 1999 | September 17 - 21, 1999 | September 21 - 23, 1999 | Conventional Airlift Well |
| | | | October 18, 1999 | Phase I Development/Test Pumping |
| | | | October 19 - 29, 1999 | Phase II Development/Test Pumping |
| | | | November 11 - 14, 1999 | Phase III Development/Test Pumping |

*In progress by DRI, IT suspends field activities.

and Quik Foam[®] for the air, RC drilling; and (2) water with bentonite and Drispac[®] for the flooded, RC drilling.

The production boreholes were 10-in. diameter for Wells HC-6, HC-7, and HC-8 and 12 1/4-in. diameter for Well HC-5. The production boreholes were drilled with downhole percussion hammers or tricone bits using either air, RC or flooded, RC techniques. Drilling fluids consisted of: (1) water with EZ Mud[®] and Quik Foam[®] injected during air, RC drilling; (2) water with EZ Mud[®] and Drispac[®] injected during air, RC drilling and used as the circulating fluid for flooded, RC drilling; and (3) water with bentonite circulated during flooded, RC drilling. The specific drilling techniques and fluids used for each borehole are discussed in [Sections 2.5, 3.5, 4.5, and 5.5](#).

Downhole geophysical data was collected in the open boreholes prior to casing installation. Additional downhole geophysical data was collected in the completed wells. Colog, Inc. (Colog) collected acoustic borehole televiewer, caliper, compensated neutron, deviation, epithermal neutron, fluid temperature, formation density, guard resistivity, natural gamma, spectral gamma, and 4-pi density data. The DRI collected caliper, geochemical, spinner flow measurement, stressed thermal flow, and video data. The DRI's subcontractor, Powder River Group (PRG), in cooperation with DRI, collected borehole radar and crosshole tomography data.

The wells were constructed with 5 1/2-in. production casing. Threaded fiberglass casing was used for all wells. However, threaded and coupled, mild-steel casing was used in the unsaturated zone in Wells HC-5 and HC-8 from the surface to depths of approximately 800 to 900 ft bgs. A mild-steel sub was used to mate the fiberglass and mild-steel casing. Fiberglass casing with 0.040-in. saw-cut slots (40-slot) was installed in the production zones within a filter-pack envelope.

The filter pack consisted of 3/8-in. gravel extending from total depth to approximately 50 ft above the top of the slotted interval. Approximately 25 ft of 6/9 sand was installed above the 3/8-in. gravel pack in all the wells. In Wells HC-5 and HC-8, approximately 25 ft of 20/40 sand was installed above the 6/9 sand. Cement grout was installed from the surface to the top of the 20/40 sand in Wells HC-5 and HC-8. Cement grout was installed from the surface to the top of cement baskets approximately 65 ft bgs in Wells HC-6 and HC-7. The annular space is open from the top of the 6/9 sand to the bottom of the cement baskets in Wells HC-6 and HC-7.

Initial well development consisted of airlifting the open borehole or completed well. Initial well development of Wells HC-6 and HC-7 consisted of airlifting the open borehole utilizing the drill string immediately following the completion of drilling. Initial well development of Wells HC-5 and HC-8 consisted of conventional

airlifting of the completed wells. Additional airlift development in Well HC-5 utilized an eductor system to allow removal of accumulated sediments from the bottom of the well. Following pump installation the wells were further developed by development/test pumping conducted for periods of days to weeks to months. Development/test pumping served two purposes: (1) additional development of the well, including removal of fluids introduced while drilling and constructing the well; and (2) generation of data used to determine the hydraulic characteristics of the aquifers.

Development/test pumping was conducted by ITLV for the four wells installed during 1999. The DRI continued development/test pumping of Wells HC-5 and HC-7 following the suspension of ITLV field activities December 6, 1999.

The following sections provide a detailed summary of operations at each well site and discuss the subjects of environmental compliance, waste management, and health and safety during 1999 PSA field activities.

2.0 Well HC-5 Summary of Operations

Well HC-5 was proposed and completed as the deep well of the well installation program (DRI, 1999). The proposed depth was 4,050 ft; however, borehole stability problems contributed to the decision to complete the well at a depth of 3,565 ft. [Figure 1-3](#) shows the location of Well HC-5. Well HC-5 was the first well of the 1999 well installation program.

Well HC-5 was drilled to a total depth of 3,565 ft bgs beginning June 18, 1999. Well casing was installed to a total depth of 3,560.76 ft bgs with the filter-packed, slotted interval from 3,385.03 to 3,530.63 ft bgs. The well construction details are provided on [Table 1-1](#). Completion of the well occurred August 18, 1999, when the installation of the grout seal was completed. Borehole stability problems presented difficulties with drilling this well and delays in the collection of downhole geophysical data. A total of 62 days was spent drilling and constructing this well. [Figure 2-1](#) presents the drilling progress of Well HC-5.

Initial well development, consisting of conventional airlifting, occurred August 18 through 19, 1999. A second phase of airlift development was conducted September 30 through October 1, 1999, utilizing an eductor pipe and airline. Initial pump development occurred October 4 through 8, 1999. Further development and test pumping occurred October 9 and 10, 1999; October 11 through 27, 1999; October 30 through November 3, 1999; November 11 through 12, 1999; November 15 through 22, 1999; and November 30 through December 6, 1999, when ITLV suspended monitoring of pumping. The DRI continued development/test pumping of Well HC-5 after December 6, 1999. Approximately 162,000 gallons more fluid was used to drill the well than had been discharged throughout drilling, construction, and pumping activities through December 6, 1999.

Alpha and beta activity measurements of drill cuttings were within the background range. Tritium (H^3) activities of discharge fluids were also within the background range throughout the duration of Well HC-5 activities. Fluoride (F) concentrations in the discharge fluid ranged from from 5.0 to 6.0 milligrams per liter (mg/L) on December 6, 1999.

[Table A-1 \(Appendix A\)](#) provides the chronology of drilling, construction, development, and testing of Well HC-5.

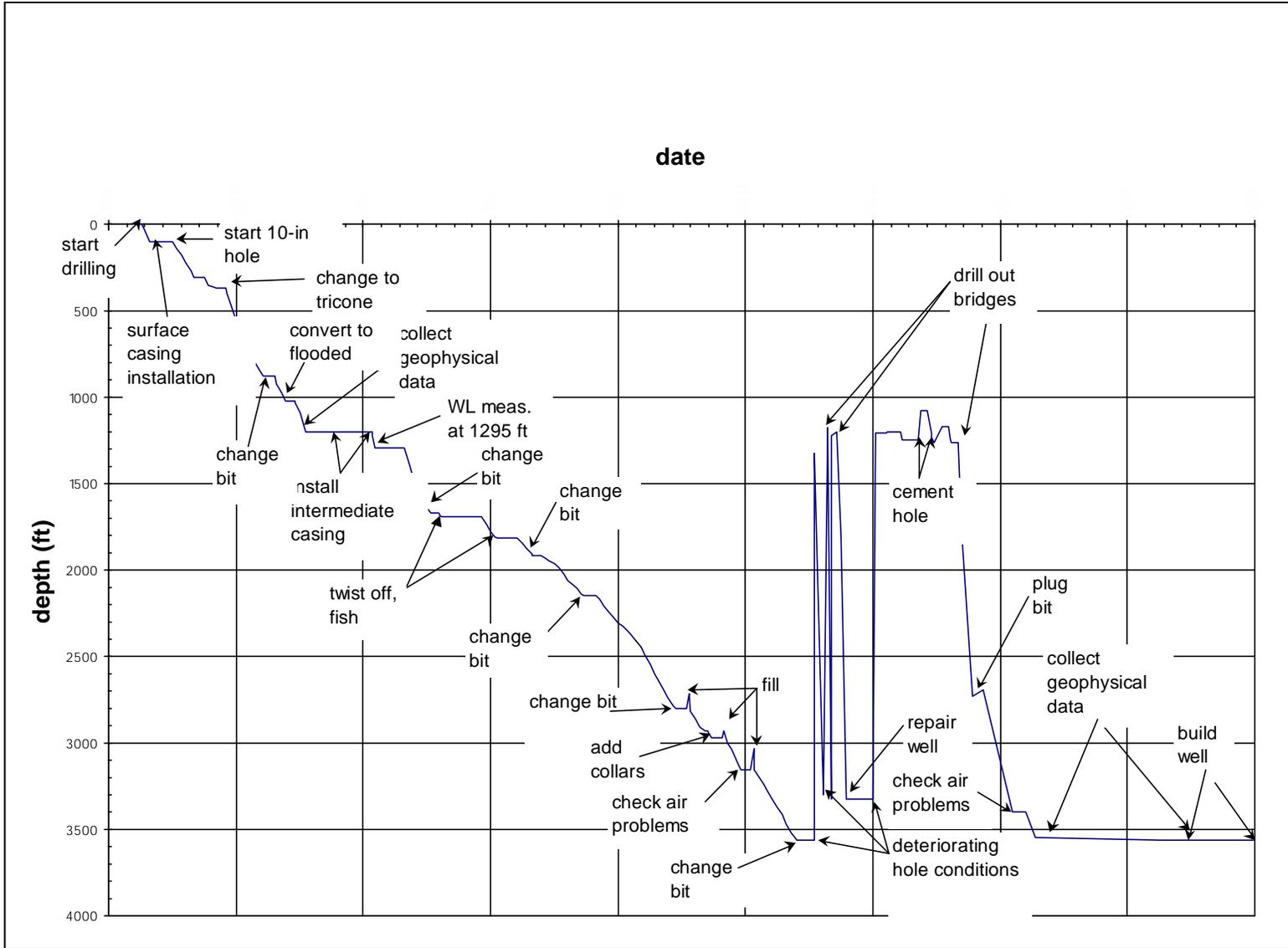


Figure 2-1
Well HC-5 Drilling Progress

2.1 Well HC-5 Geology

The HC-5 borehole encountered porphyritic, medium to coarse-grained biotite granite throughout most of the drilled interval. The presence of thin aplite dikes is suggested by geophysical logs in some intervals. Larger, oxidized drill cuttings and geophysical logs indicated numerous fractured intervals. Geophysical logs also suggested fluid inflow into the borehole. Numerous clay-rich intervals, interpreted as fault gouge zones, were encountered. Lithologic descriptions are provided as [Figure 2-2](#). [Figure 2-3](#) summarizes these geologic features.

2.2 Well HC-5 Hydrology

All fluids used to drill the well were spiked with a tracer solution of sodium fluoride (NaF). The target concentration was 50 mg/L. The fluoride concentration in fluids during drilling was monitored in each truck load of water delivered to the drill site, in the drilling fluid immediately prior to injection into the borehole, and in the drilling fluid immediately upon discharge to the surface. Monitoring of fluoride concentrations in these injected and discharged fluids was conducted on one- to two-hour intervals above the predicted water table and at hourly intervals in the saturated zone during drilling and well construction activities. [Figure 2-4](#) presents the fluoride concentration data in fluids from these sources. [Table A-2 \(Appendix A\)](#) presents the data used for [Figure 2-4](#).

The fluoride concentration was also monitored in fluids discharged during well development/testing (see [Section 2.6](#)) on two- to four-hour intervals to judge the progress of well development. [Figure 2-5](#) shows the fluoride concentrations in fluids from these sources. [Tables A-3 through A-11 \(Appendix A\)](#) present the data used for [Figure 2-5](#).

Water balance calculations show that not all of the water used to drill the well was discharged during drilling of the borehole and airlift development and development/test pumping of the completed well. Approximately 162,000 gallons more water were used to drill the well than had been discharged through December 6, 1999. The water balance data is presented as [Table A-12 \(Appendix A\)](#).

Water production varied from approximately 5 to 20 gallons per minute (gpm) during airlift development of the open borehole. Water production during development/test pumping varied from approximately 4 to 6.7 gpm. Water production data is included in [Tables A-3 through A-11 \(Appendix A\)](#).

Fluid-level monitoring was conducted in the open borehole prior to well construction, as well as, after completion of the well. [Table A-13 \(Appendix A\)](#) provides fluid level data obtained for the term of the ITLV involvement in PSA data collection.

- 0 - 260 ft Granite, mottled pinkish grayish white to yellowish grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local trace greenish alteration of some plagioclase feldspars, especially 50 to 60 ft; 160 to 170 ft; and 200 to 220 ft. Locally some feldspars altered to very fine grained sericite, especially 40 to 50 ft and 130 to 150 ft. Potassium feldspar phenocrysts to 12 millimeters (mm). Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Local very weak pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 3 to 8 mm chips.
- 260 - 270 ft Granite, mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 3 to 12 mm chips, probable fracture zone.
- 270 - 370 ft Granite, mottled grayish white to yellowish grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of plagioclase feldspars, especially 330 to 340 ft. Potassium feldspar phenocrysts to 20 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Weak pale yellow to ochreous orange stains along fractures throughout interval. Good quality cuttings with 3 to 8 mm chips, larger chips (to 15 mm) 320 to 330 ft, possibly indicating fracture zone.
- 370 - 430 ft Granite, mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 5 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 1 to 5 mm chips, larger chips (to 12 mm) 370 to 380 ft, possibly indicating fracture zone.
- 430 - 500 ft Granite, mottled grayish greenish pinkish white to grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Slight greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Persistent minor pale yellow to ochreous orange stains as halos and along fractures throughout. Good quality cuttings with 1 to 5 mm chips.
- 500 - 580 ft Granite, mottled grayish greenish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive slight greenish alteration of some plagioclase feldspars, especially 530 to 550 ft. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, partially altered to chlorite. Minor accessory magnetite. Sparse pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 1 to 5 mm chips.
- 580 - 660 ft Granite, mottled grayish greenish pinkish white to grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Slight greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 16 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Sparse pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 8 mm chips.
- 660 - 680 ft Granite, mottled grayish greenish pinkish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Greenish alteration of plagioclase feldspars. Feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 15 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Strong pale yellow to ochreous orange stains as halos and along fractures throughout. Good quality cuttings with 3 to 12 mm chips.

Figure 2-2
Well HC-5 Lithologic Descriptions
(Page 1 of 4)

| | |
|------------------|---|
| 680 - 830 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of some plagioclase feldspars, especially 680 to 700 ft and 780 to 830 ft. Some feldspars altered to very fine grained sericite, especially 710 to 780 ft. Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasively altered to chlorite. Minor accessory magnetite. Trace pyrite. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 8 mm chips. Finely ground chips 730 to 750 ft and 760 to 780 ft |
| 830 - 840 ft | <u>Granite</u> , mottled grayish greenish pinkish white to greenish reddish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 18 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Trace fine grained, disseminated pyrite. Strong reddish brown to ochreous orange stains throughout. Good quality cuttings with 2 to 15 mm chips. Probable fracture zone. Geophysical logs suggest the presence of a thin aplite dike in this interval |
| 840 - 1,020 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive slight greenish alteration of some plagioclase feldspars. Locally some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Trace disseminated pyrite throughout much of interval, locally oxidized. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 8 mm chips. Larger chips (to 20 mm) 850 to 860 ft and 900 to 910 ft, possibly indicating fracture zones. |
| 1,020 - 1,120 ft | <u>Granite</u> , mottled grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive strong greenish alteration of plagioclase feldspars. Potassium feldspar phenocrysts to 18 mm. Possible silicification of matrix throughout interval. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Trace fine grained, disseminated, oxidized pyrite throughout interval. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 4 to 30 mm chips. Large chips throughout the interval indicates fracture zone. |
| 1,120 - 1,200 ft | <u>Granite and clay</u> , mottled pale greenish gray to reddish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (30%), clear to milky quartz (25%), and milky white to translucent plagioclase feldspar (20%) in clay matrix (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Chips apparently silicified. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Local reddish brown to ochreous orange stains 1,150 to 1,160 ft. Good quality cuttings with 3 to 8 mm chips in clay matrix interpreted as zone of fault gouge. |
| 1,200 - 1,360 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Includes clay component 1,300 to 1,310 ft. Pervasive slight greenish alteration of some plagioclase feldspars throughout interval. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Sparse pale yellow to ochreous orange stains as halos and along fractures, especially 1,350 to 1,360 ft. Good quality cuttings with 2 to 10 mm chips. Probable fracture zone 1,350 to 1,360 ft. |
| 1,360 - 1,380 ft | <u>Granite and clay</u> , mottled pale greenish gray to pale brownish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (30%), clear to milky quartz (25%), and milky white to translucent plagioclase feldspar (20%) in clay matrix (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Chips apparently silicified. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Local reddish brown to ochreous orange stains 1,370 to 1,380 ft. Good quality cuttings with 3 to 8 mm chips in clay matrix interpreted as zone of fault gouge. |
| 1,380 - 1,440 ft | <u>Granite</u> , mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 3 to 13 mm chips. |

Figure 2-2
Well HC-5 Lithologic Descriptions
 (Page 2 of 4)

- 1,440 - 1,520 ft Granite and clay, mottled pale greenish gray to pale brownish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (30%), clear to milky quartz (25%), and milky white to translucent plagioclase feldspar (20%) in clay matrix (25%). Lessor (10%) clay matrix 1,460 to 1,500 ft. Some feldspars altered to very fine grained sericite. Some chips apparently silicified. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Good quality cuttings with 3 to 12 mm chips in clay matrix suggest zones of fault gouge, especially 1,440 to 1,460 ft and 1,500 to 1,520 ft
- 1,520 - 1,620 ft Granite, mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 15 mm. Locally some feldspars altered to very fine grained sericite. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 10 mm chips.
- 1,620 - 1,660 ft Granite, mottled greenish grayish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Trace reddish brown to ochreous orange stains on fractures. Includes 30% brownish gray clay 1,650 to 1,660 ft, possible fault gouge zone. Good quality cuttings with 3 to 12 mm chips. Possible fracture zone 1,620 to 1,640 ft
- 1,660 - 1,840 ft Granite, mottled grayish greenish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 1,690 to 1,700 ft and 1,710 to 1,720 ft. Pervasive but slight alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos and along fractures, especially 1,700 to 1,770 ft. Good quality cuttings with 2 to 10 mm chips. Larger chips to 20 mm 1,690 to 1,700 ft and 1,710 to 1,720 ft, possibly indicating fracture zones. Geophysical logs suggest the presence of aplite dikes 1,710 to 1,740 ft.
- 1,840 - 2,020 ft Granite, mottled grayish greenish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of some plagioclase feldspars, especially 1,840 to 1,900 ft; 1,940 to 1,950 ft; and 2,010 to 2,020 ft. Weak, but pervasive alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 20 mm. Includes 20% greenish gray clay 2,010 to 2,020 ft indicating possible zone of fault gouge. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Trace pale yellow to ochreous orange stains along fractures 1,910 to 1,920 ft. Good quality cuttings with 2 to 15 mm chips. Larger chips, (20 to 40 mm) 1,860 to 1,870 ft; 1,880 to 1,900 ft; 1,910 to 1,920 ft; 1,990 to 2,000 ft; and 2,010 to 2,020 ft, possibly indicating fracture zones. Geophysical logs suggest fracture with significant inflow 2,000 to 2,010 ft.
- 2,020 - 2,440 ft Granite, mottled creamy grayish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 2,020 to 2,040 ft; 2,060 to 2,080 ft; and 2,110 to 2,140 ft. Pervasive weak alteration of a small fraction of feldspars to very fine grained sericite throughout interval, sometimes coating fractures. Potassium feldspar phenocrysts to 20 mm. Accessory biotite, as books and aggregates, black to greenish black, local slight alteration to chlorite. Minor accessory magnetite. Good quality cuttings with 2 to 12 mm chips. Larger chips, 20 to 40 mm 2,040 to 2,050 ft; 2,100 to 2,110 ft; 2,200 to 2,210 ft; 2,280 to 2,300 ft; and 2,390 to 2,400 ft, possibly indicating fracture zones.
- 2,440 - 2,620 Granite, mottled grayish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 2,490 to 2,500 ft and 2,560 to 2,570 ft. Local alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black to greenish black, local slight alteration to chlorite. Minor accessory magnetite. Local greenish gray clay component up to 20%, especially 2,490 to 2,500 ft; 2,570 to 2,590 ft; and 2,610 to 2,620 ft. Good quality cuttings with 2 to 8 mm chips. Geophysical logs suggest fracture zone 2,580 to 2,620 ft.

Figure 2-2
Well HC-5 Lithologic Descriptions
 (Page 3 of 4)

- 2,620 - 2,660 ft Granite, grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Weak, but pervasive alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Good quality cuttings with 2 to 8 mm chips.
- 2,660 - 2,730 ft Granite, mottled grayish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 2,690 to 2,700 ft. Local alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Greenish gray clay component up to 80%, possibly fault gouge. Fine cuttings with 2 to 5 mm chips. Geophysical logs suggest interval is a fracture zone.
- 2,730 - 2,950 ft Granite, mottled grayish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 2,780 to 2,790 ft and 2,800 to 2,810 ft. Local alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Good quality cuttings with 2 to 15 mm chips. Larger chips (to 25 mm) 2,820 to 2,840 ft and 2,860 to 2,870 ft, possibly indicating fracture zones. Geophysical logs suggest the presence of a thin aplite dike in the interval 2,800 to 2,810 ft.
- 2,950 - 3,150 ft Granite, mottled grayish white to grayish greenish white to grayish yellowish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of some plagioclase feldspars, especially 2,950 to 2,970 ft, 3,000 to 3,010 ft, and 3,140 to 3,150 ft. Weak, but pervasive alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 12m. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Pale yellow stains along fractures 3,020 to 3,070 ft. Good quality cuttings with 2 to 6 mm chips. Larger chips (to 20 mm) 2,980 to 2,990 ft, possibly indicating fracture zone. Geophysical logs suggest fracture with significant inflow at approximately 2,990 ft.
- 3,150 - 3,420 ft Granite, mottled grayish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 3,200 to 3,210 ft and 3,400 to 3,410 ft. Local alteration of a small fraction of feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Good quality cuttings with 2 to 8 mm chips. Larger chips to 15 mm 3,200 to 3,210 ft and 3,270 to 3,280 ft.
- 3,420 - 3,565 ft Granite, mottled grayish white to grayish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars, especially 3,440 to 3,450 ft; 3,500 to 3,510 ft; and 3,540 to 3,560 ft. Local alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 15 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Greenish gray clay component 3,420 to 3,430 ft and 3,500 to 3,510 ft, possibly fault gouge. Good quality cuttings with 3 to 12 mm chips, larger cuttings to 15 mm 3,440 to 3,450 ft and 3,480 to 3,490 ft, possibly indicating fracture zones.

Figure 2-2
Well HC-5 Lithologic Descriptions
(Page 4 of 4)

| Fractured Intervals (ft bgs) | Clay-rich Intervals (ft bgs) | Aplite Dike Intervals (ft bgs) | Fluid Inflow Intervals (ft bgs) |
|---------------------------------|---------------------------------|-----------------------------------|------------------------------------|
| 260 to 270 | 1,120 to 1,200 | 830 to 840 | 2,000 to 2,010 |
| 320 to 330 | 1,360 to 1,380 | 1,710 to 1,740 | 2,990 |
| 370 to 380 | 1,440 to 1,460 | 2,800 to 2,810 | |
| 830 to 840 | 1,500 to 1,520 | | |
| 850 to 860 | 1,650 to 1,660 | | |
| 900 to 910 | 3,420 to 3,430 | | |
| 1,020 to 1,120 | 3,500 to 3,510 | | |
| 1,350 to 1,360 | | | |
| 1,620 to 1,640 | | | |
| 1,690 to 1,700 | | | |
| 1,710 to 1,720 | | | |
| 1,860 to 1,870 | | | |
| 1,880 to 1,900 | | | |
| 1,910 to 1,920 | | | |
| 1,990 to 2,000 | | | |
| 2,010 to 2,020 | | | |
| 2,040 to 2,050 | | | |
| 2,100 to 2,110 | | | |
| 2,200 to 2,210 | | | |
| 2,280 to 2,300 | | | |
| 2,390 to 2,400 | | | |
| 2,580 to 2,620 | | | |
| 2,660 to 2,730 | | | |
| 2,820 to 2,840 | | | |
| 2,860 to 2,870 | | | |
| 3,200 to 3,210 | | | |
| 3,270 to 3,280 | | | |
| 3,440 to 3,450 | | | |
| 3,480 to 3,490 | | | |

Figure 2-3
Summary of Well HC-5 Geologic Features

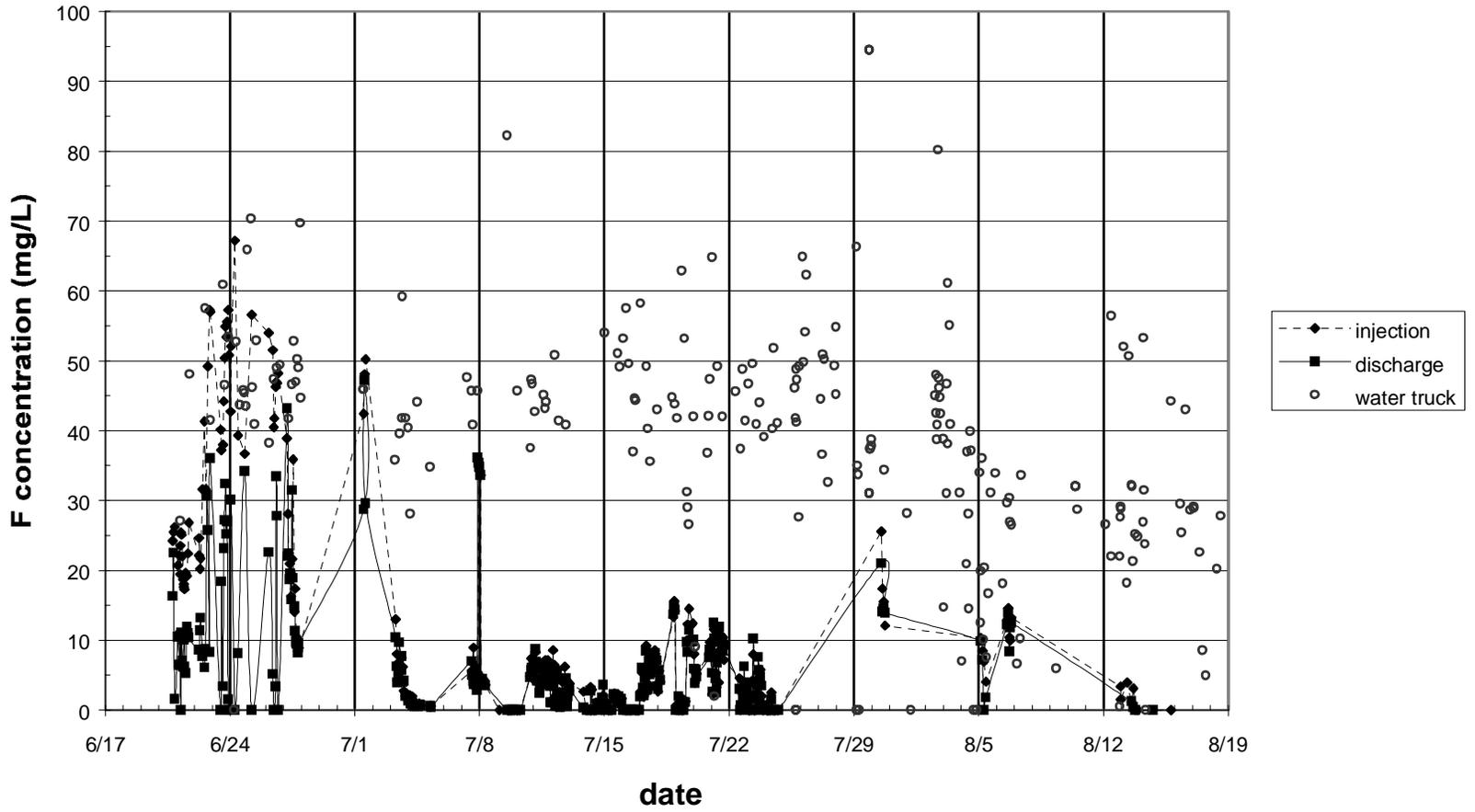


Figure 2-4
Well HC-5 Fluoride Concentrations During Drilling

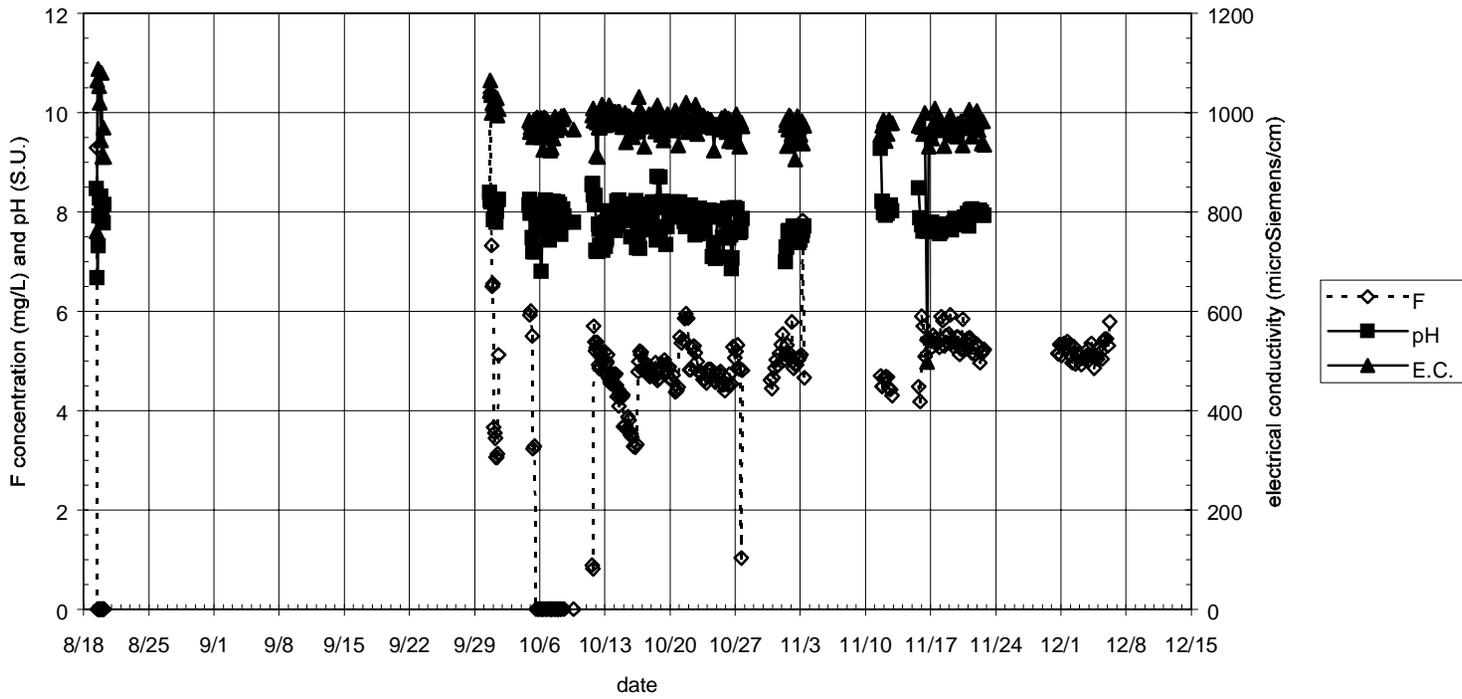


Figure 2-5
Well HC-5 Well Development Parameters

2.3 Well HC-5 Geophysical Surveys

Collection of main body of downhole geophysical data was implemented in two phases by Colog. Data was collected from surface to a depth of approximately 1,200 ft in the 17 1/2-in. diameter borehole during the first phase. Data was collected from a depth of approximately 1,200 ft to the total depth of 3,565 ft in the 12 1/4-in. diameter borehole during the second phase. Considerable difficulty was experienced during the second phase of data collection due to unstable hole conditions. Downhole geophysical data was collected from the completed well in a third phase of data collection. Additional video, caliper, geochemical, thermal flow meter, borehole radar, and water level data were collected by DRI and DRI/PRG at various points, as required to achieve the scientific goals of the project.

Upon completion of drilling to a depth of 1,200 ft, the first phase of downhole geophysical data collection was conducted on June 28, 1999. This phase consisted of the collection of an abbreviated suite of data prior to the installation of the intermediate casing string. The second phase of downhole geophysical data collection occurred between August 7 and 14, 1999, after the borehole had reached the total depth of 3,565 ft. The second phase of data collection was complicated by unstable borehole conditions which resulted in staged data collection in both the open borehole and through the open-faced drill string (i.e., drill pipe without drilling tools, such as collars or bit). The data collection process was repeatedly interrupted by the necessity to clear bridges (sloughed material) from the borehole.

A deviation survey, conducted in the open borehole, indicated the bottom of the borehole had deviated 4.1 degrees from vertical in a west-southwest direction. The deviation of the borehole placed the bottom of the borehole a distance of 144.66 ft at an azimuth of 243 degrees from the collar and resulted in a true vertical depth of 3,566.04 ft bgs.

Table A-14 (Appendix A) provides a summary of the geophysical data collected from the borehole. Figures 2-6 to 2-8 provide condensed illustrations of the geophysical traces for Well HC-5.

2.4 Well HC-5 Radiological Monitoring

Monitoring of discharge effluent from drilling, well development, and testing was conducted as specified in the *Project Shoal Site-Specific Health and Safety Plan (SSHASP)* (DOE/NV, 1999c), *Fluid Management Plan (FMP) for the Project Shoal Area Off-Sites Project* (DOE/NV, 1999b), and *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT, 1999). Regular on-site radiological monitoring of discharged effluents, both fluid and solid, was conducted by ITLV personnel.

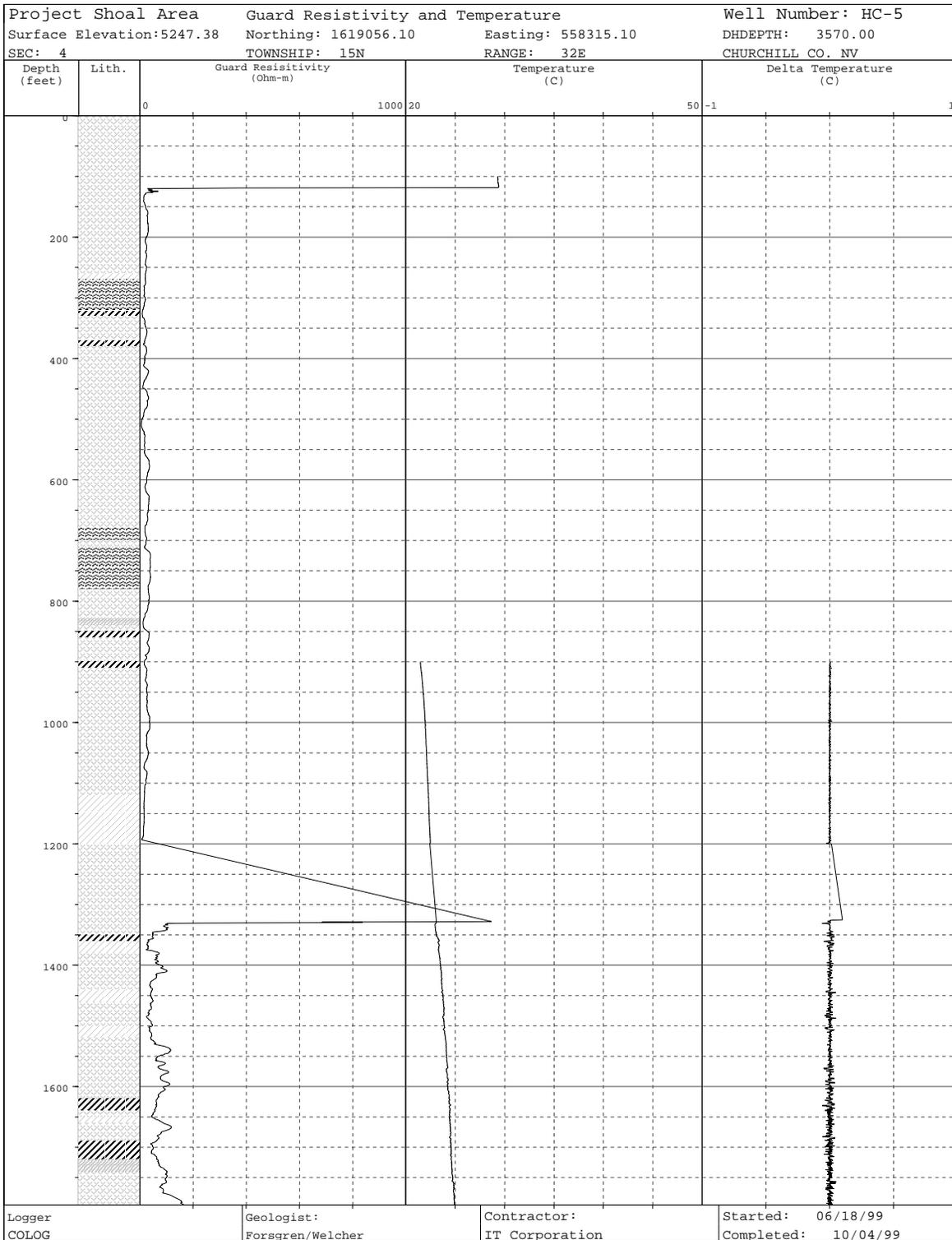


Figure 2-6
Well HC-5 Traces of Temperature and Resistivity Data
 (Page 1 of 2)

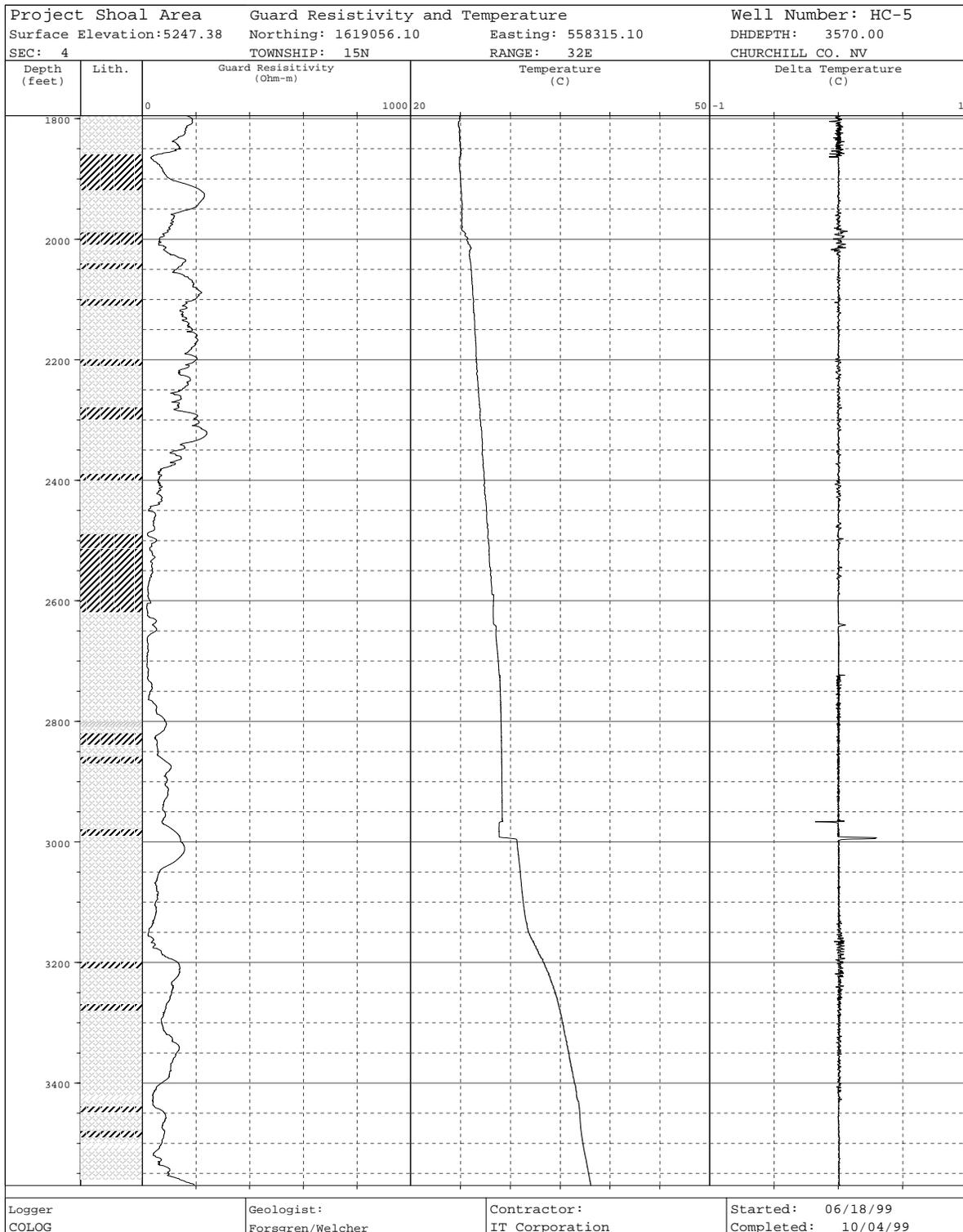


Figure 2-6
Well HC-5 Traces of Temperature and Resistivity Data
(Page 2 of 2)

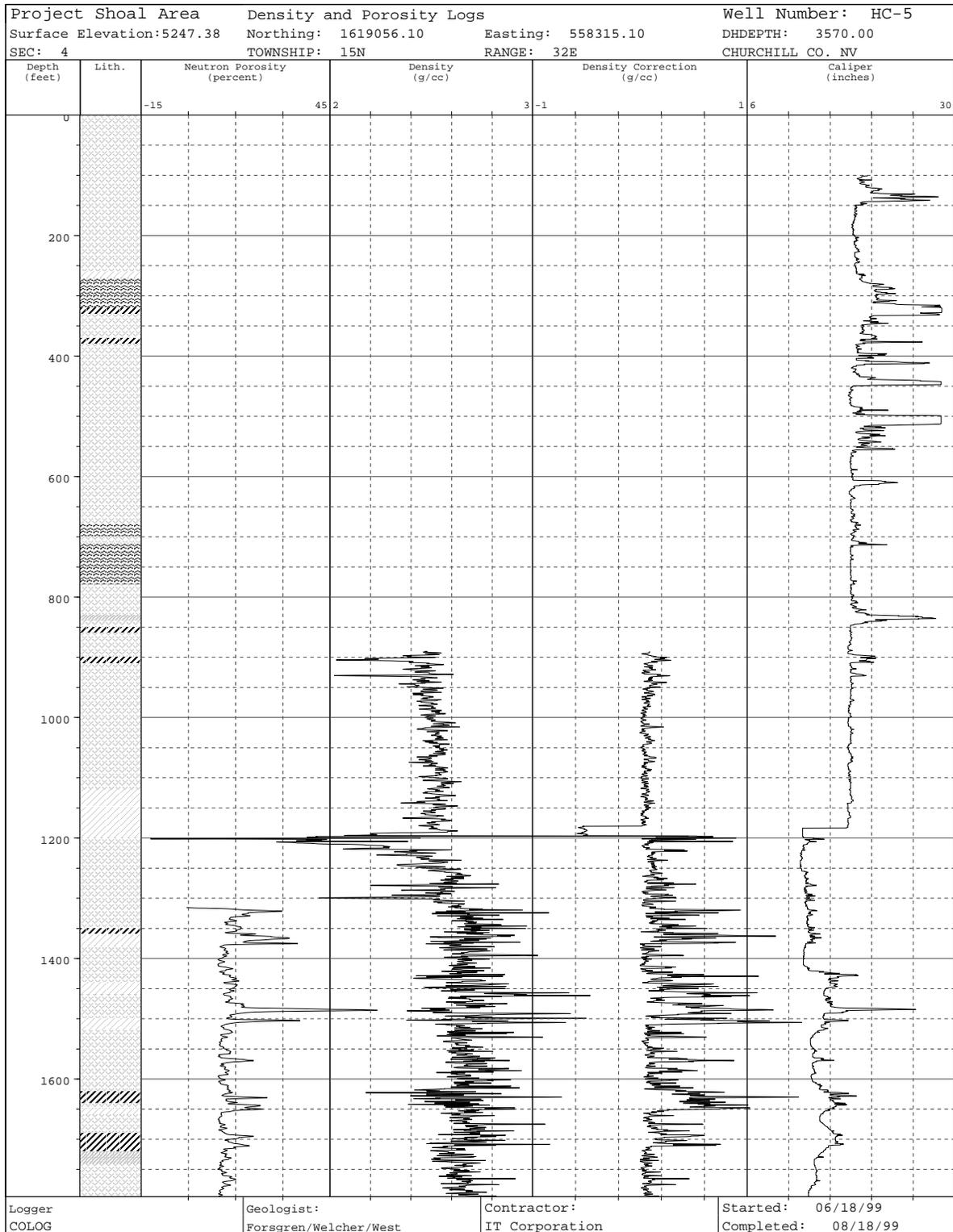


Figure 2-7
Well HC-5 Traces of Density, Porosity, and Caliper Data
 (Page 1 of 2)

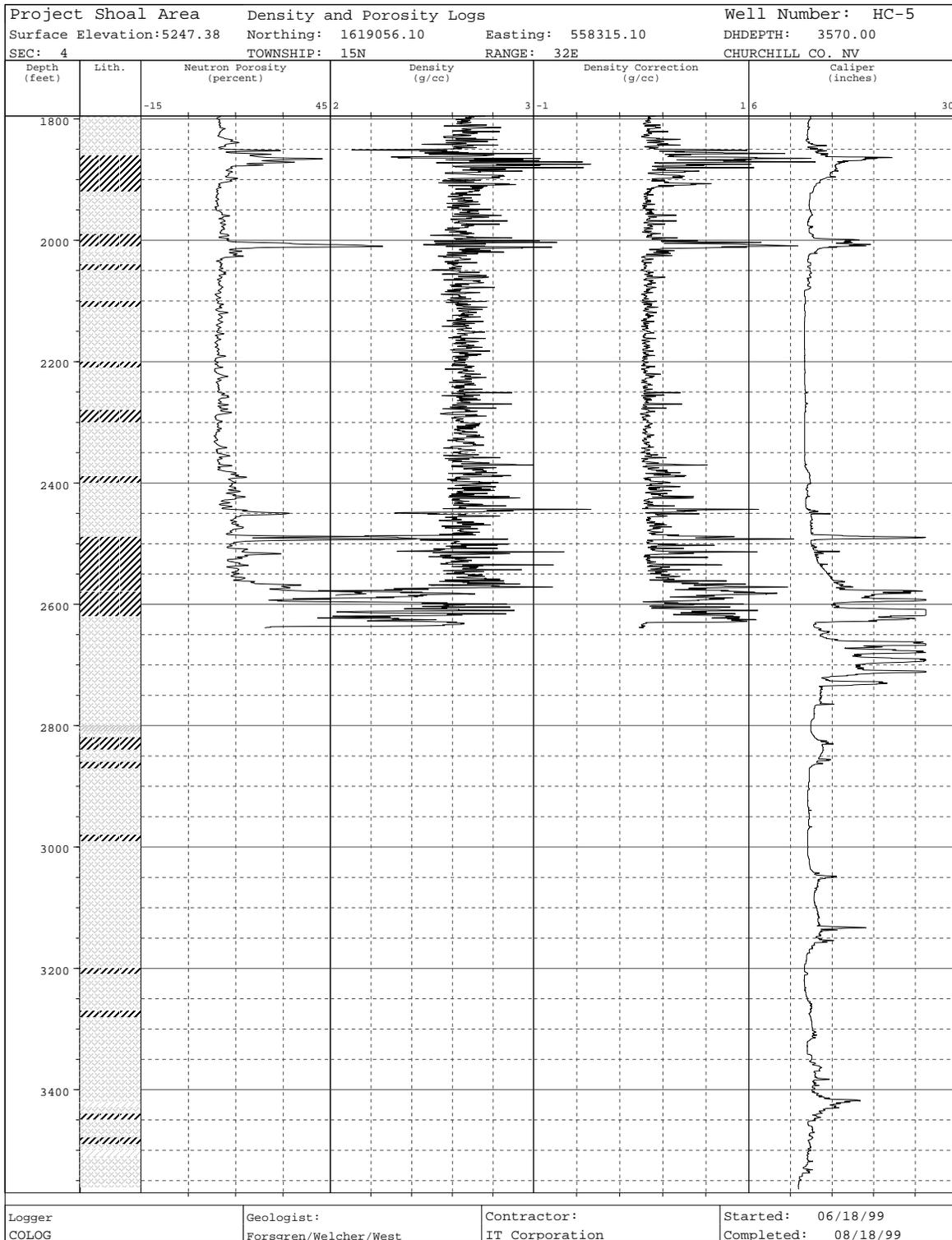


Figure 2-7
Well HC-5 Traces of Density, Porosity, and Caliper Data
(Page 2 of 2)

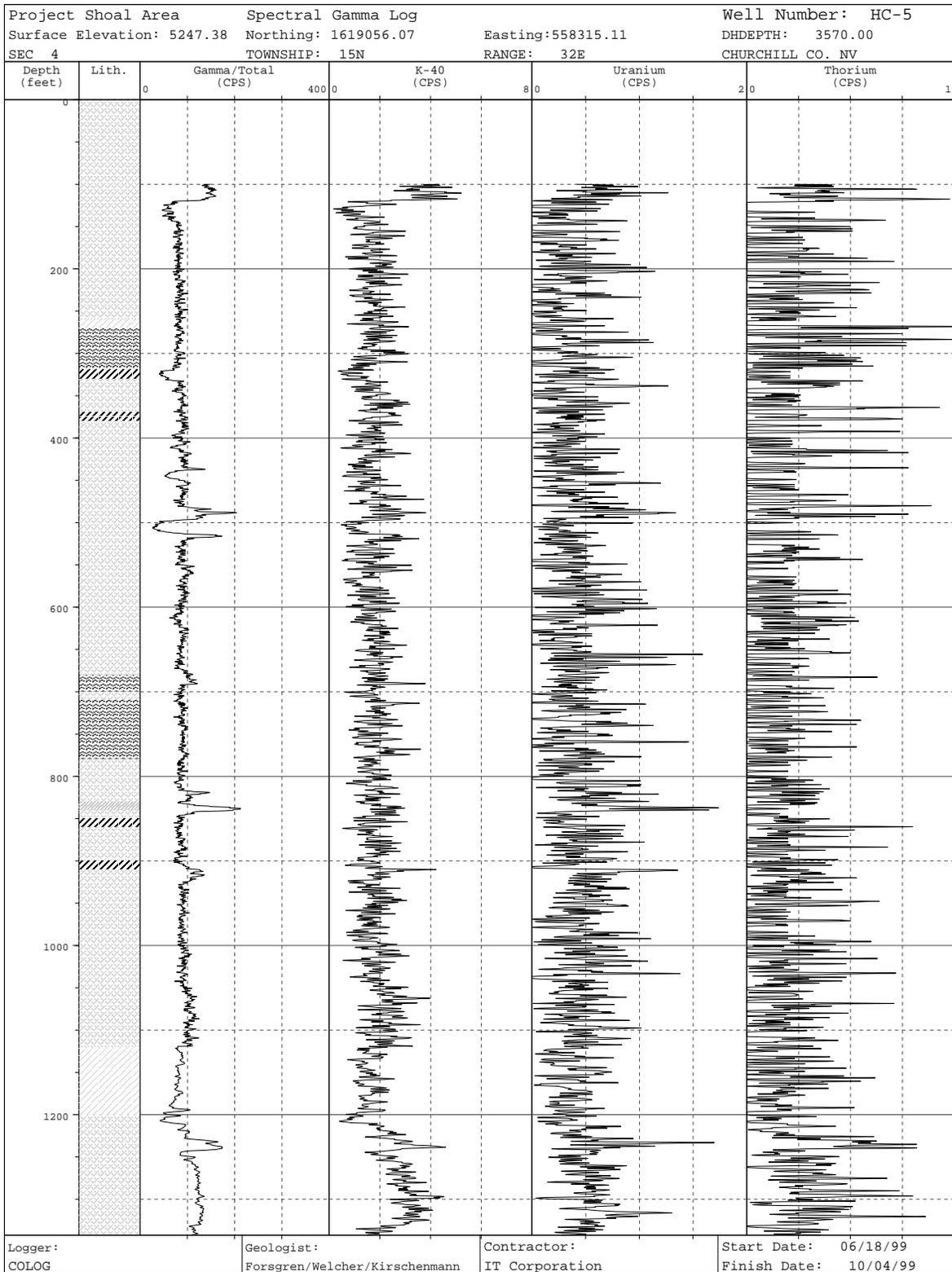


Figure 2-8
Well HC-5 Traces of Spectral Gamma Data
(Page 1 of 3)

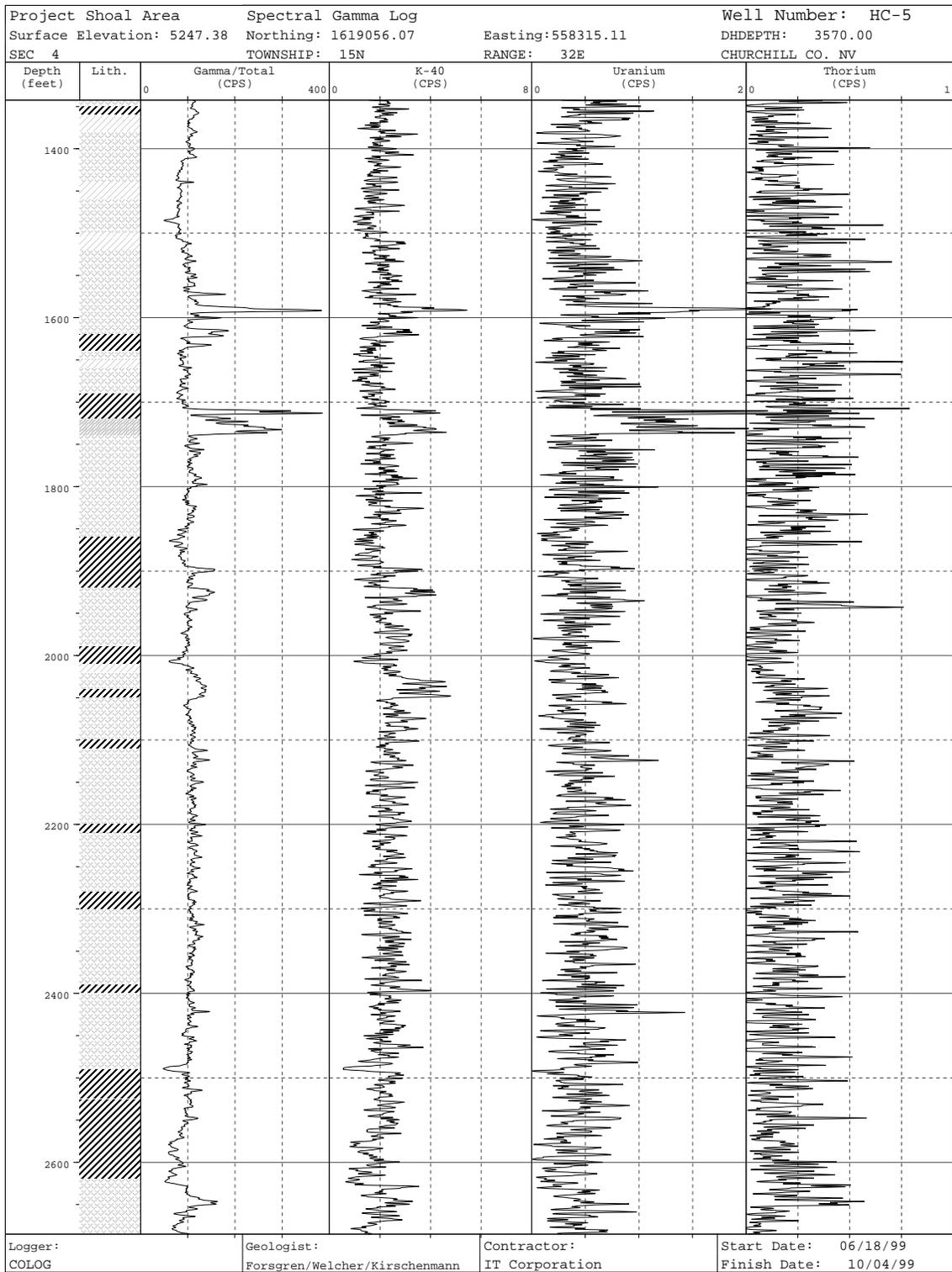


Figure 2-8
Well HC-5 Traces of Spectral Gamma Data
(Page 2 of 3)

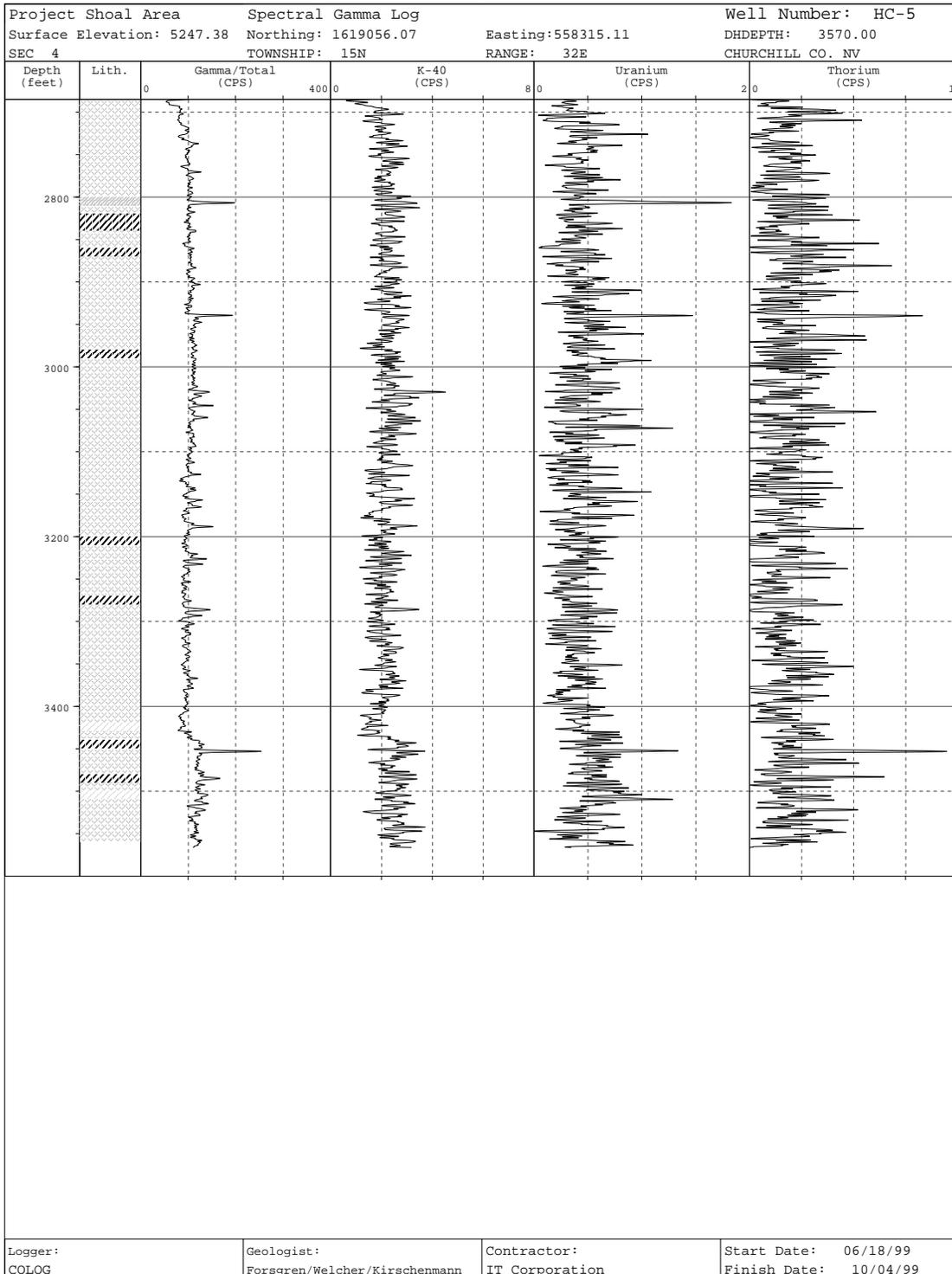


Figure 2-8
Well HC-5 Traces of Spectral Gamma Data
(Page 3 of 3)

Fluid samples for tritium analysis were collected from each water truck load used to drill the well, from drilling fluids immediately prior to circulation into the borehole (injection fluids) and immediately upon discharge to the surface (discharge fluids) on two-hour intervals during drilling beginning approximately 100 ft above the predicted water table, and from discharge fluids on two- to four-hour intervals during well development and testing. The samples were analyzed for tritium using on-site laboratory monitoring equipment. Tritium activities of fluids were recorded using a Packard Liquid Scintillation Counter®.

Solid effluent samples (drill cuttings) were collected on approximately 20- to 140-ft intervals and allowed to dry prior to recording the alpha and beta activity measurements using a portable survey instrument, a NE Technology Electra®.

Tritium activities of fluid effluents during drilling are shown on [Figure 2-9](#). [Table A-15 \(Appendix A\)](#) presents the data used for [Figure 2-9](#). Tritium activities of fluid effluents during airlifting and development/test pumping are shown on [Figure 2-10](#). [Tables A-3 through A-11 \(Appendix A\)](#) present the data used for [Figure 2-10](#). Alpha and beta activity measurements of drill cuttings are shown on [Table A-16 \(Appendix A\)](#).

Based on field screening and on-site laboratory analyses, Well HC-5 effluents were found to have natural background alpha and beta activity measurements, and natural background tritium activities.

2.5 Well HC-5 Well Construction

All drilling equipment was decontaminated at the Lang Exploratory Drilling (Lang) yard prior to mobilization to PSA, using a combination of stream cleaning and high pressure washing. Additional decontamination prior to the movement of the equipment to the HC-5 location consisted of on-site pressure washing to remove potential contamination incurred during transport to PSA.

Drilling of HC-5 commenced on June 18, 1999. A 24-in. diameter hole was drilled to a depth of 100 ft bgs using a tricone bit and conventional, mud-rotary drilling techniques with bentonite and water as the drilling fluid. A 20-in. diameter surface casing was installed to a depth of 100 ft bgs and cemented in place using Type II neat cement with an additive of 2 percent calcium chloride.

Between June 20 and 27, 1999, a nominal 17 3/4-in. diameter hole was drilled to a depth of 1,200 ft for the intermediate casing string. A combination of the air, RC method with either a downhole percussion hammer bit or tricone bit and the flooded, RC method with a tricone bit was used to advance the borehole. Approximately 10 gpm of drilling fluid, consisting of water, EZ Mud® (a liquid polymer) and Quik Foam®

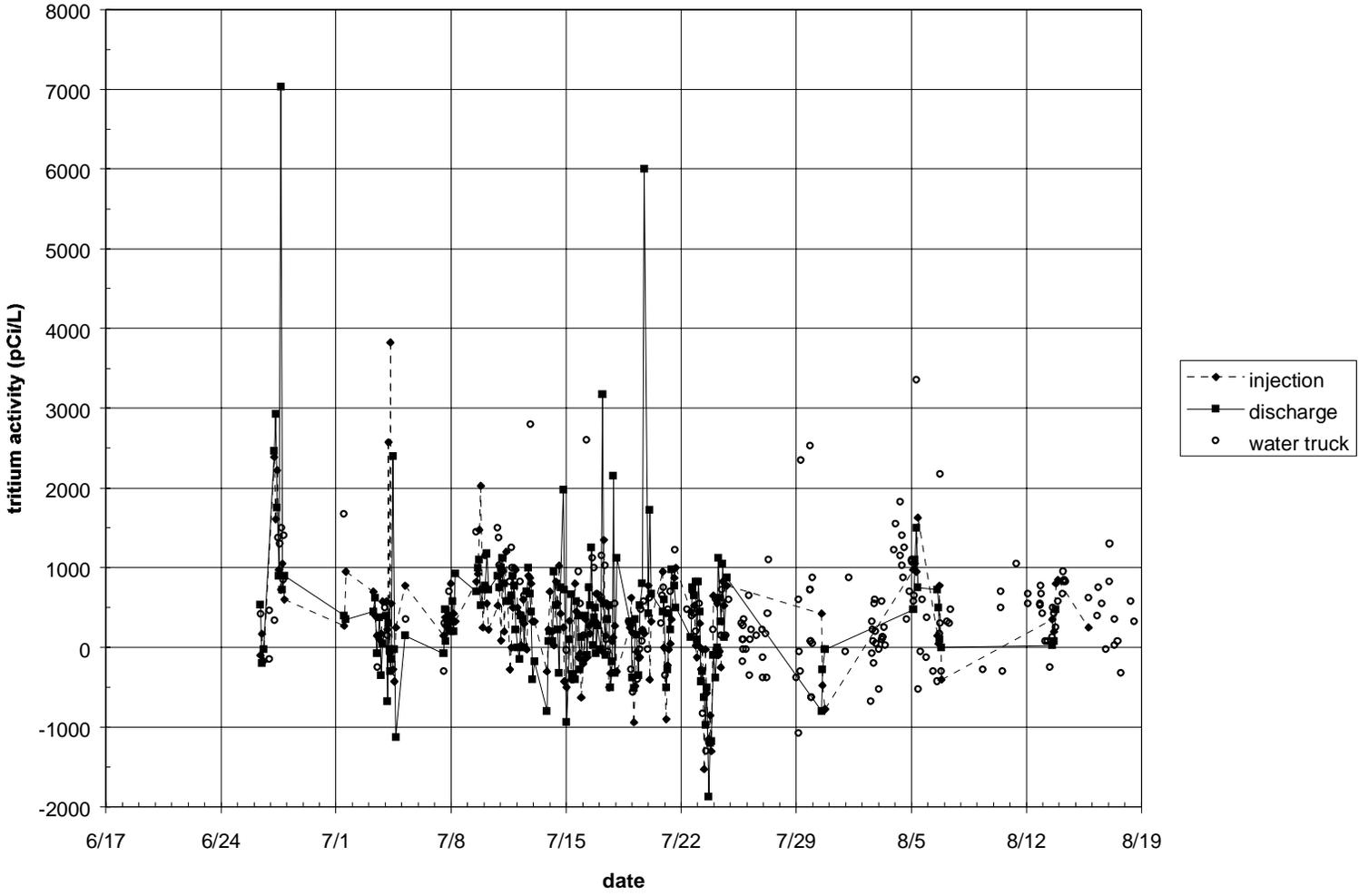


Figure 2-9
Well HC-5 Tritium Activities During Drilling

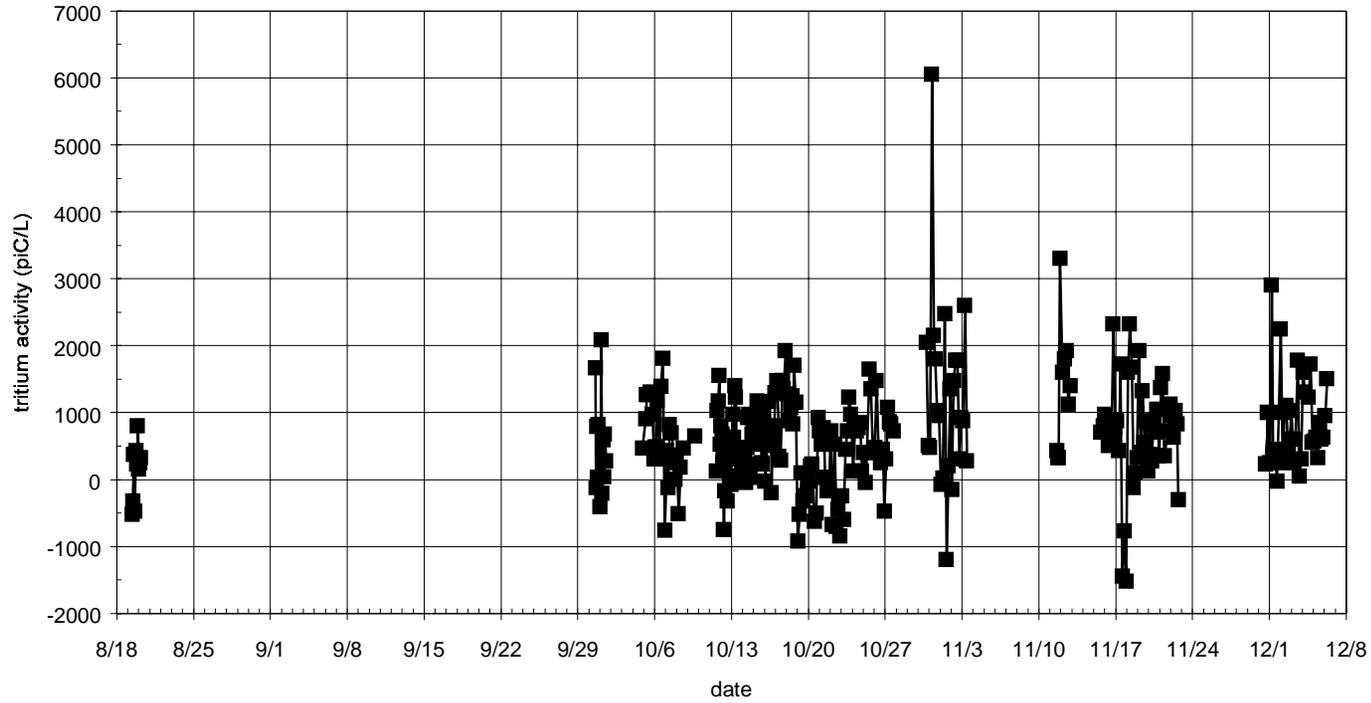


Figure 2-10
Well HC-5 Tritium Activities During Development/Testing

(a foaming agent) was injected during air, RC drilling to facilitate cuttings return. Bentonite-based drilling fluid with the addition of Drispac® (a powdered polymer) was circulated during flooded, RC drilling to a depth of 1,200 ft.

The intermediate casing string, consisting of threaded and coupled, 13 3/8-in. diameter mild steel casing, was installed to a depth of 1,200 ft and grouted in place with Type II neat cement on June 30, 1999. The grout was installed from 1,200 ft to surface by pumping through a tremie pipe.

A nominal 12 1/4-in. diameter hole was advanced to a total depth of 3,565 ft between July 1 and August 6, 1999. Air, RC techniques with a downhole percussion hammer were used to a depth of 1,295 ft and flooded, RC techniques and a tricone bit were used below 1,295 ft. Both methods employed polymer-based drilling fluids (water, Drispac®, and EZ Mud®). [Table A-17 \(Appendix A\)](#) shows the drilling fluid additives used, listed by activity, for the drilling and installation of Well HC-5.

Drilling progress was hampered by mechanical problems and borehole stability problems. Drill string failure resulted in two episodes of parting the drill string and fishing out the bottom portion of the string. Air compressor and air pressure problems resulted in several episodes of tripping out the drill string and tripping it back in to identify or correct the problems and numerous instances of plugging the bit or bottom hole assembly with drill cuttings. Borehole stability problems resulted in numerous episodes of drilling fill and/or bridges from the borehole beginning July 18, 1999, when 90 ft of fill was encountered after changing a bit at a depth of 2,803 ft. Unstable borehole conditions persisted through the completion of drilling the borehole to its total depth of 3,565 ft and continued through the second phase of downhole geophysical data collection, as discussed in [Section 2.3](#).

Stability problems resulted in cementing off the formation from depths of 1,050 to 1,230 ft, and then re-drilling this interval using conventional, mud-rotary methods. These problems also hampered the second phase of downhole geophysical data collection, due to numerous bridges which had to be repeatedly cleared from the borehole. Ultimately, borehole stability problems resulted in completing the borehole to a depth of 3,565 ft instead of the originally proposed depth of 4,050 ft.

[Table A-1 \(Appendix A\)](#) and [Figure 2-1](#) provide additional details of the chronology and progress of drilling activities, respectively. [Figure 2-11](#) presents a summary of Well HC-5 drilling parameters.

Upon completion of the drilling on August 6, 1999, drilling fluid was circulated from total depth for approximately one hour to clear drill cuttings from the borehole. Collection of downhole geophysical data began immediately upon removal of the drill string from the borehole.

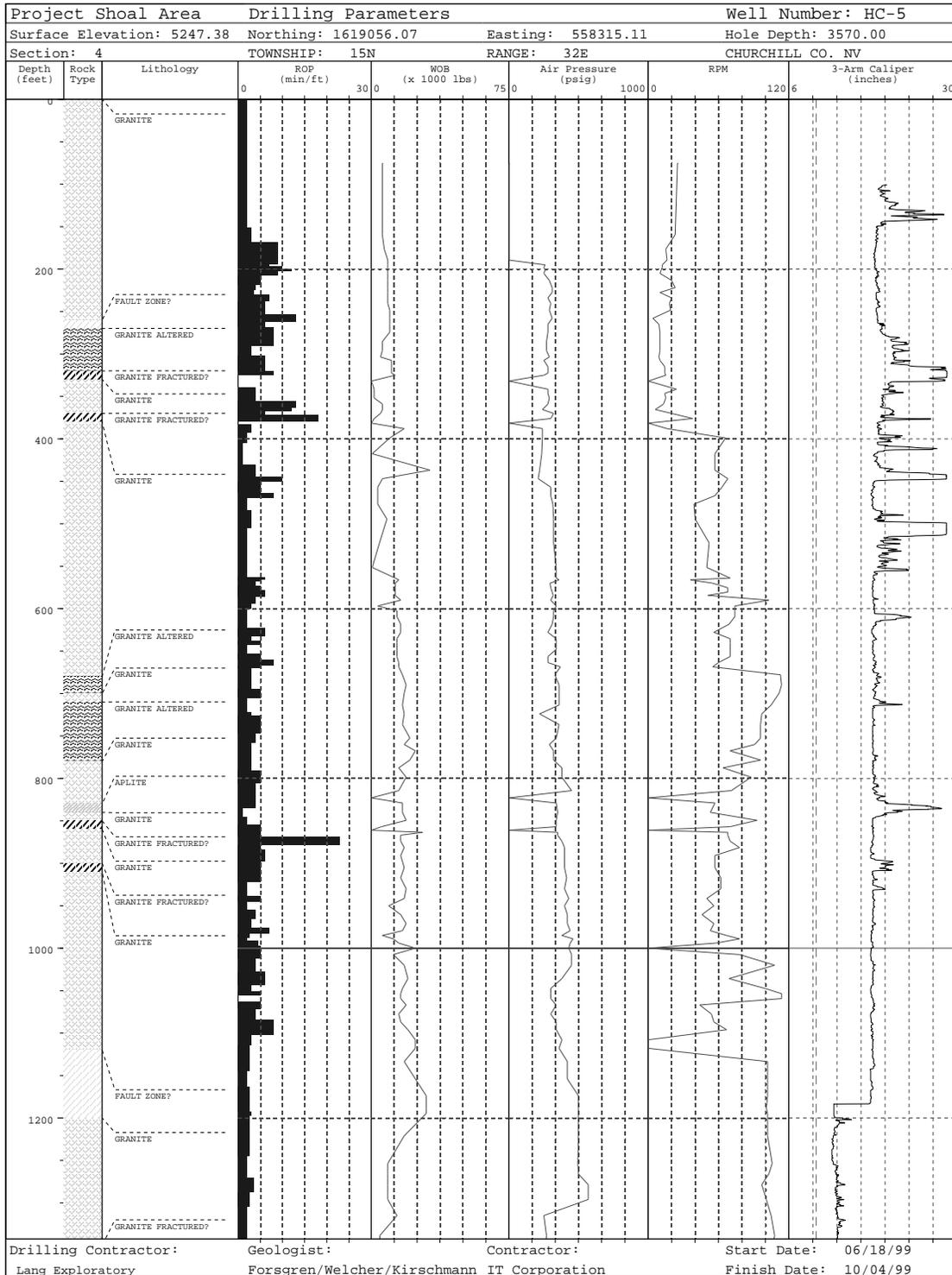


Figure 2-11
Well HC-3 Summary of Drilling Parameters
(Page 1 of 3)

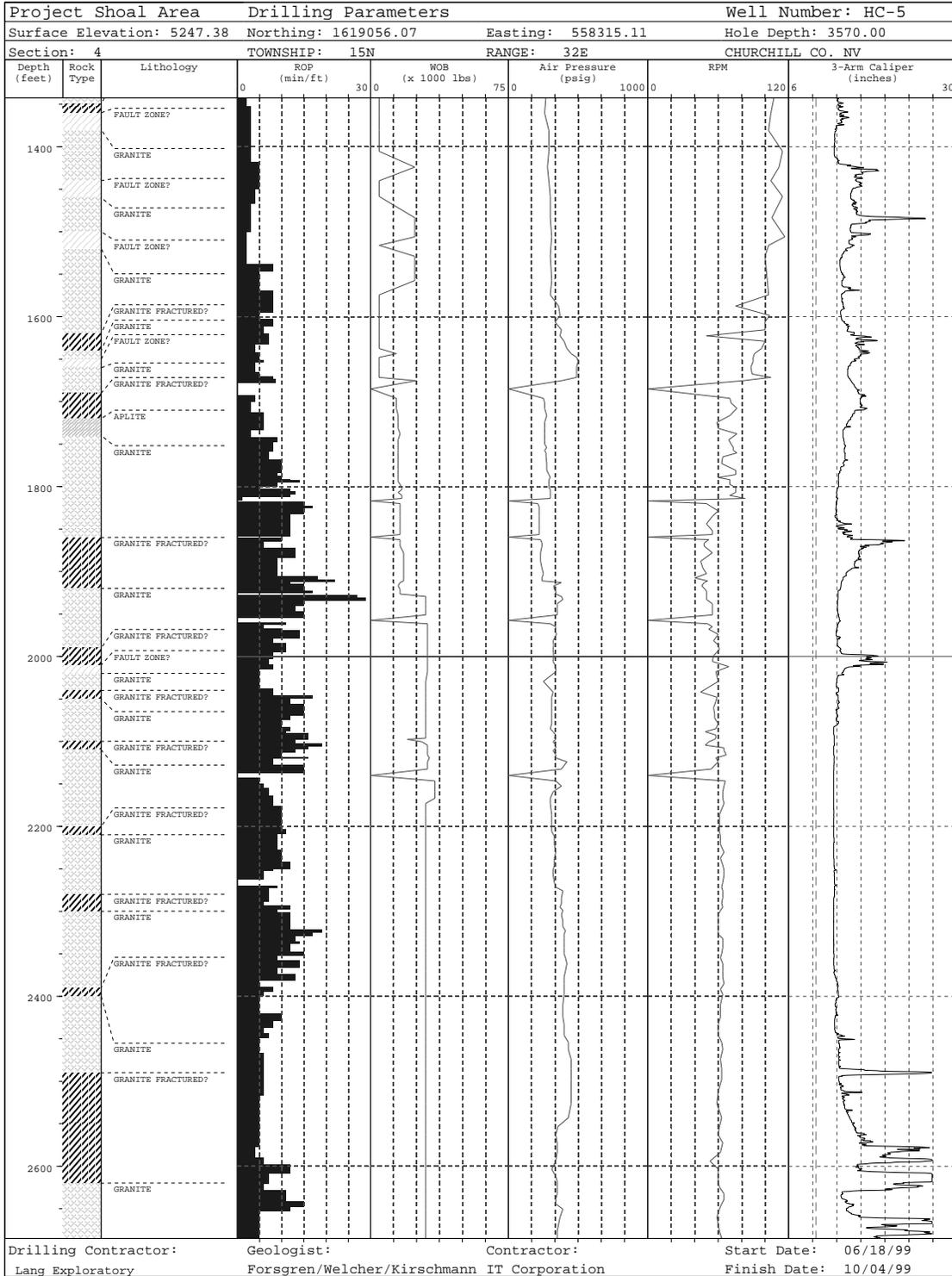


Figure 2-11
Well HC-3 Summary of Drilling Parameters
(Page 2 of 3)

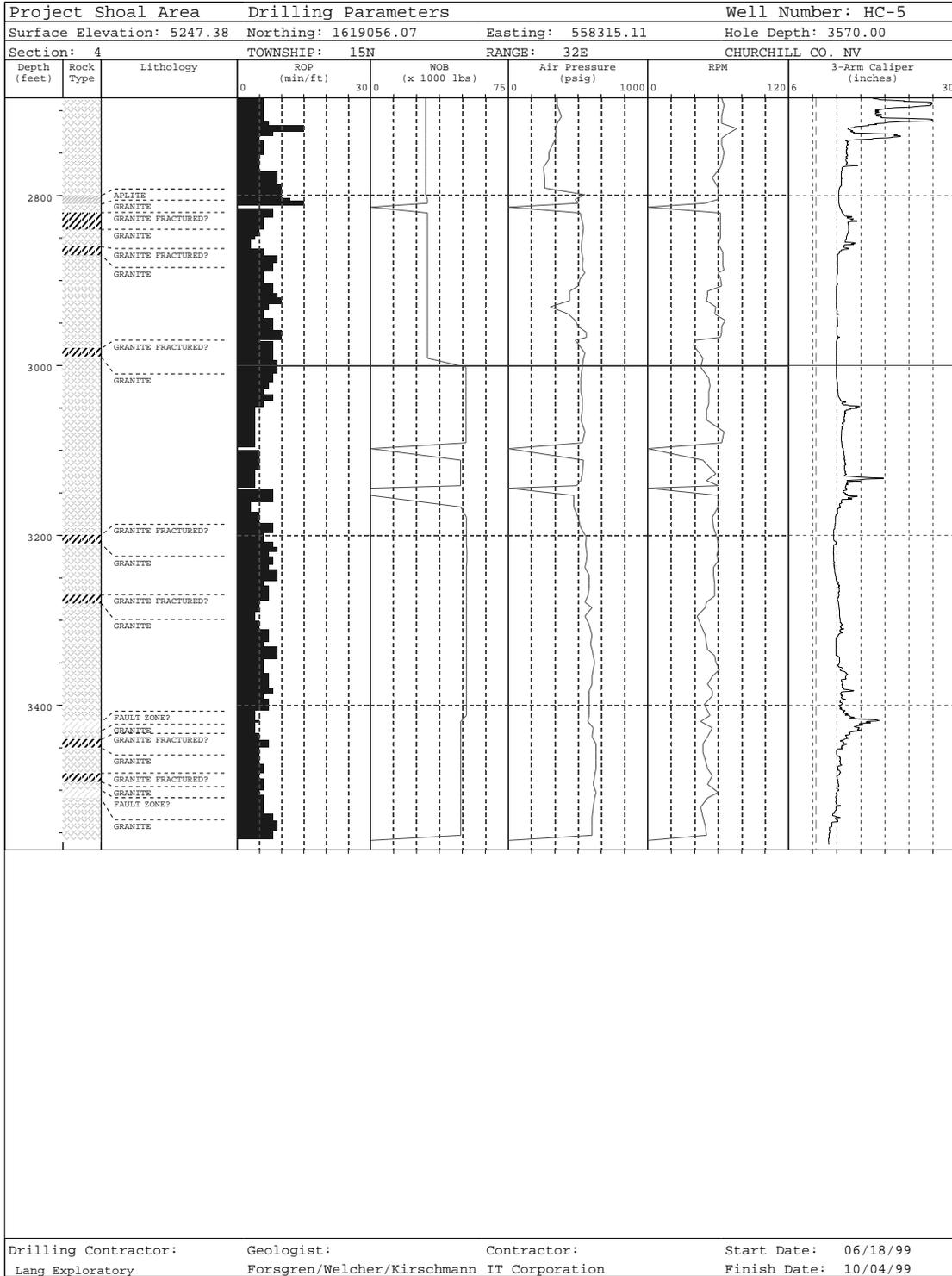


Figure 2-11
Well HC-3 Summary of Drilling Parameters
(Page 3 of 3)

Unstable borehole conditions hampered the collection of downhole geophysical data, as discussed in [Section 2.3](#). Collection of downhole geophysical data was completed on August 15, 1999.

Installation of the 5 1/2-in. outside diameter (OD) well casing to a depth of 3,560.76 ft bgs was completed on August 16, 1999. Blank, mild-steel well casing extends from the surface to a depth of 879.03 ft, fiberglass well casing extends from 879.03 to 3,560.76 ft. The fiberglass casing is slotted from 3,385.03 to 3,530.63 ft bgs with 0.040-in. saw-cut slots. The well casing was landed in suspension from a landing plate mounted on the surface casing.

Centralizers were placed on the 5 1/2-in. casing string at depths of approximately 3,006 ft bgs, 3,065 ft bgs, and 3,152 ft bgs. The filter pack consists of 3/8-in. diameter gravel from the total depth of 3,565 ft to 3,335 ft bgs, 6/9 sand from 3,335 to 3,310 ft bgs, and 20/40 sand from 3,310 to 3,295.5 ft bgs. The filter pack materials were installed via tremie pipe while circulating water through the tremie pipe.

The sanitary seal was installed via tremie from the surface to a depth of 3,295.5 ft bgs in six lifts from August 17 to 18, 1999. The first lift consisted of neat cement with the addition of 2 percent calcium chloride and was mixed on site by Lang. Neat cement for the last five lifts was provided by a commercial subcontractor to Lang. [Table 1-1](#) lists the well construction details, while [Figure 2-12](#) illustrates the final subsurface well completion, and [Figure 2-13](#) presents the final surface completion of Well HC-5.

2.6 Well HC-5 Well Development and Testing

Initial well development consisted of approximately twenty-two hours of conventional airlifting the completed well August 19 and 20, 1999. A total of 18,785 gallons of fluid were removed from the well by conventional airlift techniques. Fluoride concentrations, tritium activities, and the field parameters of temperature, electrical conductivity, and pH were monitored on two-hour intervals throughout the duration of conventional airlift development. [Table A-3](#) ([Appendix A](#)) lists the development parameters during conventional airlifting.

A second phase of airlift development occurred September 30 through October 1, 1999. A total of 10,233 gallons of fluid were removed in approximately 21 hours. An eductor pipe was used in conjunction with the airline to allow removal of accumulated sediment from the bottom of the wellbore by reverse circulation. Fluoride concentrations, tritium activities, and the field parameters of temperature, electrical conductivity, and pH were monitored on two-hour intervals throughout

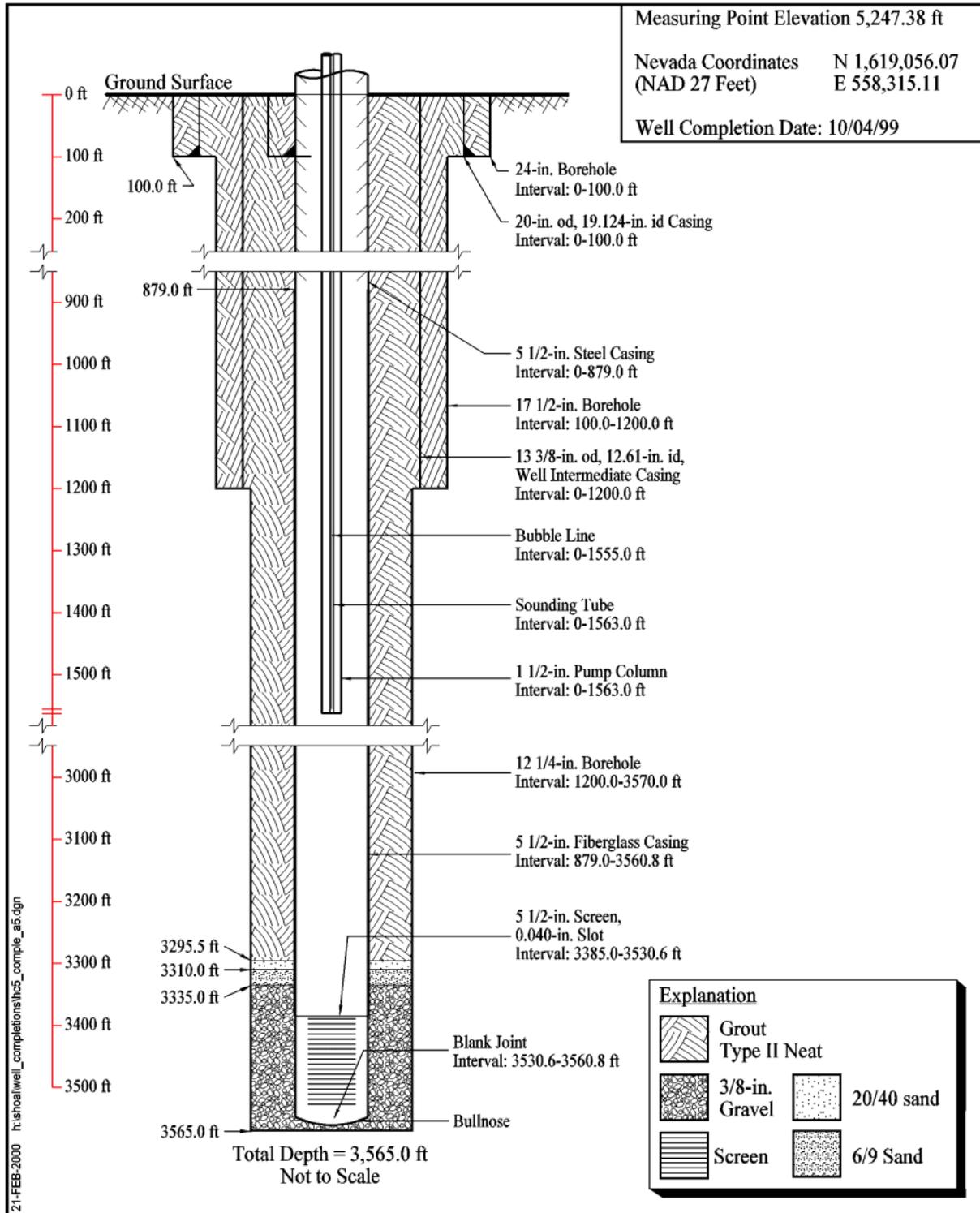


Figure 2-12
 HC-5 Well Completion Diagram

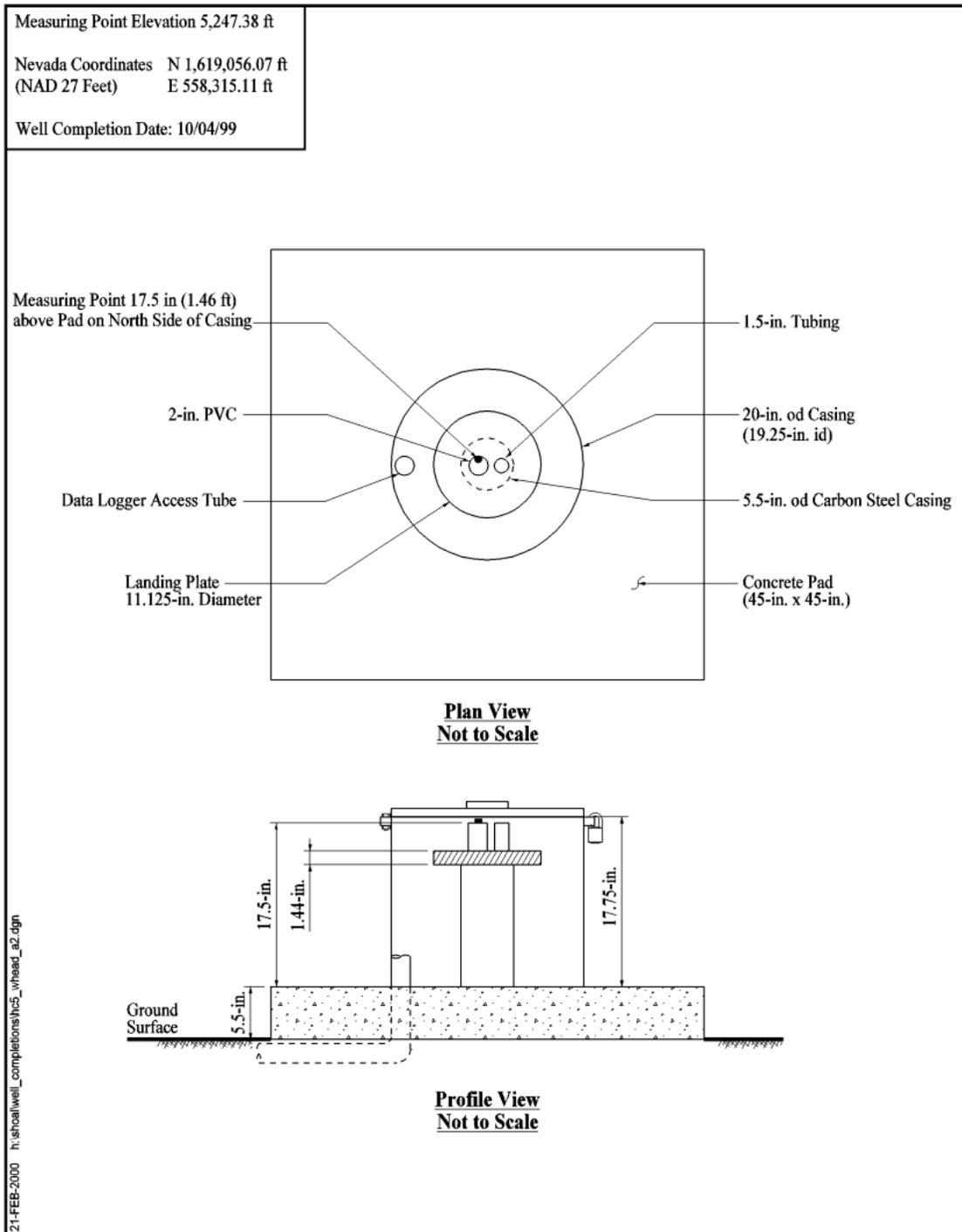


Figure 2-13
Well Head Completion Diagram for Well HC-5

the duration of eductor airlifting. [Table A-4 \(Appendix A\)](#) lists the development parameters during eductor airlifting.

A submersible pump was permanently installed to a depth of 1,570 ft on October 4, 1999. A 1 1/2-in. diameter, Schedule 40, polyvinyl chloride (PVC) sounding tube was strapped to the pump column and extended from the surface to 1,563 ft bgs. A 1/4-in. diameter, stainless-steel, airline was also strapped to the pump column and extended from the surface to a depth of 1,555 ft.

The first of six phases of development/test pumping occurred from October 4 to 8, 1999. The well was continuously pumped for approximately 93 hours and a total of 31,321 gallons of fluid removed. Fluoride concentration and tritium activity data were collected on two- to four-hour intervals. Field parameters of temperature, electrical conductivity, and pH were collected on two- to four-hour intervals. [Table A-5 \(Appendix A\)](#) presents the development parameters during this phase of development/test pumping.

Additional miscellaneous development/test pumping was conducted October 9 and 10, 1999. This miscellaneous development/test pumping was conducted for approximately seven hours with a total of 1,254 gallons of fluid removed from the well. [Table A-6 \(Appendix A\)](#) lists the development parameters for this miscellaneous development/test pumping.

Phases II through VI of development/test pumping occurred from October 11 through December 6, 1999, when ITLV suspended field operations. The DRI continued to develop/test pump Well HC-5 after December 6, 1999. Pumping occurred for a total of approximately 35 days and resulted in the discharge of approximately 265,000 gallons of fluid at an average discharge rate of approximately 5.5 gpm through December 6, 1999. Field water quality parameters of temperature, pH, and electrical conductivity, as well as, fluoride concentrations and tritium activities in the discharge fluids were monitored by ITLV through December 6, 1999. Initially, the field parameters were monitored on two-hour intervals and fluoride concentrations and tritium activities were monitored on two- to four-hour intervals. The DRI relaxed the field parameter collection requirement to four-hour intervals midway through the Phase II development/test pumping. [Tables A-7 through A-11 \(Appendix A\)](#) present the development parameters for these phases of development/test pumping.

Electrical conductivities of the discharge fluids ranged between approximately 900 and 1,100 microSiemens/centimeter (cm) and remained stable throughout the last phase of pumping. The pH values ranged between approximately 6.5 and 9.0 standard units (S.U.) and showed a slightly increasing trend throughout the last phase of pumping. Fluoride concentrations in discharge fluids ranged from

approximately 0 to 10 mg/L and showed a slightly increasing trend between 5 and 6 mg/L throughout the last phase of pumping.

Figure 2-4 shows the trends of the development parameters through both airlifting and development/test pumping. Figure 2-9 shows the tritium activities of the discharge fluid during airlifting and pumping. Table A-12 (Appendix A) presents the water balance data.

2.7 Well HC-5 Sampling

Samples of discharge effluent temporarily stored in lined sumps were collected as specified in the *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT, 1999) and *Fluid Management Plan for the Project Shoal Area Off-Sites Project* (DOE/NV, 1999b) for characterization prior to discharge/ disposal. The analytical results from these samples are shown in Table A-18 (Appendix A).

3.0 Well HC-6 Summary of Operations

Well HC-6 was proposed and completed as the upgradient well of the tracer test well pair. However, hydrogeologic data observed during the drilling of Well HC-8 (originally proposed as the downgradient well of the tracer test well pair) suggested that the original location of Well HC-6 (the upgradient well of the tracer test pair) would result in the tracer test wells being installed in two distinct structural blocks with different hydrologic characteristics.

For this and other reasons, Well HC-8 was completed as the intermediate depth well and Wells HC-6 and HC-7 were designated as the tracer test well pair. Wells HC-6 and HC-7 were installed in an area thought to be a single hydrologic compartment free of structural complications. Well HC-6 was installed approximately 100 ft west-northwest of Well HC-7 as the upgradient or injection well for the two well tracer test (see [Section 1.4](#)). [Figure 1-3](#) shows the proposed and actual location of Well HC-6. The tracer test wells were proposed as water table wells (DRI, 1999). This was the third well installed during 1999.

Well HC-6 was drilled to a total depth of 1,240 ft bgs beginning September 24, 1999. The well casing was installed to a total depth of 1,233.7 ft bgs with the filter-packed, slotted interval from 1,115.98 to 1,232.3 ft bgs. Well construction details are provided on [Table 1-1](#). Completion of the well occurred October 1, 1999, when the sanitary grout seal was installed. A total of eight days was spent drilling and constructing this well. [Figure 3-1](#) presents the drilling progress of Well HC-6.

Open borehole well development, consisting of RC airlifting, occurred September 28 and 29, 1999. Pump development and aquifer testing occurred October 2 through 4, 1999. All fluid used to drill the well has been discharged during drilling, well construction, and development/test pumping activities through October 4, 1999.

Alpha and beta activity measurements of drill cutting were within the background range. Tritium activities of discharge fluids were also within the background range throughout the duration of Well HC-6 activities. Fluoride concentrations were less than 0.5 mg/L on October 4, 1999.

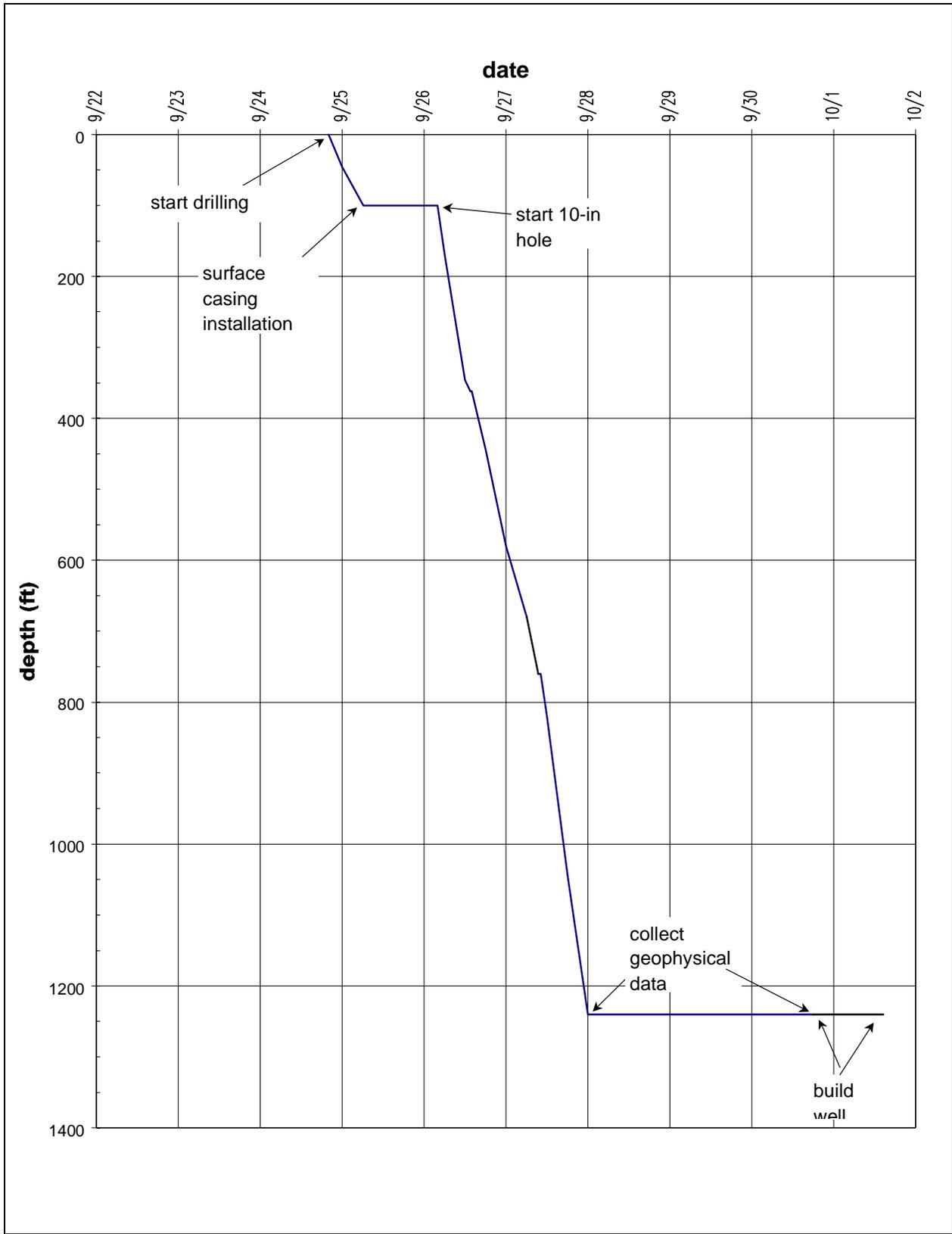


Figure 3-1
Well HC-6 Drilling Progress

[Table B-1 \(Appendix B\)](#) provides the chronology of drilling, construction, development, and testing of Well HC-6.

Three phases of tracer tests have been conducted by DRI utilizing Well HC-6 as the injection well while continuously pumping Well HC-7. Chemical tracers sodium iodide (NaI), carbon-13 enriched sodium bicarbonate ($\text{NaH}^{13}\text{CO}_3$), and deuterium oxide (D_2O) were injected in Well HC-6 during the initial phase beginning November 3, 1999. Lithium chloride (LiCl), lithium bromide (LiBr), perfluoro benzoic acid (PFBA), and sodium hydroxide (NaOH) were injected during the second phase beginning November 10, 1999. Cesium chloride (CsCl) was injected in Well HC-6 during the third phase beginning November 28, 1999.

3.1 Well HC-6 Geology

The HC-6 borehole encountered porphyritic, medium to coarse-grained biotite granite throughout the drilled interval. Possible fractured intervals, as indicated by larger, oxidized drill cuttings and caliper logs, were encountered from 160 to 170 ft bgs; 210 to 220 ft bgs; 230 to 250 ft bgs; 270 to 280 ft bgs; 290 to 340 ft bgs; 360 to 370 ft bgs; 420 to 430 ft bgs; 500 to 510 ft bgs; 530 to 550 ft bgs; 650 to 670 ft bgs; 720 to 730 ft bgs; 1,120 to 1,140 ft bgs; and 1,160 to 1,170 ft bgs. The downhole video camera showed high-angle water-conducting fractures at depths of 980 and 998 ft bgs. Clay-rich intervals were encountered from 200 to 210 ft bgs; 270 to 280 ft bgs; and 490 to 500 ft bgs. The clay-rich intervals have been interpreted as fault gouge zones. Lithologic descriptions are provided as [Figure 3-2](#).

3.2 Well HC-6 Hydrology

All fluids used to drill the well were spiked with a tracer solution of NaF. The target concentration was 50 mg/L. The concentration of fluoride during drilling was monitored in each water truck load used to drill the well, in the drilling fluid immediately prior to injection into the borehole, and in the drilling fluid immediately upon discharge to the surface. Monitoring of these injected and discharged fluids was conducted on 100-ft intervals above the predicted water table and on one-hour intervals in the saturated zone. [Figure 3-3](#) shows the fluoride concentrations in fluids from these sources. [Table B-2 \(Appendix B\)](#) presents the data used for [Figure 3-3](#).

The fluoride concentration was also monitoring in fluids discharged during well development/testing on two- to four-hour intervals to judge the progress of well development. [Figure 3-4](#) shows the fluoride concentrations in fluids from these sources. [Tables B-3 and B-4 \(Appendix B\)](#) present the data used for [Figure 3-4](#).

Water balance calculations show that all water used to drill the well was discharged during drilling, well construction and development/test

| | |
|--------------|---|
| 0 - 150 ft | <u>Granite</u> , mottled light pinkish grayish buff to light pinkish greenish buff. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive, but slight greenish alteration of some plagioclase feldspars, especially 60 to 70 ft. Potassium feldspar phenocrysts to 20 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasive slight alteration to chlorite. Minor accessory magnetite. Minor pale yellow to ochreous orange stains along fractures throughout interval. Good quality cuttings good with 2 to 5 mm chips. |
| 150 - 290 ft | <u>Granite</u> , mottled light pinkish greenish yellowish buff. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of plagioclase feldspars throughout interval. Potassium feldspar phenocrysts to 20 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasive weak alteration to chlorite. Minor accessory magnetite. Trace oxidized disseminated pyrite. Pervasive pale yellow to ochreous orange stains as halos and along fractures throughout. Minor clay noted 200 to 210 ft and 270 to 280 ft. Good quality cuttings with 2 to 10 mm chips, larger chips (to 20 mm) 160 to 170 ft; 210 to 220 ft; 230 to 250 ft; and 270 to 280 ft, possibly indicating fracture zones. |
| 290 - 340 ft | <u>Granite</u> , mottled creamy yellowish grayish buff to yellowish grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of plagioclase feldspars 310 to 320 ft and 330 to 340 ft. Potassium feldspar phenocrysts to 18 mm. Accessory biotite as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Trace disseminated oxidized pyrite. Slight pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with chips 2 to 8 mm, larger chips (to 15 mm) noted throughout interval, possibly indicating fracture zones. |
| 340 - 420 ft | <u>Granite</u> , mottled creamy grayish white to white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 8 mm. Accessory biotite as books and aggregates, black. Minor accessory magnetite. Trace pale yellow to ochreous orange stains along fractures. Good quality cuttings with chips 2 to 8 mm, larger chips (to 15 mm) noted 360 to 370 ft, possibly indicating fracture zones. |
| 420 - 430 ft | <u>Granite</u> , mottled grayish white to creamy buff. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Some feldspars altered to fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite as books and aggregates, black to greenish black, partially altered to chlorite. Minor accessory magnetite. Pale yellow to ochreous orange halos and stains along fractures. Good quality cuttings with chips 3 to 10 mm, larger chips (to 15 mm), possibly indicating fracture zone. |
| 430 - 470 ft | <u>Granite</u> , mottled creamy grayish white to white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 12 mm. Accessory biotite as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos around very fine grained disseminated oxidized pyrite. Finely ground cuttings with chips 1 to 4 mm. |
| 470 - 480 ft | <u>Granite</u> , mottled light grayish white to light grayish green. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive strong greenish alteration of plagioclase feldspars. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasive weak alteration to chlorite. Minor accessory magnetite. Good quality cuttings with 2 to 5 mm chips. |
| 480 - 530 ft | <u>Granite</u> , mottled creamy buff to white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Slight greenish alteration of some plagioclase feldspar. Potassium feldspar phenocrysts to 10 mm. Accessory biotite as books and aggregates, black to greenish black, locally slight alteration to chlorite. Minor accessory magnetite. Most cuttings finely ground with chips 2 to 5 mm, larger chips to 15 mm noted 500 to 510 ft, possibly indicating fracture zone. Some clay noted 490 to 500 ft. |

Figure 3-2
Well HC-6 Lithologic Descriptions
 (Page 1 of 2)

| | |
|------------------|--|
| 530 - 550 ft | <u>Granite</u> , mottled creamy yellowish buff to light greenish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of plagioclase feldspars. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black to brown, locally altered to chlorite, locally oxidized. Minor accessory magnetite. Minor pale yellow to ochreous orange stains as halos and along fractures. Cuttings quality is good with 4 to 10 mm chips, possibly indicating fracture zone. May include thin altered aplite dike in 530 to 540 ft interval. |
| 550 - 640 ft | <u>Granite</u> , mottled light pinkish creamy buff to light pinkish, white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 15 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Good quality cuttings with 2 to 10 mm chips. |
| 640 - 830 ft | <u>Granite</u> , mottled creamy yellowish buff to light pinkish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Locally greenish alteration of plagioclase feldspars, especially 650 to 660 ft; 720 to 730 ft; 760 to 780 ft; and 800 to 810 ft. Potassium feldspar phenocrysts to 12mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite, especially 640 to 660 ft; 720 to 730 ft; 780 to 790 ft; and 800 to 810 ft. Minor accessory magnetite. Local minor pale yellow to ochreous orange stains as halos and along fractures, especially 640 to 680 ft and 800 to 820 ft. Good quality cuttings 2 to 10 mm chips, larger chips to 20 mm 650 to 670 ft and 720 to 730 ft, possibly indicating fracture zones. |
| 830 - 1,020 ft | <u>Granite</u> , mottled pinkish grayish buff to greenish grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky plagioclase feldspar (25%). Local greenish alteration of plagioclase feldspars, especially 830 to 840 ft; 870 to 880 ft; and 980 to 990 ft. Potassium feldspar phenocrysts to 20 mm. Accessory biotite as books and aggregates, greenish gray, pervasive weak alteration to chlorite throughout, but especially 900 to 910 ft; 920 to 940 ft; 970 to 980 ft; 990 to 1,000 ft; and 1,010 to 1,020 ft. Minor accessory magnetite. Local slight pale yellow to ochreous orange halos and stains along fractures. Good quality cuttings with chips 1 to 10 mm, finely ground cuttings 830 to 840 ft; 850 to 860 ft; 900 to 910 ft; and 940 to 960 ft. |
| 1,020 - 1,060 ft | <u>Granite</u> , mottled greenish grayish buff to creamy greenish buff. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Some plagioclase feldspars show pale greenish alteration. Local alteration of feldspars to sericite. Potassium feldspar phenocrysts to 13 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Trace ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 6 mm chips. |
| 1,060 - 1,090 ft | <u>Granite</u> , mottled grayish yellowish pinkish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 10 mm. Accessory biotite as books and aggregates, black. Minor accessory magnetite. Minor pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 4 mm chips. |
| 1,090 - 1,220 ft | <u>Granite</u> , mottled light pinkish creamy buff to light pinkish greenish grayish buff to light yellowish pinkish gray. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of plagioclase feldspars, especially 1,090 to 1,110 ft; 1,160 to 1,180 ft; and 1,210 to 1,220 ft. Potassium feldspar phenocrysts to 15 mm. Accessory biotite as books and aggregates, black to greenish black, locally altered to chlorite, especially 1,090 to 1,110 ft and 1,160 to 1,220 ft. Minor accessory magnetite. Trace accessory disseminated pyrite. Minor pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 1 to 10 mm chips, larger chips (to 15 mm) 1,120 to 1,140 ft and 1,160 to 1,170 ft, possibly indicating fracture zones. |
| 1,220 - 1,240 ft | <u>Granite</u> , mottled pinkish grayish white to grayish white. Porphyritic (?), with medium grained, subhedral granular groundmass of clear to milky pinkish potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 8 mm. Accessory biotite as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Cuttings finely ground with 1 to 3 mm chips. |

Figure 3-2
Well HC-6 Lithologic Descriptions
 (Page 2 of 2)

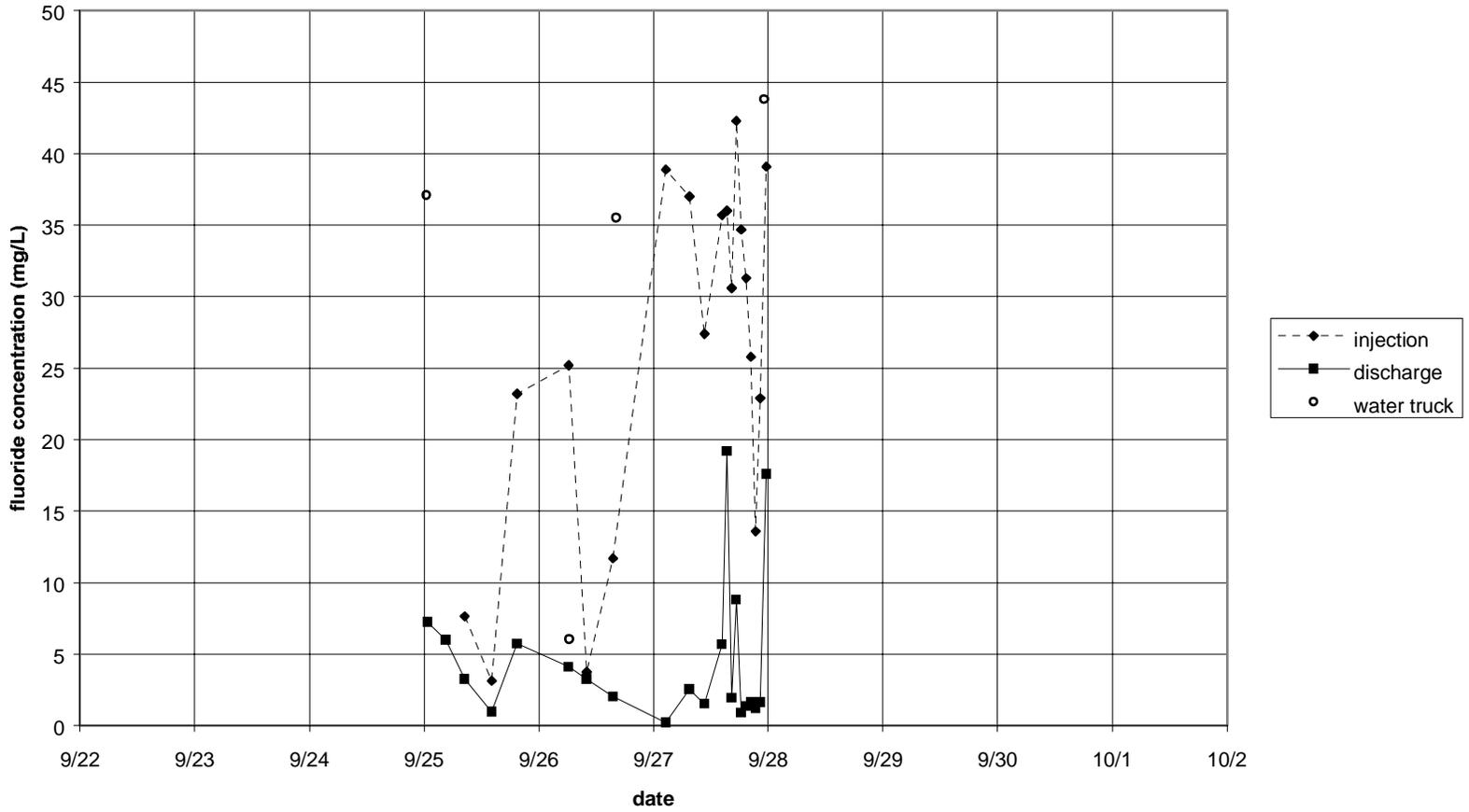


Figure 3-3
Well HC-6 Fluoride Concentrations During Drilling

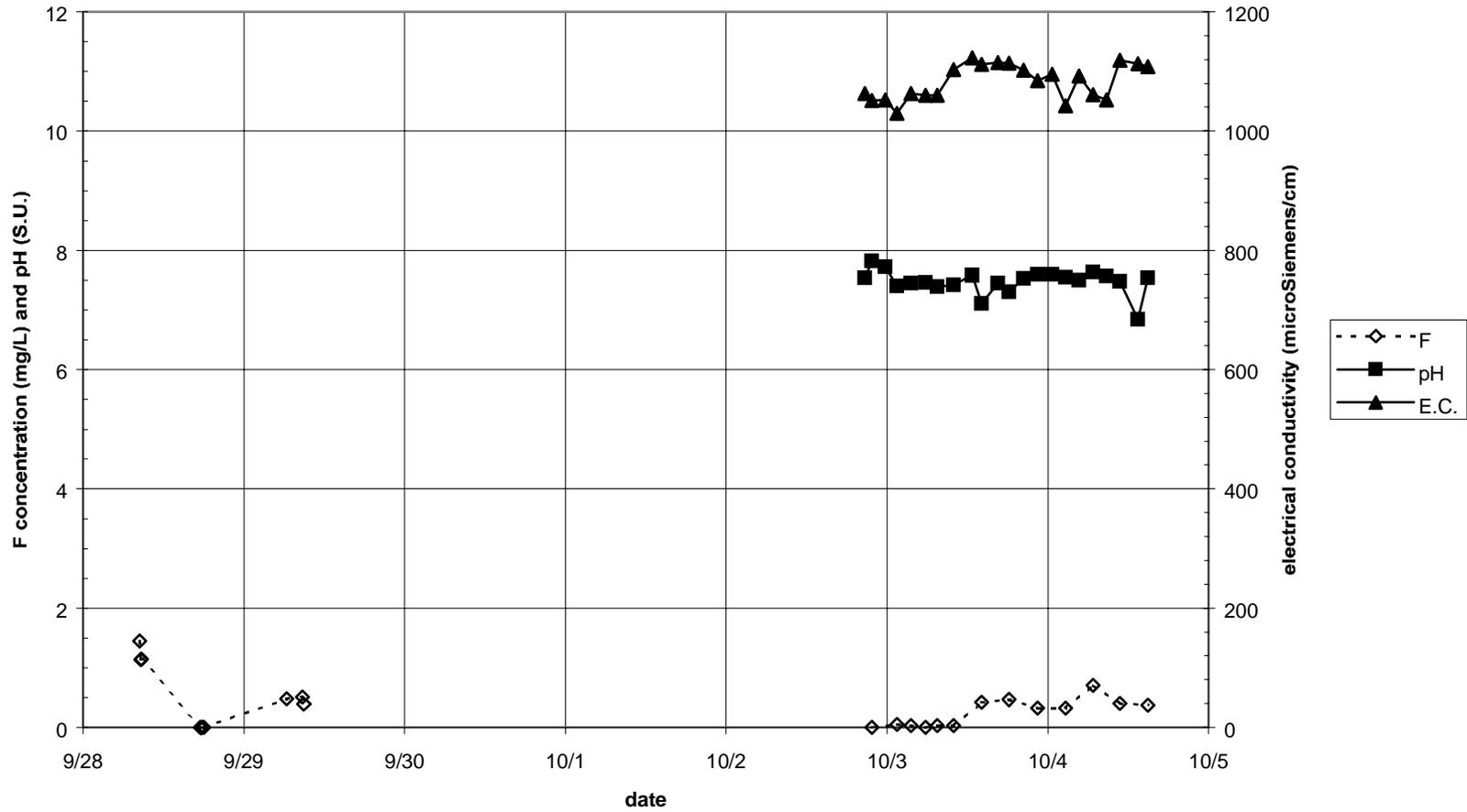


Figure 3-4
Well HC-6 Well Development Parameters

pumping activities. The water balance data is presented as [Table B-5 \(Appendix B\)](#).

Water production varied from 5 to 100 gpm during airlift development of the open borehole. Water production during development/test pumping varied from 1.5 to 5.4 gpm with an average rate of 3.7 gpm, based on totalizer readings.

Water-level monitoring was conducted in the open borehole prior to well construction, as well as after completion of the well. [Table B-6 \(Appendix B\)](#) provides water level data obtained for the term of the ITLV involvement in PSA data collection.

3.3 Well HC-6 Geophysical Surveys

Upon completion of drilling to the total depth of 1,240 ft and after initial airlift development, a suite of downhole geophysical data was collected from the 10-in. diameter borehole by Colog. Colog also collected downhole geophysical data from the completed well. Additional video, caliper, geochemical, thermal flow meter, borehole radar, cross hole tomography, and water level data were collected by DRI and DRI/PRG at various points, as required to achieve the scientific goals of the project.

A deviation survey was conducted in the open borehole. The survey indicated the bottom of the borehole had deviated 5.7 degrees from vertical in a northwest direction. The deviation of the borehole placed the bottom of the borehole a distance of 54.98 ft away from the collar at an azimuth of 328 degrees and resulted in a true vertical depth of 1,231.97 ft bgs.

Cross hole tomography was attempted between completed wells HC-6 and HC-7, but proved to be unsuccessful.

[Table B-7 \(Appendix B\)](#) provides a summary of the geophysical data collected from the borehole. Figures 3-5 to 3-7 provide condensed illustrations of the geophysical traces for HC-6.

3.4 Well HC-6 Radiological Monitoring

Monitoring of discharge effluent from drilling, well development, and testing was conducted as specified in the Project Shoal SSHASP (DOE/NV, 1999c), FMP for the Project Shoal Area Off-Sites Project (DOE/NV, 1999b), and Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada (IT, 1999). Regular on-site radiological monitoring of discharged effluents, including both fluids and solids, was conducted by ITLV personnel.

Fluid effluent samples for tritium analysis were collected from each water truck load used to drill the well, from drilling fluids immediately

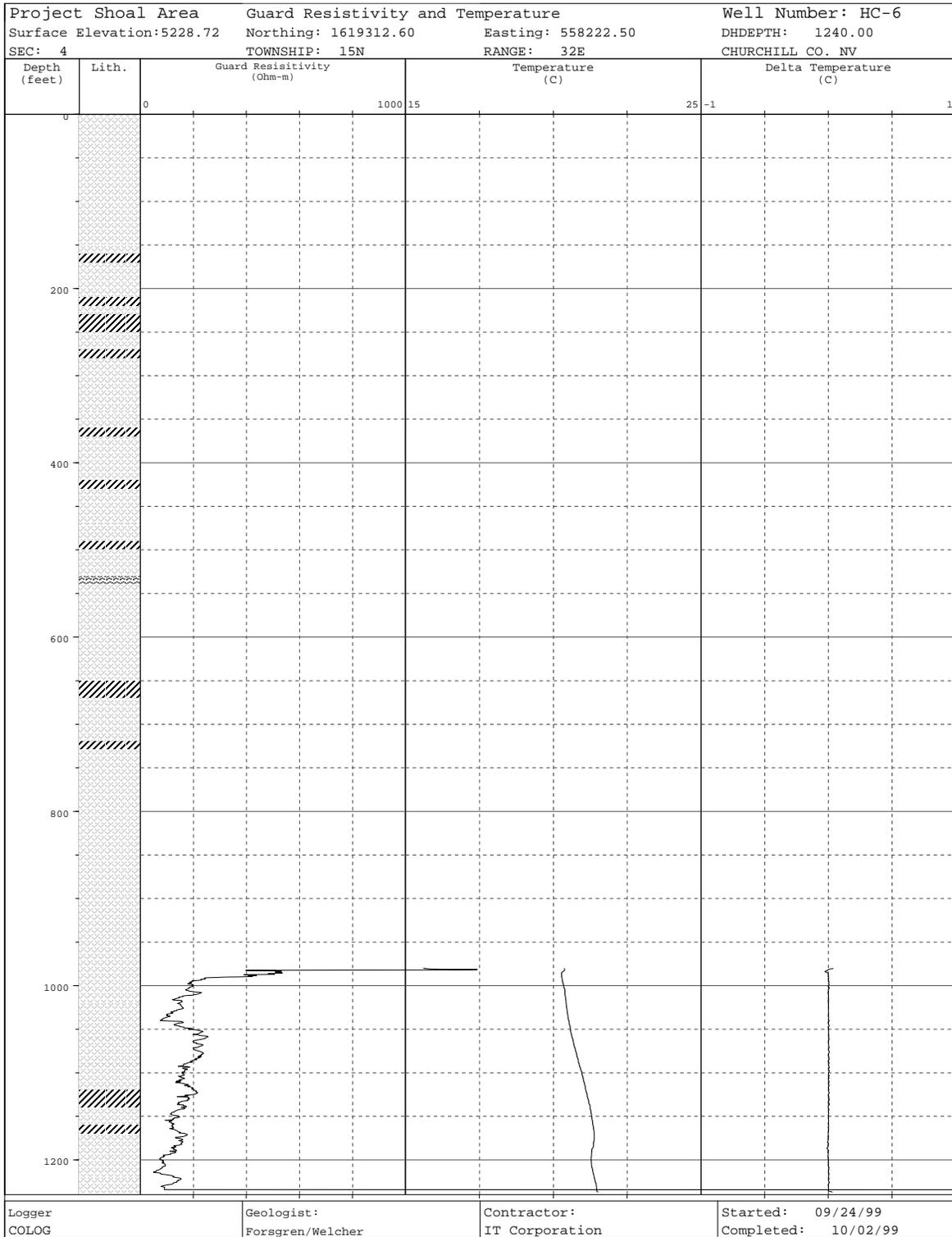


Figure 3-5
Well HC-6 Traces of Temperature and Resistivity Data

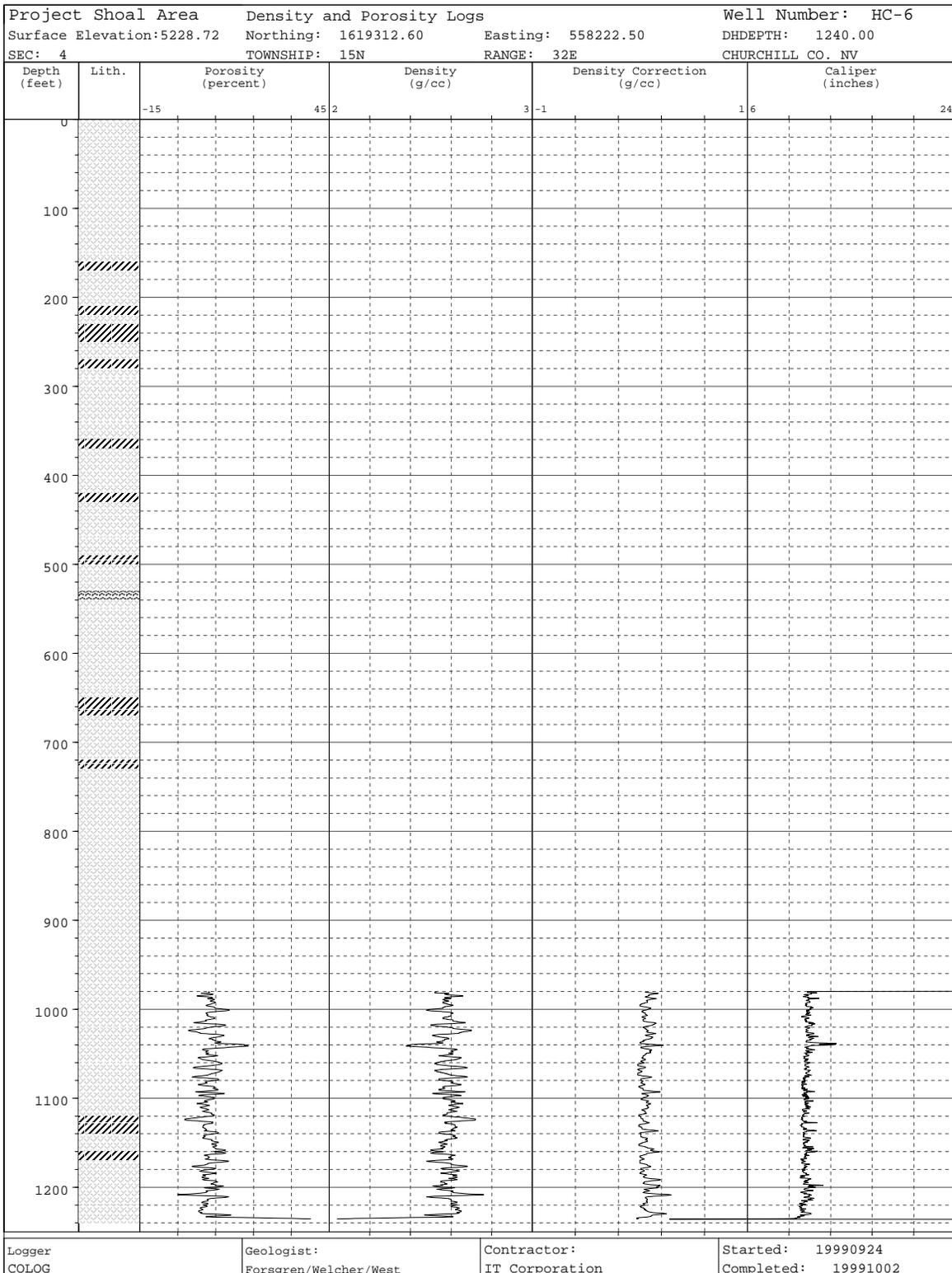


Figure 3-6
Well HC-6 Traces of Density, Porosity, and Caliper Data

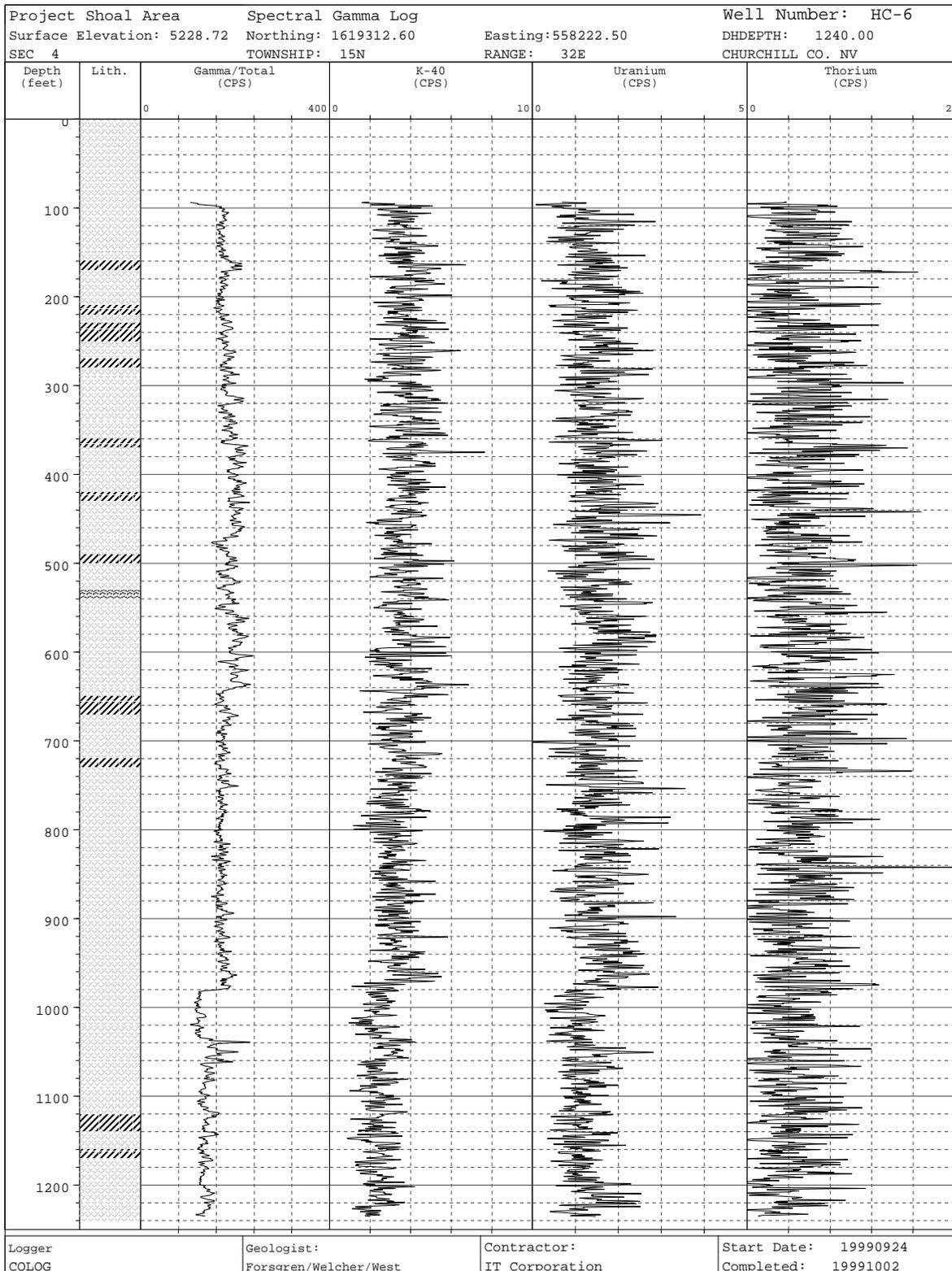


Figure 3-7
Well HC-6 Traces of Spectral Gamma Data

prior to circulation into the borehole (injection fluids), and immediately upon discharge to the surface (discharge fluids) on two-hour intervals during drilling, and from discharge fluids approximately every two to four hours during well development and testing. The samples were analyzed for tritium using on-site laboratory monitoring equipment. Tritium activities of fluids were recorded using a Packard Liquid Scintillation Counter[®].

Solid effluent samples (drill cuttings) were collected on approximately 100-ft intervals and allowed to dry prior to recording the alpha and beta activity measurements using a portable survey instrument, a NE Technology Electra[®].

Tritium activities of fluid effluents during drilling are shown on [Figure 3-8](#). Tritium activities of fluid effluents during well development and testing are shown on [Figure 3-9](#). Alpha and beta activity measurements of drill cuttings are shown on [Table B-9](#) ([Appendix B](#)). [Table B-2](#) ([Appendix B](#)) presents the data used for [Figure 3-8](#). [Tables B-3](#) and [B-4](#) ([Appendix B](#)) present the data used for [Figure 3-9](#).

Based on field screening and on-site laboratory analyses, Well HC-6 effluents were found to have natural background alpha and beta activity measurements, and natural background tritium activities.

3.5 Well HC-6 Well Construction

Following completion of Well HC-8 and prior to mobilization to the Well HC-6 location, all drilling equipment was decontaminated on-site using a combination of stream cleaning and high pressure washing.

The Well HC-6 location was revised, based on data collected during the drilling and installation of Well HC-8 (see section 5.1). Hydrogeologic data observed during the drilling of Well HC-8 suggested that the original location of Well HC-6, the upgradient well of the tracer test well pair, would have resulted in the wells being installed in two distinct structural blocks with different hydraulic characteristics. The tracer test well pair was installed in an area thought to be free of structural complications. [Figure 1-3](#) shows the proposed and the installed location of Well HC-6.

Drilling of Well HC-6 commenced on September 24, 1999. A 24-in. diameter hole was drilled to a depth of 100 ft bgs using a tricone bit and conventional mud rotary drilling techniques with bentonite and water as the drilling fluid. A 20-in. diameter surface casing was installed to a depth of 100 ft bgs and cemented in place using Type II neat cement with an additive of 2 percent calcium chloride.

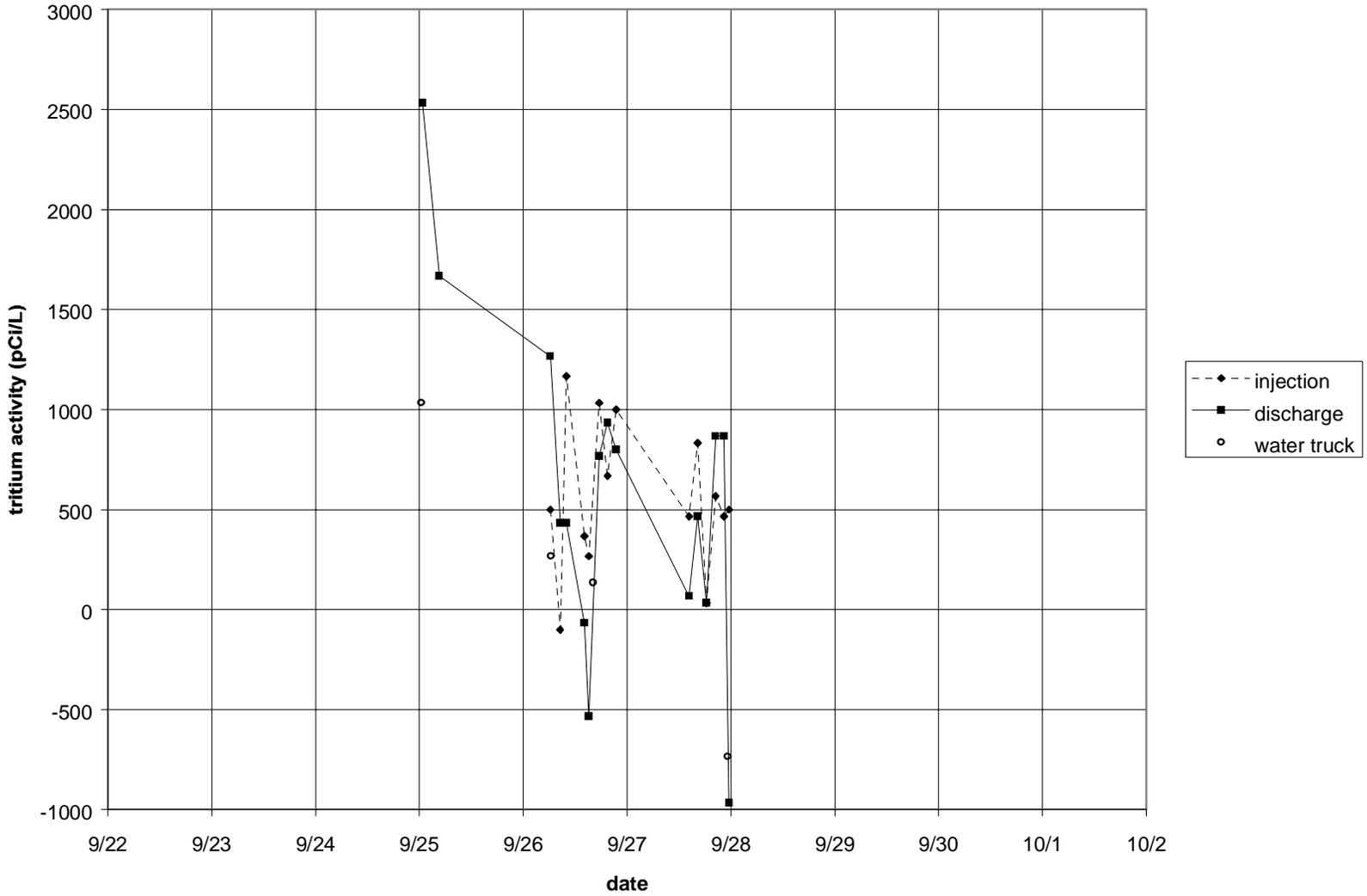


Figure 3-8
Well HC-6 Tritium Activities During Drilling

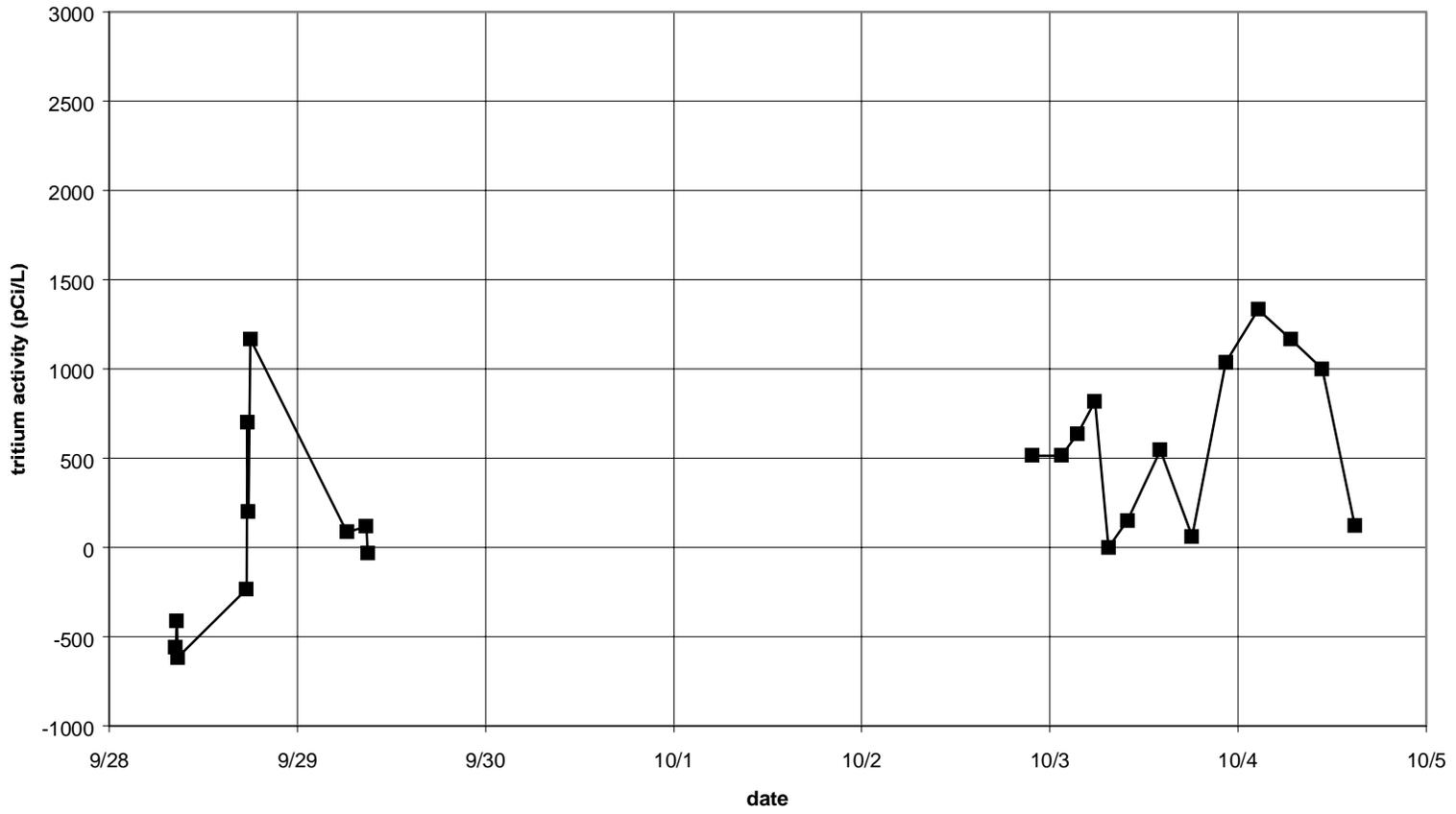


Figure 3-9
Well HC-6 Tritium Activities During Development/Testing

The main hole for the well was advanced to a depth of 1,240 ft bgs using a 10-in. diameter downhole percussion hammer and air rotary, RC drilling techniques between September 26 and 28, 1999. Drilling progress was only briefly halted on two occasions to conduct repairs on the drilling equipment. [Table B-1 \(Appendix B\)](#) and [Figure 3-1](#) present additional details of the chronology and drilling progress of Well HC-6. [Figure 3-10](#) presents a summary of Well HC-6 drilling parameters. While advancing the main hole, water with EZ Mud[®] was injected at a rate of approximately 10 gpm to facilitate cuttings return. [Table B-10 \(Appendix B\)](#) shows the drilling fluid additives used, listed by activity, for the drilling and installation of Well HC-6.

Upon completion of the drilling, water was circulated from total depth to clear drill cuttings from the borehole. Approximately a day and a half was spent monitoring water levels, airlifting the hole by RC techniques through the drill string to initially develop the well, and collecting downhole video data. Water levels were consistently recorded at a depth of approximately 980 ft bgs (see [Table B-6 \[Appendix B\]](#)). Evaluation of the water level and video data led to the conclusion that the well would be adequate to meet the scientific objectives of the project.

Collection of downhole geophysical data began immediately upon removal of the drill string from the borehole. Collection of downhole geophysical data was completed on September 30, 1999.

The well was then completed by installing 5 1/2-in. OD fiberglass well casing to a depth of 1,233.7 ft bgs and landing the casing in suspension from a landing plate mounted on the surface casing on September 30, 1999. The well casing is slotted from 1,115.98 to 1,232.3 ft bgs with 0.040-in. saw-cut slots. No centralizers were placed on the 5 1/2-in. casing string due to hole-size constraints. Filter pack consisted of 3/8-in. diameter gravel from total depth to 1,105 ft bgs; 6/9 sand from 975 to 1,105 ft bgs; and a final lift of 3/8-in. gravel from 970 to 975 ft bgs. The filter pack was installed via tremie pipe while circulating fresh water.

The sanitary seal, consisting of neat cement with the addition of 2 percent calcium chloride, was installed via tremie pipe from the surface to a depth of 69 ft bgs on October 1, 1999. A cement basket was used to support the sanitary seal. The annular space between the borehole wall and well casing is open from 69 to 970 ft bgs. [Table 1-1](#) lists the well construction details, while [Figure 3-11](#) illustrates the final subsurface well completion, and [Figure 3-12](#) presents the final surface completion of HC-6.

1999 Well Installation Report, Project Shoal Area, Churchill County, Nevada

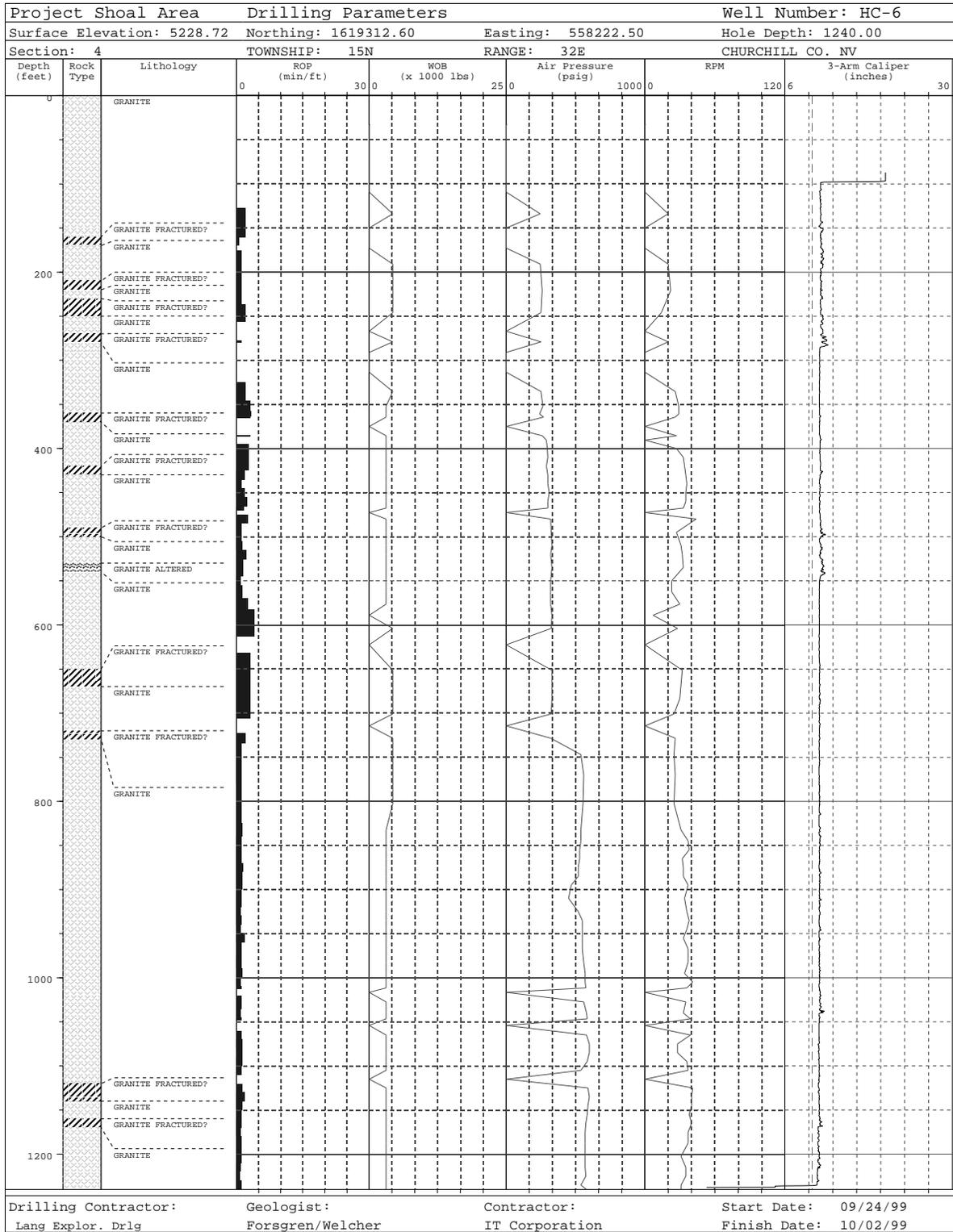


Figure 3-10
Well HC-6 Summary of Drilling Parameters

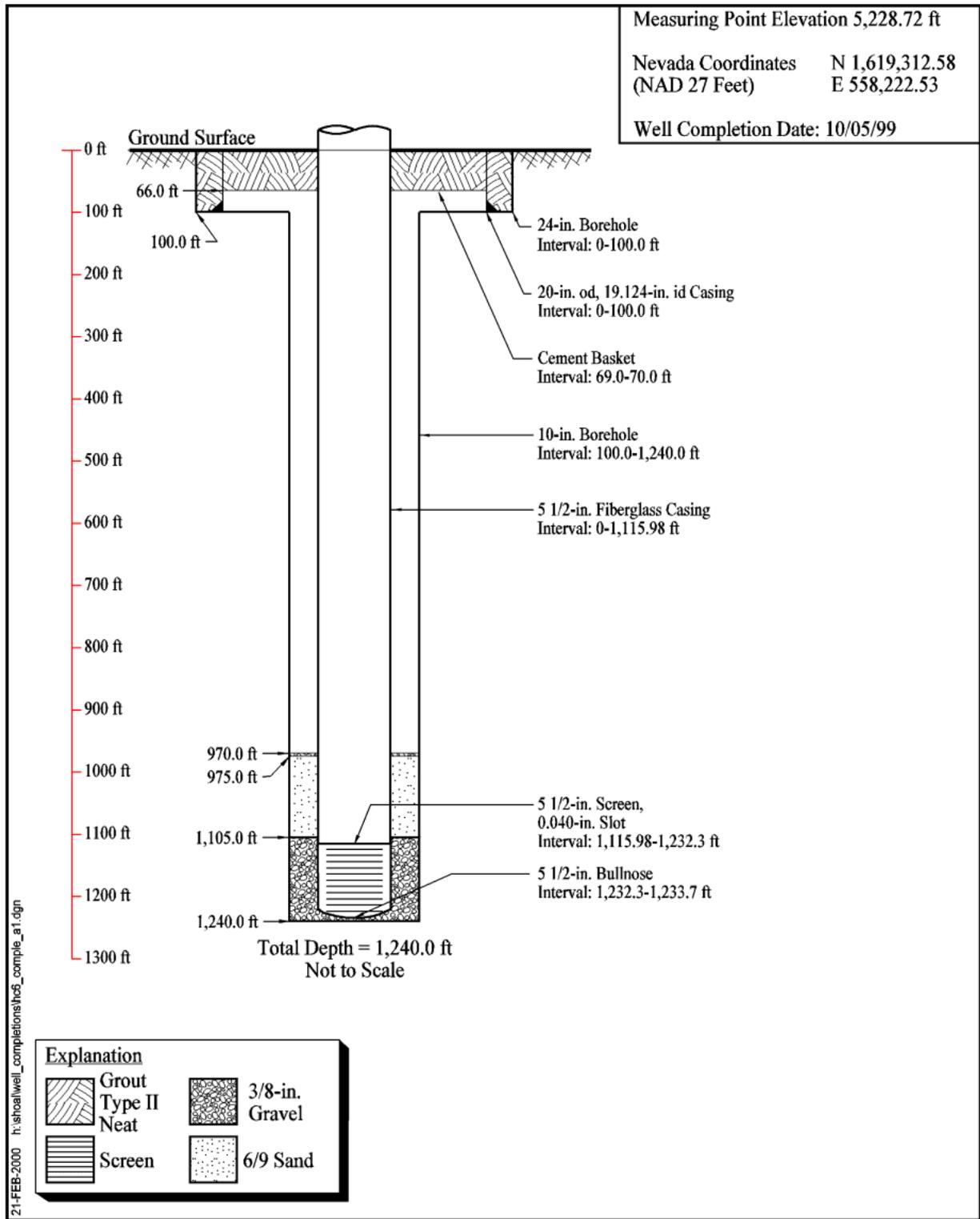
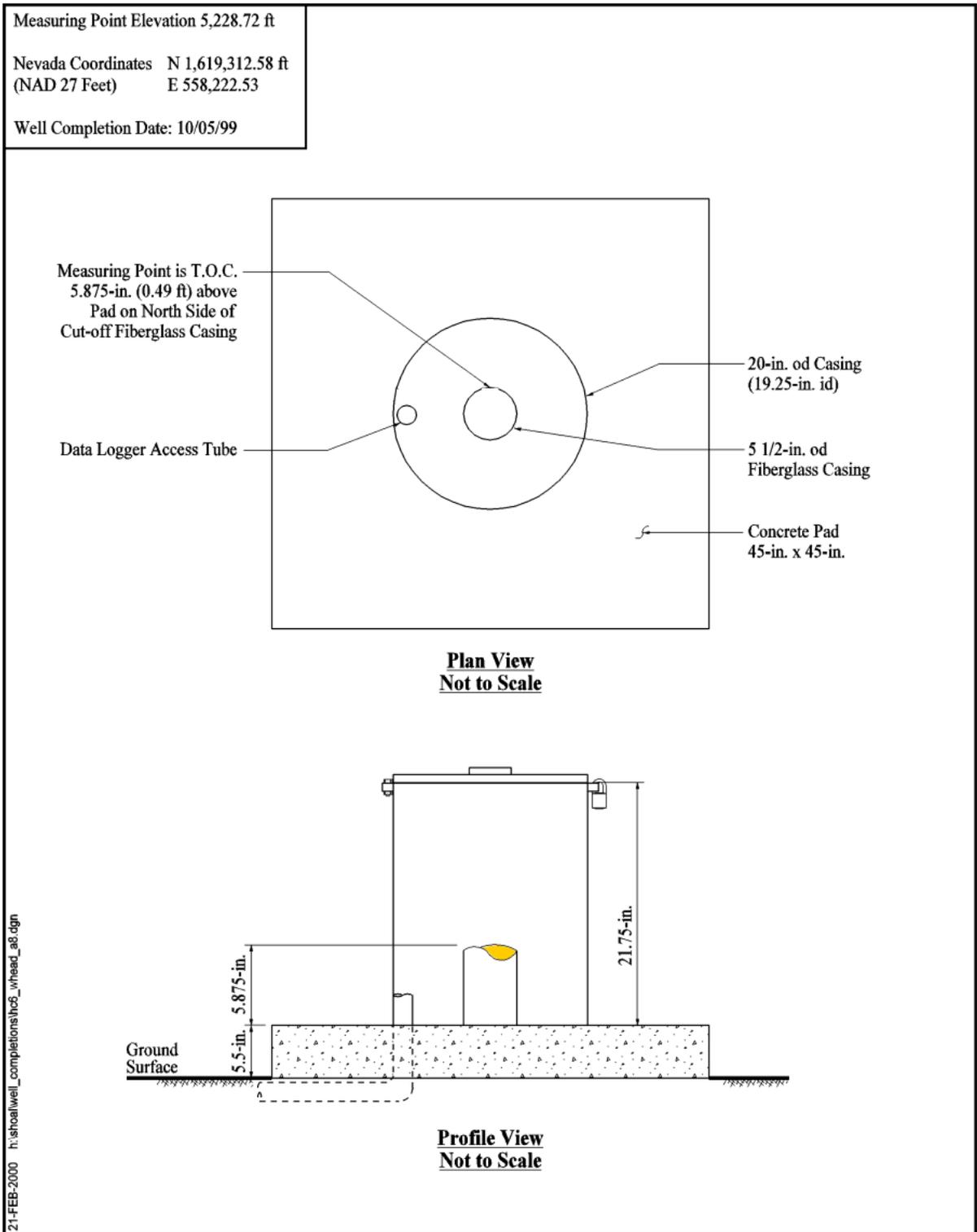


Figure 3-11
 HC-6 Well Completion Diagram



**Figure 3-12
Well Head Completion Diagram for Well HC-6**

3.6 Well HC-6 Well Development and Testing

Initial well development consisted of approximately six hours of RC airlifting through the drill string on September 28 and 29, 1999, as noted above in [Section 3.5](#). Approximately 6,960 gallons of fluid were removed from the well by airlift techniques. Fluoride concentrations and tritium activities were monitored on two- to four-hour intervals throughout the duration of airlift development. [Table B-3 \(Appendix B\)](#) lists the development parameters during airlifting.

A submersible pump was temporarily installed to a depth of 1,208 ft on October 2, 1999. The pump was used to further develop the well and conduct an aquifer test from October 2 to 4, 1999. The development/pumping was conducted for a total of 2,699 minutes with a total of 9,968 gallons of fluid removed from the well at an average discharge rate of 3.7 gpm. Field water quality parameters of temperature, pH, and electrical conductivity, as well as, fluoride concentrations and tritium activities were monitored throughout the duration of development/testing on two- to four-hour intervals. [Table B-4 \(Appendix B\)](#) lists the development parameters during pumping. [Figure 3-4](#) shows the trends of the development parameters through both the airlift development and development/test pumping. [Figure 3-5](#) shows the tritium activities of the discharge fluid during airlifting and pumping.

Electrical conductivities of the development/test pumping effluent ranged from approximately 1,000 to 1,100 microSiemens/cm. pH values ranged between approximately 7 and 8 standard units. Fluoride concentrations ranged from 0 to approximately 1.5 mg/L and were consistently less than 0.5 mg/L during the final stages of pumping on October 4, 1999.

The DRI initiated tracer testing November 3, 1999. The tracer testing consisted of injecting known volumes of tracer material in the upgradient well, Well HC-6, while continuously pumping the downgradient well, Well HC-7. Known volumes of NaI, $\text{NaH}^{13}\text{CO}_3$, and D_2O were injected in Well HC-6 beginning November 3, 1999. The second phase of tracer testing began November 10, 1999 with the injection of known volumes of LiCl, LiBr, PFBA, and NaOH. A known volume of CsCl was injected in Well HC-6 beginning November 28, 1999 during the third phase of tracer testing.

3.7 Well HC-6 Sampling

Samples of discharge effluent temporarily stored in lined sumps were collected as specified in the *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT Corporation, 1999) and *Fluid Management Plan for the Project Shoal Area Off-Sites Project* (DOE/NV, 1999b) for characterization prior to discharge/

disposal. The analytical results from these samples are shown in [Table B-11 \(Appendix B\)](#).

4.0 Well HC-7 Summary of Operations

Well HC-7 was originally proposed as the intermediate depth well (DRI, 1999) but was completed as the downgradient well of the tracer test well pair. The Well HC-7 location was revised, based on data collected during the drilling and installation of Well HC-8 (see [Section 5.1](#)). Hydrogeologic data observed during the drilling of Well HC-8 (originally proposed as the downgradient well of the tracer test well pair) suggested that the proposed location of Well HC-6 (the upgradient well of the tracer test pair) would result in the tracer test wells being installed in two distinct structural blocks with different hydrologic characteristics.

For this and other reasons, Well HC-8 was completed as the intermediate depth well and Wells HC-6 and HC-7 were designated as the tracer test well pair. Wells HC-6 and HC-7 were installed in an area thought to be a single hydrologic compartment free of structural complications. Well HC-7 was installed approximately 100 ft south-southeast of Well HC-6 as the downgradient or pumping well for the two well tracer test (see [Section 1.4](#)), as shown on [Figure 1-3](#). The tracer test wells were proposed as water table wells (DRI, 1999).

Well HC-7 was drilled to a total depth of 1,240 ft bgs beginning October 3, 1999. The well casing was installed to a total depth of 1,225.1 ft bgs with the filter-packed, slotted interval from 1,106.47 to 1,223.6 ft bgs. The well construction details are provided on [Table 1-1](#). Completion of the well occurred October 8, 1999, when the sanitary grout seal was installed. A total of six days was spent drilling and constructing this well. [Figure 4-1](#) presents the drilling progress of Well HC-7.

Open-borehole well development, consisting of RC airlifting occurred October 6, 1999. Initial pump development occurred October 27 to 28, 1999. Further development/test pumping began October 28 and continued through November 29, 1999, when ITLV suspended monitoring. The DRI continued to pump Well HC-7 after November 29, 1999 to facilitate continued tracer testing discussed in [Section 3.0](#).

Water balance calculations show that all of the fluid used to drill the well was discharged during drilling, well construction, and development/test pumping activities.

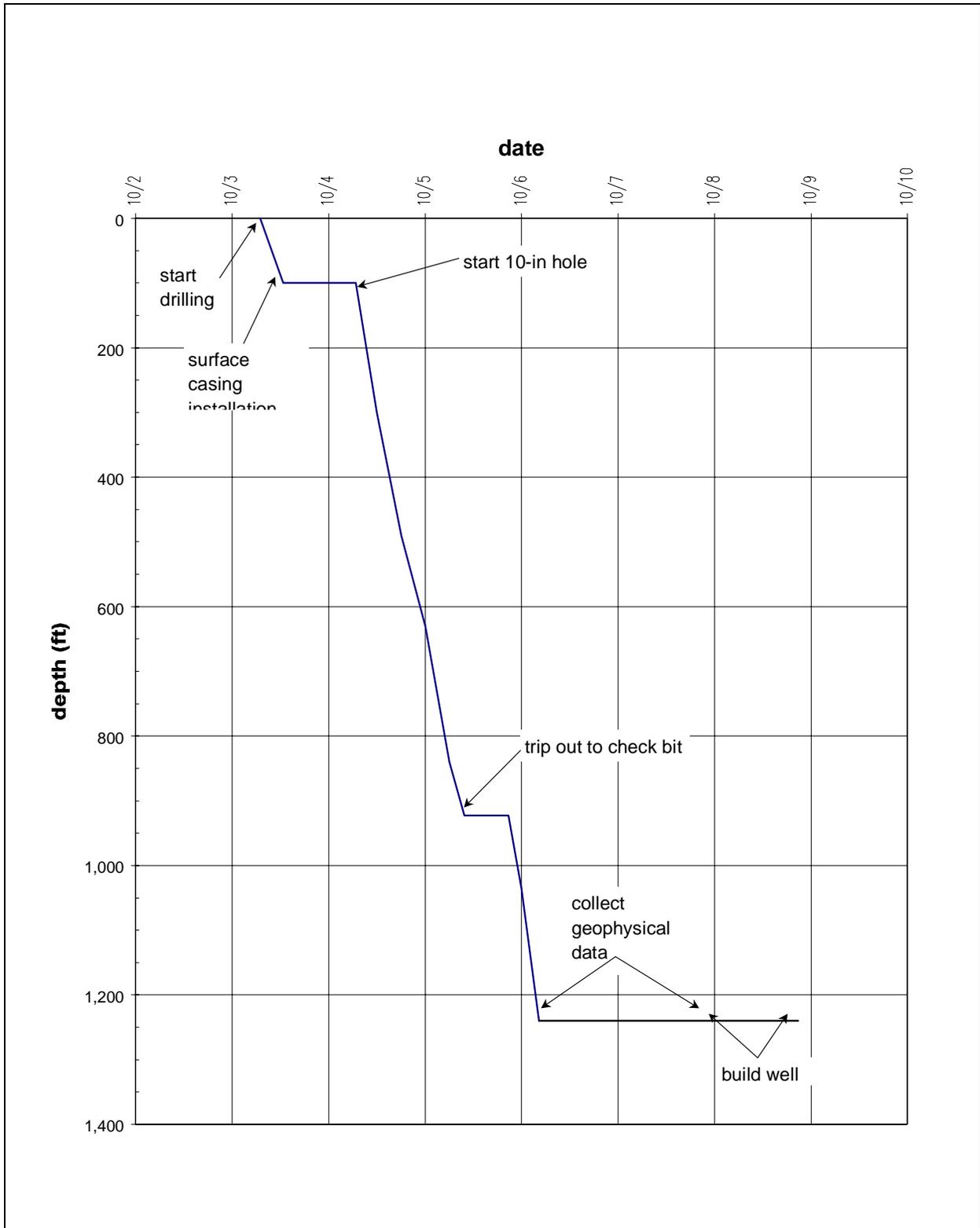


Figure 4-1
Well HC-7 Drilling Progress

Alpha and beta activity measurements of drill cuttings were within the background range. Tritium activities of discharge fluids were also within the background range throughout the duration of Well HC-7 activities. Fluoride concentrations ranged from 0.10 to 0.53 mg/L on November 22, 1999.

[Table C-1 \(Appendix C\)](#) provides the chronology of drilling, construction, development, and testing of Well HC-7.

4.1 Well HC-7 Geology

The Well HC-7 borehole encountered porphyritic, medium to coarse-grained biotite granite throughout most of the drilled interval. A fractured aplite dike was encountered from 335 to 370 ft bgs with a clay selvage from 330 to 335 ft bgs. A second aplite dike is suggested by the geophysical logs from 702 to 710 ft bgs. Fracture zones, as indicated by larger, oxidized drill cuttings and caliper logs, were encountered from 380 to 410 ft bgs; 720 to 730 ft bgs; 800 to 890 ft bgs; 900 to 910 ft bgs; 1,170 to 1,200 ft bgs; and 1,220 to 1,230 ft bgs. The downhole video camera showed a high-angle, water-conducting fracture at a depth of 1,045 ft bgs. Lithologic descriptions are provided in [Figure 4-2](#).

4.2 Well HC-7 Hydrology

All drilling fluids injected into the borehole were spiked with a tracer solution of NaF. The target concentrations were 50 mg/L. The fluoride concentration in fluids during drilling was monitored in each truck load of water used to drill the well, in the drilling fluid immediately prior to injection into the borehole, and in the drilling fluid immediately upon discharge to the surface. Monitoring of these injected and discharged fluids was conducted on 100-ft intervals above the predicted water table and on one-hour intervals in the saturated zone. [Figure 4-3](#) presents the fluoride concentration data in fluids from these sources. [Table C-2 \(Appendix C\)](#) presents the data used for [Figure 4-3](#).

The fluoride concentration was also monitored in fluids discharged during well development/testing on two- to four-hour intervals to judge the progress of well development. [Figure 4-4](#) shows the fluoride concentrations in fluids from these sources. [Tables C-3 through C-5 \(Appendix C\)](#) presents the data used for [Figure 4-4](#).

Water balance calculations show that all water used to drill the well was discharged during either drilling of the borehole, airlift development of the open borehole, or development/test pumping of the completed well. The water balance data is presented as [Table C-6 \(Appendix C\)](#).

| | |
|------------------|---|
| 0 - 330 ft | <u>Granite</u> , mottled pinkish grayish white to mottled yellowish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive weak greenish alteration of plagioclase feldspars throughout most of interval. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Minor pale yellow to ochreous orange stains as halos and along fractures throughout, but especially 170 to 180 ft. Good quality cuttings with 1 to 10 mm chips, except 260 to 270 ft which is finely ground. |
| 330 - 370 ft | <u>Aplite</u> , mottled reddish brown to tan. Porphyritic, with fine grained groundmass of translucent quartz and potassium feldspar (?). Some euhedral quartz crystals suggest open space filling. Quartz phenocrysts to 3 mm. Accessory biotite as books and aggregates, reddish brown, altered and oxidized. Ochreous reddish brown stains throughout. Cuttings quality good with chips to 15 mm. Interval includes a 5 ft black clay selvage (330 to 335 ft). Probable fracture zone. |
| 370 - 680 ft | <u>Granite</u> , mottled grayish white to creamy buff white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of plagioclase feldspars, especially 370 to 400 ft; 420 to 430 ft; 440 to 450 ft; 620 to 630 ft; and 640 to 680 ft. Potassium feldspar phenocrysts to 8 mm. Accessory biotite as books and aggregates, black to greenish black, locally altered to chlorite, especially 370 to 390 ft and 420 to 430 ft. Minor accessory magnetite. Ochreous reddish brown stains 380 to 390 ft. Trace pale yellow to ochreous orange stains as halos and along fractures, 390 to 400 ft and 410 to 420 ft. Good quality cuttings with chips nominally 1 to 5 mm, larger chips to 10 mm 380 to 390 ft and 400 to 410 ft, possibly indicating fracture zones. |
| 680 - 720 ft | <u>Granite</u> , mottled yellowish white to greenish yellowish buff. Porphyritic, with medium grained, subhedral granular groundmass of milky potassium feldspar (40%), clear to milky quartz (35%), and milky plagioclase feldspar (25%). Feldspars predominantly altered to fine grained sericite. Potassium feldspar phenocrysts to 5 mm. Accessory biotite as books and aggregates, greenish gray, altered to chlorite. Minor accessory pyrite. Minor pale yellow to ochreous orange halos and stains along fractures. Finely ground cuttings with chips 1 to 2 mm. Geophysical logs suggest the presence of an aplite dike from 702 to 710 ft. |
| 720 - 1,040 ft | <u>Granite</u> , mottled grayish white to creamy buff white, creamy pinkish white 960 to 970 ft. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Some plagioclase feldspars locally show pale greenish alteration, especially 720 to 740 ft; 770 to 780 ft; 840 to 860 ft; 960 to 980 ft; and 1,010 to 1,020 ft. Potassium feldspar phenocrysts to 7 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasive weak alteration to chlorite. Minor accessory magnetite. Minor pale yellow to ochreous orange stains as halos and along fractures throughout. Cuttings quality is generally good with 3 to 5 mm chips. Larger chips (to 12 mm) 720 to 730 ft; 800 to 890 ft; and 900 to 910 ft, possibly indicating fracture zones. |
| 1,040 - 1,240 ft | <u>Granite</u> , mottled grayish greenish buff to pinkish gray white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive weak greenish alteration of plagioclase feldspars throughout interval. Potassium feldspar phenocrysts to 12 mm. Accessory biotite as books and aggregates, black to greenish black, slightly but pervasively altered to chlorite. Minor accessory magnetite. Minor pale yellow to ochreous orange stains as halos and on fractures throughout. Cuttings quality is generally good with 2 to 8 mm chips. Larger chips (to 12 mm) 1,170 to 1,200 ft and 1,220 to 1,230 ft, possibly indicating fracture zones. |

Figure 4-2
Well HC-7 Lithologic Descriptions

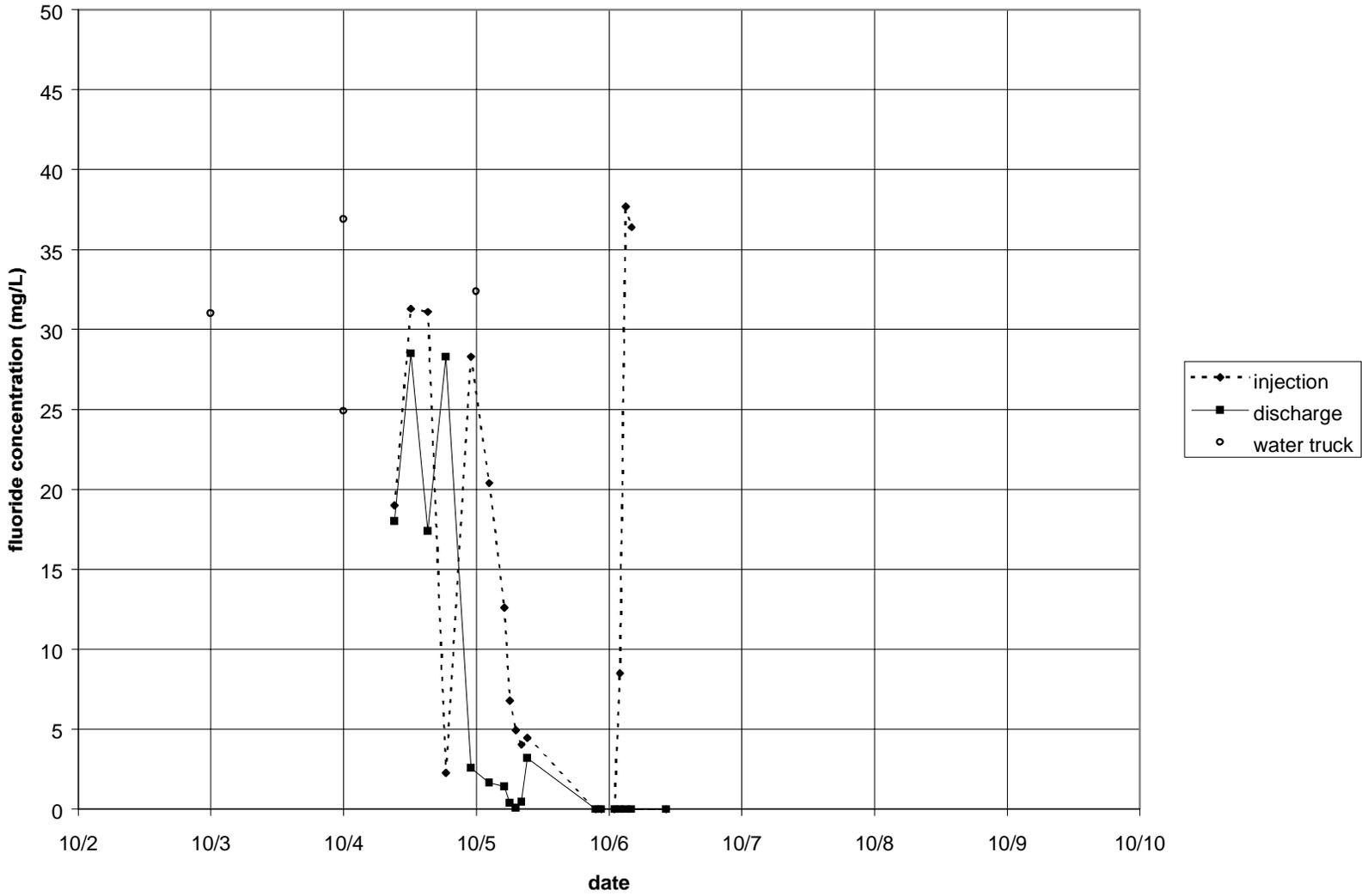


Figure 4-3
Well HC-7 Fluoride Concentrations During Drilling

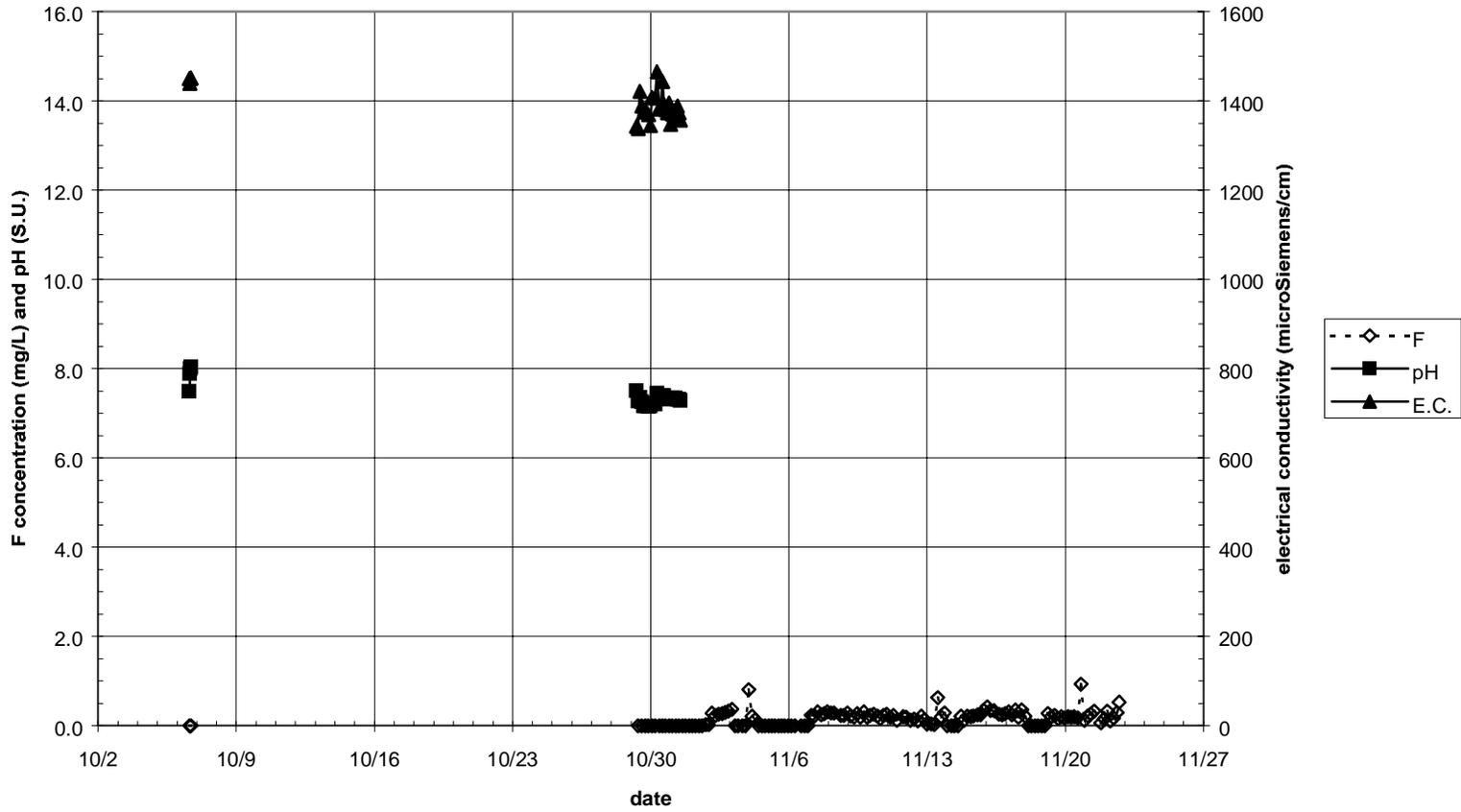


Figure 4-4
Well HC-7 Well Development Parameters

Water production varied from approximately 8 to 34 gpm during airlift development of the open borehole. Water production during development/testing was approximately 3 gpm. Water production during the tracer test was maintained at 3 gpm.

Water-level monitoring was conducted in the open borehole prior to well construction, as well as, after completion of the well. [Table C-7 \(Appendix C\)](#) provides water level data obtained for the term of the ITLV involvement in PSA data collection.

4.3 Well HC-7 Geophysical Surveys

Upon completion of drilling to the total depth of 1,240 ft and after initial airlift development, a suite of downhole geophysical data was collected from the open 10-in. diameter borehole by Colog. Colog collected additional downhole geophysical data from the completed well. Additional video, caliper, geochemical, thermal flow meter, borehole radar, and water level data were collected by DRI and DRI/PRG at various points, as required to achieve the scientific goals of the project.

A deviation survey was conducted in the open borehole. The survey indicated the bottom of the borehole had deviated 1.9 degrees from vertical in a northerly direction. The deviation of the borehole placed the bottom of the borehole a distance of 16.48 ft away from the collar at an azimuth of 353 degrees and resulted in a true vertical depth of 1,234.62 ft bgs.

Cross hole tomography was attempted between completed wells HC-6 and HC-7, but proved to be unsuccessful.

[Table C-8 \(Appendix C\)](#) provides a summary of the geophysical data collected from the borehole. [Figures 4-5 to 4-7](#) provide condensed illustrations of the geophysical traces for Well HC-7.

4.4 Well HC-7 Radiological Monitoring

Monitoring of discharge effluent from drilling, well development, and testing was conducted as specified in the Project Shoal SSHASP (DOE/NV, 1999c), *Fluid Management Plan for the Project Shoal Area Off-Sites Project* (DOE/NV, 1999b), and *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT, 1999). Regular on-site radiological monitoring of discharged effluents, including both fluids and solids, was conducted by ITLV personnel.

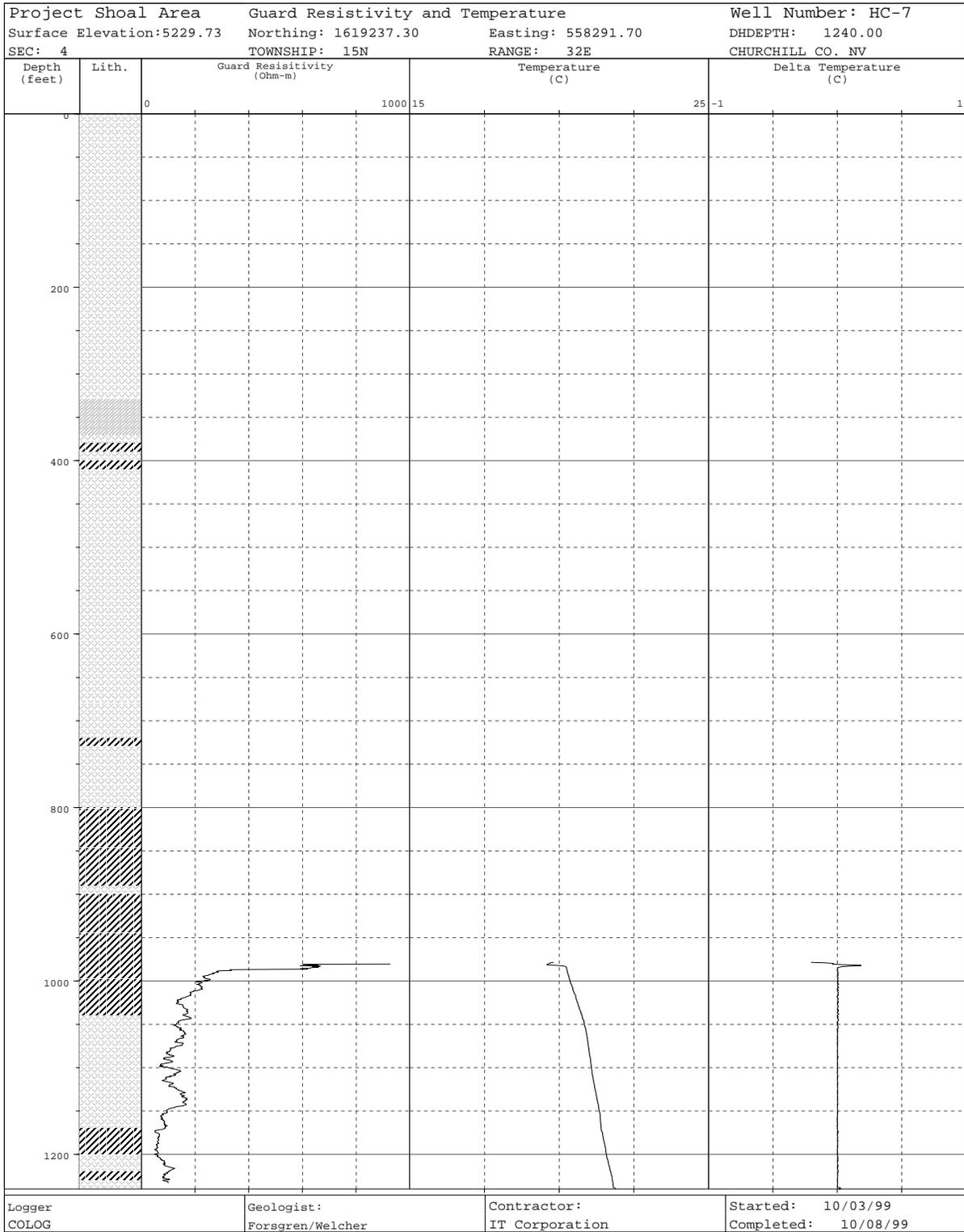


Figure 4-5
Well HC-7 Traces of Temperature and Resistivity Data

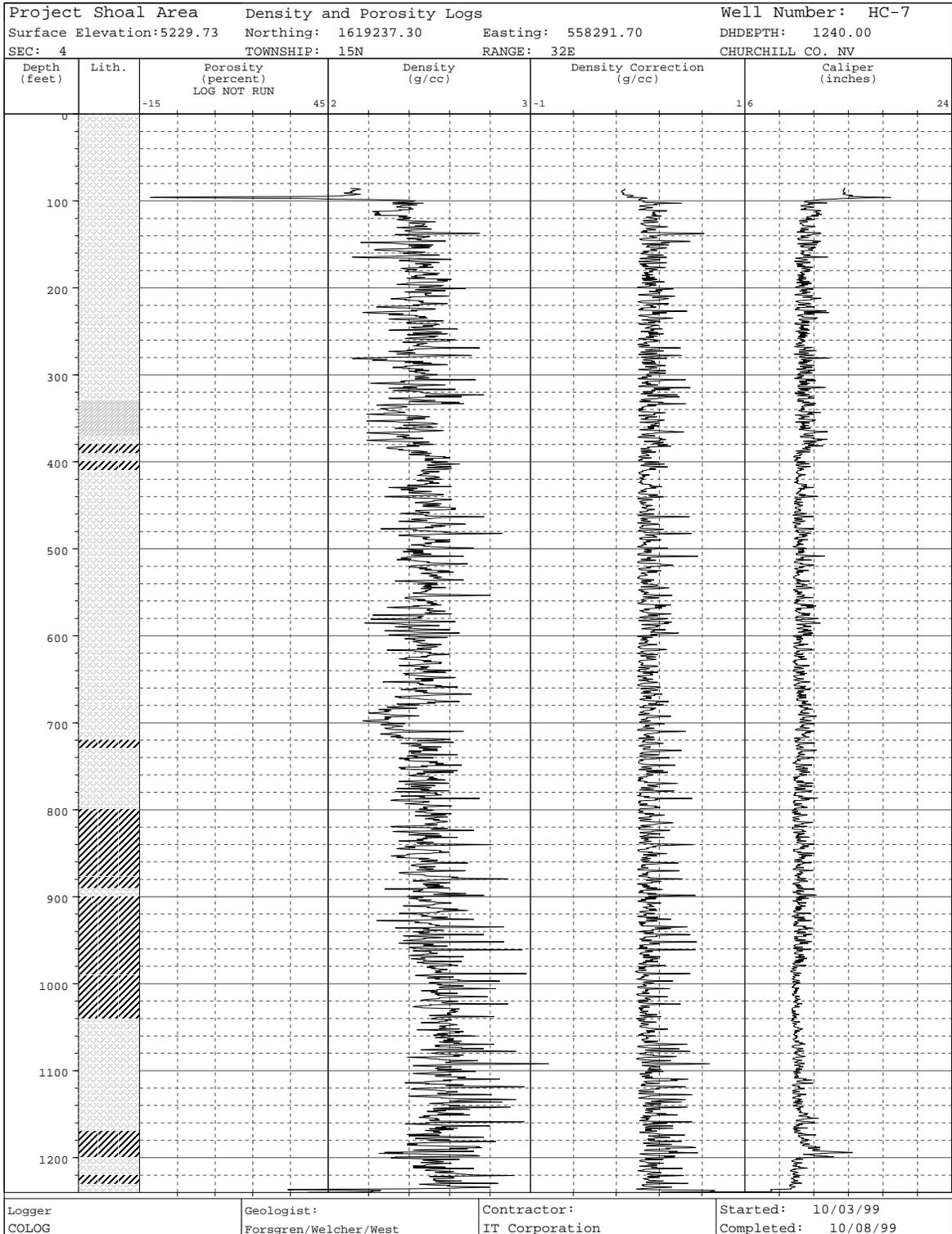


Figure 4-6
Well HC-7 Traces of Density, Porosity, and Caliper Data

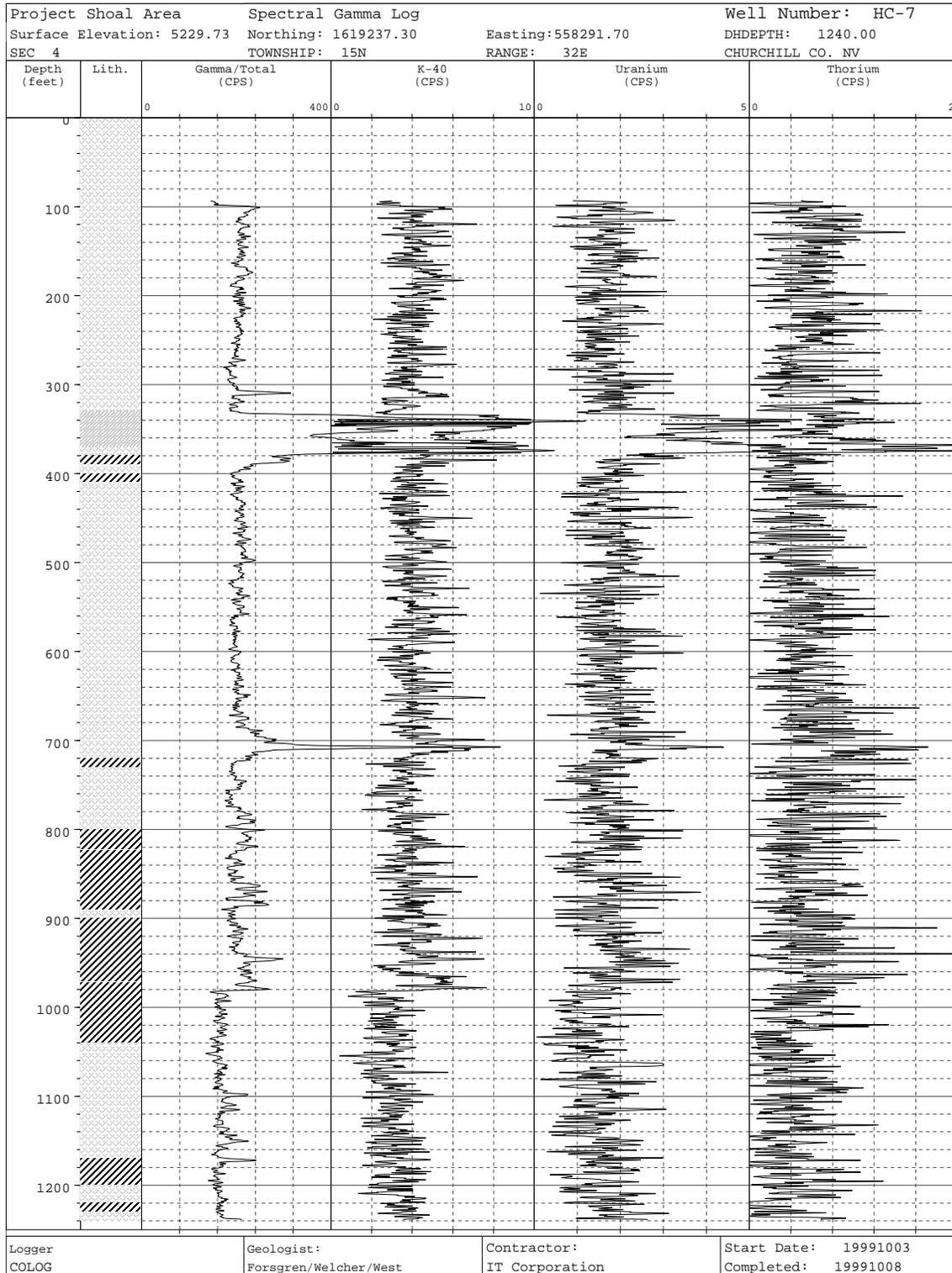


Figure 4-7
Well HC-7 Traces of Spectral Gamma Data

Fluid samples for tritium analysis were collected from each water truck load used to drill the well, from drilling fluids immediately prior to circulation into the borehole (injection fluids), and immediately upon discharge to the surface (discharge fluids) on two-hour intervals during drilling, and from discharge fluids approximately on two- to four-hour intervals during well development and testing. The samples were analyzed for tritium using on-site laboratory monitoring equipment. Tritium activities of fluids were recorded using a Packard Liquid Scintillation Counter[®].

Solid effluent samples (drill cuttings) were collected on approximately 50- to 100-ft intervals below 240 ft and allowed to dry prior to recording the alpha and beta activity measurements using a portable survey instrument, a NE Technology Electra.

Tritium activities of fluid effluents during drilling are shown on [Figure 4-8](#). [Table C-9 \(Appendix C\)](#) presents the data used for [Figure 4-8](#). Tritium activities of fluid effluents during well development and testing are shown on [Figure 4-9](#). Alpha and beta activity measurements of drill cuttings are shown on [Table C-10](#). [Tables C-3 through C-5 \(Appendix C\)](#) present the data used for [Figure 4-9](#).

Based on field screening and on-site laboratory analyses, Well HC-7 effluents were found to have natural background alpha and beta activity measurements, and natural background tritium activities.

4.5 Well HC-7 Well Construction

Following completion of Well HC-6 and prior to mobilization to the Well HC-7 location, all drilling equipment was decontaminated on-site using a combination of stream cleaning and high pressure washing.

The Well HC-7 location was revised, based on data collected during the drilling and installation of Well HC-8 (see section 5.1). Hydrogeologic data observed during the drilling of Well HC-8 suggested that the original location of the upgradient well of the tracer test well pair would result in the wells being installed in two distinct structural blocks with different hydraulic characteristics. The tracer test well pair was redesignated as Wells HC-6 and HC-7 and relocated to an area thought to be free of structural complications as discussed in [Section 4.0](#). [Figure 1-3](#) shows the final location of Well HC-7.

Initial drilling of Well HC-7 commenced on October 3, 1999. A 24-in. diameter hole was drilled to a depth of 100 ft bgs using a tricone bit and conventional mud rotary drilling techniques with bentonite and water as the drilling fluid. A 20-in. diameter surface casing was installed to a depth of 100 ft bgs and cemented in place using Type II neat cement with an additive of 2 percent calcium chloride.

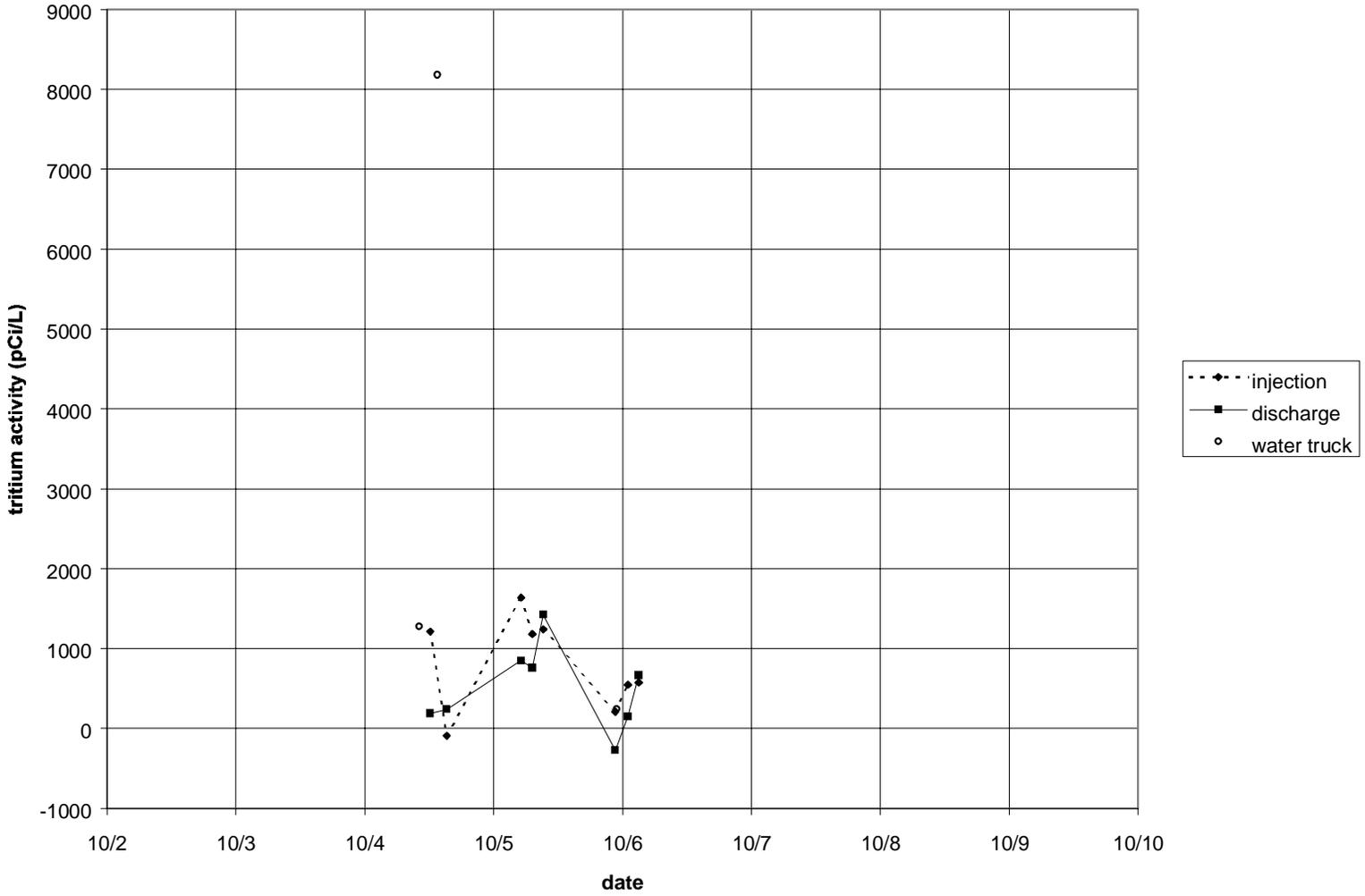


Figure 4-8
Well HC-7 Tritium Activities During Drilling

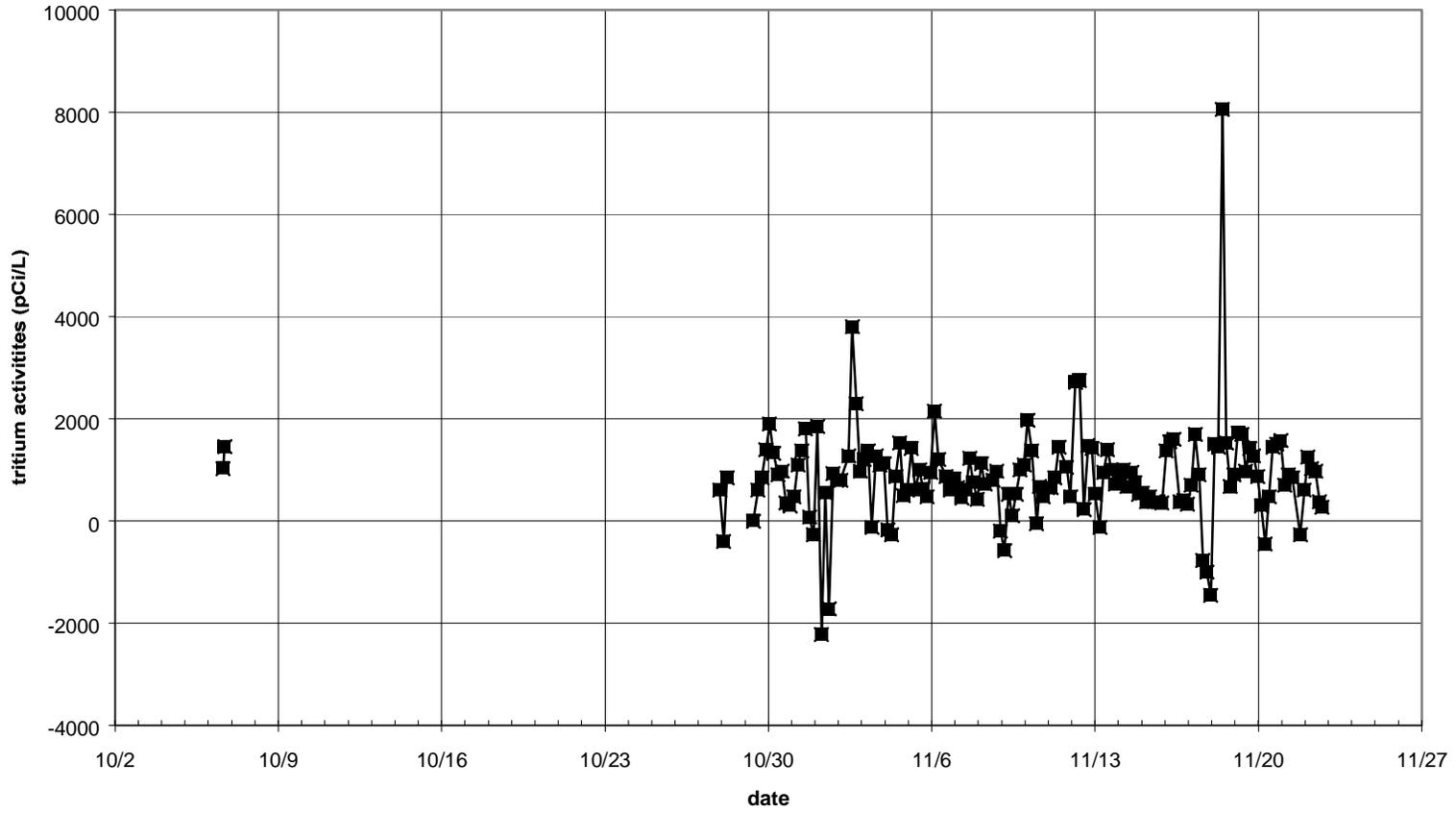


Figure 4-9
Well HC-7 Tritium Activities During Development/Testing

The main hole for the well was advanced to a depth of 1,240 ft bgs using a 10-in. diameter downhole percussion hammer and air-rotary, RC drilling techniques between October 4 and 6, 1999. Drilling progress was briefly interrupted once to check the bit. [Table C-1 \(Appendix C\)](#) and [Figure 4-1](#) present the details of the chronology and drilling progress of Well HC-7. [Figure 4-10](#) presents a summary of Well HC-7 drilling parameters. While advancing the main hole, water with EZ Mud[®] was injected at a rate of approximately 10 gpm to facilitate cuttings return. [Table C-11 \(Appendix C\)](#) shows the drilling fluid additives used, listed by activity, for the drilling and installation of Well HC-7.

Upon completion of drilling, water was circulated from total depth to clear drill cuttings from the borehole. Approximately eighteen hours was spent monitoring water levels, airlifting the hole by RC techniques through the drill string to initially develop the well, and collecting downhole video data. Water levels were consistently recorded at a depth of approximately 1,000 ft bgs (see [Table C-7 \[Appendix C\]](#)). Evaluation of the water level and video data led to the conclusion that the well would be adequate to meet the scientific objectives of the project.

Collection of downhole geophysical data began immediately upon removal of the drill string from the borehole. Collection of downhole geophysical data was completed on October 7, 1999.

The well was then completed on October 7, 1999 by installing 5 1/2-in. OD fiberglass well casing to a depth of 1,225.1 ft bgs and landing the casing in suspension from a landing plate mounted on the surface casing. The well casing is slotted from 1,106.47 to 1,223.6 ft bgs with 0.040-in. saw-cut slots. No centralizers were placed on the 5 1/2-in. casing string due to hole size constraints. Filter pack, consisting 3/8-in. diameter gravel, was installed from total depth to 1,100 ft bgs by pouring it in the borehole from the surface. The 6/9 sand was then installed in a similar manner from 980 to 1,100 ft bgs. The filter pack was installed by pouring from the surface due to a plugged tremie pipe, which the drilling contractor was unable to re-install after it was removed and cleared.

The sanitary seal, consisting of neat cement with an additive of 2 percent calcium chloride, was installed from the surface to a depth of 66 ft bgs on October 8, 1999. A cement basket was used to support the sanitary seal. The annular space between the borehole wall and well casing is open from 66 to 980 ft bgs. [Table 1-1](#) lists the well construction details, [Figure 4-11](#) illustrates the final subsurface well completion, and [Figure 4-12](#) presents the final surface completion of Well HC-7.

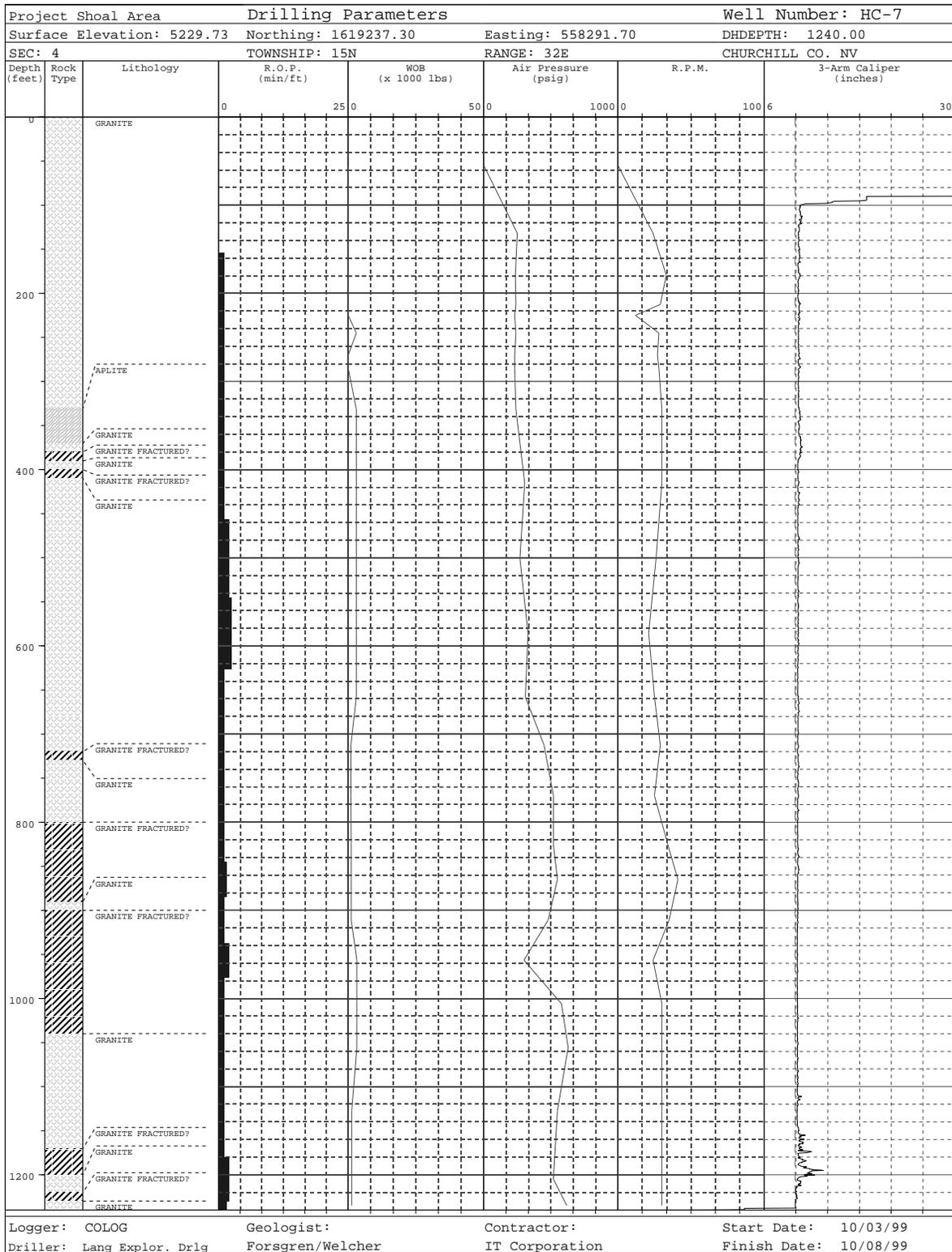


Figure 4-10
Well HC-7 Summary of Drilling Parameters

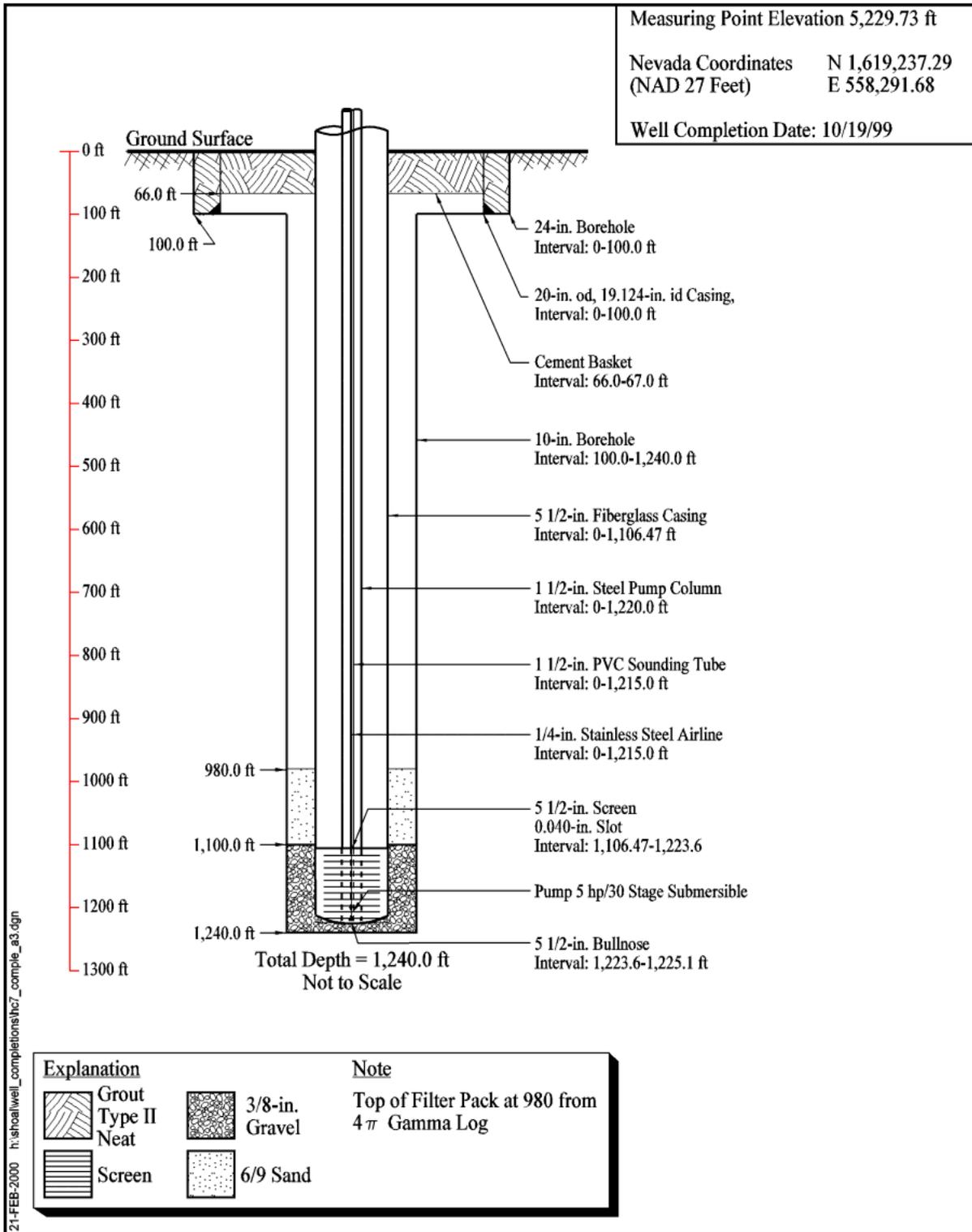
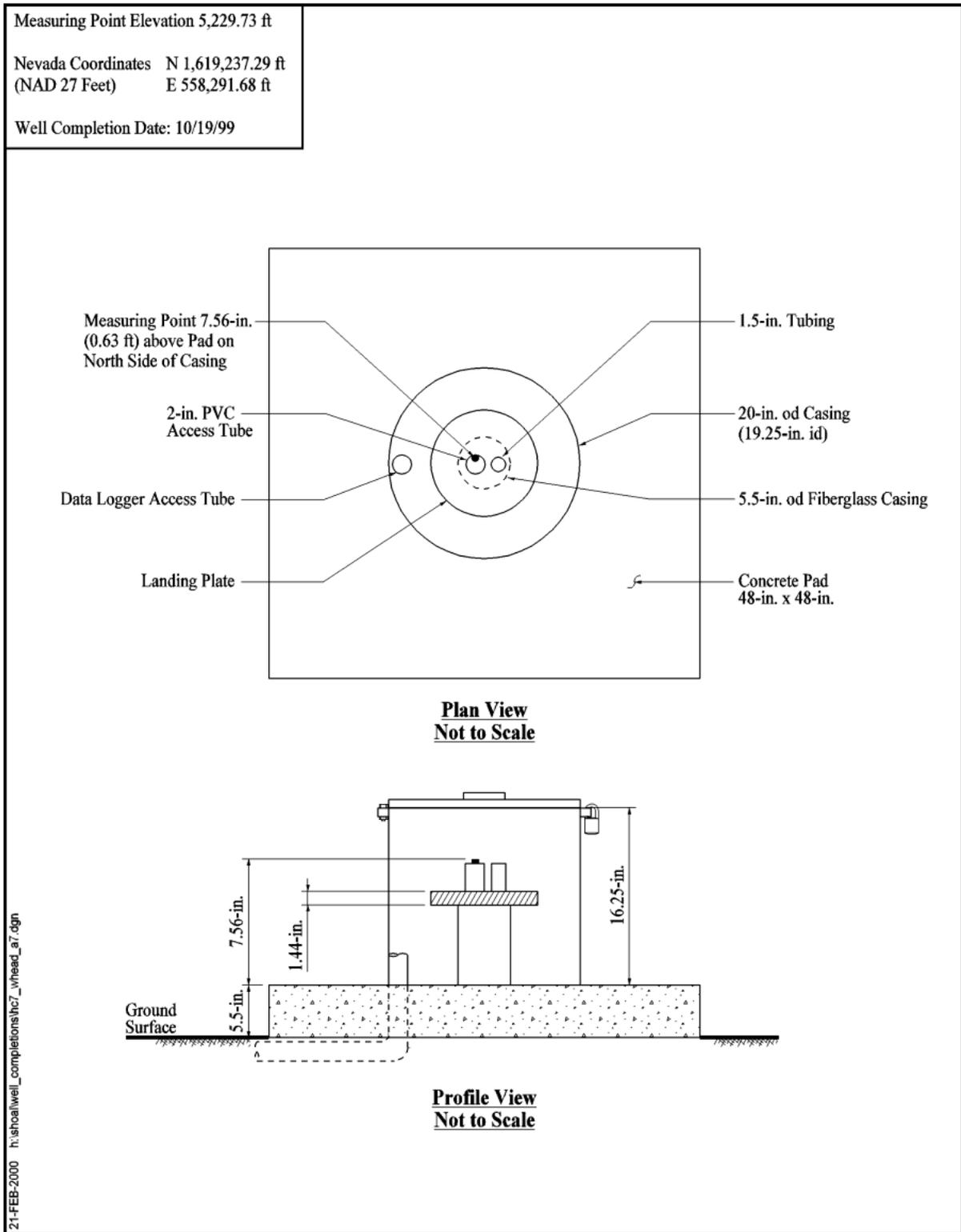


Figure 4-11
Well HC-7 Well Completion Diagram



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Figure 4-12
Well Head Completion Diagram for HC-7

4.6 Well HC-7 Well Development and Testing

Initial well development consisted of approximately three hours of RC airlifting through the drill string on October 6, 1999. Approximately 3,284 gallons of fluid were removed from the well by airlift techniques. Fluoride concentrations and tritium activities were monitored on two-hour intervals throughout the duration of airlift development. [Table C-3 \(Appendix C\)](#) lists the development parameters during airlifting.

A submersible pump was permanently installed to a depth of 1,208 ft on October 19, 1999. The pump was used to further develop the well from October 27 to 28, 1999. Fluoride concentrations and tritium activities were monitored on two-hour intervals throughout the duration of Phase I development/test pumping. [Table C-4 \(Appendix C\)](#) lists the development parameters during development pumping. Initial development/test pumping was conducted for a total of 660 minutes with a total of 1,980 gallons of fluid removed from the well at an average discharge rate of 3 gpm.

Phase II development/test pumping began October 28, 1999 and continued through November 29, 1999 when ITLV suspended monitoring activities. The DRI continued to pump Well HC-7 after November 29, 1999 to facilitate tracer testing. Tracer testing was initiated by DRI November 3, 1999, with the injection of NaI, $\text{NaH}^{13}\text{CO}_3$, and D_2O in Well HC-6 while continuing to pump Well HC-7. A second group of tracers, LiCl, LiBr, PFBA, and NaOH were injected beginning November 10, 1999. A third tracer, CsCl, was injected beginning November 29, 1999. Fluoride concentrations and tritium activities were monitored on two-hour intervals through November 22, 1999. [Table C-5 \(Appendix C\)](#) lists the development parameters during Phase II pumping through ITLV's term of involvement.

Field water quality parameters of temperature, pH, and electrical conductivity, as well as fluoride concentrations and tritium activities were monitored throughout the duration of testing on two- to four-hour intervals. [Table C-4 \(Appendix C\)](#) lists the development parameters during Phase I development/test pumping, [Table C-5 \(Appendix C\)](#) lists the development parameters during Phase II development/test pumping. [Figure 4-4](#) shows the trends of the development parameters through both well development and testing. [Figure 4-8](#) shows the tritium activities of the discharge fluid during development and testing.

Electrical conductivities of the development/test pumping effluent ranged from 1,350 to 1,450 microSiemens/cm. The pH ranged from 7.5 to 8 standard units. Fluoride concentrations remained below 0.5 mg/L throughout the duration of the pumping. These parameters remained

stable through November 22, 1999 (i.e., when routine sampling was discontinued at the request of DRI).

4.7 Well HC-7 Sampling

Samples of discharge effluent temporarily stored in lined sumps were collected as specified in the *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada (IT, 1999)* and *Fluid Management Plan for the Project Shoal Area Off-Sites Project (DOE/NV, 1999b)* for characterization prior to discharge/ disposal. The analytical results from these samples are shown in [Table C-12 \(Appendix C\)](#).

5.0 Well HC-8 Summary of Operations

Well HC-8 was originally proposed as the downgradient well of the tracer test well pair (DRI, 1999). The tracer test wells were proposed as water table wells. However, water level data collected between 1,280 and 1,686 ft in the HC-8 borehole suggested that the formation had very low water-yielding capabilities throughout the potential slotted interval of a water table well. These data and other hydrogeologic data observed during the drilling of Well HC-8 suggested that the originally proposed location of Well HC-6 (the upgradient well of the tracer test pair), would result in the tracer test wells being installed in two distinct structural blocks with different hydraulic head characteristics. Therefore, Well HC-8 was completed as the intermediate depth well. Wells HC-6 and HC-7 were then designated as the tracer test well pair and moved to an alternate location, as discussed in [Sections 3.5](#) and [4.5](#). [Figure 1-3](#) shows the location of Well HC-8.

Well HC-8 was drilled to a total depth of 2,530 ft bgs beginning August 21, 1999. The well casing was installed to a total depth of 2,441.3 ft bgs with the filter-packed, slotted interval from 2,294.44 to 2,410.92 ft bgs. The well construction details are provided on [Table 1-1](#). Completion of the well occurred September 21, 1999, when the installation of the sanitary grout seal was completed. Borehole instability problems resulted in difficulties with drilling this well and delays in the collection of downhole geophysical data. A total of 32 days was spent drilling and constructing this well. [Figure 5-1](#) presents the drilling progress of HC-8.

Initial well development, consisting of conventional airlifting, occurred September 21 to 23, 1999. Initial pump development occurred October 18, 1999. Further pump development and aquifer testing occurred October 19 through October 29, 1999 and November 11 through 14, 1999. Approximately 35,000 gallons more fluid was used to drill the well than had been discharged during drilling, well construction, and development/test pumping activities.

Alpha and beta activity measurements of drill cuttings were within the background range. Tritium activities of discharge fluids were also within the background range throughout the duration of Well HC-8 activities. Fluoride concentrations continued to decline through the duration of pumping to approximately 0.5 mg/L on November 14, 1999.

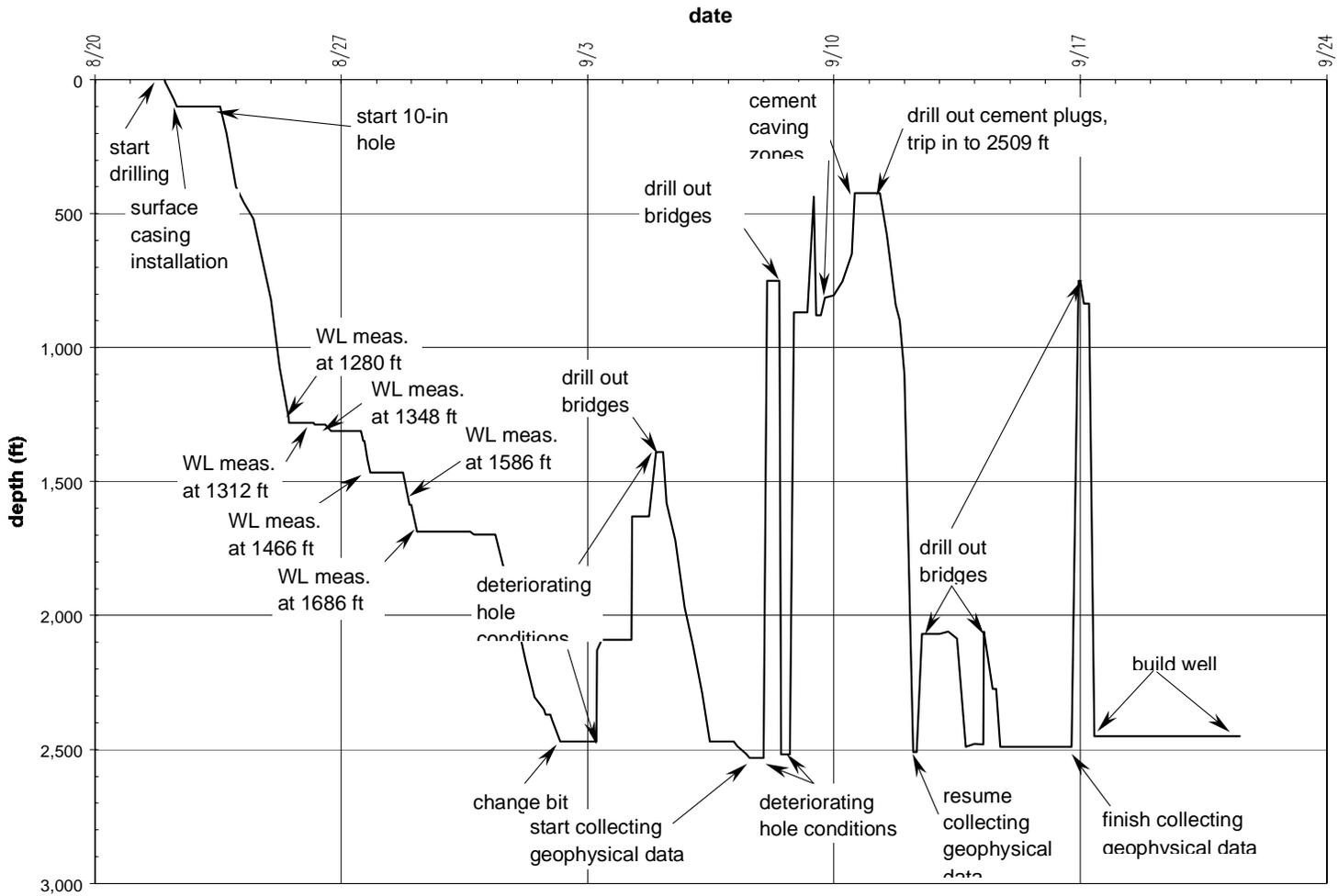


Figure 5-1
Well HC-8 Drilling Progress

Table D-1 (Appendix D) provides the chronology of drilling, construction, development, and testing of Well HC-8.

5.1 Well HC-8 Geology

The HC-8 borehole encountered porphyritic, medium to coarse-grained biotite granite throughout most of the drilled interval. The presence of thin aplite dikes is suggested by the geophysical logs in several intervals. Mircobreccia texture was observed in the drill cuttings from 160 to 240 ft bgs. Larger, oxidized drill cuttings and geophysical logs indicated the presence of numerous fractured intervals. Geophysical logs also suggested fluid inflow in numerous intervals. Numerous clay-rich intervals, interpreted as fault gouge zones, were encountered. Lithologic descriptions are provided as Figure 5-2. Figure 5-3 summarizes these geologic features.

5.2 Well HC-8 Hydrology

All fluids used to drill the well were spiked with a tracer solution of NaF. The target concentration was 50 mg/L. The fluoride concentration in fluids during drilling was monitored in each truck load of water used to drill the well, in the drilling fluid immediately prior to injection into the borehole, and in the drilling fluid immediately upon discharge to the surface. Monitoring of these injected and discharged fluids was conducted on 100-ft intervals above the predicted water table and on one-hour intervals in the saturated zone. Figure 5-4 presents the fluoride concentration data in fluids from these sources. Table D-2 (Appendix D) presents the data used for Figure 5-4.

The fluoride concentration was also monitored in fluids discharged during well development/testing on two- to four-hour intervals to judge the progress of well development. Figure 5-5 shows the fluoride concentrations in fluids from these sources. Tables D-3 through D-6 (Appendix D) present the data used for Figure 5-5.

Water balance calculations show that not all of the water used to drill the well was discharged during drilling of the borehole, airlift development of the open borehole, and development/test pumping of the completed well. Approximately 35,000 gallons more water were used to drill the well than have been discharged. The water balance data is presented as Table D-7 (Appendix D).

Water production varied from approximately 2.5 to 20 gpm during airlift development of the open borehole. Water production during development/test pumping was approximately 2 gpm. Water production rate data is included in Tables D-3 through D-6 (Appendix D).

| | |
|--------------|---|
| 0 - 160 ft | <u>Granite</u> , mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 3 to 13 mm chips. |
| 160 - 240 ft | <u>Granite</u> , mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, slightly altered to chlorite. Minor accessory magnetite. Pale yellow to ochreous orange stains as halos and along fractures. Greenish gray clay component in interval 170 to 180 ft, suggesting zone of fault gouge. Microbreccia texture noted in some chips throughout interval. Geophysical logs suggest the presence of a thin aplite dike in the interval 180 to 190 ft. Good quality cuttings with 5 to 12 mm chips. |
| 240 - 330 ft | <u>Granite</u> , mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, slightly altered to chlorite. Minor accessory magnetite. Minor accessory disseminated pyrite throughout interval, locally oxidized. Pale yellow to ochreous orange stains as halos and along fractures. Greenish gray clay component throughout, suggesting zone of fault gouge. Geophysical logs suggest the presence of thin aplite dikes in the intervals 260 to 270 ft and 310 to 320 ft. Good quality cuttings with 4 to 11 mm chips. |
| 330 - 460 ft | <u>Granite</u> , mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 3 to 13 mm chips. Larger chips (to 20 mm) 335 to 370 ft and 380 to 400 ft, possibly indicating fracture zones. |
| 460 - 480 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasive weak alteration to chlorite. Minor accessory magnetite. Minor grayish clay component. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 8 mm chips. Larger chips (to 15 mm) 460 to 470 ft, possibly indicating a fracture zone. |
| 480 - 560 ft | <u>Granite</u> , mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 16 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 4 to 12 mm chips. |
| 560 - 660 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive slight greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, partially altered to chlorite. Minor accessory magnetite. Sparse pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 1 to 5 mm chips. |
| 660 - 740 ft | <u>Granite</u> , mottled grayish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Good quality cuttings with 2 to 8 mm chips. |

Figure 5-2
Well HC-8 Lithologic Descriptions
 (Page 1 of 3)

| | |
|------------------|--|
| 740 - 780 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, pervasive weak alteration to chlorite. Minor accessory magnetite. Minor clay component. Trace pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 8 mm chips. Larger chips (to 15 mm) 740 to 750 ft, possibly indicating a fracture zone. |
| 780 - 870 ft | <u>Granite</u> , grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Minor grayish clay component 860 to 870 ft. Good quality cuttings with 2 to 8 mm chips, larger chips (to 15 mm) 860 to 870 ft, possibly indicating a fracture zone. |
| 870 - 950 ft | <u>Granite</u> , mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, slightly altered to chlorite. Minor accessory magnetite. Pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 3 to 10 mm chips. |
| 950 - 1,050 ft | <u>Granite</u> , mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Slight greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, slightly altered to chlorite. Minor accessory magnetite. Pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 4 to 11 mm chips, larger chips (to 17 mm) 950 to 960 ft; 970 to 980 ft; 1,000 to 1,010 ft; and 1,030 to 1,040 ft, possibly indicating fracture zones. |
| 1,050 - 1,110 ft | <u>Granite</u> , mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 15 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Good quality cuttings with 3 to 10 mm chips. |
| 1,110 - 1,300 ft | <u>Granite</u> , mottled grayish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars. Local alteration of some feldspars to very fine grained sericite. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, local minor alteration to chlorite. Minor accessory magnetite. Fine cuttings with 2 to 5 mm chips, larger chips to 10 mm 1,250 to 1,260 ft, possibly indicating a fracture zone. Geophysical logs suggest the presence of an aplite dike in the interval 1,290 to 1,300 ft. |
| 1,300 - 1,610 ft | <u>Granite</u> , mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Good quality cuttings with 3 to 12 mm chips. |
| 1,610 - 1,670 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish pinkish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Slight greenish alteration of some plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 15 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Sparse pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 8 mm chips. |
| 1,670 - 1,790 ft | <u>Granite</u> , grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Good quality cuttings with 4 to 10 mm chips. Geophysical logs suggest a fracture zone with fluid inflow 1,790 to 1,810 ft. |

Figure 5-2
Well HC-8 Lithologic Descriptions
 (Page 2 of 3)

| | |
|------------------|--|
| 1,790 - 1,900 ft | <u>Granite</u> , mottled grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive strong greenish alteration of plagioclase feldspars. Potassium feldspar phenocrysts to 18 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Trace fine grained, disseminated, oxidized pyrite throughout interval. Trace pale yellow to ochreous orange stains as halos and along fractures. Minor clay component locally. Good quality cuttings with 4 to 15 mm chips. Larger chips (to 20 mm) 1,830 to 1,900 ft, possibly indicating a fracture zone. Geophysical logs suggest fluid inflow 1,850 to 1,860 ft and 1,870 to 1,880 ft. |
| 1,900 - 2,030 ft | <u>Granite</u> , mottled grayish white to yellowish grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of plagioclase feldspars. Potassium feldspar phenocrysts to 18 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Weak pale yellow to ochreous orange stains along fractures throughout interval. Good quality cuttings with 3 to 8 mm chips, larger chips (to 15 mm) 1,930 to 1,940 ft and 1,990 to 2,030 ft, possibly indicating fracture zone. Geophysical logs suggest fractures with fluid inflow 1,960 to 1,970 ft and 1,990 ft. |
| 2,030 - 2,070 ft | <u>Granite</u> , mottled greenish grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive greenish alteration of plagioclase feldspars. Some feldspars altered to very fine grained sericite. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, altered to chlorite. Minor accessory magnetite. Trace reddish brown to ochreous orange stains on fractures. Includes brownish gray clay component, possible fault gouge zone. Good quality cuttings with 3 to 12 mm chips, larger chips (to 20 mm) 2,030 to 2,070 ft and especially 2,050 to 2,060 ft, possibly indicating a fracture zone. |
| 2,070 - 2,170 ft | <u>Granite</u> , mottled grayish pinkish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Potassium feldspar phenocrysts to 12 mm. Accessory biotite, as books and aggregates, black. Minor accessory magnetite. Good quality cuttings with 3 to 13 mm chips. |
| 2,170 - 2,230 ft | <u>Granite</u> , mottled grayish greenish white to grayish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local greenish alteration of some plagioclase feldspars. Potassium feldspar phenocrysts to 8 mm. Accessory biotite, as books and aggregates, black to greenish black, slightly altered to chlorite. Minor accessory magnetite. Good quality cuttings with 3 to 8 mm chips. |
| 2,230 - 2,330 ft | <u>Granite</u> , mottled grayish greenish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Pervasive slight greenish alteration of some plagioclase feldspars throughout interval. Potassium feldspar phenocrysts to 10 mm. Accessory biotite, as books and aggregates, black to greenish black, locally altered to chlorite. Minor accessory magnetite. Sparse pale yellow to ochreous orange stains as halos and along fractures. Good quality cuttings with 2 to 10 mm chips, larger chips (to 18 mm) 2,230 to 2,240 ft and 2,310 to 2,330 ft, possibly indicating fracture zones. |
| 2,330 - 2,530 ft | <u>Granite</u> , mottled grayish white to grayish pinkish white to grayish greenish white. Porphyritic, with medium to coarse grained, subhedral granular groundmass of clear to milky pink potassium feldspar (40%), clear to milky quartz (35%), and milky white to translucent plagioclase feldspar (25%). Local slight greenish alteration of some plagioclase feldspars. Potassium feldspar phenocrysts to 15 mm. Accessory biotite, as books and aggregates, black to greenish black, locally slightly altered to chlorite. Minor accessory magnetite. Good quality cuttings with 3 to 12 mm chips. Geophysical logs suggest the presence of a fracture with fluid inflow 2,380 ft. |

Figure 5-2
Well HC-8 Lithologic Descriptions
 (Page 3 of 3)

| Fractured Intervals (ft bgs) | Clay-rich Intervals (ft bgs) | Aplite Dike Intervals (ft bgs) | Fluid Inflow Intervals (ft bgs) |
|---------------------------------|---------------------------------|-----------------------------------|------------------------------------|
| 335 to 370 | 170 to 180 | 180 to 190 | 1,790 to 1,810 |
| 380 to 400 | 240 to 330 | 260 to 270 | 1,850 to 1,860 |
| 460 to 470 | 460 to 480 | 310 to 320 | 1,870 to 1,880 |
| 740 to 750 | 740 to 780 | 1,290 to 1,300 | 1,960 to 1,970 |
| 860 to 870 | 860 to 870 | | 1,990 to 2,380 |
| 950 to 960 | 2,030 to 2,070 | | |
| 970 to 980 | | | |
| 1,000 to 1,010 | | | |
| 1030 to 1,040 | | | |
| 1,250 to 1,260 | | | |
| 1,830 to 1,900 | | | |
| 1,930 to 1,940 | | | |
| 1,990 to 2,070 | | | |
| 2,230 to 2,240 | | | |
| 2,310 to 2,330 | | | |

Figure 5-3
Well HC-8 Summary of Geologic Features

Fluid-level monitoring was conducted in the open borehole prior to well construction, as well as, after completion of the well. [Table D-8 \(Appendix D\)](#) provides fluid level data obtained for the term of the ITLV involvement in PSA data collection.

5.3 Well HC-8 Geophysical Surveys

Collection of the main body of downhole geophysical data was implemented in two phases by Colog. Data from surface to 1,686 ft was collected in the 10-in. diameter borehole during the first phase. Data from 1,686 ft to the total depth of 2,530 ft was collected in the 10-in. diameter borehole during the second phase. Considerable difficulty was experienced during the second phase of data collection due to unstable hole conditions. Colog also collected additional downhole geophysical data from the completed well. Additional video, caliper, geochemical, thermal flow meter, borehole radar, and water level data were collected by DRI and DRI/PRG at various points, as required to achieve the scientific goals of the project.

Upon completion of drilling to a depth of 1,686 ft, the first phase of downhole geophysical data collection was conducted in the open

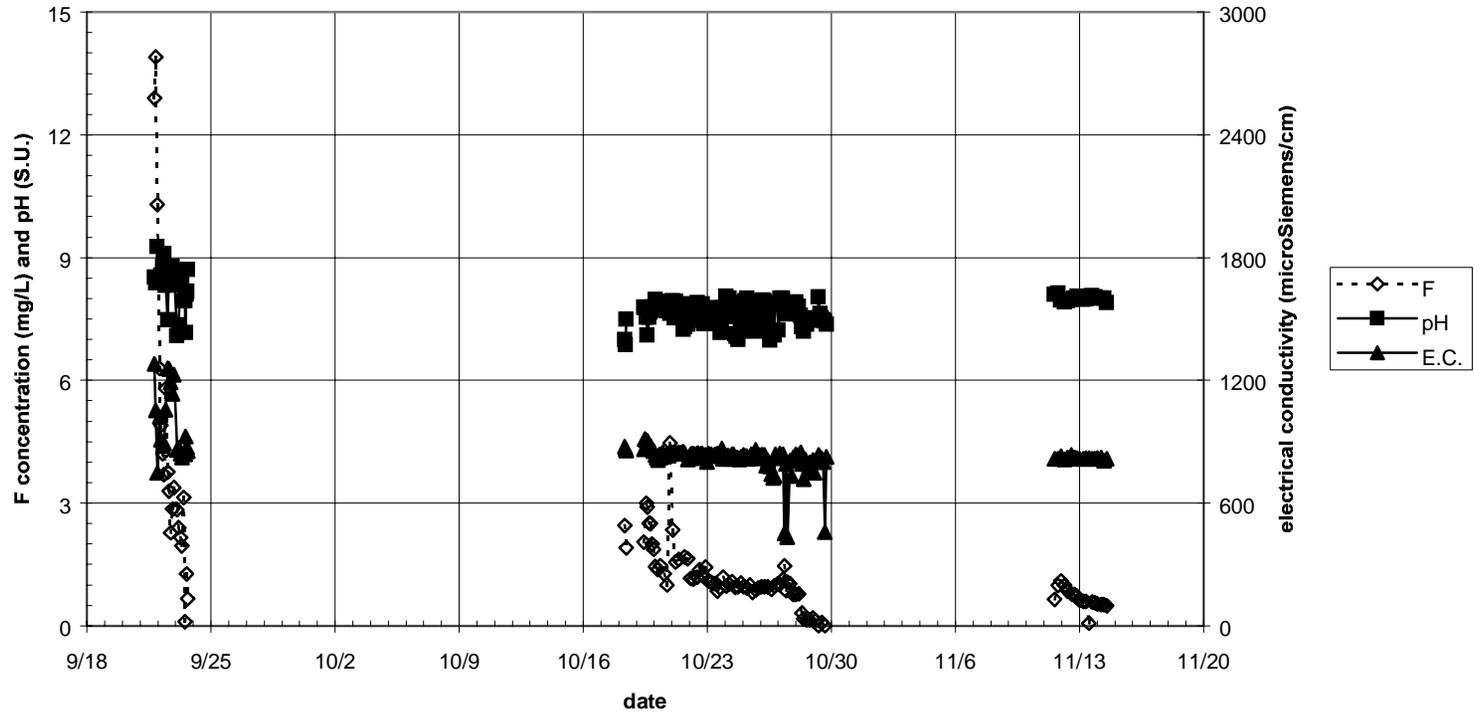


Figure 5-5
Well HC-8 Well Development Parameters

borehole on August 29 and 30, 1999. This phase consisted of the collection of an abbreviated suite of data. The second phase of downhole geophysical data collection occurred between September 7 and 16, 1999 when the borehole had reached a total depth of 2,530 ft. The second phase of data collection was complicated by unstable borehole conditions which resulted in staged data collection both in the open borehole and through the open-faced drill string. The data collection process was repeatedly interrupted by the necessity to clear bridges from the borehole.

A deviation survey was conducted within the open borehole. The survey indicated the bottom of the borehole had deviated 3.0 degrees from vertical in a northwest direction. The deviation of the borehole placed the bottom of the borehole a distance of 44.77 ft away from the collar at an azimuth of 304 degrees and resulted in a true vertical depth of 2,480.32 ft bgs.

Table D-9 (Appendix D) provides a summary of the geophysical data collected from the borehole. Figures 5-6 to 5-8 provide condensed illustrations of the geophysical traces for Well HC-8.

5.4 Well HC-8 Radiological Monitoring

Monitoring of discharge effluent from drilling, well development, and testing was conducted as specified in the Project Shoal SSHASP (DOE/NV, 1999c), *Fluid Management Plan (FMP) for the Project Shoal Area Off-Sites Project* (DOE/NV, 1999b), and *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT, 1999). Regular on-site radiological monitoring of discharged effluents, including both fluids and solids, was conducted by ITLV personnel.

Fluid samples for tritium analysis were collected from each water truck load used to drill the well, from drilling fluids immediately prior to circulation into the borehole (injection fluids), and immediately upon discharge to the surface (discharge fluids) on two-hour intervals during drilling, and from discharge fluids on two- to four-hour intervals during well development and testing. The samples were analyzed for tritium using on-site laboratory monitoring equipment. Tritium activities of fluids were recorded using a Packard Liquid Scintillation Counter®.

Solid effluent samples (drill cuttings) were collected on 50- to 200-ft intervals below 450 ft and allowed to dry prior to recording the alpha and beta activity measurements using a portable survey instrument, a NE Technology Electra®.

Tritium activities of fluid effluents during drilling are shown on Figure 5-9. Table D-10 (Appendix D) provides the data used for Figure 5-9. Tritium activities of fluid effluents during well

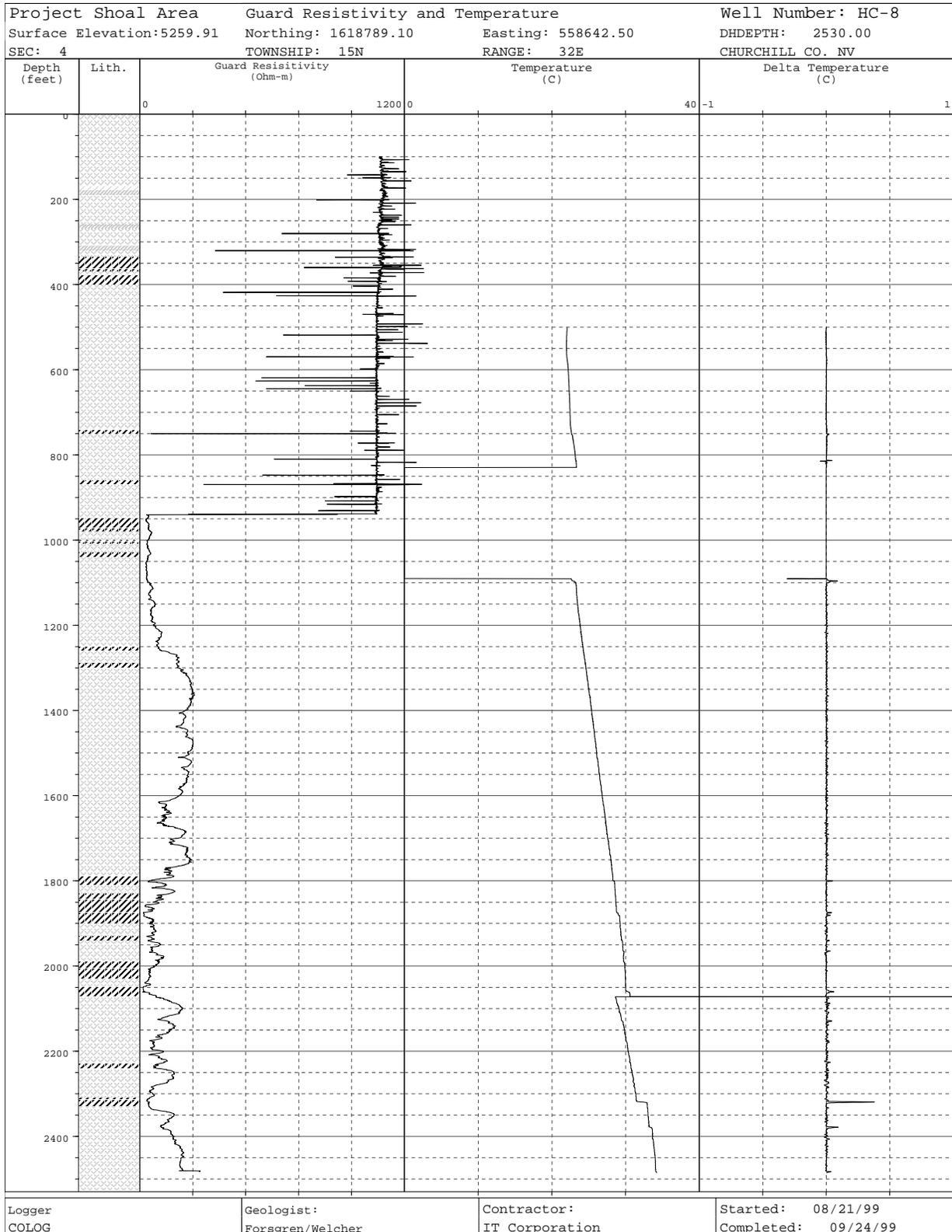


Figure 5-6
Well HC-8 Traces of Temperature and Resistivity Data

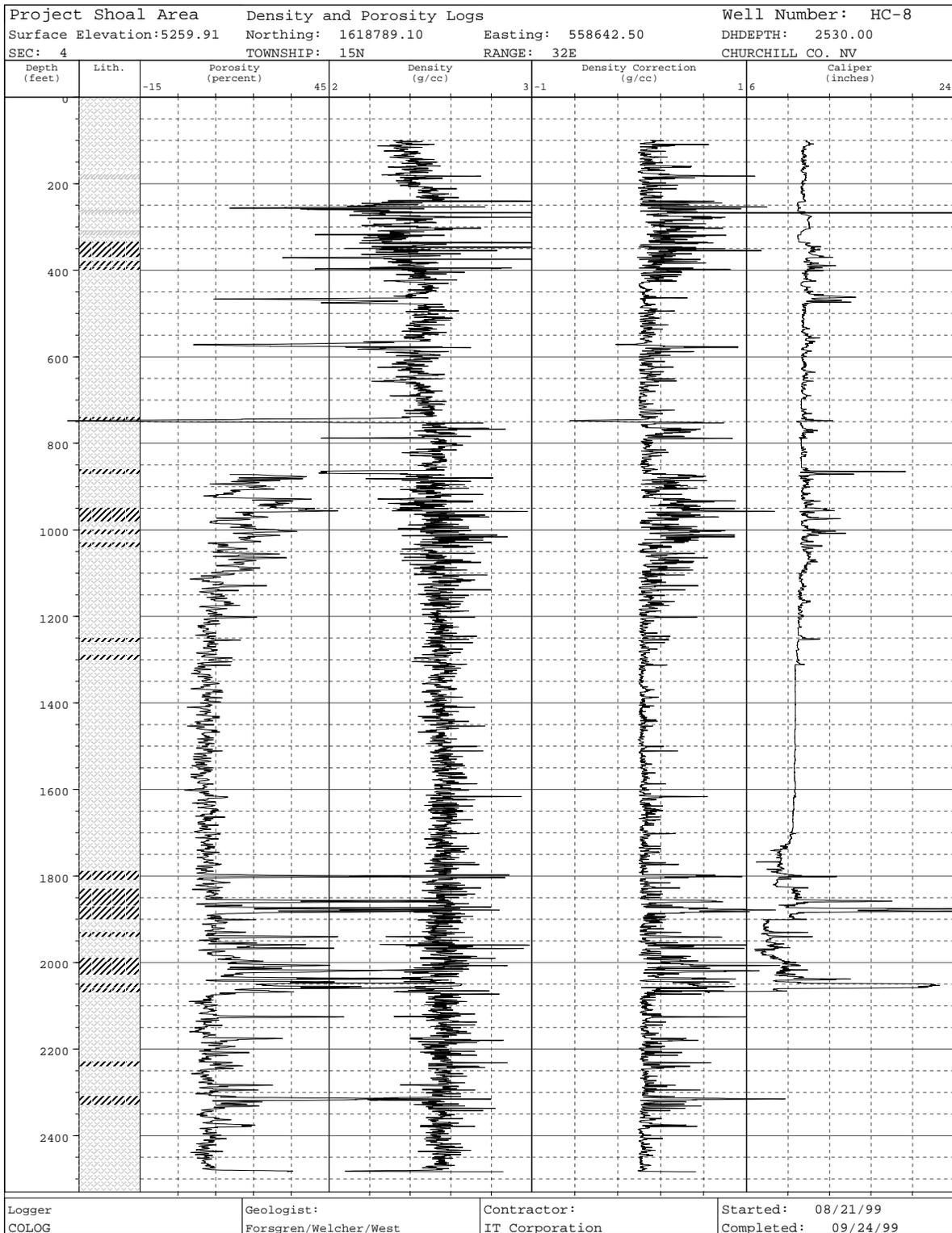


Figure 5-7
Well HC-8 Traces of Density Porosity, and Caliper Data

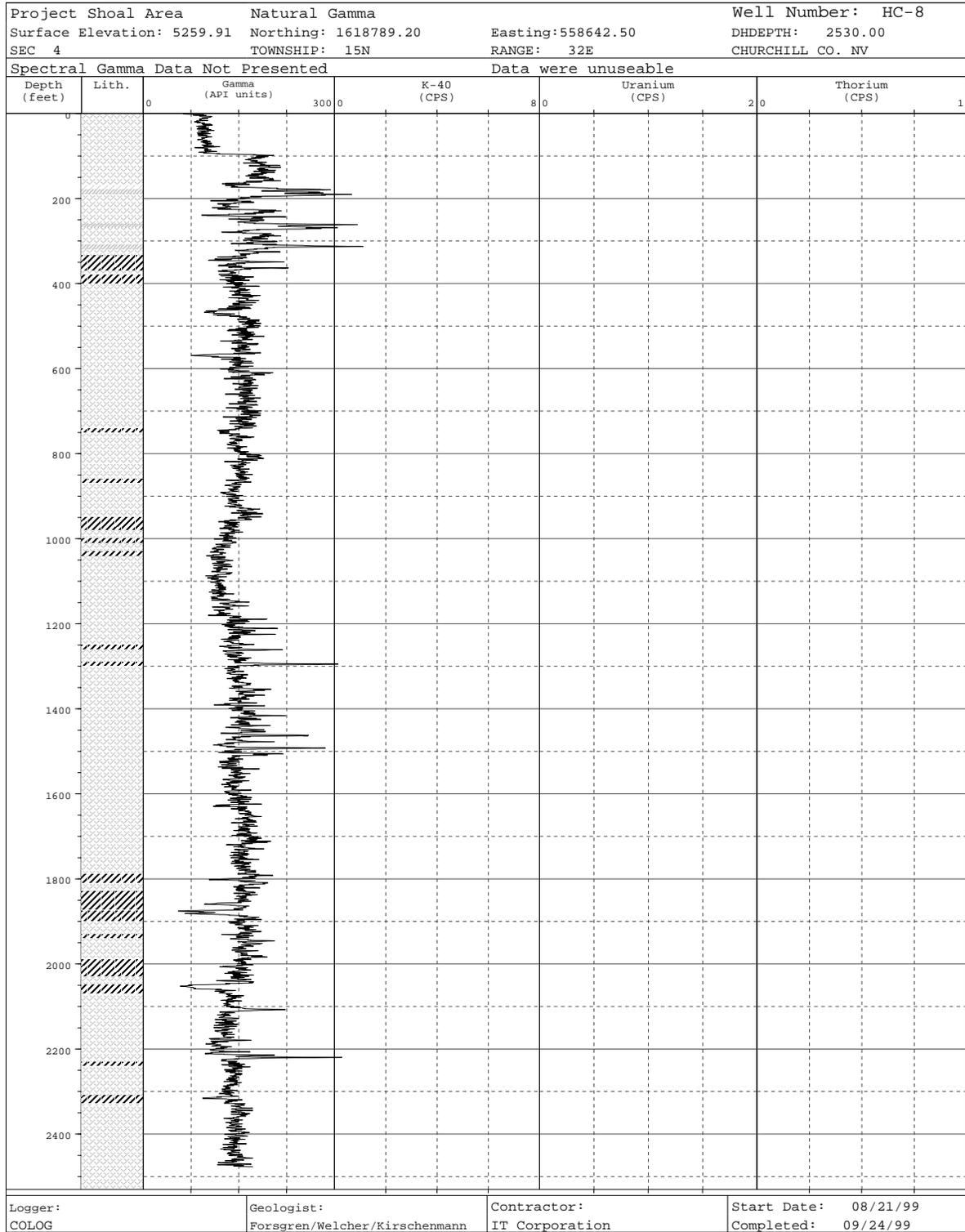


Figure 5-8
Well HC-8 Traces of Spectral Gamma Data

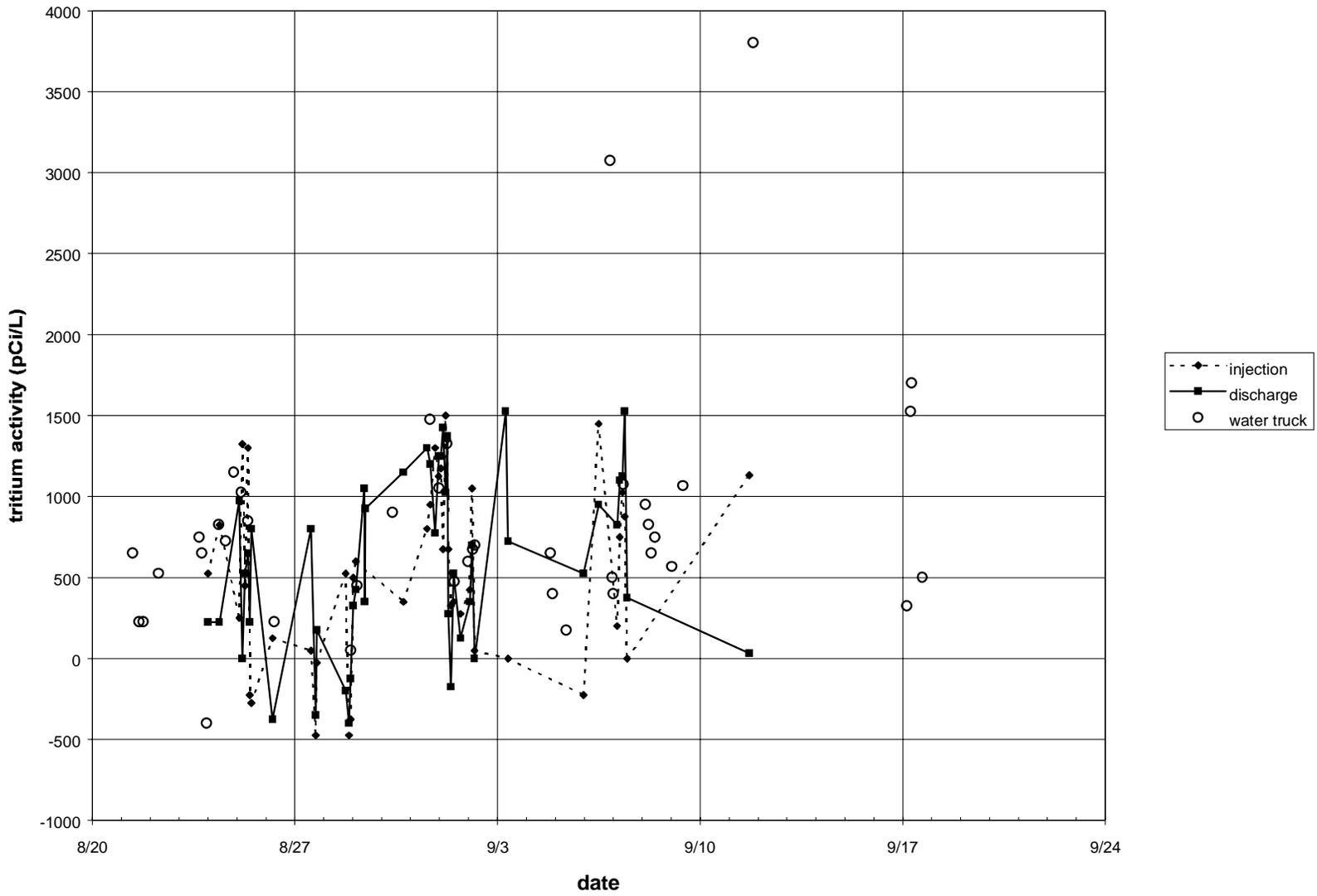


Figure 5-9
Well HC-8 Tritium Activities During Drilling

development and testing are shown on [Figure 5-10](#). [Tables D-3 through D-6 \(Appendix D\)](#) present the data used for [Figure 5-10](#). Alpha and beta activity measurements of drill cuttings are shown on [Table D-11 \(Appendix D\)](#).

Based on field screening and on-site laboratory analyses, Well HC-8 effluents were found to have natural background alpha and beta activity measurements, and natural background tritium activities.

5.5 Well HC-8 Well Construction

Following completion of Well HC-5 and prior to mobilization to the Well C-8 location, all drilling equipment was decontaminated on-site using a combination of stream cleaning and high pressure washing.

Well HC-8 was originally designed as the downgradient well of the tracer test well pair. The tracer test wells were designed as water table wells. However, water level data collected by DRI at total borehole depths of 1,280 ft; 1,312 ft; 1,348 ft; 1,466 ft; 1,586 ft; and 1,686 ft suggested that the water transmitting capabilities of the formation at these depths was insufficient to meet the scientific objectives of the proposed well. Additionally, it was determined that the Well HC-8 borehole had penetrated a significant high-angle, north-south structural feature. This feature apparently acts as a hydraulic barrier with substantially higher water levels west of the feature. The upgradient well of the tracer well pair, as originally proposed, would have been located west of the structure while the downgradient well was east of the structure in a hydraulically distinct structural block. Therefore, it was decided to complete Well HC-8 as the intermediate depth well and relocate proposed Wells HC-6 and HC-7 as the tracer test well pair.

Drilling of Well HC-8 commenced on August 21, 1999. A 24-in. diameter hole was drilled to a depth of 100 ft bgs using a tricone bit and conventional, mud rotary drilling techniques with bentonite and water as the drilling fluid. A 20-in. diameter surface casing was installed to a depth of 100 ft bgs and cemented in place using Type II neat cement with an addition of 2 percent calcium chloride.

The nominal 10-in. diameter main hole for the well was advanced to a total depth of 2,530 ft bgs using a combination of air, RC drilling techniques with either a downhole percussion hammer or tricone bit and flooded, RC drilling techniques with a tricone bit between August 23 and September 17, 1999.

Numerous difficulties were experienced with this borehole due to unstable borehole conditions. These difficulties began August 31 at a depth of 1,697 ft when 27 ft of fill was encountered at the bottom of the hole after changing the drill bit. Unstable borehole conditions

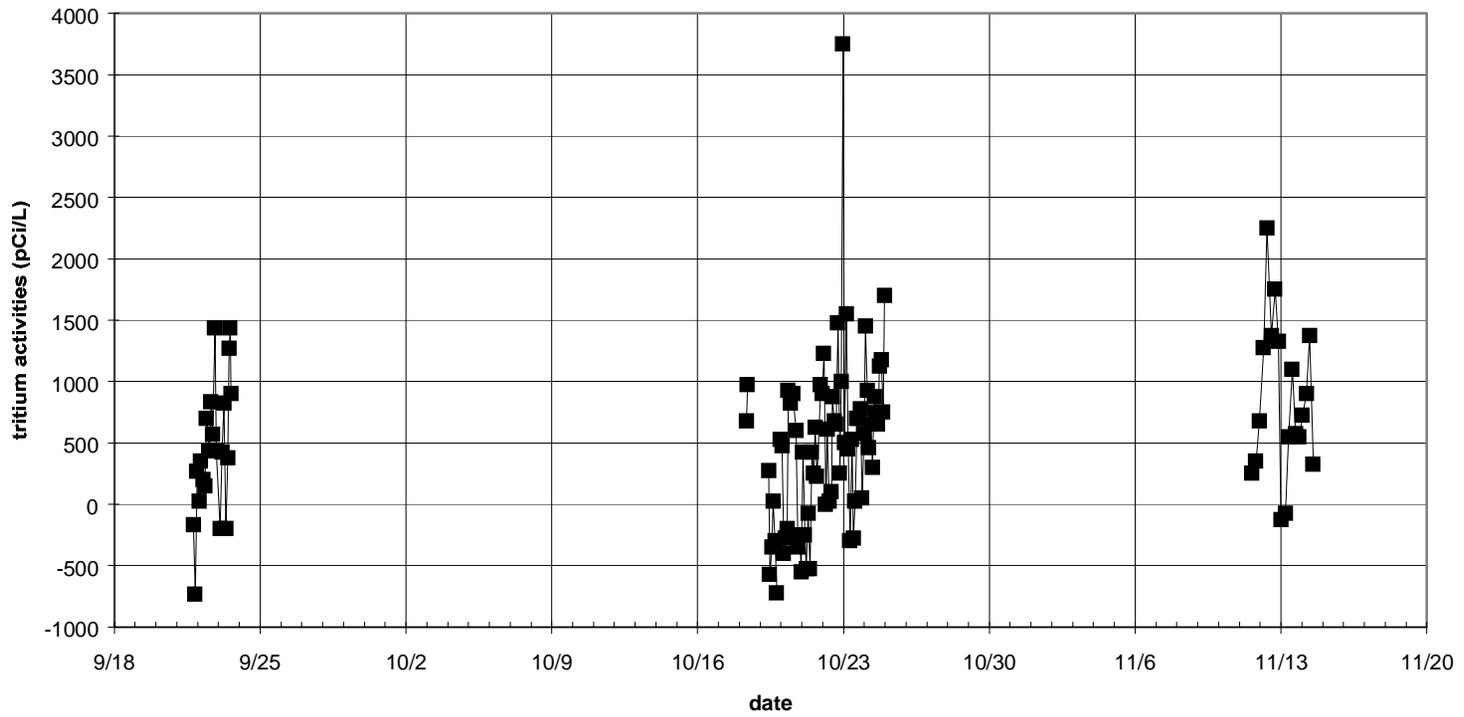


Figure 5-10
Well HC-8 Tritium Activities During Development/Test Pumping

persisted through the completion of drilling the borehole to its total depth of 2,530 ft and continued through the second phase of downhole geophysical data collection. Borehole instability problems contributed to the decision to complete the well at a depth of 2,530 ft rather than the proposed 2,790 ft depth for the intermediate well.

[Table D-1 \(Appendix D\)](#) and [Figure 5-1](#) present additional details of the chronology and progress of drilling activities, respectively.

[Figure 5-11](#) presents a summary of Well HC-8 drilling parameters. While advancing the main hole by the air, RC drilling technique, water with EZ Mud[®] was injected at an approximate rate of 10 gpm to facilitate cuttings return. Water with Drispac[®] (a powdered polymer drilling fluid additive), and soda ash, (a pH control drilling fluid additive), comprised the drilling fluid while drilling by the flooded, RC method. [Table D-12 \(Appendix D\)](#) shows the drilling fluid additives used, listed by activity, for the drilling and installation of Well HC-8.

Upon completion of the drilling on September 9, 1999, bentonite-based drilling fluid was briefly circulated from total depth to clear drill cuttings from the borehole. Collection of downhole geophysical data began immediately upon removal of the drill string from the borehole. Unstable borehole conditions hampered the collection of downhole geophysical data, as discussed in [Section 5.3](#). Collection of downhole geophysical data was completed on September 19th, 1999.

Installation of the 5 1/2-in. OD well casing to a depth of 2,441.3 ft bgs was completed on September 18, 1999. Blank, mild steel well casing extends from the surface to a depth of 811.18 ft, fiberglass well casing extends from 811.18 to 2,441.3 ft. The fiberglass casing is slotted from 2,294.44 to 2,410.92 ft bgs with 0.040-in. saw-cut slots. The well casing was landed in suspension from a landing plate mounted on the surface casing.

No centralizers were placed on the 5 1/2-in. casing string due to hole size constraints. The filter pack consists of 3/8-in. diameter gravel from the total depth of 2,449 ft to 2,247 ft bgs, 6/9 sand from 2,222 to 2,247 ft bgs, and 20/40 sand from 2,200 to 2,222 ft bgs. The filter pack materials were installed via tremie pipe while circulating water through the tremie pipe.

The sanitary seal was installed via tremie pipe from the surface to a depth of 2,200 ft bgs in five lifts from September 19 to 21, 1999. The first two lifts consisted of neat cement with the addition of 2 percent calcium chloride and were mixed on site by Lang. Neat cement for the last three lifts was provided by a commercial subcontractor to Lang. [Table 1-1](#) lists the well construction details, [Figure 5-12](#) illustrates the final subsurface well completion, and [Figure 5-13](#) presents the final surface completion of Well HC-8.

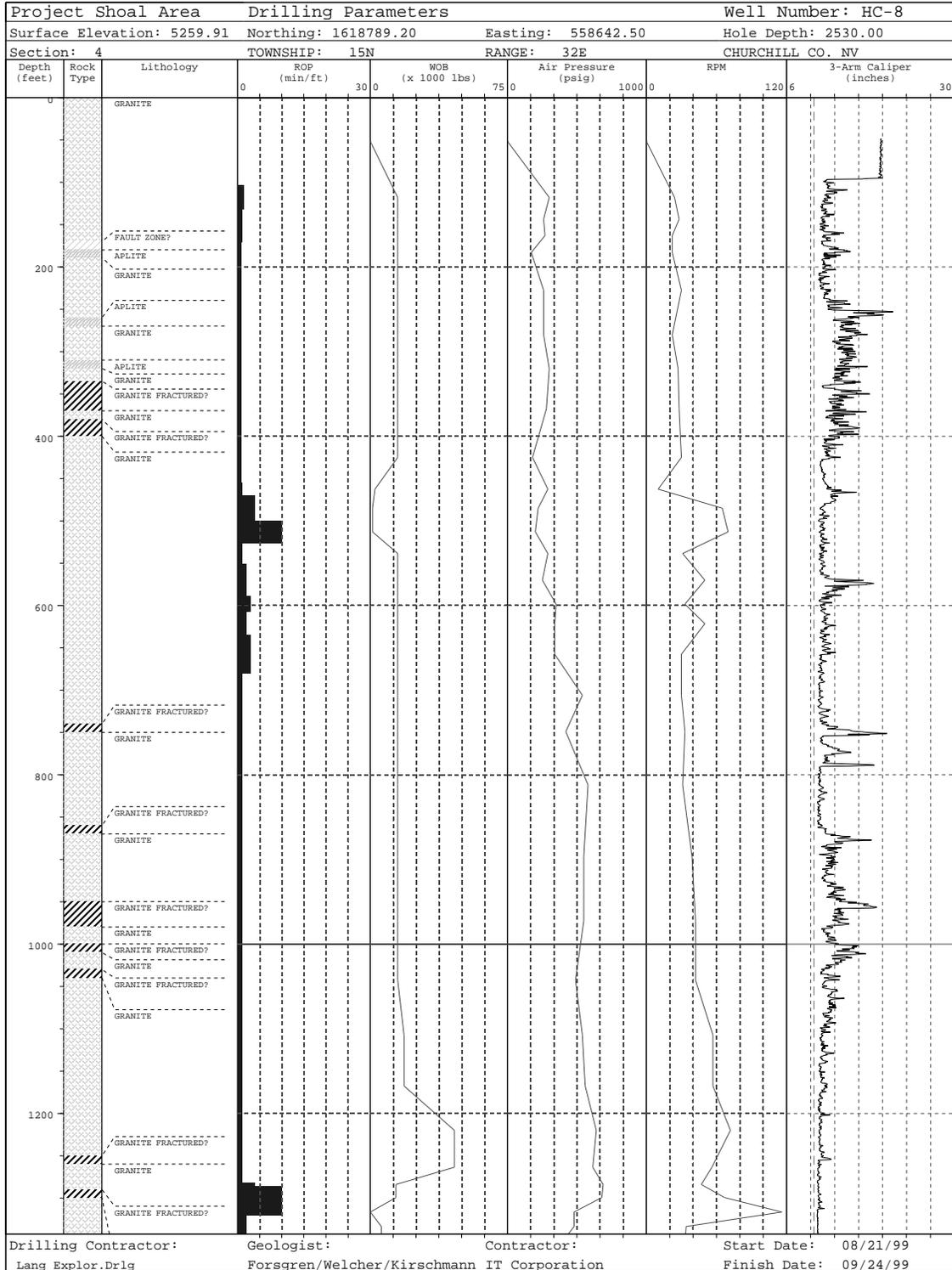


Figure 5-11
 Well HC-8 Summary of Drilling Parameters
 (Page 1 of 2)

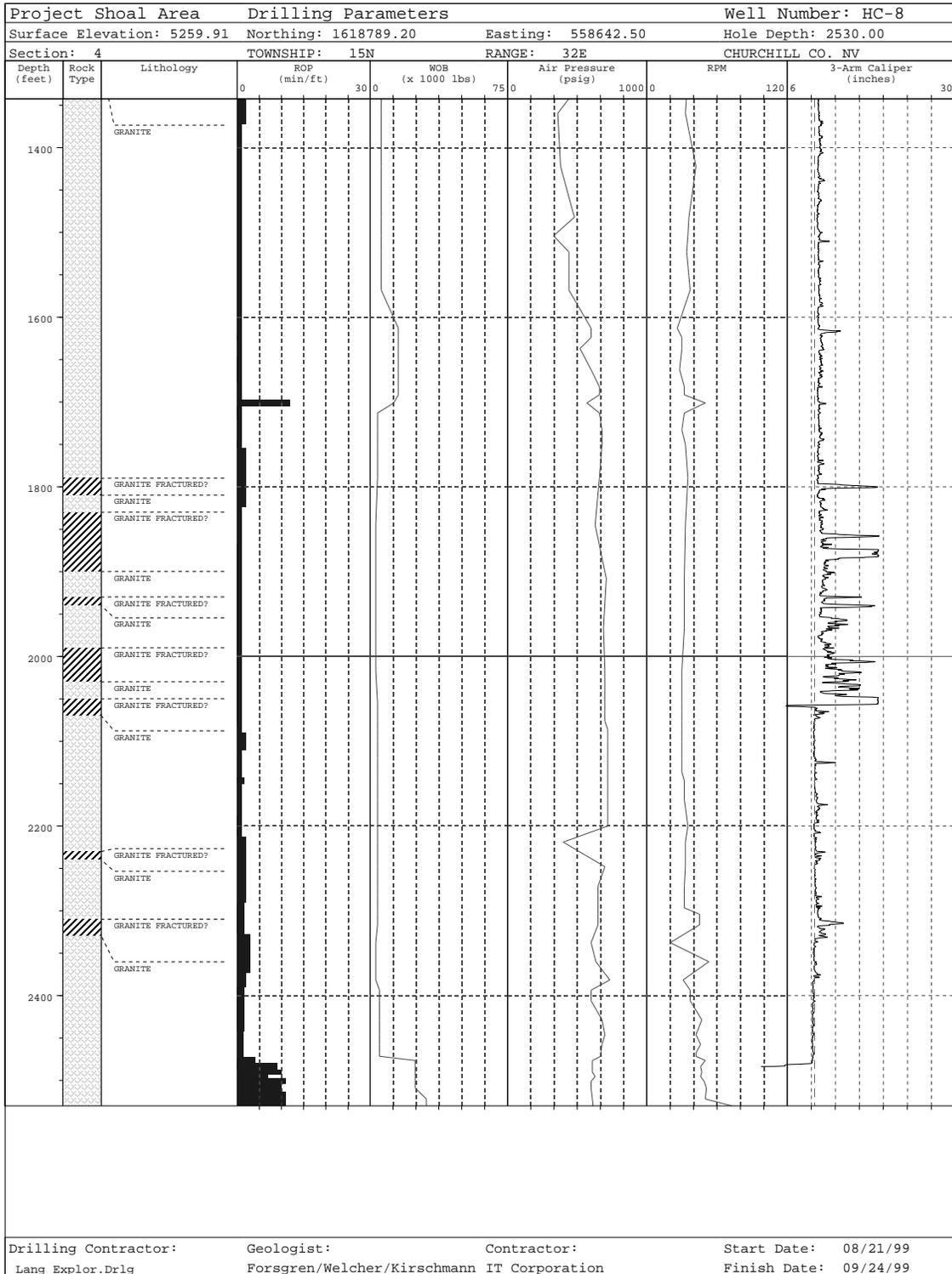


Figure 5-11
Well HC-8 Summary of Drilling Parameters
(Page 2 of 2)

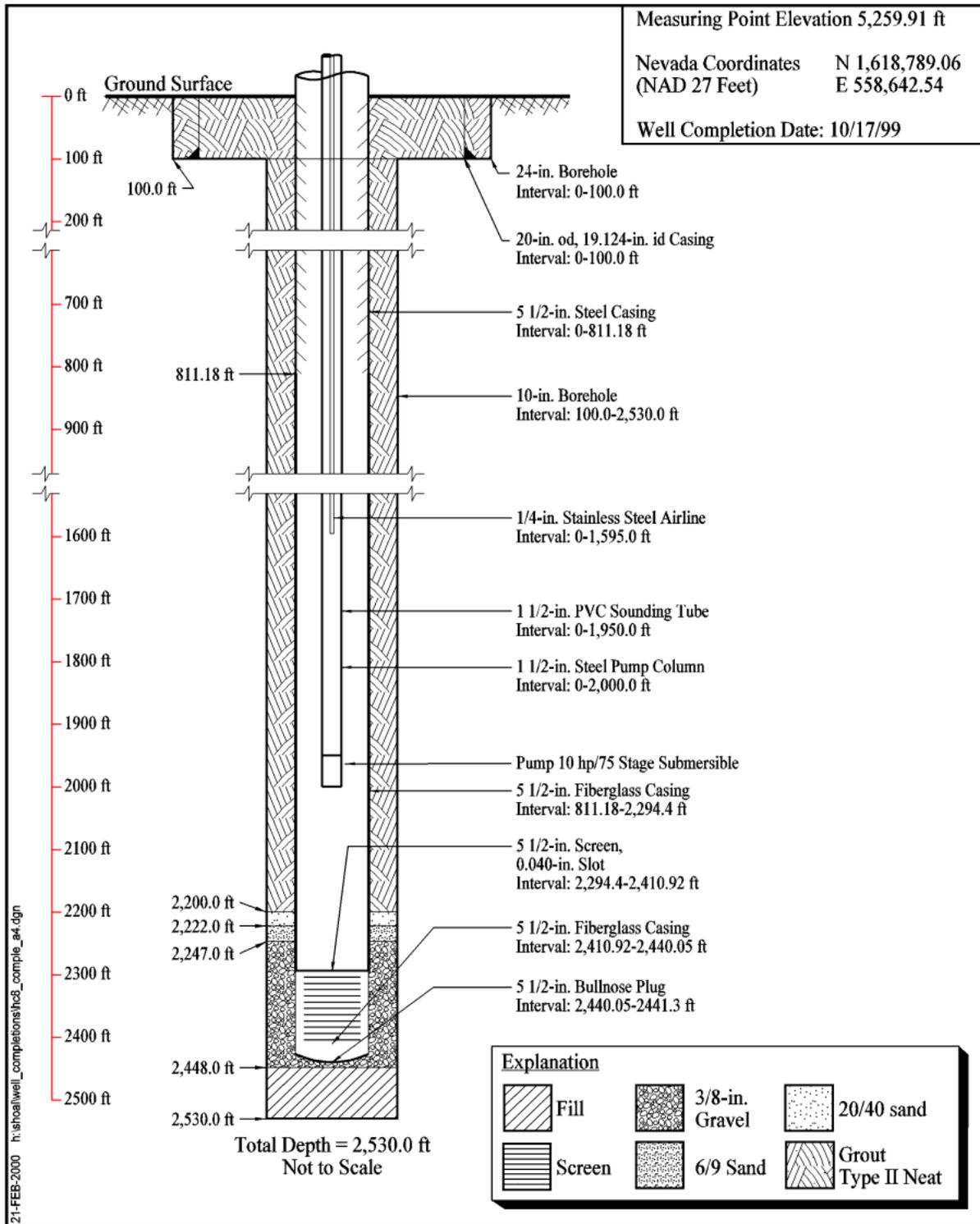


Figure 5-12
HC-8 Well Completion Diagram

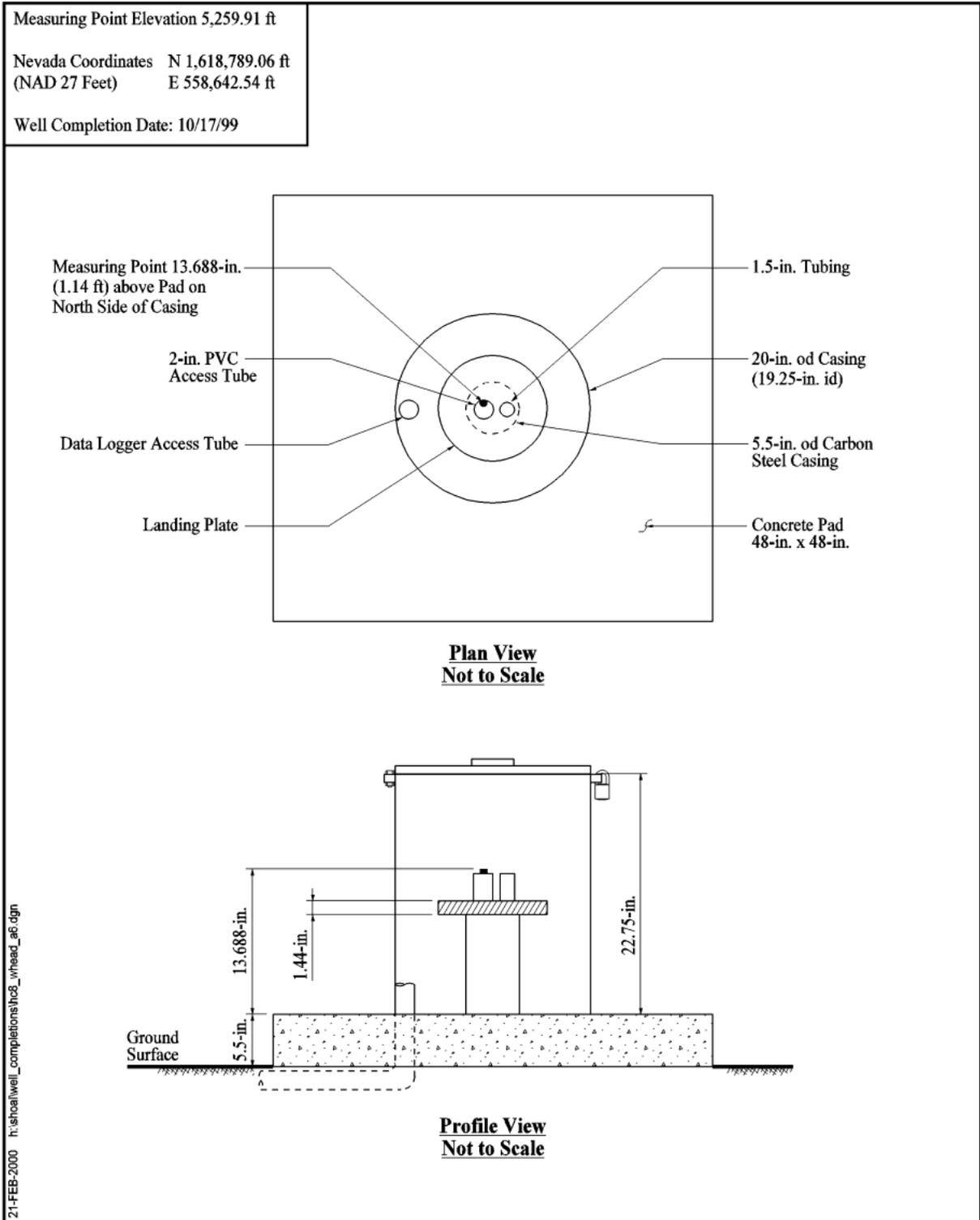


Figure 5-13
Well Head Completion Diagram for Well HC-8

5.6 Well HC-8 Well Development and Testing

Initial well development consisted of approximately thirty-three hours of conventional airlifting the completed well with an airline. A total of 13,324 gallons of fluid were removed from the well by airlift techniques. Fluoride concentrations and tritium activities were monitored at approximately two-hour intervals throughout the duration of airlift development. [Table D-4 \(Appendix D\)](#) lists the development parameters during airlifting.

A submersible pump was permanently installed to a depth of 1,992 ft on October 17, 1999. The pump was used to further develop the well on October 18, 1999. The Phase I development/test pumping was conducted for a total of 138 minutes with a total of 350 gallons of fluid removed from the well at an average discharge rate of 2.5 gpm. [Table D-5 \(Appendix D\)](#) lists the development parameters during Phase I development/test pumping.

Phase II development/test pumping was conducted from October 19 to 29, 1999 for approximately 10 days with a total of 25,463 gallons of fluid removed from the well at an average discharge rate of 1.7 gpm. [Table D-6 \(Appendix D\)](#) lists the development parameters for Phase II development/test pumping.

Phase III development/test pumping occurred from November 11 to 14, 1999 for a total of 4,233 minutes with a total of 8,951 gallons of fluid removed from the well at an average discharge rate of 2.1 gpm. [Table D-7 \(Appendix D\)](#) lists the development parameters for Phase III development/test pumping.

Field water quality parameters of temperature, pH, and electrical conductivity, as well as fluoride concentrations and tritium activities were monitored throughout the duration of development/test pumping on two- to four-hour intervals. This data is presented on [Tables D-3 through D-6 \(Appendix D\)](#) as identified above. [Figure 5-4](#) shows the trends of the development parameters through both well development and testing. [Figure 5-8](#) shows the tritium activities of the discharge fluid during development and testing. [Figure D-7 \(Appendix D\)](#) presents the water balance data.

Electrical conductivities of development/test pumping effluents ranged from 750 to 850 microSiemens/cm. The pH values ranged from 8 to 8.5 standard units. Fluoride concentrations ranged from 0 to 13 mg/L and show a decreasing trend to approximately 0.5 mg/L during the last phase of development/test pumping completed November 14, 1999.

5.7 Well HC-8 Sampling

Samples of discharge effluent temporarily stored in lined sumps were collected as specified in the *Field Instructions for Project Shoal Area Subsurface Investigation, Churchill County, Nevada* (IT, 1999) and *Fluid Management Plan for the Project Shoal Area Off-Sites Project* (DOE/NV, 1999b) for characterization prior to discharge/disposal. The analytical results from these samples are shown in [Table D-13](#) ([Appendix D](#)).

6.0 Environmental Compliance and Waste Management

The ITLV Office had the lead responsibility for environmental compliance and waste management at PSA. The environmental compliance elements of the PSA investigation were addressed in the planning phases of the project by the completion and approval of a *National Environmental Policy Act* Checklist, review and evaluation of state and federal regulations potentially applicable to the project, and negotiation and approval of the FMP (DOE/NV, 1996b). Waste management involved the tracking, packaging, labeling, and storage of wastes generated during investigation activities. The PSA investigation generated sanitary, hydrocarbon, and fluid waste. No hazardous or radioactive waste was generated at the PSA. Waste management training was conducted for all personnel prior to beginning site operations, and as new personnel arrived on location.

6.1 Source Water for Drilling

Source water for drilling came from a water supply well, HS-1, located approximately 4 miles east of PSA in Fairview Valley. A groundwater sample was collected and analyzed from Well HS-1. The analytical results from this sample are presented in [Table 6-1](#). ITLV staff compared the analytical results to relevant regulatory levels to ensure that the drilling source water could be used.

6.2 Waste Management

All hazardous materials were managed on site in accordance with SQP ITVL-0501, "Control of Hazardous Materials." A Material Safety Data Sheet (MSDS) and preapproval by the ITLV Environmental Compliance Group was required for all products brought to PSA. Copies of the MSDS and approval forms were readily accessible by site personnel. Spill response equipment was located in marked spill response kits at each well site. Spill response and reporting was guided by Standard Quality Practice ITLV-0513, "Spill Management." Incidental spills occurred during drilling operations; however, no reportable spills were observed during 1999 PSA field activities.

Table 6-1
Well HS-1 Analytical Results
 (Page 1 of 6)

| Sample Number | Sample Date | Parameter | Result | Units | Error | Detection Limit |
|---------------|-------------|------------------------|--------|----------|-------|-----------------|
| PSW00011 | 6/17/1999 | Gasoline | 0.1 | mg/L | | 0.1 |
| PSW00011 | 6/17/1999 | Diesel Range Organics | 1 | mg/L | | 1 |
| PSW00011 | 6/17/1999 | Aluminum | 9.9 | µg/L | | 9.9 |
| PSW00011 | 6/17/1999 | Antimony | 3.6 | µg/L | | 3.6 |
| PSW00011 | 6/17/1999 | Arsenic | 16.7 | µg/L | | 2 |
| PSW00011 | 6/17/1999 | Barium | 40.1 | µg/L | | 0.2 |
| PSW00011 | 6/17/1999 | Beryllium | 0.1 | µg/L | | 0.1 |
| PSW00011 | 6/17/1999 | Boron | 387 | µg/L | | 8.9 |
| PSW00011 | 6/17/1999 | Cadmium | 0.2 | µg/L | | 0.2 |
| PSW00011 | 6/17/1999 | Calcium | 33,400 | µg/L | | 9.5 |
| PSW00011 | 6/17/1999 | Chromium | 1.2 | µg/L | | 0.4 |
| PSW00011 | 6/17/1999 | Cobalt | 0.6 | µg/L | | 0.6 |
| PSW00011 | 6/17/1999 | Copper | 119 | µg/L | | 0.4 |
| PSW00011 | 6/17/1999 | Iron | 104 | µg/L | | 6.2 |
| PSW00011 | 6/17/1999 | Lead | 5.2 | µg/L | | 0.9 |
| PSW00011 | 6/17/1999 | Lithium | 41.4 | µg/L | | 2 |
| PSW00011 | 6/17/1999 | Magnesium | 5,520 | µg/L | | 6.9 |
| PSW00011 | 6/17/1999 | Manganese | 8.6 | µg/L | | 0.1 |
| PSW00011 | 6/17/1999 | Molybdenum | 4.9 | µg/L | | 1.9 |
| PSW00011 | 6/17/1999 | Nickel | 2.3 | µg/L | | 0.6 |
| PSW00011 | 6/17/1999 | Potassium | 7,270 | µg/L | | 46.8 |
| PSW00011 | 6/17/1999 | Selenium | 2.2 | µg/L | | 2.2 |
| PSW00011 | 6/17/1999 | Silicon | 31,400 | µg/L | | 10.5 |
| PSW00011 | 6/17/1999 | Silver | 0.5 | µg/L | | 0.5 |
| PSW00011 | 6/17/1999 | Sodium | 38,300 | µg/L | | 2.4 |
| PSW00011 | 6/17/1999 | Thallium | 2.2 | µg/L | | 2.2 |
| PSW00011 | 6/17/1999 | Vanadium | 28.2 | µg/L | | 0.4 |
| PSW00011 | 6/17/1999 | Zinc | 9.1 | µg/L | | 1.5 |
| PSW00011 | 6/17/1999 | Mercury | 0.02 | µg/L | | 0.02 |
| PSW00011 | 6/17/1999 | Specific Conductivity | 450 | umhos/cm | | 1 |
| PSW00011 | 6/17/1999 | pH | 7.9 | S.U. | | 0.1 |
| PSW00011 | 6/17/1999 | Total Dissolved Solids | 350 | mg/L | | 20 |
| PSW00011 | 6/17/1999 | Bromide | 0.2 | mg/L | | 0.2 |

Table 6-1
Well HS-1 Analytical Results
 (Page 2 of 6)

| Sample Number | Sample Date | Parameter | Result | Units | Error | Detection Limit |
|---------------|-------------|----------------------------------|--------|-------|-------|-----------------|
| PSW00011 | 6/17/1999 | Chloride | 31 | mg/L | | 1 |
| PSW00011 | 6/17/1999 | Fluoride | 0.47 | mg/L | | 0.1 |
| PSW00011 | 6/17/1999 | Sulfate | 55 | mg/L | | 5 |
| PSW00011 | 6/17/1999 | Bicarbonate as CaCO ₃ | 120 | mg/L | | 10 |
| PSW00011 | 6/17/1999 | Carbonate as CaCO ₃ | 10 | mg/L | | 10 |
| PSW00011 | 6/17/1999 | Ammonia | 0.5 | mg/L | | 0.5 |
| PSW00011 | 6/17/1999 | Nitrate/Nitrite | 0.92 | mg/L | | 0.05 |
| PSW00011 | 6/17/1999 | Total Phosphorus | 0.05 | mg/L | | 0.05 |
| PSW00011 | 6/17/1999 | Dissolved Organic Carbon | 1 | mg/L | | 1 |
| PSW00011 | 6/17/1999 | Total Organic Carbon | 2.1 | mg/L | | 1 |
| PSW00011 | 6/17/1999 | Cyanide, Total | 0.01 | mg/L | | 0.01 |
| PSW00011 | 6/17/1999 | Sulfide | 5 | mg/L | | 5 |
| PSW00011 | 6/17/1999 | Ac-228 | -9 | pCi/L | 17 | 22 |
| PSW00011 | 6/17/1999 | Ag-110m | 1.9 | pCi/L | 3.9 | 6.9 |
| PSW00011 | 6/17/1999 | Am-241 | -2 | pCi/L | 21 | 34 |
| PSW00011 | 6/17/1999 | Be-7 | 20 | pCi/L | 110 | 180 |
| PSW00011 | 6/17/1999 | Bi-212 | 28 | pCi/L | 47 | 81 |
| PSW00011 | 6/17/1999 | Bi-214 | 9 | pCi/L | 11 | 13 |
| PSW00011 | 6/17/1999 | Ce-139 | 0.3 | pCi/L | 4.3 | 7.0 |
| PSW00011 | 6/17/1999 | Ce-144 | 8 | pCi/L | 25 | 40 |
| PSW00011 | 6/17/1999 | Co-56 | -1 | pCi/L | 15 | 27 |
| PSW00011 | 6/17/1999 | Co-57 | 3.5 | pCi/L | 3.2 | 4.9 |
| PSW00011 | 6/17/1999 | Co-58 | -5.3 | pCi/L | 7.9 | 16 |
| PSW00011 | 6/17/1999 | Co-60 | 1.2 | pCi/L | 3.0 | 5.4 |
| PSW00011 | 6/17/1999 | Cr-51 | 90 | pCi/L | 430 | 740 |
| PSW00011 | 6/17/1999 | Cs-134 | 3.9 | pCi/L | 4.0 | 6.7 |
| PSW00011 | 6/17/1999 | Cs-137 | -1.1 | pCi/L | 3.4 | 6.3 |
| PSW00011 | 6/17/1999 | Eu-152 | 3 | pCi/L | 17 | 32 |
| PSW00011 | 6/17/1999 | Eu-154 | -5.5 | pCi/L | 9.9 | 20 |
| PSW00011 | 6/17/1999 | Eu-155 | -5 | pCi/L | 11 | 18 |
| PSW00011 | 6/17/1999 | Fe-59 | 5 | pCi/L | 35 | 66 |
| PSW00011 | 6/17/1999 | I-131 | 200 | pCi/L | 3,200 | 5,500 |
| PSW00011 | 6/17/1999 | K-40 | -79 | pCi/L | 74 | 68 |

Table 6-1
Well HS-1 Analytical Results
 (Page 3 of 6)

| Sample Number | Sample Date | Parameter | Result | Units | Error | Detection Limit |
|---------------|-------------|-----------------------|--------|-------|-------|-----------------|
| PSW00011 | 6/17/1999 | Mn-54 | 0.4 | pCi/L | 4.0 | 7.3 |
| PSW00011 | 6/17/1999 | Na-22 | -2.1 | pCi/L | 3.7 | 7.5 |
| PSW00011 | 6/17/1999 | Nb-94 | 0.8 | pCi/L | 2.8 | 5.1 |
| PSW00011 | 6/17/1999 | Nb-95 | -4 | pCi/L | 10 | 19 |
| PSW00011 | 6/17/1999 | Pa-234m | 50 | pCi/L | 740 | 1,000 |
| PSW00011 | 6/17/1999 | Pb-212 | -1.7 | pCi/L | 7.9 | 8.5 |
| PSW00011 | 6/17/1999 | Pb-214 | 1.4 | pCi/L | 9.4 | 11 |
| PSW00011 | 6/17/1999 | Ru-106 | -14 | pCi/L | 40 | 74 |
| PSW00011 | 6/17/1999 | Sb-124 | -4 | pCi/L | 14 | 26 |
| PSW00011 | 6/17/1999 | Sb-125 | -2.1 | pCi/L | 8.8 | 16 |
| PSW00011 | 6/17/1999 | Sc-46 | 0.5 | pCi/L | 7.9 | 14 |
| PSW00011 | 6/17/1999 | Sr-85 | -9 | pCi/L | 15 | 30 |
| PSW00011 | 6/17/1999 | Th-227 | -13 | pCi/L | 18 | 31 |
| PSW00011 | 6/17/1999 | Th-234 | -7 | pCi/L | 81 | 89 |
| PSW00011 | 6/17/1999 | Tl-208 | -2.0 | pCi/L | 5.6 | 7.2 |
| PSW00011 | 6/17/1999 | U-235 | -4 | pCi/L | 19 | 32 |
| PSW00011 | 6/17/1999 | Zn-65 | 2.5 | pCi/L | 8.7 | 16 |
| PSW00011 | 6/17/1999 | Gross Alpha | 8.9 | pCi/L | 1.4 | 1.00 |
| PSW00011 | 6/17/1999 | Gross Beta | 8.9 | pCi/L | 1.2 | 1.1 |
| PSW00011 | 6/17/1999 | Tritium | 10 | pCi/L | 180 | 0 |
| PSW00013 | 6/17/1999 | Gasoline | 0.1 | mg/L | | 0.1 |
| PSW00013 | 6/17/1999 | Diesel Range Organics | 1 | mg/L | | 1 |
| PSW00013 | 6/17/1999 | Aluminum | 9.9 | µg/L | | 9.9 |
| PSW00013 | 6/17/1999 | Antimony | 3.6 | µg/L | | 3.6 |
| PSW00013 | 6/17/1999 | Arsenic | 16.5 | µg/L | | 2 |
| PSW00013 | 6/17/1999 | Barium | 40.6 | µg/L | | 0.2 |
| PSW00013 | 6/17/1999 | Beryllium | 0.1 | µg/L | | 0.1 |
| PSW00013 | 6/17/1999 | Boron | 376 | µg/L | | 8.9 |
| PSW00013 | 6/17/1999 | Cadmium | 0.2 | µg/L | | 0.2 |
| PSW00013 | 6/17/1999 | Calcium | 33,100 | µg/L | | 9.5 |
| PSW00013 | 6/17/1999 | Chromium | 1.1 | µg/L | | 0.4 |
| PSW00013 | 6/17/1999 | Cobalt | 0.61 | µg/L | | 0.6 |
| PSW00013 | 6/17/1999 | Copper | 15.3 | µg/L | | 0.4 |

Table 6-1
Well HS-1 Analytical Results
 (Page 4 of 6)

| Sample Number | Sample Date | Parameter | Result | Units | Error | Detection Limit |
|---------------|-------------|----------------------------------|--------|----------|-------|-----------------|
| PSW00013 | 6/17/1999 | Iron | 127 | µg/L | | 6.2 |
| PSW00013 | 6/17/1999 | Lead | 0.9 | µg/L | | 0.9 |
| PSW00013 | 6/17/1999 | Lithium | 40.3 | µg/L | | 2 |
| PSW00013 | 6/17/1999 | Magnesium | 5,480 | µg/L | | 6.9 |
| PSW00013 | 6/17/1999 | Manganese | 7.1 | µg/L | | 0.1 |
| PSW00013 | 6/17/1999 | Molybdenum | 8.2 | µg/L | | 1.9 |
| PSW00013 | 6/17/1999 | Nickel | 1.6 | µg/L | | 0.6 |
| PSW00013 | 6/17/1999 | Potassium | 7,220 | µg/L | | 46.8 |
| PSW00013 | 6/17/1999 | Selenium | 2.2 | µg/L | | 2.2 |
| PSW00013 | 6/17/1999 | Silicon | 31,100 | µg/L | | 10.5 |
| PSW00013 | 6/17/1999 | Silver | 0.5 | µg/L | | 0.5 |
| PSW00013 | 6/17/1999 | Sodium | 38,400 | µg/L | | 2.4 |
| PSW00013 | 6/17/1999 | Thallium | 2.2 | µg/L | | 2.2 |
| PSW00013 | 6/17/1999 | Vanadium | 28.6 | µg/L | | 0.4 |
| PSW00013 | 6/17/1999 | Zinc | 4.4 | µg/L | | 1.5 |
| PSW00013 | 6/17/1999 | Mercury | 0.02 | µg/L | | 0.02 |
| PSW00013 | 6/17/1999 | Specific Conductivity | 460 | umhos/cm | | 1 |
| PSW00013 | 6/17/1999 | pH | 7.8 | S.U. | | 0.1 |
| PSW00013 | 6/17/1999 | Total Dissolved Solids | 320 | mg/L | | 20 |
| PSW00013 | 6/17/1999 | Bromide | 0.2 | mg/L | | 0.2 |
| PSW00013 | 6/17/1999 | Chloride | 31 | mg/L | | 1 |
| PSW00013 | 6/17/1999 | Fluoride | 0.47 | mg/L | | 0.1 |
| PSW00013 | 6/17/1999 | Sulfate | 54 | mg/L | | 5 |
| PSW00013 | 6/17/1999 | Bicarbonate as CaCO ₃ | 110 | mg/L | | 10 |
| PSW00013 | 6/17/1999 | Carbonate as CaCO ₃ | 10 | mg/L | | 10 |
| PSW00013 | 6/17/1999 | Ammonia | 0.5 | mg/L | | 0.5 |
| PSW00013 | 6/17/1999 | Nitrate/Nitrite | 0.93 | mg/L | | 0.05 |
| PSW00013 | 6/17/1999 | Total Phosphorus | 0.05 | mg/L | | 0.05 |
| PSW00013 | 6/17/1999 | Dissolved Organic Carbon | 1 | mg/L | | 1 |
| PSW00013 | 6/17/1999 | Total Organic Carbon | 1 | mg/L | | 1 |
| PSW00013 | 6/17/1999 | Cyanide, Total | 0.01 | mg/L | | 0.01 |
| PSW00013 | 6/17/1999 | Sulfide | 5 | mg/L | | 5 |
| PSW00013 | 6/17/1999 | Ac-228 | -9 | pCi/L | 35 | 56 |

Table 6-1
Well HS-1 Analytical Results
 (Page 5 of 6)

| Sample Number | Sample Date | Parameter | Result | Units | Error | Detection Limit |
|---------------|-------------|-----------|--------|-------|-------|-----------------|
| PSW00013 | 6/17/1999 | Ag-110m | 0.1 | pCi/L | 6.8 | 13 |
| PSW00013 | 6/17/1999 | Am-241 | 7 | pCi/L | 30 | 48 |
| PSW00013 | 6/17/1999 | Be-7 | -160 | pCi/L | 200 | 380 |
| PSW00013 | 6/17/1999 | Bi-212 | 66 | pCi/L | 92 | 150 |
| PSW00013 | 6/17/1999 | Bi-214 | -12 | pCi/L | 21 | 27 |
| PSW00013 | 6/17/1999 | Ce-139 | 2.0 | pCi/L | 6.9 | 11 |
| PSW00013 | 6/17/1999 | Ce-144 | -16 | pCi/L | 37 | 61 |
| PSW00013 | 6/17/1999 | Co-56 | 3 | pCi/L | 35 | 68 |
| PSW00013 | 6/17/1999 | Co-57 | -2.2 | pCi/L | 4.8 | 7.9 |
| PSW00013 | 6/17/1999 | Co-58 | 0 | pCi/L | 20 | 32 |
| PSW00013 | 6/17/1999 | Co-60 | -1.0 | pCi/L | 6.6 | 14 |
| PSW00013 | 6/17/1999 | Cr-51 | -530 | pCi/L | 780 | 1,500 |
| PSW00013 | 6/17/1999 | Cs-134 | -2.9 | pCi/L | 7.9 | 15 |
| PSW00013 | 6/17/1999 | Cs-137 | 1.6 | pCi/L | 6.7 | 12 |
| PSW00013 | 6/17/1999 | Eu-152 | 20 | pCi/L | 43 | 79 |
| PSW00013 | 6/17/1999 | Eu-154 | 15 | pCi/L | 18 | 30 |
| PSW00013 | 6/17/1999 | Eu-155 | 15 | pCi/L | 15 | 22 |
| PSW00013 | 6/17/1999 | Fe-59 | -30 | pCi/L | 78 | 160 |
| PSW00013 | 6/17/1999 | I-131 | 2,700 | pCi/L | 5,100 | 8,300 |
| PSW00013 | 6/17/1999 | K-40 | -10 | pCi/L | 130 | 150 |
| PSW00013 | 6/17/1999 | Mn-54 | 0.7 | pCi/L | 8.7 | 16 |
| PSW00013 | 6/17/1999 | Na-22 | 5.7 | pCi/L | 6.9 | 11 |
| PSW00013 | 6/17/1999 | Nb-94 | 2.6 | pCi/L | 4.9 | 9.1 |
| PSW00013 | 6/17/1999 | Nb-95 | -13 | pCi/L | 20 | 41 |
| PSW00013 | 6/17/1999 | Pa-234m | 2,100 | pCi/L | 1,300 | 1,700 |
| PSW00013 | 6/17/1999 | Pb-212 | 4 | pCi/L | 13 | 14 |
| PSW00013 | 6/17/1999 | Pb-214 | -3 | pCi/L | 19 | 21 |
| PSW00013 | 6/17/1999 | Ru-106 | -5 | pCi/L | 65 | 120 |
| PSW00013 | 6/17/1999 | Sb-124 | -15 | pCi/L | 27 | 52 |
| PSW00013 | 6/17/1999 | Sb-125 | -8 | pCi/L | 15 | 28 |
| PSW00013 | 6/17/1999 | Sc-46 | 10 | pCi/L | 15 | 26 |
| PSW00013 | 6/17/1999 | Sr-85 | -18 | pCi/L | 26 | 51 |
| PSW00013 | 6/17/1999 | Th-227 | -16 | pCi/L | 30 | 51 |

Table 6-1
Well HS-1 Analytical Results
 (Page 6 of 6)

| Sample Number | Sample Date | Parameter | Result | Units | Error | Detection Limit |
|---------------|-------------|-------------|--------|-------|-------|-----------------|
| PSW00013 | 6/17/1999 | Th-234 | -30 | pCi/L | 100 | 110 |
| PSW00013 | 6/17/1999 | Tl-208 | 4 | pCi/L | 10 | 13 |
| PSW00013 | 6/17/1999 | U-235 | 6 | pCi/L | 29 | 46 |
| PSW00013 | 6/17/1999 | Zn-65 | 5 | pCi/L | 18 | 35 |
| PSW00013 | 6/17/1999 | Gross Alpha | 7.4 | pCi/L | 1.3 | 1.2 |
| PSW00013 | 6/17/1999 | Gross Beta | 8.1 | pCi/L | 1.2 | 1.3 |
| PSW00013 | 6/17/1999 | Tritium | 90 | pCi/L | 180 | 0 |

Hydrocarbon waste produced at PSA consisted of used absorbent material, plastic debris, used oil and antifreeze, used oil and fuel filters, and compressor/booster condensate. Lined, bermed waste storage areas were established for the storage of all hydrocarbon products and waste. Drums and buckets of hydrocarbon products and waste were stored on pallets within these posted areas. All waste containers were labeled with the contents, date, and inventory number. All hydrocarbon waste generated at PSA was documented in the waste management logbook for tracking purposes.

All hydrocarbon waste was removed from PSA on November 10, 1999, and sent to a permitted facility for recycling. Sanitary waste was collected on site in roll-off bins and ultimately disposed of at the Churchill County landfill.

6.3 Fluid Management

All fluids, generated during drilling, well construction, and development/test pumping activities were managed in accordance with the FMP (DOE/NV, 1999b).

The FMP provided guidance for the management of fluids generated during well drilling and construction activities, well development/test pumping, and the tracer test. The fluid management strategy was based on process knowledge and verification of process knowledge through field screening, on-site monitoring, and off-site laboratory analyses.

All fluids produced during the drilling and well construction activities and development/test pumping were monitored on site for tritium activities on two- to four-hour intervals (see [Sections 2.4, 3.4, 4.4,](#)

and 5.4). Tritium activities of discharge fluids remained within the background range. Samples of fluids contained in the lined sumps were analyzed and the results presented to NDEP prior to discharge/disposal to the constructed infiltration basin.

Lined sumps were constructed near each well location in accordance with the FMP (DOE/NV, 1999). The sumps were used to contain both fluids and cuttings from the drilling and well construction processes and subsequent development/testing. Additional lined sumps were constructed at the Well HC-5 and HC-8 sites to contain additional fluids generated by these deeper wells. A centrally located infiltration basin (unlined sump) was constructed for the disposal of fluids which met the FMP discharge criteria.

Figure 1-3 shows the location of the sumps. The sumps were surrounded by orange construction fencing and each sump was equipped with an escape ladder and rope.

6.3.1 Disposition of Fluids and Analytical Results

Fluids and drill cuttings were monitored by a combination of field screening techniques on a real time basis to meet the requirements of both the FMP and SSHASP. Field screening of alpha and beta activity measurements of drill cuttings was conducted with hand-held screening devices (NE Electra[®]). On-site monitoring of tritium activities of fluids produced during drilling, well construction, and development/test pumping activities utilized a Packard Liquid Scintillation Counter[®]. Sections 2-4, 3-4, 4-4, and 5-4 discuss these monitoring requirements and results. All field screening and monitoring results showed alpha and beta activity measurements, and tritium activities within the background ranges of site bedrock and groundwater.

Drilling, well construction, and development/test pumping fluids were discharged directly into lined sumps during operations. Drill cuttings remain in the lined sumps. Depending on operational requirements, fluids were either characterized prior to discharge to the infiltration basin or transferred to another lined sump for temporary storage pending characterization and ultimate discharge to the infiltration basin. Table 6-2 presents the transfer history of fluids.

Fluid sample laboratory results were compared to the fluid management decision criteria limits of less than 10 times the Nevada Drinking Water Standards (NDWS) (Table 6-3) to determine if the fluids could be discharged to the infiltration basin. The FMP required that NDEP authorized the discharge of fluids from a lined sump to the infiltration basin. All fluid samples met the discharge criteria for discharge/disposal to the infiltration basin. Tritium activities of fluids remained well below the Nevada Drinking Water Standard

**Table 6-2
Fluid Transfer Inventory**

| Transfer Date | Sample Collection Date | Sample Identifiers | Storage Sump Identifier | Fluid Source Identifier |
|---------------|------------------------|--|-------------------------|-------------------------|
| 7/10/1999 | 6/29/1999 | PSF00008, PSF00012 (FD), and PSF00013 (FB) | HC-7 | HC-5 |
| 7/10/1999 | 7/5/1999 | PSF00014, PSF00015 (FD), and PSF00016 (FB) | HC-7 | HC-5 |
| 8/1/1999 | 7/27/1999 | PSF00017, PSF00018 (FD), and PSF00019 (FB) | HC-7 | HC-5 |
| 8/9/1999 | 8/3/1999 | PSF00020, PSF00021 (FD), and PSF00022 (FB) | HC-7 | HC-5 |
| 9/3/1999 | 8/24/1999 | PSF00023, PSF00024 (FD), and PSF00025 (FB) | HC-7 | HC-5 |
| 9/10/1999 | 9/7/1999 | PSF00026, PSF00027 (FD), and PSF00028 (FB) | HC-8A | HC-8 |
| 9/30/1999 | 9/22/1999 | PSF00029, PSF00030 (FD), and PSF00031 (FB) | HC-7 | HC-8 |
| 10/8/1999 | 10/5/1999 | PSF00032 (FB), PSF00033 (FD), and PSF00034 | HC-7 | HC-6 |
| 10/15/1999 | 10/11/1999 | PSF00035 (FB), PSF00036 (FD), and PSF00037 | HC-7 | HC-5 |
| 10/21/1999 | 10/15/1999 | PSF00038 | HC-6 | HC-5 |
| 10/21/1999 | 10/15/1999 | PSF00039, PSF00040 (FD), and PSF00041 (FB) | HC-7A | HC-5 and HC-7 |
| 10/28/1999 | 10/22/1999 | PSF00042, PSF00043 (FD), and PSF00044 (FB) | HC-7A | HC-5 |
| 11/5/1999 | 11/1/1999 | PSF00045, PSF00046 (FD), and PSF00047 (FB) | HC-5A | HC-5 |
| 11/5/1999 | 11/1/1999 | PSF00048 | HC-7 | HC-5 |
| 11/11/1999 | 11/3/1999 | PSF00050 | HC-7A | HC-7 |
| 11/15/1999 | 11/3/1999 | PSF00051, PSF00052 (FD), and PSF00053 (FB) | HC-8A | HC-5 and HC-8 |
| 11/18/1999 | 11/15/1999 | PSF00054, PSF00055 (FD), and PSF00056 (FB) | HC-5A | HC-5 and HC-7 |
| ** | 11/19/1999 | PSF00057, PSF00058 (FD), and PSF00059 (FB) | HC-5A | HC-5 and HC-7 |
| 11/30/1999 | 11/22/1999 | PSF00060, PSF00061 (FD), and PSF00062 (FB) | HC-8A | HC-5 |
| 12/7/1999 | 11/30/1999 | PSF00063, PSF00064 (FD), and PSF00065 (FB) | HC-5A | HC-7 |
| ** | 12/6/1999 | PSF00066, PSF00067 (FD), and PSF00068 (FB) | HC-7A | HC-7 |
| ** | 12/6/1999 | PSF00069 | HC-8A | HC-5 |

** Completed by DRI

**Table 6-3
Fluid Management Decision Criteria Limits**

| FMP Parameters | NDWS ^a | 10 x NDWS Limit ^b |
|----------------|-------------------|------------------------------|
| Gross Alpha | 15 pCi/L | 150 pCi/L |
| Gross Beta | 50 pCi/L | 500 pCi/L |
| Tritium | 20,000 pCi/L | 200,000 pCi/L |

^aAssumes background value for each parameter is zero.

^bLimit for infiltration basin discharge

(NAC 445A, 1998) of 20,000 picoCuries per liter (pCi/L). [Tables A-18 \(Appendix A\)](#), [B-11 \(Appendix B\)](#), [C-12 \(Appendix C\)](#), and [D-13 \(Appendix D\)](#) present the analytical results of the fluid management samples.

At the time of this writing, the DRI tracer test is still being conducted at the PSA. This test involves the pumping of large volumes of water and requires the use of the on-site sumps. Once all operations associated with this test have been completed, an evaluation of all PSA fluid and groundwater data shall be performed in order to determine the regulatory status of the drill cuttings left in the PSA sumps.

[Table 6-4](#) summarizes the sumps, contents and status as of December 6, 1999.

**Table 6-4
Current Status of Project Shoal Area Drilling Sumps**

| Sump | Contents | Status | Comments |
|-------|-----------------------------------|---------------------|---|
| HC-5 | Drilling cuttings from Well HC-5 | Inactive | |
| HC-5A | Development from Well HC-5 | Active ^a | Currently used to contain water from HC-5 pumping. |
| HC-6 | Cuttings from Well HC-6 | Active ^a | Currently used to contain water from HC-7 testing. |
| HC-7 | Empty | Inactive | Originally planned for Well HC-7; Used for temporary storage of water prior to discharge. |
| HC-7A | Cuttings and water from Well HC-7 | Active ^a | Currently used to contain water from HC-7 testing. |
| HC-8 | Cutting from Well HC-8 | Inactive | |
| HC-8A | Water from HC-5 | Active ^a | Initially for well development and testing water from HC-8; Currently used to contain HC-5 development water. |

^aAs of December 6, 1999.

7.0 Site Health and Safety

All work activities at the PSA were conducted in accordance with 29 CFR 1910.120 (CFR, 1998), the U.S. Department of Energy Environmental Restoration Program Health and Safety Plan (HASP) (DOE/NV, 1998b), the Project Shoal Area Subsurface, SSHASP (DOE/NV, 1999c). Copies of HASP and SSHASP were maintained on site during project activities. Additionally, all activities were conducted in compliance with Department of Energy Orders and Occupational Safety and Health Administration regulations.

The SSHASP was subsequently modified by three Technical Field Changes. The first Technical Field Change, dated June 23, 1999, relaxed the requirement for the use of thermoluminescent dosimeters during field activities at PSA. The second Technical Field Change, dated September 29, 1999, added the scope of work for the removal, repair, and reinstallation pump and related appurtenances for Well HC-4. The third Technical Field Change, dated October 28, 1999, added the scope of work for the drilling and installation of a replacement well near well HS-1.

All site personnel were required to read the HASP and SSHASP and sign the appropriate signature page indicating their understanding. Tailgate Safety Briefings were conducted by ITLV personnel for all site personnel at the beginning of each work shift through out the duration of the project. All attending personnel signed the signature sheet.

8.0 References

AEC, see U.S. Atomic Energy Commission, Nevada Operations Office.

CFR, see *Code of Federal Regulations*.

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DRI, see Desert Research Institute.

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U.S. Department of Energy, Nevada Operations Office. 1996. *Industrial Sites Quality Assurance Project Plan, Nevada Test Site, Nevada, Rev. 1*. Las Vegas, NV.

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Appendix A
Well HC-5 Data

Table A-1
Well HC-5 Chronology
 (Page 1 of 4)

| Date and Time | Depth (ft) | Activity |
|--------------------|------------|---|
| 6/15/99 to 6/18/99 | | Mobilization to PSA |
| 6/18/99 20:10 | 0 | Begin drilling HC-5 with 24-in. tricone bit by conventional mud-rotary method using bentonite-based fluid |
| 6/19/99 5:35 | 100 | Complete 24-in. hole to 100 ft |
| 6/19/99 21:05 | 100 | Complete installation and grouting of 20-in. conductor casing to 100 ft |
| 6/20/99 12:50 | 100 | Begin drilling 17 3/4-in. hole by air, reverse-circulation method with downhole hammer at 100 ft |
| 6/21/99 17:15 | 305 | Slow drilling, trip drill string out to check hammer |
| 6/22/99 5:45 | 305 | Resume drilling at 305 ft by air, reverse-circulation method with hammer bit |
| 6/22/99 22:00 | 372 | Stop drilling at 372 ft, trip out drill string to change from hammer to tricone bit |
| 6/23/99 10:30 | 372 | Resume drilling at 372 ft by air, reverse-circulation method with tricone |
| 6/25/99 12:30 | 880 | Stop drilling at 880 ft, trip out drill string to replace tricone bit |
| 6/26/99 3:00 | 880 | Resume drilling at 880 ft by air, reverse-circulation method with tricone (20 ft of fill encountered) |
| 6/26/99 18:30 | 1,020 | Stop drilling at 1,020 ft, trip out drill steel to convert to flooded, reverse-circulation using bentonite-based fluid |
| 6/27/99 5:00 | 1,020 | Resume drilling at 1,020 ft by flooded-reverse with tricone (encountered 25 ft of fill), bentonite-based fluid used |
| 6/27/99 20:15 | 1,200 | Finish 17 1/2-in. hole to 1,200 ft, trip out drill string |
| 6/28/99 5:45 | 1,200 | Colog collecting downhole geophysical data |
| 6/29/99 0:00 | 1,200 | Colog completes collecting downhole geophysical data, set up to install 13 3/8-in. intermediate casing |
| 6/29/99 7:30 | 1,200 | Start 13 3/8-in. intermediate casing in |
| 6/30/99 10:05 | 1,200 | Complete installation and grouting of 13 3/8-in. intermediate casing to 1,200 ft, trip drill string in |
| 7/1/99 11:00 | 1,200 | Resume drilling 12 1/4-in. hole by air, reverse-circulation method with a tricone at 1,200 ft with polymer-based fluid |
| 7/1/99 15:10 | 1,295 | Stop drilling at 1,295 ft, DRI collects water level data |
| 7/2/99 15:30 | 1,295 | DRI finishes collecting water level data, trip out drill string to convert to flooded, reverse-circulation method |
| 7/3/99 6:00 | 1,295 | Resume drilling 12 1/4-in. hole at 1,295 ft by flooded, reverse-circulation method with tricone bit using Drispac and water |
| 7/4/99 16:30 | 1,673 | Stop drilling at 1,673 ft, trip out drill string to check bit |
| 7/5/99 4:00 | 1,673 | Resume drilling 12 1/4-in. hole at 1,673 ft by air, reverse-circulation method with more aggressive tricone bit |
| 7/5/99 6:35 | 1,690 | Twist off drill rods at 1,690 ft, prepare to go fishing |
| 7/7/99 12:30 | 1,690 | Resume drilling 12 1/4-in. hole at 1,690 ft after successful fishing expedition and repair of tophead holding valve |
| 7/8/99 8:15 | 1,818 | Twist off drill rods at 1,818 ft, prepare to go fishing |
| 7/9/99 11:15 | 1,818 | Resume drilling 12 1/4-in. hole at 1,818 feet after successful fishing expedition |
| 7/10/99 7:00 | 1,913 | Stop drilling at 1,913 feet, trip out drill string to add collars and check bit |
| 7/10/99 19:30 | 1,913 | Resume drilling 12 1/4-in. hole at 1,913 feet after changing out roller/reamers and adding 4 additional collars |

Table A-1
Well HC-5 Chronology
 (Page 2 of 4)

| Date and Time | Depth (ft) | Activity |
|---------------|------------|---|
| 7/13/99 3:15 | 2,143 | Stop drilling at 2,143 feet, trip out drill string to check bit and add shock sub |
| 7/13/99 19:15 | 2,143 | Resume drilling 12 1/4-in. hole at 2,143 feet after adding shock sub and changing tricone bits |
| 7/18/99 3:30 | 2,803 | Stop drilling at 2,803 feet, trip out drill string to change bit |
| 7/18/99 21:15 | 2,803 | Resume drilling 12 1/4-in. hole at 2,803 feet, encountered 90 ft of fill, lost circulation several times in fill |
| 7/19/99 18:10 | 2,934 | Stop drilling at 2,934 feet, losing air pressure, trip out drill string to find cause |
| 7/19/99 23:00 | 2,934 | Resume drilling 12 1/4-in. hole at 2,934 feet |
| 7/20/99 4:05 | 2,970 | Stop drilling at 2,970 ft, trip out drill string to add 10 additional collars |
| 7/20/99 19:40 | 2,970 | Resume drilling 12 1/4-in. hole at 2,970 ft, encountered 40 ft of fill |
| 7/21/99 17:20 | 3,150 | Stop drilling at 3,150 feet, trip out drill string to check out air problems |
| 7/22/99 11:30 | 3,150 | Resume drilling 12 1/4-in. hole at 3,150 ft, 120 ft of fill encountered, air problem corrected |
| 7/24/99 20:00 | 3,565 | Stop drilling at 3,565 ft, trip out drill string to change bit |
| 7/25/99 18:15 | 1,320 | Trip drill string in, hole deteriorating, encountered 50 ft bridge at 1,320 ft, nearly got struck |
| 7/26/99 6:30 | 3,460 | Continue to trip in drill string, 120 ft of fill encountered at 3,420 ft, nearly got struck, plug bit, trip out drill string |
| 7/26/99 17:30 | 3,460 | Unplug drill string, trip drill string in, numerous bridges encountered from 1,220 to 3,325 ft |
| 7/27/99 13:30 | 3,325 | Stop drilling due to problems with water supply well, trip drill string out from 3,325 ft |
| 7/29/99 3:30 | 3,325 | Water supply well repaired, trip drill string in to resume drilling, bridge encountered at 1,208 ft |
| 7/29/99 7:00 | 1,208 | Can't move bridge, trip out drill string while deciding on course of action |
| 7/29/99 18:30 | 1,208 | Trip drill string in, bridge encountered at 1,203 ft, plug drill string, trip out drill string |
| 7/30/99 8:45 | 1,208 | Unplug drill string, trip drill string in for flooded, reverse-circulation drilling, fill encountered at 1,201 ft, hole deteriorating |
| 7/30/99 14:00 | 1,201 | Convert to conventional circulation, drill fill to 1,248 ft, trip out drill string to cement hole |
| 7/31/99 2:35 | 1,248 | DRI collecting caliper data |
| 7/31/99 3:10 | 1,248 | DRI finishes collecting caliper data, set up to cement hole above 1,230 ft |
| 7/31/99 15:30 | 1,180 | Complete cementing hole from 1,050 to 1,230 ft, trip drill string in to 1,080 ft |
| 8/1/99 0:00 | 1,080 | Resume drilling 12 1/4-in. hole by conventional method with tricone using polymer-based fluid at 1,080 ft |
| 8/1/99 4:40 | 1,210 | Convert to flooded-reverse method with polymer-based fluid, continue drilling fill |
| 8/1/99 8:40 | 1,260 | Drilled to 1,260 feet, plug drill string, trip out drill string |
| 8/1/99 11:35 | 1,260 | DRI collects caliper data to 1,248 ft, prepare to cement hole second time |
| 8/1/99 19:00 | 1,170 | Complete cementing hole from 1,170 to 1,260 ft, trip drill string in to 1,170 ft, convert to conventional method |
| 8/2/99 3:30 | 1,170 | Resume drilling 12 1/4-in. hole by conventional method with tricone using polymer-based fluid at 1,170 ft |
| 8/2/99 6:45 | 1,260 | Drilled to 1,260 ft, clean out mud tank after drilling cement plug, mix fresh mud |

Table A-1
Well HC-5 Chronology
 (Page 3 of 4)

| Date and Time | Depth (ft) | Activity |
|---------------|------------|---|
| 8/2/99 17:00 | 1,260 | Resume tripping drill string in, drill numerous bridges encountered from 1,365 to 1,800 ft |
| 8/2/99 22:20 | 1,800 | Convert to flooded, reverse-circulation method with polymer-based fluid, trip drill string in, drill numerous bridges 1,800 to 2,730 ft |
| 8/3/99 11:45 | 2,730 | Plug drill string at 2,730 ft, trip drill string out |
| 8/3/99 20:40 | 2,730 | DRI collects caliper data to 2,694 ft |
| 8/4/99 1:25 | 2,694 | Trip in drill string, drill numerous bridges encountered from 2,700 to 3,400 ft |
| 8/5/99 16:45 | 3,402 | Plug drill string at 3,402 ft, trip out drill string to find/fix air problem |
| 8/6/99 9:30 | 3,402 | Resume drilling fill from 3,402 to 3,545 ft |
| 8/6/99 21:50 | 3,545 | Stop drilling at 3,545 ft, trip out drill string |
| 8/7/99 7:00 | | Colog collecting downhole geophysical data |
| 8/7/99 19:50 | | Colog having problems, stop collecting geophysical data |
| 8/8/99 6:45 | | Colog resumes collecting downhole geophysical data |
| 8/8/99 18:15 | | Colog stops collecting downhole geophysical data, DRI/PRG sets up to collect borehole radar data |
| 8/8/99 23:30 | | DRI/PRG damaged cable/tool, stop set up to collect data |
| 8/9/99 6:45 | | Colog resumes collecting downhole geophysical data |
| 8/9/99 18:15 | | Colog stops collecting downhole geophysical data, DRI/PRG sets up to collect borehole radar data |
| 8/10/99 7:00 | | DRI/PRG finishes collecting borehole radar data, Colog resumes collecting downhole geophysical data |
| 8/10/99 16:00 | | Colog stops collecting downhole geophysical data |
| 8/10/99 21:50 | | DRI collects downhole geochemical data, collects water level data (1,308 ft), collects thermal flow meter data |
| 8/11/99 16:35 | | Trip open-faced drill string in to 2,740 ft |
| 8/11/99 23:00 | | Colog collecting downhole geophysical data below 2,740 ft, having to repeatedly trip in drill string to clear bridges |
| 8/12/99 15:35 | | Colog stops collecting downhole geophysical data, DRI collects thermal flowmeter data below 2,740 ft |
| 8/12/99 18:25 | | DRI stops collecting thermal flowmeter data, trip drill string out |
| 8/12/99 3:20 | | Trip drill string in to clear bridges with mill-tooth tricone using bentonite-based fluid |
| 8/13/99 19:10 | | Stop drilling fill and conditioning hole at 3,565 ft, trip drill string out |
| 8/14/99 4:10 | | Colog collecting downhole geophysical data |
| 8/15/99 5:00 | | Colog completes collecting downhole geophysical data, set up to install 5 1/2-in. well casing |
| 8/15/99 12:43 | | Start well casing in |
| 8/16/99 9:05 | | Casing installed to design depth of 3,560.76 ft bgs, screened interval 3,385.03 to 3,530.63 ft bgs, set up to install filter pack |
| 8/17/99 10:15 | | Complete installation of filter pack, top of 3/8-in. gravel at 3,335 ft, top of 6/9 sand at 3,310 ft, top of 20/40 sand at 3,295.5 |

Table A-1
Well HC-5 Chronology
 (Page 4 of 4)

| Date and Time | Depth (ft) | Activity |
|----------------|------------|---|
| 8/18/99 22:30 | | Complete installation of cement grout seal from 3,295.5 ft to surface, set up to air lift develop |
| 8/19/99 4:25 | | Begin conventional airlift development with BQ airline |
| 8/20/99 6:30 | | Stop air-lift development, total of 19,100 gal discharged in 1,329 min, trip out airline |
| 8/20/99 8:35 | | Depth to water 1,361 ft |
| 8/22/99 12:30 | | Colog prepares to collect 4 pi data |
| 8/22/99 17:45 | | Colog finishes collecting 4 pi data |
| 8/30/99 16:15 | | Depth to water 1,365.1 ft |
| 9/29/99 9:00 | | Began installation of eductor and airline for airlift development |
| 9/30/99 13:30 | | Complete installation of HQ eductor to 3,550 ft and AQ airline to 2,000 ft |
| 9/30/99 14:40 | | Start well development (airlifting and surging) |
| 10/1/99 14:15 | | Complete airlift development (5 casing volumes evacuated) |
| 10/1/99 15:00 | | Start removal of airline and eductor from well |
| 10/3/99 11:00 | | Complete airline and eductor removal, start pump installation |
| 10/4/99 13:30 | | Complete pump installation to 1,570 ft, sounding tube at 1,563 ft, airline at 1,555 ft |
| 10/4/99 17:56 | | Start Phase I development/test pumping |
| 10/8/99 15:09 | | Stop Phase I development/test pumping |
| 10/9/99 10:00 | | Start miscellaneous development/test pumping |
| 10/9/99 15:58 | | Stop miscellaneous development/test pumping |
| 10/10/99 16:30 | | Continue miscellaneous development/test pumping |
| 10/10/99 17:30 | | Stop miscellaneous development/test pumping |
| 10/11/99 14:15 | | Start Phase II development/test pumping |
| 10/27/99 18:00 | | Stop Phase II development/test pumping |
| 10/30/99 18:20 | | Start Phase III development/test pumping |
| 11/3/99 10:35 | | Stop Phase III development/test pumping |
| 11/11/99 15:00 | | Start Phase IV development/test pumping |
| 11/12/99 21:02 | | Stop Phase IV development/test pumping |
| 11/15/99 16:30 | | Start Phase V development/test pumping |
| 11/22/99 18:30 | | Stop Phase V development/test pumping |
| 11/30/99 17:00 | | Start Phase VI development/test pumping |
| 12/7/99 | | Phase VI development/test pumping in progress, IT suspends monitoring |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 1 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|-----------------------------------|---------------------|-----------------------------|------------------------|-----------------------------|------------------------|-------------------------|--------------------|---------|
| 6/19/99 17:00 | -- | -- | -- | -- | -- | 28.40 | 48.70 | amw |
| 6/19/99 17:10 | -- | -- | -- | -- | -- | 28.40 | 337.00 | amw |
| 6/20/99 6:40 | -- | -- | -- | -- | -- | 25.70 | 291.00 | tjc |
| 6/20/99 6:40 | -- | -- | -- | -- | -- | 27.30 | 291.00 | tjc |
| 6/20/99 6:42 | -- | -- | -- | -- | -- | 25.40 | 8.21 | tjc |
| 6/20/99 6:42 | -- | -- | -- | -- | -- | 27.30 | 8.06 | tjc |
| 6/20/99 18:50 | 130 | 27.70 | 24.20 | 27.80 | 16.30 | -- | -- | we |
| 6/20/99 20:00 | 151 | 26.80 | 25.50 | 26.20 | 22.50 | -- | -- | tjc |
| 6/20/99 21:30 | 170 | 27.10 | 26.20 | 28.40 | 1.60 | -- | -- | tjc |
| 6/21/99 1:31 | 187 | 28.30 | 20.70 | 27.40 | 10.50 | -- | -- | tjc |
| 6/21/99 3:30 | 196 | 28.10 | 22.10 | 27.60 | 6.46 | -- | -- | tjc |
| 6/21/99 3:30 | 196 | -- | -- | 27.40 | 6.42 | -- | -- | tjc |
| 6/21/99 4:44 | -- | -- | -- | -- | -- | 28.00 | 27.10 | tjc |
| 6/21/99 4:48 | 203 | 28.00 | 23.50 | -- | -- | -- | -- | tjc |
| 6/21/99 4:50 | 203 | 28.40 | 19.40 | -- | -- | -- | -- | tjc |
| 6/21/99 4:55 | 203 | -- | -- | 27.50 | 10.70 | -- | -- | tjc |
| 6/21/99 5:40 | 209 | 27.70 | 25.40 | 27.80 | 0.00 | -- | -- | tjc |
| 6/21/99 6:40 | 227 | 27.60 | 25.10 | 27.20 | 11.10 | -- | -- | tjc |
| 6/21/99 7:45 | 237 | 28.00 | 22.00 | 27.80 | 7.10 | -- | -- | tjc |
| 6/21/99 8:45 | 247 | 28.60 | 18.70 | 28.30 | 6.15 | -- | -- | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 2 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 6/21/99 10:05 | 254 | 28.00 | 17.60 | 27.70 | 10.10 | -- | -- | tjc |
| 6/21/99 10:05 | 254 | 27.10 | 18.00 | -- | -- | -- | -- | tjc |
| 6/21/99 10:45 | 261 | 27.80 | 17.30 | 27.60 | 6.19 | -- | -- | tjc |
| 6/21/99 11:55 | 270 | 28.20 | 19.60 | 28.20 | 5.28 | -- | -- | we |
| 6/21/99 14:10 | 281 | 27.60 | 19.20 | 27.60 | 11.90 | -- | -- | we |
| 6/21/99 15:25 | 290 | 27.40 | 22.40 | 27.40 | 11.00 | -- | -- | we |
| 6/21/99 16:35 | 302 | 27.30 | 26.80 | 27.10 | 10.40 | -- | -- | we |
| 6/21/99 17:45 | -- | -- | -- | -- | -- | 27.90 | 48.10 | fmf |
| 6/22/99 6:15 | -- | 27.80 | 22.10 | -- | -- | -- | -- | tjc |
| 6/22/99 6:15 | 308 | 28.50 | 24.60 | -- | -- | -- | -- | tjc |
| 6/22/99 6:20 | 308 | -- | -- | 28.10 | 8.64 | -- | -- | tjc |
| 6/22/99 7:20 | 318 | 27.80 | 20.20 | 27.90 | 11.40 | -- | -- | tjc |
| 6/22/99 8:20 | 325 | 28.00 | 21.70 | 28.00 | 13.20 | -- | -- | tjc |
| 6/22/99 10:40 | 340 | 27.80 | 31.60 | 27.70 | 7.66 | -- | -- | tjc |
| 6/22/99 13:25 | 355 | 27.50 | 41.30 | 27.50 | 6.06 | -- | -- | fmf |
| 6/22/99 14:35 | -- | -- | -- | -- | -- | 28.00 | 57.50 | fmf |
| 6/22/99 15:25 | 363 | 28.00 | 31.60 | 27.70 | 8.73 | -- | -- | fmf |
| 6/22/99 16:40 | 363 | -- | -- | 27.70 | 30.80 | -- | -- | fmf |
| 6/22/99 18:00 | 363 | 27.90 | 49.20 | 28.40 | 25.70 | -- | -- | we |
| 6/22/99 20:05 | 368 | 27.20 | 57.30 | 27.20 | 8.33 | -- | -- | fmf |
| 6/22/99 21:15 | 372 | 27.80 | 57.00 | 27.60 | 36.00 | -- | -- | fmf |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 3 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 6/22/99 21:20 | -- | -- | -- | -- | -- | 27.80 | 41.50 | fmf |
| 6/23/99 11:10 | 380 | 28.20 | 40.10 | 28.30 | 0.00 | -- | -- | we |
| 6/23/99 12:20 | 400 | 27.90 | 37.20 | 27.90 | 18.40 | -- | -- | we |
| 6/23/99 14:15 | -- | -- | -- | -- | -- | 27.90 | 60.90 | we |
| 6/23/99 14:30 | 430 | 27.80 | 38.00 | 27.60 | 3.41 | -- | -- | we |
| 6/23/99 15:30 | 444 | 28.20 | 44.20 | 28.00 | 23.10 | -- | -- | we |
| 6/23/99 16:30 | 450 | 28.10 | 50.40 | 27.90 | 27.20 | -- | -- | we |
| 6/23/99 17:05 | -- | -- | -- | -- | -- | 28.00 | 46.50 | we |
| 6/23/99 17:35 | 464 | 28.10 | 54.90 | 28.10 | 32.40 | -- | -- | we |
| 6/23/99 19:05 | 470 | 27.90 | 53.40 | 27.70 | 25.20 | -- | -- | we |
| 6/23/99 20:20 | 484 | 27.80 | 55.60 | 27.50 | 27.00 | -- | -- | bac |
| 6/23/99 21:30 | 505 | 27.80 | 57.30 | 25.10 | 1.50 | -- | -- | bac |
| 6/23/99 21:50 | -- | -- | -- | -- | -- | 27.30 | 53.40 | bac |
| 6/24/99 | 540 | 27.20 | 50.80 | 27.30 | -- | -- | -- | bac/kh |
| 6/24/99 | 560 | 27.10 | 42.70 | 27.30 | 0.00 | -- | -- | bac/kh |
| 6/24/99 1:20 | 565 | 25.70 | 52.10 | 26.90 | 30.10 | -- | -- | bac/kh |
| 6/24/99 5:30 | -- | -- | -- | -- | -- | 27.50 | 0.00 | bac/kh |
| 6/24/99 6:30 | 597 | 26.60 | 67.20 | 26.90 | -- | -- | -- | bac/kh |
| 6/24/99 8:15 | -- | -- | -- | -- | -- | 27.60 | 52.70 | bac/kh |
| 6/24/99 10:40 | 655 | 27.30 | 39.30 | 27.30 | 8.15 | -- | -- | bac/kh |
| 6/24/99 13:00 | -- | -- | -- | -- | -- | 26.20 | 43.70 | bac/kh |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 4 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 6/24/99 18:00 | -- | -- | -- | -- | -- | 26.90 | 45.80 | bac/kh |
| 6/24/99 19:30 | -- | -- | -- | -- | -- | 28.30 | 45.40 | bac/kh |
| 6/24/99 20:00 | 740 | 27.80 | 36.70 | 26.90 | 34.20 | -- | -- | bac/kh |
| 6/24/99 21:00 | -- | -- | -- | -- | -- | 28.10 | 43.50 | bac/kh |
| 6/24/99 23:00 | -- | -- | -- | -- | -- | 26.00 | 65.90 | bac |
| 6/25/99 4:25 | -- | -- | -- | -- | -- | 26.60 | 70.30 | bac |
| 6/25/99 5:25 | 840 | 26.50 | 56.60 | 27.40 | -- | -- | -- | bac |
| 6/25/99 5:40 | -- | -- | -- | -- | -- | 26.80 | 46.20 | bac |
| 6/25/99 9:15 | -- | -- | -- | -- | -- | 27.00 | 40.90 | tjc |
| 6/25/99 11:35 | -- | -- | -- | -- | -- | 27.00 | 52.90 | tjc |
| 6/26/99 4:05 | 898 | 27.60 | 54.00 | 27.50 | 22.60 | -- | -- | tjc |
| 6/26/99 5:05 | -- | -- | -- | -- | -- | 27.60 | 38.20 | tjc |
| 6/26/99 9:30 | 950 | 25.60 | 51.50 | 26.30 | 5.13 | -- | -- | tjc |
| 6/26/99 10:40 | -- | -- | -- | -- | -- | 26.70 | 47.40 | kh |
| 6/26/99 10:45 | 966 | 27.10 | 40.50 | 27.40 | 0.00 | -- | -- | kh |
| 6/26/99 11:30 | 975 | 27.20 | 41.80 | 26.20 | 0.00 | -- | -- | kh |
| 6/26/99 13:00 | 990 | 25.90 | 46.30 | 17.50 | 3.34 | -- | -- | kh |
| 6/26/99 14:00 | 1,000 | 26.30 | 47.00 | 20.20 | 33.40 | -- | -- | kh |
| 6/26/99 15:15 | 1,020 | 26.20 | 46.80 | 26.50 | 27.80 | 26.60 | 49.00 | kh |
| 6/26/99 16:50 | 1,020 | 26.90 | 48.20 | 24.80 | 0.00 | -- | -- | kh |
| 6/26/99 19:30 | -- | -- | -- | -- | -- | 27.00 | 49.40 | kh |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 5 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|-----------------------------------|---------------------|-----------------------------|------------------------|-----------------------------|------------------------|-------------------------|--------------------|---------|
| 6/27/99 4:40 | -- | 27.60 | 38.90 | 27.30 | 43.20 | -- | -- | tjc |
| 6/27/99 6:05 | 1,033 | 27.00 | 28.10 | 27.10 | 22.00 | -- | -- | tjc |
| 6/27/99 6:45 | -- | -- | -- | -- | -- | 27.10 | 41.70 | tjc |
| 6/27/99 7:10 | 1,045 | 27.10 | 22.50 | 26.90 | 22.40 | -- | -- | tjc |
| 6/27/99 8:10 | 1,058 | 27.20 | 20.90 | 27.10 | 18.70 | -- | -- | tjc |
| 6/27/99 9:10 | 1,065 | 27.20 | 19.70 | 27.00 | 19.50 | -- | -- | tjc |
| 6/27/99 10:15 | 1,080 | 27.20 | 16.30 | 26.70 | 15.80 | -- | -- | tjc |
| 6/27/99 11:20 | 1,085 | 26.70 | 21.60 | 25.40 | 31.50 | 26.40 | 46.60 | kh |
| 6/27/99 12:45 | 1,100 | 23.10 | 35.90 | 25.30 | 18.90 | -- | -- | kh |
| 6/27/99 14:00 | -- | -- | -- | -- | -- | 27.10 | 52.80 | kh |
| 6/27/99 14:45 | 1,120 | 26.20 | 14.10 | 27.30 | 14.90 | -- | -- | kh |
| 6/27/99 15:45 | 1,140 | 26.90 | 17.40 | 27.20 | 11.30 | -- | -- | kh |
| 6/27/99 16:35 | -- | -- | -- | -- | -- | 26.80 | 47.00 | kh |
| 6/27/99 16:45 | 1,155 | 27.40 | 10.50 | 27.40 | 9.71 | -- | -- | kh |
| 6/27/99 17:45 | 1,170 | 26.30 | 9.32 | 26.30 | 9.45 | -- | -- | kh |
| 6/27/99 18:45 | -- | -- | -- | -- | -- | 26.60 | 50.20 | kh |
| 6/27/99 19:30 | 1,200 | 27.40 | 8.47 | 26.30 | 8.20 | -- | -- | kh |
| 6/27/99 20:15 | -- | -- | -- | -- | -- | 26.90 | 49.00 | tjc |
| 6/27/99 20:30 | 1,200 | 27.00 | 8.91 | 26.60 | 9.54 | -- | -- | kh |
| 6/27/99 22:15 | -- | -- | -- | -- | -- | 27.30 | 69.70 | tjc |
| 6/27/99 23:15 | -- | -- | -- | -- | -- | 27.10 | 44.70 | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 6 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/1/99 11:35 | -- | -- | -- | -- | -- | 26.70 | 45.90 | kh |
| 7/1/99 12:00 | 1,240 | 26.50 | 42.40 | 26.60 | 28.70 | -- | -- | kh |
| 7/1/99 13:05 | 1,260 | 26.30 | 48.10 | 26.10 | 47.20 | -- | -- | kh |
| 7/1/99 14:30 | 1,280 | 26.30 | 50.20 | 26.20 | 29.60 | -- | -- | kh |
| 7/3/99 6:05 | -- | -- | -- | -- | -- | 26.10 | 35.80 | kh |
| 7/3/99 6:45 | 1,305 | 26.80 | 13.00 | 26.80 | 10.40 | -- | -- | we |
| 7/3/99 8:00 | 1,325 | 27.00 | 8.02 | 26.90 | 6.25 | -- | -- | we |
| 7/3/99 9:20 | 1,352 | 27.00 | 4.33 | 27.10 | 3.92 | -- | -- | we |
| 7/3/99 10:35 | 1,369 | 26.70 | 6.81 | 27.10 | 5.31 | -- | -- | kh |
| 7/3/99 11:50 | 1,393 | 26.90 | 6.25 | 26.30 | 9.67 | -- | -- | kh |
| 7/3/99 12:20 | -- | -- | -- | -- | -- | 26.50 | 39.60 | kh |
| 7/3/99 14:40 | 1,406 | 26.30 | 6.30 | 27.00 | 5.69 | -- | -- | kh |
| 7/3/99 15:08 | -- | -- | -- | -- | -- | 26.30 | 41.80 | kh |
| 7/3/99 15:20 | 1,430 | 26.70 | 7.42 | 26.40 | 7.71 | -- | -- | kh |
| 7/3/99 16:00 | -- | -- | -- | -- | -- | 26.40 | 59.20 | kh |
| 7/3/99 16:31 | 1,455 | 26.80 | 6.15 | 27.00 | 4.01 | -- | -- | kh |
| 7/3/99 17:59 | 1,480 | 26.40 | 2.74 | 26.60 | 4.20 | -- | -- | kh |
| 7/3/99 20:10 | 1,520 | 26.50 | 1.96 | 26.00 | 2.01 | 26.20 | 41.80 | kh |
| 7/3/99 23:45 | 1,546 | 26.70 | 1.22 | 26.40 | 1.33 | 26.80 | 40.40 | we |
| 7/4/99 1:45 | 1,569 | 26.70 | 2.09 | 26.00 | 1.59 | -- | -- | we |
| 7/4/99 2:50 | -- | -- | -- | -- | -- | 26.90 | 28.10 | we |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 7 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|-----------------------------------|---------------------|-----------------------------|------------------------|-----------------------------|------------------------|-------------------------|--------------------|---------|
| 7/4/99 3:10 | 1,580 | 26.40 | 1.47 | 26.20 | 0.936 | -- | -- | we |
| 7/4/99 4:40 | 1,590 | 26.40 | 1.20 | 25.90 | 0.90 | -- | -- | we |
| 7/4/99 4:40 | 1,590 | 25.70 | 1.96 | 25.60 | 1.27 | -- | -- | we |
| 7/4/99 6:10 | 1,602 | 25.90 | 1.02 | 26.00 | 0.929 | -- | -- | we |
| 7/4/99 7:25 | 1,611 | 25.80 | 0.966 | 25.50 | 0.657 | -- | -- | we |
| 7/4/99 8:35 | 1,620 | 26.40 | 0.787 | 26.40 | 0.507 | -- | -- | we |
| 7/4/99 9:45 | 1,625 | 26.30 | 0.617 | 26.40 | 0.647 | -- | -- | tjc |
| 7/4/99 11:05 | 1,633 | 26.10 | 0.622 | 25.50 | 0.561 | -- | -- | tjc |
| 7/4/99 11:50 | -- | -- | -- | -- | -- | 26.80 | 44.10 | tjc |
| 7/4/99 13:10 | 1,645 | 26.70 | 0.643 | 27.00 | 0.542 | -- | -- | tjc |
| 7/4/99 14:10 | 1,654 | 27.20 | 0.927 | 26.80 | 0.614 | -- | -- | tjc |
| 7/4/99 15:15 | 1,665 | 27.10 | 0.740 | 27.10 | 0.746 | -- | -- | tjc |
| 7/4/99 16:15 | 1,672 | 26.80 | 0.690 | 26.90 | 0.706 | -- | -- | tjc |
| 7/5/99 5:05 | 1,678 | 27.20 | 0.535 | 25.50 | 0.623 | -- | -- | we |
| 7/5/99 5:45 | -- | -- | -- | -- | -- | 27.20 | 34.800 | we |
| 7/5/99 6:30 | 1,692 | 27.20 | 0.557 | 25.90 | 0.455 | -- | -- | we |
| 7/7/99 7:05 | -- | -- | -- | -- | -- | 26.40 | 47.60 | tjc |
| 7/7/99 13:25 | 1,700 | 26.50 | 5.59 | 26.40 | 6.99 | -- | -- | tjc |
| 7/7/99 13:30 | -- | -- | -- | -- | -- | 26.40 | 45.70 | tjc |
| 7/7/99 14:30 | 1,710 | 26.50 | 6.76 | 26.40 | 5.04 | -- | -- | tjc |
| 7/7/99 14:35 | -- | -- | -- | -- | -- | 26.60 | 40.80 | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/7/99 15:35 | 1,721 | 26.60 | 8.95 | 26.60 | 4.11 | -- | -- | tjc |
| 7/7/99 16:30 | 1,730 | 26.60 | 4.00 | 26.50 | 3.72 | -- | -- | tjc |
| 7/7/99 18:30 | 1,744 | 26.10 | 5.39 | 26.60 | 5.97 | -- | -- | tjc |
| 7/7/99 19:35 | 1,750 | 25.90 | 3.87 | 26.50 | 3.61 | -- | -- | tjc |
| 7/7/99 20:35 | 1,756 | 26.50 | 4.49 | 26.30 | 2.86 | -- | -- | tjc |
| 7/7/99 21:20 | -- | -- | -- | -- | -- | 26.00 | 45.70 | tjc |
| 7/7/99 21:30 | 1,762 | 26.00 | 5.37 | 26.70 | 36.10 | -- | -- | we |
| 7/7/99 22:30 | 1,768 | 26.00 | 35.30 | 25.90 | 35.40 | -- | -- | we |
| 7/7/99 23:30 | 1,778 | 25.80 | 34.30 | 25.80 | 34.80 | -- | -- | we |
| 7/8/99 1:00 | 1,785 | 27.20 | 33.60 | 27.10 | 33.60 | -- | -- | we |
| 7/8/99 2:00 | 1,791 | 26.10 | 4.25 | 25.70 | 4.27 | -- | -- | we |
| 7/8/99 3:00 | 1,795 | 25.60 | 4.19 | 25.50 | 3.58 | -- | -- | we |
| 7/8/99 4:00 | 1,800 | 26.90 | 4.59 | 27.00 | 4.43 | -- | -- | we |
| 7/8/99 5:15 | 1,805 | 27.00 | 3.88 | 26.50 | 3.73 | -- | -- | we |
| 7/8/99 6:15 | 1,809 | 27.00 | 4.31 | 26.90 | 3.57 | -- | -- | we |
| 7/8/99 7:20 | 1,814 | 26.70 | 3.57 | 26.70 | 3.51 | -- | -- | we |
| 7/8/99 23:30 | -- | -- | -- | 27.10 | 0.00 | -- | -- | tc |
| 7/9/99 2:35 | -- | 26.10 | 0.00 | -- | -- | -- | -- | tc |
| 7/9/99 13:00 | 1,823 | 27.30 | 0.00 | 26.80 | 0.00 | -- | -- | tjc |
| 7/9/99 13:00 | 1,823 | 26.80 | 0.00 | 27.00 | 0.00 | -- | -- | tjc |
| 7/9/99 13:05 | -- | -- | -- | -- | -- | 27.00 | 82.20 | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/9/99 13:05 | -- | -- | -- | -- | -- | 26.40 | 82.20 | tjc |
| 7/9/99 14:00 | 1,826 | 27.60 | 0.00 | 26.70 | 0.00 | -- | -- | tjc |
| 7/9/99 15:00 | 1,830 | 27.70 | 0.00 | 27.30 | 0.00 | -- | -- | tjc |
| 7/9/99 16:00 | 1,835 | 27.00 | 0.00 | 26.90 | 0.00 | -- | -- | tjc |
| 7/9/99 17:15 | 1,843 | 26.70 | 0.00 | 26.70 | 0.00 | -- | -- | tjc |
| 7/9/99 18:15 | 1,847 | 26.80 | 0.00 | 26.60 | 0.00 | -- | -- | tjc |
| 7/9/99 19:30 | 1,852 | 27.40 | 0.00 | 27.20 | 0.00 | -- | -- | tjc |
| 7/9/99 20:30 | 1,859 | 27.00 | 0.00 | 27.20 | 0.00 | -- | -- | tjc |
| 7/9/99 22:15 | 1,860 | 23.30 | 0.00 | 26.30 | 0.00 | -- | -- | tjc |
| 7/9/99 23:15 | 1,868 | 26.70 | 0.00 | 26.20 | 0.00 | -- | -- | tc |
| 7/10/99 2:00 | 1,885 | 25.70 | 0.00 | 26.30 | 0.00 | -- | -- | tc |
| 7/10/99 2:40 | -- | -- | -- | -- | -- | 26.80 | 45.70 | tc |
| 7/10/99 3:00 | 1,892 | 25.90 | 0.00 | 26.50 | 0.00 | -- | -- | tc |
| 7/10/99 4:10 | 1,900 | 26.10 | 0.00 | 26.50 | 0.00 | -- | -- | tc |
| 7/10/99 6:00 | 1,910 | 26.50 | 0.00 | 26.30 | 0.00 | -- | -- | tc |
| 7/10/99 7:00 | 1,912 | 26.50 | 0.00 | 26.50 | 0.00 | -- | -- | tc |
| 7/10/99 20:00 | 1,914 | 27.40 | 4.83 | 27.20 | 4.72 | -- | -- | tjc |
| 7/10/99 20:35 | -- | -- | -- | -- | -- | 27.50 | 37.50 | tjc |
| 7/10/99 21:30 | 1,920 | 27.30 | 7.40 | 27.20 | 5.72 | -- | -- | tjc |
| 7/10/99 21:35 | -- | -- | -- | -- | -- | 27.30 | 47.30 | tjc |
| 7/10/99 22:35 | 1,923 | 26.70 | 7.43 | 26.90 | 6.08 | -- | -- | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|-----------------------------------|---------------------|-----------------------------|------------------------|-----------------------------|------------------------|-------------------------|--------------------|---------|
| 7/10/99 23:05 | -- | -- | -- | -- | -- | 26.90 | 46.70 | tc |
| 7/10/99 23:40 | 1,927 | 26.70 | 4.46 | 26.40 | 5.00 | -- | -- | tc |
| 7/11/99 0:50 | 1,932 | 26.20 | 6.31 | 26.40 | 6.40 | -- | -- | tc |
| 7/11/99 2:00 | 1,935 | 26.50 | 6.59 | 26.50 | 6.55 | -- | -- | tc |
| 7/11/99 2:30 | -- | -- | -- | -- | -- | 26.80 | 42.70 | tc |
| 7/11/99 3:00 | 1,938 | 25.40 | 8.28 | 27.30 | 8.71 | -- | -- | tc |
| 7/11/99 4:20 | 1,940 | 26.60 | 6.16 | 26.70 | 6.91 | -- | -- | tc |
| 7/11/99 5:30 | 1,945 | 26.60 | 4.12 | 25.80 | 4.16 | -- | -- | tc |
| 7/11/99 7:00 | 1,952 | 24.90 | 6.87 | 25.70 | 6.04 | -- | -- | tc |
| 7/11/99 8:30 | 1,957 | 26.2 | 3.57 | 26.70 | 2.44 | -- | -- | tc |
| 7/11/99 9:30 | 1,960 | 26.50 | 4.46 | 26.80 | 3.66 | -- | -- | tc |
| 7/11/99 14:00 | 1,964 | 26.70 | 4.43 | 26.70 | 4.37 | -- | -- | tjc |
| 7/11/99 14:10 | -- | -- | -- | -- | -- | 26.70 | 45.10 | tjc |
| 7/11/99 15:00 | 1,969 | 26.80 | 6.12 | 26.90 | 5.34 | -- | -- | tjc |
| 7/11/99 16:15 | 1,979 | 27.20 | 7.18 | 27.20 | 4.75 | -- | -- | tjc |
| 7/11/99 16:20 | -- | -- | -- | -- | -- | 27.10 | 43.20 | tjc |
| 7/11/99 17:30 | 1,980 | 26.70 | 5.68 | 26.70 | 6.62 | -- | -- | tjc |
| 7/11/99 17:35 | -- | -- | -- | -- | -- | 26.90 | 44.10 | tjc |
| 7/11/99 18:30 | 1,988 | 27.00 | 6.94 | 26.80 | 4.16 | -- | -- | tjc |
| 7/11/99 19:35 | 1,994 | 27.30 | 7.15 | 27.40 | 5.13 | -- | -- | tjc |
| 7/11/99 20:35 | 1,999 | 27.30 | 4.56 | 27.20 | 3.70 | -- | -- | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/11/99 21:40 | 2,008 | 27.30 | 5.13 | 27.20 | 4.20 | -- | -- | tjc |
| 7/11/99 22:40 | 2,016 | 27.30 | 3.63 | 27.50 | 3.38 | -- | -- | tjc |
| 7/11/99 23:40 | 2,023 | 26.50 | 1.25 | 25.80 | 1.11 | -- | -- | tc |
| 7/12/99 1:00 | 2,038 | 26.80 | 1.20 | 26.60 | 1.06 | -- | -- | tc |
| 7/12/99 3:00 | 2,045 | 25.20 | 11.10 | 25.80 | 5.03 | -- | -- | tc |
| 7/12/99 3:00 | 2,045 | 25.10 | 6.11 | -- | -- | -- | -- | tc |
| 7/12/99 4:00 | 2,050 | 26.30 | 4.06 | 26.20 | 3.45 | -- | -- | tc |
| 7/12/99 5:00 | 2,055 | 25.90 | 6.48 | 25.70 | 5.67 | -- | -- | tc |
| 7/12/99 5:10 | -- | -- | -- | -- | -- | 26.30 | 50.80 | tc |
| 7/12/99 6:00 | 2,060 | 26.40 | 1.55 | 26.50 | 1.48 | -- | -- | tc |
| 7/12/99 7:00 | 2,065 | 27.10 | 0.52 | 27.00 | 0.59 | -- | -- | tc |
| 7/12/99 8:00 | 2,069 | 26.90 | 5.22 | 27.20 | 5.48 | -- | -- | tc |
| 7/12/99 9:20 | 2,075 | 27.00 | 5.83 | 27.00 | 2.40 | -- | -- | tc |
| 7/12/99 10:30 | 2,080 | 27.70 | 4.46 | 27.70 | 2.49 | -- | -- | tc |
| 7/12/99 10:40 | -- | -- | -- | -- | -- | 27.20 | 41.40 | tc |
| 7/12/99 12:30 | 2,087 | 27.30 | 1.70 | 27.10 | 0.38 | -- | -- | tjc |
| 7/12/99 13:30 | 2,092 | 26.70 | 2.28 | 26.60 | 0.85 | -- | -- | tjc |
| 7/12/99 14:30 | 2,100 | 26.60 | 0.52 | 26.60 | 0.78 | -- | -- | tjc |
| 7/12/99 15:30 | 2,100 | 26.80 | 4.00 | 26.90 | 2.30 | -- | -- | tjc |
| 7/12/99 17:00 | 2,105 | 27.20 | 4.31 | 27.30 | 2.33 | -- | -- | tjc |
| 7/12/99 18:00 | 2,107 | 27.10 | 1.31 | 27.10 | 1.31 | -- | -- | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/12/99 19:00 | 2,109 | 27.20 | 6.21 | 27.70 | 2.23 | -- | -- | tjc |
| 7/12/99 20:00 | 2,113 | 26.30 | 2.48 | 26.90 | 4.57 | 26.60 | 40.80 | tjc |
| 7/12/99 21:00 | 2,119 | 26.70 | 1.37 | 27.00 | 1.74 | -- | -- | tjc |
| 7/12/99 22:00 | 2,122 | 27.10 | 2.11 | 25.50 | 0.54 | -- | -- | tjc |
| 7/12/99 23:00 | 2,128 | 24.80 | 2.16 | 25.90 | 1.90 | -- | -- | tjc |
| 7/13/99 0:30 | 2,136 | 26.40 | 2.77 | 26.20 | 2.72 | -- | -- | tc |
| 7/13/99 1:40 | 2,140 | 26.40 | 3.77 | 26.60 | 2.83 | -- | -- | tc |
| 7/13/99 20:00 | 2,150 | 26.40 | 0.00 | 26.60 | 0.32 | -- | -- | tjc |
| 7/13/99 20:00 | 2,150 | 26.40 | 2.65 | 26.60 | 0.00 | -- | -- | tjc |
| 7/13/99 21:05 | 2,155 | 26.30 | 0.00 | 26.70 | 0.00 | -- | -- | tjc |
| 7/13/99 22:00 | 2,164 | 26.90 | 0.00 | 26.90 | 0.00 | -- | -- | tjc |
| 7/13/99 23:00 | 2,170 | 26.90 | 0.00 | 26.80 | 0.00 | -- | -- | tjc |
| 7/14/99 0:15 | 2,176 | 25.30 | 0.00 | 26.00 | 0.00 | -- | -- | tc |
| 7/14/99 1:45 | 2,186 | 26.20 | 0.00 | 26.50 | 0.00 | -- | -- | tc |
| 7/14/99 4:00 | 2,196 | 25.70 | 0.00 | 25.90 | 0.00 | -- | -- | tc |
| 7/14/99 5:00 | 2,202 | 26.10 | 0.00 | 26.20 | 0.00 | -- | -- | tc |
| 7/14/99 5:00 | 2,202 | 25.80 | 3.29 | 26.20 | 2.76 | -- | -- | tc |
| 7/14/99 6:10 | 2,207 | 26.80 | 0.00 | 25.20 | 0.00 | -- | -- | tc |
| 7/14/99 7:25 | 2,215 | 26.60 | 0.00 | 26.70 | 0.00 | -- | -- | tc |
| 7/14/99 7:25 | 2,215 | 26.50 | 2.92 | 26.60 | 0.00 | -- | -- | tc |
| 7/14/99 9:00 | 2,226 | 26.20 | 0.00 | 26.50 | 0.00 | -- | -- | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/14/99 10:20 | 2,233 | 26.30 | 0.00 | 26.30 | 0.00 | -- | -- | tc |
| 7/14/99 11:25 | 2,240 | 27.20 | 0.00 | 27.10 | 0.00 | -- | -- | tc |
| 7/14/99 13:38 | 2,252 | 26.60 | 0.00 | 26.60 | 0.97 | -- | -- | we |
| 7/14/99 14:45 | 2,260 | 26.80 | 0.46 | 26.70 | 0.22 | -- | -- | we |
| 7/14/99 16:00 | 2,268 | 26.70 | 0.56 | 26.70 | 0.36 | -- | -- | we |
| 7/14/99 18:00 | 2,273 | 27.20 | 1.02 | 27.20 | 0.99 | -- | -- | we |
| 7/14/99 19:00 | 2,279 | 27.00 | 0.89 | -- | 0.56 | -- | -- | we |
| 7/14/99 20:00 | 2,289 | 26.70 | 0.00 | 26.60 | 0.00 | -- | -- | we |
| 7/14/99 21:00 | 2,293 | 26.80 | 1.62 | 26.90 | 1.79 | -- | -- | we |
| 7/14/99 22:10 | 2,297 | 25.90 | 2.03 | 26.70 | 3.59 | -- | -- | we |
| 7/14/99 23:00 | 2,301 | 26.20 | 0.11 | 26.50 | 1.62 | -- | -- | we |
| 7/15/99 0:20 | 2,308 | 26.20 | 0.70 | 26.10 | 0.75 | 25.80 | 54.00 | tc |
| 7/15/99 3:20 | 2,315 | 25.70 | 0.97 | 26.20 | 0.85 | -- | -- | tc |
| 7/15/99 4:55 | 2,321 | 25.40 | 0.00 | 25.20 | 0.00 | -- | -- | tc |
| 7/15/99 6:10 | 2,325 | 26.20 | 0.00 | 26.10 | 0.00 | -- | -- | tc |
| 7/15/99 7:20 | 2,330 | 26.20 | 0.00 | 26.80 | 0.00 | -- | -- | tc |
| 7/15/99 9:00 | 2,335 | 25.80 | 0.00 | 25.90 | 0.00 | -- | -- | tc |
| 7/15/99 10:00 | 2,339 | 26.00 | 0.00 | 25.90 | 0.00 | -- | -- | tc |
| 7/15/99 13:07 | 2,352 | 26.80 | 2.26 | 26.90 | 2.31 | -- | -- | we |
| 7/15/99 14:00 | 2,355 | 26.70 | 2.34 | 26.70 | 1.86 | -- | -- | we |
| 7/15/99 15:00 | 2,362 | 26.40 | 1.68 | 26.40 | 1.72 | -- | -- | we |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/15/99 16:23 | 2,368 | 26.90 | 1.84 | 26.80 | 1.61 | -- | -- | we |
| 7/15/99 18:00 | 2,375 | 26.40 | 1.60 | 26.60 | 0.96 | 26.80 | 51.10 | we |
| 7/15/99 19:20 | 2,381 | 26.70 | 2.22 | 26.70 | 1.97 | -- | -- | we |
| 7/15/99 20:15 | 2,387 | 26.60 | 1.48 | 26.60 | 1.46 | -- | -- | we |
| 7/15/99 20:30 | -- | -- | -- | -- | -- | 26.60 | 49.10 | we |
| 7/15/99 22:00 | 2,395 | 25.90 | 1.69 | 26.30 | 1.60 | -- | -- | we |
| 7/15/99 23:12 | 2,402 | 26.00 | 1.71 | 26.40 | 0.89 | -- | -- | we |
| 7/16/99 1:15 | 2,416 | 26.40 | 0.00 | 26.20 | 0.00 | -- | -- | tc |
| 7/16/99 1:30 | -- | -- | -- | -- | -- | 26.70 | 53.20 | tc |
| 7/16/99 2:30 | 2,428 | 24.60 | 0.00 | 25.40 | 0.00 | -- | -- | tc |
| 7/16/99 4:20 | 2,436 | 25.00 | 0.00 | 25.90 | 0.00 | -- | -- | tc |
| 7/16/99 5:25 | 2,443 | 26.10 | 0.00 | 25.40 | 0.00 | -- | -- | tc |
| 7/16/99 5:45 | -- | -- | -- | -- | -- | 26.50 | 57.50 | tc |
| 7/16/99 6:30 | 2,449 | 25.90 | 0.00 | 25.90 | 0.00 | -- | -- | tc |
| 7/16/99 8:00 | 2,460 | 25.60 | 0.00 | 25.60 | 0.00 | -- | -- | tc |
| 7/16/99 9:00 | 2,470 | 25.20 | 0.00 | 25.60 | 0.00 | 26.40 | 49.60 | tc |
| 7/16/99 10:10 | 2,480 | 26.80 | 0.00 | 26.90 | 0.00 | -- | -- | tc |
| 7/16/99 11:00 | 2,488 | 26.80 | 0.00 | 26.80 | 0.00 | -- | -- | tc |
| 7/16/99 12:00 | 2,495 | 27.10 | 0.00 | 27.00 | 0.00 | -- | -- | we |
| 7/16/99 13:12 | 2,508 | 26.90 | 0.00 | 26.90 | 0.00 | -- | -- | we |
| 7/16/99 14:35 | -- | -- | -- | -- | -- | 27.00 | 37.00 | we |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/16/99 15:04 | 2,516 | 26.90 | 0.00 | 26.80 | 0.00 | -- | -- | we |
| 7/16/99 16:45 | -- | -- | -- | -- | -- | 26.80 | 44.60 | we |
| 7/16/99 17:00 | 2,537 | 26.00 | 0.00 | 26.30 | 0.00 | -- | -- | we |
| 7/16/99 18:00 | -- | -- | -- | -- | -- | 26.70 | 44.30 | we |
| 7/16/99 18:05 | 2,550 | 26.50 | 0.00 | 26.30 | 0.00 | -- | -- | we |
| 7/16/99 18:55 | 2,556 | 26.30 | 0.00 | 26.20 | 0.00 | -- | -- | we |
| 7/16/99 20:00 | 2,570 | 26.30 | 0.00 | 26.50 | 0.00 | -- | -- | we |
| 7/16/99 21:00 | 2,575 | 26.00 | 0.00 | 26.20 | 0.00 | -- | -- | we |
| 7/16/99 22:00 | 2,590 | 26.50 | 0.00 | 26.20 | 0.00 | -- | -- | we |
| 7/16/99 23:10 | 2,598 | 26.00 | 0.00 | 26.00 | 0.00 | -- | -- | we |
| 7/17/99 0:10 | 2,607 | 26.20 | 2.60 | 25.60 | 1.94 | -- | -- | tc |
| 7/17/99 0:45 | -- | -- | -- | -- | -- | 26.60 | 58.20 | tc |
| 7/17/99 2:45 | 2,618 | 24.40 | 5.37 | 25.30 | 6.02 | -- | -- | tc |
| 7/17/99 3:50 | 2,628 | 25.00 | 2.83 | 25.30 | 3.20 | -- | -- | tc |
| 7/17/99 4:00 | -- | -- | -- | -- | -- | 25.5/25.2 | 177.0/177.0 | tc |
| 7/17/99 5:00 | 2,635 | 24.80 | 1.94 | 25.90 | 2.08 | -- | -- | tc |
| 7/17/99 6:00 | 2,641 | 24.50 | 2.83 | 25.50 | 2.63 | -- | -- | tc |
| 7/17/99 7:00 | 2,647 | 25.10 | 3.20 | 25.60 | 4.64 | -- | -- | tc |
| 7/17/99 8:15 | 2,653 | 24.80 | 9.20 | 25.60 | 8.45 | -- | -- | tc |
| 7/17/99 8:15 | 2,653 | 23.90 | 9.21 | 25.40 | 8.50 | -- | -- | tc |
| 7/17/99 8:40 | -- | -- | -- | -- | -- | 26.40 | 49.20 | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/17/99 9:30 | 2,663 | 25.60 | 4.73 | 26.00 | 2.86 | -- | -- | tc |
| 7/17/99 10:40 | -- | -- | -- | -- | -- | 26.40 | 40.30 | tc |
| 7/17/99 10:45 | 2,676 | 25.70 | 3.76 | 26.20 | 3.04 | -- | -- | tc |
| 7/17/99 11:50 | 2,690 | 26.50 | 6.71 | 26.60 | 6.97 | -- | -- | we |
| 7/17/99 12:55 | 2,700 | 26.70 | 7.72 | 26.80 | 5.05 | -- | -- | we |
| 7/17/99 13:30 | -- | -- | -- | -- | -- | 26.70 | 35.60 | we |
| 7/17/99 14:20 | 2,710 | 26.50 | 6.67 | 26.30 | 5.38 | -- | -- | we |
| 7/17/99 15:00 | 2,717 | 26.50 | 6.87 | 26.30 | 6.47 | -- | -- | we |
| 7/17/99 16:45 | 2,727 | 26.90 | 8.04 | 26.80 | 6.42 | -- | -- | we |
| 7/17/99 18:00 | 2,735 | 26.60 | 6.67 | 26.60 | 7.53 | -- | -- | we |
| 7/17/99 19:00 | 2,745 | 26.50 | 7.56 | 26.20 | 7.31 | -- | -- | we |
| 7/17/99 20:00 | 2,752 | 26.40 | 8.60 | 26.50 | 8.15 | -- | -- | we |
| 7/17/99 20:57 | 2,761 | 26.50 | 7.48 | 26.50 | 7.43 | -- | -- | we |
| 7/17/99 22:00 | 2,771 | 25.90 | 6.97 | 25.90 | 7.11 | -- | -- | we |
| 7/17/99 23:00 | 2,778 | 26.60 | 3.68 | 26.60 | 3.41 | 26.60 | 43.00 | we |
| 7/18/99 0:15 | 2,786 | 26.30 | 2.70 | 26.30 | 3.00 | -- | -- | tc |
| 7/18/99 2:00 | 2,795 | 25.50 | 5.65 | 25.90 | 5.67 | -- | -- | tc |
| 7/18/99 3:00 | 2,800 | 24.40 | 4.03 | 26.30 | 4.26 | -- | -- | tc |
| 7/18/99 19:20 | -- | -- | -- | -- | -- | 26.80 | 44.80 | we |
| 7/18/99 21:00 | 2,795 | 26.40 | 13.30 | 26.50 | 13.70 | -- | -- | we |
| 7/18/99 22:00 | 2,807 | 26.30 | 15.60 | 26.40 | 14.90 | -- | -- | we |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 17 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/18/99 23:00 | -- | -- | -- | -- | -- | 26.20 | 43.80 | we |
| 7/18/99 23:05 | 2,810 | 26.80 | 14.20 | 26.40 | 14.30 | -- | -- | we |
| 7/19/99 0:30 | 2,820 | 26.00 | 0.00 | 26.70 | 0.00 | -- | -- | jc |
| 7/19/99 1:35 | 2,826 | 26.10 | 0.81 | 26.10 | 0.22 | -- | -- | jc |
| 7/19/99 1:40 | -- | -- | -- | -- | -- | 26.30 | 41.80 | jc |
| 7/19/99 3:00 | 2,835 | 27.10 | 0.00 | 27.20 | 0.00 | -- | -- | jc |
| 7/19/99 4:08 | 2,847 | 27.10 | 0.00 | 27.10 | 2.00 | -- | -- | jc |
| 7/19/99 5:10 | 2,852 | 26.80 | 0.52 | 26.70 | 0.24 | -- | -- | jc |
| 7/19/99 6:10 | 2,865 | 26.90 | 0.00 | 26.80 | 0.30 | -- | -- | jc |
| 7/19/99 7:30 | 2,873 | 26.30 | 1.77 | 27.10 | 0.78 | -- | -- | jc |
| 7/19/99 8:30 | 2,880 | 26.90 | 0.00 | 26.30 | 0.00 | -- | -- | jc |
| 7/19/99 8:35 | -- | -- | -- | -- | -- | 26.50 | 62.90 | jc |
| 7/19/99 9:30 | 2,887 | 27.00 | 0.00 | 26.80 | 0.00 | -- | -- | jc |
| 7/19/99 10:35 | 2,892 | 26.80 | 0.00 | 27.10 | 0.00 | -- | -- | jc |
| 7/19/99 11:45 | -- | -- | -- | -- | -- | 26.70 | 53.20 | jc |
| 7/19/99 11:50 | 2,900 | 26.50 | 1.39 | 26.30 | 1.10 | -- | -- | jc |
| 7/19/99 12:55 | 2,909 | 26.00 | 1.28 | 26.20 | 1.13 | -- | -- | jc |
| 7/19/99 15:05 | -- | -- | -- | -- | -- | 26.70 | 31.20 | we |
| 7/19/99 15:15 | 2,919 | 26.70 | 9.95 | 26.20 | 9.72 | -- | -- | we |
| 7/19/99 15:58 | 2,926 | 26.40 | 12.30 | 26.60 | 8.34 | -- | -- | we |
| 7/19/99 16:25 | -- | -- | -- | -- | -- | 26.20 | 29.00 | we |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/19/99 17:40 | -- | -- | -- | -- | -- | 26.20 | 26.60 | we |
| 7/19/99 18:00 | 2,934 | 25.80 | 14.50 | 26.50 | 11.50 | -- | -- | we |
| 7/19/99 23:05 | 2,936 | 26.50 | 12.40 | 26.40 | 9.81 | -- | -- | we |
| 7/19/99 23:35 | -- | -- | -- | -- | -- | 26.30 | 42.00 | we |
| 7/20/99 0:05 | 2,945 | 26.30 | 8.02 | 26.30 | 10.10 | -- | -- | jc |
| 7/20/99 1:00 | 2,950 | 26.50 | 8.06 | 25.40 | 5.91 | -- | -- | jc |
| 7/20/99 2:00 | 2,958 | 26.50 | 3.93 | 26.30 | 3.83 | -- | -- | jc |
| 7/20/99 2:05 | -- | -- | -- | -- | -- | 26.50 | 9.01 | jc |
| 7/20/99 3:00 | 2,964 | 26.70 | 5.75 | 26.40 | 5.82 | -- | -- | jc |
| 7/20/99 4:00 | 2,970 | 26.60 | 5.19 | 26.40 | 4.82 | -- | -- | jc |
| 7/20/99 18:40 | -- | -- | -- | -- | -- | 27.00 | 36.80 | we |
| 7/20/99 20:40 | -- | -- | -- | -- | -- | 26.90 | 42.10 | we |
| 7/20/99 21:02 | 2,982 | 26.70 | 7.96 | 26.80 | 7.55 | -- | -- | we |
| 7/20/99 21:55 | 2,988 | 26.90 | 9.73 | 26.80 | 8.68 | -- | -- | we |
| 7/20/99 22:10 | -- | -- | -- | -- | -- | 26.80 | 47.40 | we |
| 7/20/99 22:55 | 2,993 | 26.90 | 8.47 | 26.80 | 8.33 | -- | -- | we |
| 7/21/99 1:00 | 3,010 | 25.40 | 2.30 | 26.60 | 5.32 | -- | -- | jc |
| 7/21/99 1:05 | -- | -- | -- | -- | -- | 26.60 | 64.80 | jc |
| 7/21/99 2:00 | 3,010 | 26.00 | 2.31 | 26.30 | 2.59 | -- | -- | jc |
| 7/21/99 3:00 | 3,020 | 27.00 | 11.60 | 27.30 | 12.50 | -- | -- | jc |
| 7/21/99 4:00 | 3,030 | 27.10 | 10.10 | 27.00 | 10.20 | -- | -- | jc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/21/99 4:30 | -- | -- | -- | -- | -- | 25.50 | 1.96 | jc |
| 7/21/99 5:00 | 3,034 | 26.80 | 12.30 | 27.00 | 9.71 | -- | -- | jc |
| 7/21/99 6:00 | 3,041 | 25.70 | 5.32 | 26.80 | 4.51 | -- | -- | jc |
| 7/21/99 7:00 | 3,049 | 26.70 | 3.26 | 26.30 | 2.45 | -- | -- | jc |
| 7/21/99 8:00 | 3,058 | 26.50 | 7.10 | 26.70 | 6.75 | -- | -- | jc |
| 7/21/99 8:20 | -- | -- | -- | -- | -- | 26.50 | 49.20 | jc |
| 7/21/99 9:00 | 3,070 | 26.40 | 8.26 | 26.10 | 8.03 | -- | -- | we |
| 7/21/99 10:00 | 3,086 | 26.40 | 3.97 | 26.30 | 11.30 | -- | -- | we |
| 7/21/99 11:00 | 3,096 | 26.40 | 10.60 | 26.30 | 11.90 | -- | -- | we |
| 7/21/99 14:00 | 3,121 | 26.40 | 9.41 | 26.40 | 9.87 | -- | -- | we |
| 7/21/99 15:10 | -- | -- | -- | -- | -- | 26.60 | 42.00 | we |
| 7/21/99 15:16 | 3,127 | 26.50 | 9.92 | 26.40 | 9.36 | -- | -- | we |
| 7/21/99 16:05 | 3,140 | 26.80 | 10.40 | 26.80 | 8.45 | -- | -- | we |
| 7/21/99 17:00 | 3,145 | 26.80 | 7.17 | 26.60 | 9.31 | -- | -- | we |
| 7/22/99 9:00 | -- | -- | -- | -- | -- | 26.80 | 45.60 | jc |
| 7/22/99 13:55 | 3,169 | 26.60 | 4.60 | 26.50 | 3.03 | -- | -- | we |
| 7/22/99 15:07 | 3,180 | 26.40 | 0.00 | 26.30 | 0.00 | -- | -- | we |
| 7/22/99 15:32 | -- | -- | -- | -- | -- | 26.50 | 37.40 | we |
| 7/22/99 16:00 | 3,186 | 26.30 | 0.39 | 26.20 | 0.67 | -- | -- | we |
| 7/22/99 17:04 | 3,196 | 26.20 | 2.63 | 26.20 | 2.93 | -- | -- | we |
| 7/22/99 18:25 | -- | -- | -- | -- | -- | 26.20 | 48.80 | we |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/22/99 19:12 | 3,207 | 26.50 | 2.07 | 26.50 | 1.71 | -- | -- | we |
| 7/22/99 20:04 | 3,214 | 26.20 | 3.88 | 26.50 | 6.27 | -- | -- | we |
| 7/22/99 21:00 | 3,220 | 26.40 | 3.84 | 26.30 | 3.95 | -- | -- | we |
| 7/22/99 21:50 | -- | -- | -- | -- | -- | 26.50 | 41.40 | we |
| 7/22/99 22:00 | 3,224 | 26.50 | 3.31 | 26.40 | 3.24 | -- | -- | we |
| 7/22/99 23:00 | 3,235 | 26.60 | 1.83 | 26.50 | 2.07 | -- | -- | tjc |
| 7/23/99 1:00 | 3,245 | 26.30 | 1.08 | 26.60 | 1.00 | -- | -- | tjc |
| 7/23/99 2:00 | 3,254 | 26.90 | 0.00 | 26.70 | 0.00 | -- | -- | tjc |
| 7/23/99 2:15 | -- | -- | -- | -- | -- | 26.50 | 46.70 | tjc |
| 7/23/99 3:00 | 3,259 | 27.40 | 0.00 | 27.00 | 0.00 | -- | -- | tjc |
| 7/23/99 4:00 | 3,266 | 26.90 | 0.00 | 26.90 | 0.00 | -- | -- | tjc |
| 7/23/99 5:00 | 32,77 | 26.00 | 4.03 | 26.00 | 2.02 | -- | -- | tjc |
| 7/23/99 6:00 | 3,280 | 26.30 | 0.00 | 26.40 | 0.00 | -- | -- | tjc |
| 7/23/99 7:00 | 3,290 | 26.00 | 1.68 | 25.90 | 0.00 | -- | -- | tjc |
| 7/23/99 7:35 | -- | -- | -- | -- | -- | 26.00 | 49.60 | tjc |
| 7/23/99 8:15 | 3,300 | 26.00 | 7.95 | 26.30 | 10.20 | -- | -- | tjc |
| 7/23/99 9:05 | 3,310 | 26.10 | 0.00 | 26.20 | 0.00 | -- | -- | tjc |
| 7/23/99 10:15 | 3,320 | 26.20 | 0.00 | 26.00 | 0.00 | -- | -- | tjc |
| 7/23/99 11:15 | 3,325 | 26.10 | 0.00 | 25.90 | 0.00 | -- | -- | tjc |
| 7/23/99 12:10 | 3,332 | 26.10 | 3.42 | 25.90 | 4.13 | -- | -- | amw |
| 7/23/99 12:35 | -- | -- | -- | -- | -- | 26.00 | 40.90 | amw |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/23/99 13:00 | 3,338 | 25.90 | 2.33 | 25.90 | 1.69 | -- | -- | amw |
| 7/23/99 15:00 | 3,345 | 25.60 | 1.25 | 26.30 | 7.57 | -- | -- | amw |
| 7/23/99 16:00 | 3,353 | 26.30 | 3.50 | 26.30 | 5.72 | -- | -- | amw |
| 7/23/99 17:00 | -- | -- | -- | -- | -- | 26.50 | 44.00 | amw |
| 7/23/99 17:05 | 3,260 | 26.60 | 1.22 | 26.40 | 1.38 | -- | -- | amw |
| 7/23/99 18:00 | 3,370 | 26.40 | 5.77 | 26.40 | 4.74 | -- | -- | amw |
| 7/23/99 19:05 | 3,380 | 26.40 | 2.01 | 26.20 | 3.46 | -- | -- | amw |
| 7/23/99 20:00 | 3,386 | 26.30 | 0.33 | 26.30 | 0.70 | -- | -- | amw |
| 7/23/99 21:00 | 3,392 | 26.50 | 0.00 | 26.60 | 0.00 | -- | -- | amw |
| 7/23/99 23:00 | 3,407 | 25.70 | 0.00 | 26.10 | 0.00 | 26.40 | 39.10 | amw |
| 7/24/99 1:15 | 3,423 | 26.70 | 0.53 | 26.10 | 0.00 | -- | -- | tjc |
| 7/24/99 2:05 | 3,436 | 26.90 | 0.00 | 26.80 | 0.00 | -- | -- | tjc |
| 7/24/99 3:10 | 3,441 | 26.40 | 0.00 | 26.70 | 0.00 | -- | -- | tjc |
| 7/24/99 4:05 | 3,451 | 26.90 | 0.00 | 27.00 | 0.00 | -- | -- | tjc |
| 7/24/99 5:00 | 3,460 | 26.80 | 0.00 | 26.00 | 0.00 | -- | -- | tjc |
| 7/24/99 6:00 | 3,469 | 26.80 | 0.00 | 26.80 | 0.00 | -- | -- | tjc |
| 7/24/99 7:00 | 3,480 | 26.70 | 0.00 | 27.00 | 0.00 | -- | -- | tjc |
| 7/24/99 8:00 | 3,486 | 26.80 | 0.00 | 26.80 | 0.00 | -- | -- | tjc |
| 7/24/99 9:00 | 3,498 | 25.70 | 2.57 | 24.40 | 1.49 | -- | -- | tjc |
| 7/24/99 10:00 | 3,505 | 25.80 | 0.00 | 26.00 | 0.00 | -- | -- | tc |
| 7/24/99 10:40 | 3,512 | -- | -- | -- | -- | 26.40 | 40.30 | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
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| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/24/99 11:05 | 3,513 | 26.10 | 0.00 | 26.20 | 0.00 | -- | -- | tc |
| 7/24/99 11:45 | 3,518 | -- | -- | -- | -- | 26.30 | 51.80 | tc |
| 7/24/99 12:30 | 3,522 | 25.90 | 0.00 | 25.80 | 0.00 | -- | -- | tc |
| 7/24/99 13:35 | 3,529 | 25.90 | 0.00 | 26.30 | 0.00 | -- | -- | tc |
| 7/24/99 14:30 | 3,536 | 25.60 | 0.00 | 26.20 | 0.00 | -- | -- | tc |
| 7/24/99 16:45 | 3,545 | 26.00 | 0.00 | 26.10 | 0.00 | -- | -- | tc |
| 7/24/99 17:00 | -- | -- | -- | -- | -- | 26.30 | 41.10 | tc |
| 7/24/99 18:30 | 3,558 | 26.00 | 0.00 | 26.40 | 0.00 | -- | -- | tc |
| 7/25/99 16:30 | -- | -- | -- | -- | -- | 26.40 | 46.10 | tc |
| 7/25/99 17:20 | -- | -- | -- | -- | -- | 26.20 | 41.80 | tc |
| 7/25/99 17:50 | -- | -- | -- | -- | -- | 26.20 | 0.00 | tc |
| 7/25/99 18:10 | -- | 26.10 | 0.00 | -- | -- | -- | -- | tc |
| 7/25/99 18:20 | -- | -- | -- | -- | -- | 25.90 | 48.80 | tc |
| 7/25/99 18:50 | -- | -- | -- | -- | -- | 25.70 | 41.20 | tc |
| 7/25/99 19:15 | -- | -- | -- | -- | -- | 26.30 | 47.30 | tc |
| 7/25/99 21:30 | -- | -- | -- | -- | -- | 26.40 | 27.60 | tc |
| 7/25/99 22:40 | -- | -- | -- | -- | -- | 26.10 | 49.20 | tc |
| 7/26/99 0:05 | -- | -- | -- | -- | -- | 26.10 | 232.00 | tc |
| 7/26/99 3:00 | -- | -- | -- | -- | -- | 26.30 | 64.90 | tc |
| 7/26/99 4:30 | -- | -- | -- | -- | -- | 26.70 | 49.80 | tc |
| 7/26/99 6:20 | -- | -- | -- | -- | -- | 26.50 | 54.10 | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 23 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/26/99 8:00 | -- | -- | -- | -- | -- | 26.20 | 62.30 | tc |
| 7/27/99 3:35 | -- | -- | -- | -- | -- | 26.30 | 44.50 | tjc |
| 7/27/99 5:00 | 1,360 | -- | -- | -- | -- | 26.10 | 36.60 | tjc |
| 7/27/99 6:30 | 1,800 | -- | -- | -- | -- | 26.40 | 50.90 | tjc |
| 7/27/99 7:55 | 2,780 | -- | -- | -- | -- | 26.60 | 50.20 | tjc |
| 7/27/99 13:30 | -- | -- | -- | -- | -- | 26.60 | 32.60 | tjc |
| 7/27/99 22:00 | -- | -- | -- | -- | -- | 26.50 | 49.30 | tjc |
| 7/27/99 23:40 | -- | -- | -- | -- | -- | 26.40 | 54.80 | tjc |
| 7/27/99 23:40 | -- | -- | -- | -- | -- | 26.30 | 45.20 | tjc |
| 7/29/99 3:20 | -- | -- | -- | -- | -- | 25.80 | 66.30 | tc |
| 7/29/99 3:30 | -- | -- | -- | -- | -- | 25.70 | 0.00 | tc |
| 7/29/99 4:45 | -- | -- | -- | -- | -- | 25.70 | 35.00 | tc |
| 7/29/99 5:40 | -- | -- | -- | -- | -- | 25.70 | 0.00 | tc |
| 7/29/99 6:00 | -- | -- | -- | -- | -- | 25.80 | 33.70 | tc |
| 7/29/99 7:05 | -- | -- | -- | -- | -- | 25.50 | 0.00 | tc |
| 7/29/99 20:37 | -- | -- | -- | -- | -- | 25.70 | 94.50 | tjc |
| 7/29/99 20:37 | -- | -- | -- | -- | -- | 25.70 | 94.50 | tc |
| 7/29/99 21:00 | -- | -- | -- | -- | -- | 25.50 | 31.00 | tjc |
| 7/29/99 21:00 | -- | -- | -- | -- | -- | 25.50 | 31.00 | tc |
| 7/29/99 22:00 | -- | -- | -- | -- | -- | 24.50 | 37.40 | tjc |
| 7/29/99 22:00 | -- | -- | -- | -- | -- | 24.50 | 37.40 | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 24 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 7/29/99 23:30 | -- | -- | -- | -- | -- | 26.20 | 37.80 | we |
| 7/29/99 23:40 | -- | -- | -- | -- | -- | 26.20 | 38.70 | we |
| 7/30/99 12:45 | 1,200 | 26.30 | 25.60 | 26.10 | 21.00 | -- | -- | tc |
| 7/30/99 14:15 | 1,200 | 25.70 | 17.40 | 25.80 | 14.10 | -- | -- | tc |
| 7/30/99 16:15 | 1,220 | 26.60 | 15.50 | 27.20 | 14.50 | -- | -- | tc |
| 7/30/99 17:05 | -- | -- | -- | -- | -- | 26.00 | 34.40 | tc |
| 7/30/99 17:50 | 1,240 | 25.10 | 12.10 | 25.30 | 13.90 | -- | -- | tc |
| 7/31/99 23:45 | -- | -- | -- | -- | -- | 25.30 | 28.20 | we |
| 8/1/99 4:40 | -- | -- | -- | -- | -- | 25.90 | 0.00 | we |
| 8/2/99 13:24 | -- | -- | -- | -- | -- | 25.60 | 45.00 | we |
| 8/2/99 14:40 | -- | -- | -- | -- | -- | 25.50 | 42.50 | we |
| 8/2/99 14:45 | -- | -- | -- | -- | -- | 25.50 | 48.00 | we |
| 8/2/99 16:00 | -- | -- | -- | -- | -- | 25.70 | 38.70 | we |
| 8/2/99 16:25 | -- | -- | -- | -- | -- | 25.70 | 40.80 | we |
| 8/2/99 17:25 | -- | -- | -- | -- | -- | 25.60 | 80.20 | we |
| 8/2/99 18:10 | -- | -- | -- | -- | -- | 25.90 | 47.50 | we |
| 8/2/99 18:45 | -- | -- | -- | -- | -- | 25.90 | 46.10 | we |
| 8/2/99 19:25 | -- | -- | -- | -- | -- | 25.50 | 44.80 | we |
| 8/2/99 20:35 | -- | -- | -- | -- | -- | 25.60 | 42.40 | we |
| 8/3/99 0:20 | -- | -- | -- | -- | -- | 25.90 | 38.80 | tjc |
| 8/3/99 1:00 | -- | -- | -- | -- | -- | NR | 14.70 | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 25 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/3/99 4:40 | -- | -- | -- | -- | -- | 25.60 | 31.00 | tjc |
| 8/3/99 5:10 | -- | -- | -- | -- | -- | 25.60 | 46.70 | tjc |
| 8/3/99 6:12 | -- | -- | -- | -- | -- | 25.80 | 38.10 | tjc |
| 8/3/99 6:30 | -- | -- | -- | -- | -- | 25.60 | 61.10 | tjc |
| 8/3/99 8:40 | -- | -- | -- | -- | -- | 26.40 | 55.10 | tjc |
| 8/3/99 9:50 | -- | -- | -- | -- | -- | 26.30 | 40.90 | tjc |
| 8/3/99 22:35 | -- | -- | -- | -- | -- | 26.90 | 31.10 | tjc |
| 8/4/99 1:10 | -- | -- | -- | -- | -- | 26.80 | 6.99 | tjc |
| 8/4/99 7:45 | -- | -- | -- | -- | -- | 26.80 | 20.90 | tjc |
| 8/4/99 8:25 | -- | -- | -- | -- | -- | 26.80 | 37.00 | tjc |
| 8/4/99 10:30 | -- | -- | -- | -- | -- | 26.70 | 28.10 | we |
| 8/4/99 11:00 | -- | -- | -- | -- | -- | 26.60 | 14.50 | we |
| 8/4/99 12:20 | -- | -- | -- | -- | -- | 26.60 | 39.90 | we |
| 8/4/99 13:45 | -- | -- | -- | -- | -- | 25.90 | 37.10 | we |
| 8/4/99 17:25 | -- | -- | -- | -- | -- | 26.10 | 0.00 | we |
| 8/4/99 21:40 | -- | -- | -- | -- | -- | 25.60 | 0.00 | tjc |
| 8/5/99 1:15 | -- | -- | -- | -- | -- | 25.40 | 34.00 | tjc |
| 8/5/99 3:05 | 3,310 | 25.60 | 10.30 | 25.80 | 9.88 | -- | -- | tjc |
| 8/5/99 3:10 | -- | -- | -- | -- | -- | 25.70 | 19.90 | tjc |
| 8/5/99 4:30 | -- | -- | -- | -- | -- | 25.70 | 36.00 | tjc |
| 8/5/99 5:15 | 3,350 | 25.90 | 8.52 | 25.90 | 7.16 | -- | -- | tjc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 26 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/5/99 6:30 | -- | -- | -- | -- | -- | 26.10 | 10.10 | we |
| 8/5/99 7:15 | 3,370 | 26.10 | 6.94 | 26.10 | 0.00 | -- | -- | we |
| 8/5/99 7:20 | -- | -- | -- | -- | -- | 26.10 | 20.40 | we |
| 8/5/99 9:30 | 3,397 | 26.10 | 4.03 | 26.10 | 1.82 | -- | -- | we |
| 8/5/99 10:15 | -- | -- | -- | -- | -- | 25.50 | 7.54 | we |
| 8/5/99 13:25 | -- | -- | -- | -- | -- | 25.60 | 16.70 | we |
| 8/5/99 16:25 | -- | -- | -- | -- | -- | 25.40 | 31.10 | we |
| 8/5/99 22:30 | -- | -- | -- | -- | -- | 25.90 | 33.90 | we |
| 8/5/99 22:35 | -- | -- | -- | -- | -- | 26.10 | 12.50 | we |
| 8/6/99 8:20 | -- | -- | -- | -- | -- | 26.00 | 18.10 | we |
| 8/6/99 14:00 | -- | -- | -- | -- | -- | 25.60 | 29.70 | we |
| 8/6/99 14:05 | 3,345 | 25.60 | 12.90 | 25.40 | 12.20 | -- | -- | we |
| 8/6/99 15:55 | 3,472 | 25.00 | 14.60 | 25.20 | 13.90 | -- | -- | we |
| 8/6/99 17:25 | -- | -- | -- | -- | -- | 25.50 | 30.40 | we |
| 8/6/99 17:30 | 3,505 | 25.30 | 10.40 | 25.30 | 8.37 | -- | -- | we |
| 8/6/99 18:20 | -- | -- | -- | -- | -- | 26.00 | 26.90 | we |
| 8/6/99 18:25 | 3,517 | 25.70 | 9.96 | 25.60 | 11.80 | -- | -- | we |
| 8/6/99 20:05 | 3,530 | 25.30 | 13.20 | 25.20 | 12.50 | -- | -- | we |
| 8/6/99 20:10 | -- | -- | -- | -- | -- | 25.70 | 26.50 | we |
| 8/7/99 4:00 | -- | -- | -- | -- | -- | 25.50 | 6.63 | tc |
| 8/7/99 8:00 | -- | -- | -- | -- | -- | 26.00 | 10.20 | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 27 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/7/99 9:00 | -- | -- | -- | -- | -- | 26.10 | 33.60 | tc |
| 8/9/99 8:20 | -- | -- | -- | -- | -- | 25.30 | 5.96 | we |
| 8/10/99 10:30 | -- | -- | -- | -- | -- | 25.30 | 22.60 | we |
| 8/10/99 10:30 | -- | -- | -- | -- | -- | 25.10 | 32.00 | we |
| 8/10/99 13:00 | -- | -- | -- | -- | -- | 25.20 | 28.70 | we |
| 8/11/99 9:15 | -- | -- | -- | -- | -- | 26.00 | 14.40 | tc |
| 8/12/99 2:15 | -- | -- | -- | -- | -- | 26.00 | 16.10 | tc |
| 8/12/99 2:50 | -- | -- | -- | -- | -- | 26.00 | 26.60 | tc |
| 8/12/99 10:20 | -- | -- | -- | -- | -- | 25.30 | 56.40 | tc |
| 8/12/99 10:20 | -- | -- | -- | -- | -- | 25.10 | 22.00 | tc |
| 8/12/99 21:59 | -- | -- | -- | -- | -- | 25.00 | 22.00 | js |
| 8/12/99 22:02 | -- | -- | -- | -- | -- | 25.40 | 0.53 | js |
| 8/12/99 22:39 | -- | -- | -- | -- | -- | 25.30 | 27.60 | js |
| 8/12/99 22:42 | -- | 26.00 | 3.40 | -- | -- | -- | -- | js |
| 8/12/99 23:15 | -- | 25.60 | 1.48 | -- | -- | -- | -- | tc |
| 8/12/99 23:20 | -- | -- | -- | -- | -- | 25.40 | 29.10 | tc |
| 8/12/99 23:33 | -- | -- | -- | -- | -- | 25.60 | 28.80 | js |
| 8/13/99 3:30 | -- | -- | -- | -- | -- | 25.60 | 52.00 | tc |
| 8/13/99 7:20 | -- | -- | -- | -- | -- | 25.10 | 18.20 | tc |
| 8/13/99 8:00 | -- | 25.20 | 3.90 | -- | -- | -- | -- | tc |
| 8/13/99 10:20 | -- | -- | -- | -- | -- | 25.20 | 50.70 | tc |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling
 (Page 28 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/13/99 13:30 | -- | -- | -- | -- | -- | 25.10 | 32.20 | js |
| 8/13/99 13:35 | -- | 25.10 | 1.13 | 25.10 | 1.25 | -- | -- | js |
| 8/13/99 14:30 | -- | -- | -- | -- | -- | 25.50 | 32.00 | js |
| 8/13/99 15:55 | -- | -- | -- | -- | -- | 25.40 | 21.30 | js |
| 8/13/99 16:05 | -- | 26.00 | 3.11 | 25.90 | 0.45 | -- | -- | js |
| 8/13/99 18:45 | -- | -- | -- | -- | -- | 25.60 | 25.20 | js |
| 8/13/99 18:50 | -- | 26.30 | 0.00 | 26.30 | 0.00 | -- | -- | js |
| 8/13/99 22:00 | -- | 25.70 | 0.00 | -- | -- | 25.20 | 24.80 | js |
| 8/14/99 5:20 | -- | -- | -- | -- | -- | 27.30 | 26.90 | tc |
| 8/14/99 5:55 | -- | -- | -- | -- | -- | 27.20 | 53.30 | tc |
| 8/14/99 6:38 | -- | -- | -- | -- | -- | 27.40 | 31.50 | tc |
| 8/14/99 7:45 | -- | -- | -- | -- | -- | 26.40 | 23.80 | tc |
| 8/14/99 9:10 | -- | -- | -- | -- | -- | 26.30 | 0.00 | tc |
| 8/14/99 18:50 | -- | -- | -- | 25.90 | 0.00 | -- | -- | js |
| 8/15/99 19:00 | -- | -- | -- | -- | -- | 25.80 | 44.20 | tjc |
| 8/15/99 19:03 | -- | 26.10 | 0.00 | -- | -- | -- | -- | tjc |
| 8/16/99 7:35 | -- | -- | -- | -- | -- | 25.80 | 29.50 | tjc |
| 8/16/99 9:05 | -- | -- | -- | -- | -- | 25.60 | 25.40 | tjc |
| 8/16/99 14:40 | -- | -- | -- | -- | -- | 25.60 | 43.00 | tjc |
| 8/16/99 20:30 | -- | -- | -- | -- | -- | 25.70 | 28.60 | tjc |
| 8/17/99 1:30 | -- | -- | -- | -- | -- | 25.70 | 29.10 | js |

Table A-2
Well HC-5 Fluoride Concentrations During Drilling

(Page 29 of 29)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|---|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/17/99 1:45 | -- | -- | -- | -- | -- | 25.90 | 28.90 | js |
| 8/17/99 9:20 | -- | -- | -- | -- | -- | 26.40 | 22.60 | js |
| 8/17/99 13:40 | -- | -- | -- | -- | -- | 25.60 | 8.54 | tjc |
| 8/17/99 17:45 | -- | -- | -- | -- | -- | 25.60 | 4.94 | tjc |
| 8/18/99 8:30 | -- | -- | -- | -- | -- | 25.90 | 20.20 | tjc |
| 8/18/99 14:00 | -- | -- | -- | -- | -- | 25.90 | 27.80 | tjc |

-- = Not measured

Table A-3
Well HC-5 Well Development Parameters During Conventional Airlifting
 (Page 1 of 2)

| Well Number: HC-5 | | Start Time/Date: 8/19/99 4:25 | | End Date/Time: 8/20/99 6:30 | | | | | | | | | | |
|---|-----------------|---|-------------------|------------------------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|------------------|--|-----------|----------|------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | | | | |
| Test Type: Airlift Development | | Initial SWL: Not Measured | | End SWL: Not Measured | | Datum: T.O.C. | | | | | | | | |
| Sample Team: Forsgren, Welcher | | Sample Type: Grab | | | | | | | | | | | | |
| Development Method: Conventional Airlift with AQ Airline | | | | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| fmf | 8/19/99 | 4:25 | | start airlifting | | | | | | | | | | |
| fmf | 8/19/99 | 4:25 | 4:35 | 10 | 5 | 50 | 10 | 50 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 4:45 | 4:55 | 10 | 5 | 50 | 20 | 100 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 5:10 | 5:20 | 10 | 5 | 50 | 30 | 150 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 5:35 | 6:05 | 30 | 5 | 150 | 60 | 300 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 6:25 | 7:05 | 40 | 10 | 400 | 100 | 700 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 7:20 | 7:45 | 25 | 10 | 250 | 125 | 950 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 8:10 | 9:50 | 100 | 15 | 1,500 | 225 | 2,450 | 9:50 | 23.9 | 760 | 8.46 | 9.29 | -525 |
| fmf | 8/19/99 | 9:50 | 10:20 | 30 | 15 | 450 | 255 | 2,900 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 10:30 | 10:35 | 5 | 15 | 75 | 260 | 2,975 | -- | -- | -- | -- | -- | -- |
| fmf | 8/19/99 | 10:45 | 11:30 | 45 | 15 | 675 | 305 | 3,650 | 11:30 | 24.4 | 1,064 | 6.67 | 0.00 | -325 |
| fmf | 8/19/99 | 11:30 | 11:55 | 25 | 15 | 375 | 330 | 4,025 | -- | -- | -- | -- | -- | -- |
| AMW | 8/19/99 | 12:05 | 13:30 | 85 | 15 | 1,275 | 415 | 5,300 | 13:30 | 24.3 | 1,087 | 7.31 | 0.00 | 375 |
| AMW | 8/19/99 | 13:30 | 15:30 | 120 | 15 | 1,800 | 535 | 7,100 | 15:30 | 24.5 | 1,053 | 7.91 | 0.00 | -475 |
| AMW | 8/19/99 | 15:30 | 16:43 | 73 | 15 | 1,095 | 608 | 8,195 | -- | -- | -- | -- | -- | -- |
| AMW | 8/19/99 | 18:04 | 18:15 | 11 | 15 | 165 | 619 | 8,360 | 18:15 | 26.6 | 1,020 | 8.27 | 0.00 | 425 |

Table A-3
Well HC-5 Well Development Parameters During Conventional Airlifting
 (Page 2 of 2)

| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------|-----------------------|----------------------|-----------------------|--------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------------|---------------------|--|--------------|-------------|---------------------------|
| AMW | 8/19/99 | 18:15 | 20:15 | 120 | 15 | 1,800 | 739 | 10,160 | 20:15 | 30.0 | 944 | 8.31 | 0.00 | 225 |
| AMW | 8/19/99 | 20:15 | 22:15 | 120 | 15 | 1,800 | 859 | 11,960 | 22:15 | 30.1 | 1,080 | 8.02 | 0.00 | 800 |
| AMW | 8/19/99 | 22:15 | 0:00 | 105 | 15 | 1,575 | 964 | 13,535 | -- | -- | -- | -- | -- | -- |
| fmf | 8/20/99 | 0:00 | 0:30 | 30 | 15 | 450 | 994 | 13,985 | 0:30 | 23.6 | 910 | 7.89 | 0.00 | 150 |
| fmf | 8/20/99 | 0:30 | 0:40 | 10 | 15 | 150 | 1,004 | 14,135 | -- | -- | -- | -- | -- | -- |
| fmf | 8/20/99 | 0:55 | 2:45 | 110 | 15 | 1,650 | 1,114 | 15,785 | 2:45 | 26.6 | 970 | 7.77 | 0.00 | 250 |
| fmf | 8/20/99 | 2:45 | 4:40 | 115 | 15 | 1,725 | 1,229 | 17,510 | 4:40 | 23.1 | 910 | 8.14 | 0.00 | 325 |
| fmf | 8/20/99 | 4:40 | 4:45 | 5 | 15 | 75 | 1,234 | 17,585 | -- | -- | -- | -- | -- | -- |
| fmf | 8/20/99 | 5:00 | 6:10 | 70 | 15 | 1,050 | 1,304 | 18,635 | -- | -- | -- | -- | -- | -- |
| fmf | 8/20/99 | 6:20 | 6:30 | 10 | 15 | 150 | 1,314 | 18,785 | -- | -- | -- | -- | -- | -- |
| fmf | 8/20/99 | 6:30 | | stop airlifting | | | | | | | | | | |

-- = Not measured

Table A-4
Well HC-5 Well Development Parameters During Eductor Airlifting
 (Page 1 of 2)

| Well Number: HC-5 | | Start Time/Date: 9/30/99 14:40 | | End Date/Time: 10/1/99 14:15 | | | | | | | | | | |
|---|-----------------|---|-------------------|-------------------------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|------------------|--|-----------|----------|------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | | | | |
| Test Type: Airlift Development | | Initial SWL: 1,365.1 | | End SWL: Not Measured | | Datum: T.O.C. | | | | | | | | |
| Sample Team: Forsgren, Coburn | | Sample Type: Grab | | | | | | | | | | | | |
| Development Method: HQ Eductor with AQ Airline | | | | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ^s (pCi/L) |
| fmf | 9/30/99 | 14:40 | | start airlifting | | | | | | | | | | |
| fmf | 9/30/99 | 14:40 | 14:55 | 15 | 13.3 | 200 | 15 | 200 | 14:55 | 24.9 | 1,043 | 8.39 | 8.34 | 1667 |
| fmf | 9/30/99 | 14:58 | 15:05 | 7 | 20 | 140 | 22 | 339 | -- | -- | -- | -- | -- | -- |
| fmf | 9/30/99 | 15:05 | 15:20 | 15 | 9.4 | 141 | 37 | 480 | -- | -- | -- | -- | -- | -- |
| fmf | 9/30/99 | 15:25 | 16:35 | 70 | 7.0 | 490 | 107 | 970 | 16:35 | 26.1 | 1,065 | 8.24 | 10.4 | -121 |
| fmf | 9/30/99 | 16:35 | 18:00 | 85 | 8.2 | 697 | 192 | 1,668 | 18:00 | 26.2 | 1,035 | 8.20 | 8.22 | 788 |
| fmf | 9/30/99 | 18:00 | 18:05 | 5 | 8.2 | 41 | 197 | 1,708 | -- | -- | -- | -- | -- | -- |
| fmf | 9/30/99 | 18:10 | 19:40 | 90 | 7.7 | 693 | 287 | 2,401 | 19:40 | 25.2 | 999 | 8.25 | 7.32 | 30 |
| fmf | 9/30/99 | 19:40 | 21:20 | 100 | 7.7 | 770 | 387 | 3,171 | 21:20 | 25.4 | 1,018 | 8.24 | 6.50 | 818 |
| fmf | 9/30/99 | 21:30 | 22:45 | 75 | 8.4 | 630 | 462 | 3,801 | -- | -- | -- | -- | -- | -- |
| fmf | 9/30/99 | 22:55 | 23:15 | 20 | 8.1 | 162 | 482 | 3,963 | 23:15 | 25.7 | 1,002 | 8.23 | 6.55 | -- |
| fmf | 9/30/99 | 23:20 | 0:00 | 40 | 7.9 | 316 | 522 | 4,279 | -- | -- | -- | -- | -- | -- |
| TJC | 10/1/99 | 0:15 | 1:40 | 85 | 6.7 | 570 | 607 | 4,849 | 1:40 | 24.2 | 1,014 | 7.84 | 3.66 | -412 |
| TJC | 10/1/99 | 1:50 | 3:20 | 90 | 7.5 | 675 | 697 | 5,524 | -- | -- | -- | -- | -- | -- |

Table A-4
Well HC-5 Well Development Parameters During Eductor Airlifting
 (Page 2 of 2)

| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------------|-------------------|--------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|------------------|--|-----------|----------|------------------------|
| TJC | 10/1/99 | 3:40 | 3:45 | 5 | 10 | 50 | 702 | 5,574 | 3:45 | 24.1 | 1,014 | 7.97 | 3.55 | 2,088 |
| TJC | 10/1/99 | 3:45 | 5:45 | 120 | 10 | 1,200 | 822 | 6,774 | 5:45 | 24.8 | 1,031 | 7.97 | 3.44 | -205 |
| TJC | 10/1/99 | 5:45 | 5:50 | 5 | 10 | 50 | 827 | 6,824 | -- | -- | -- | -- | -- | -- |
| TJC | 10/1/99 | 5:55 | 7:40 | 105 | 6.7 | 703 | 932 | 7,527 | 7:40 | 24.6 | 1,014 | 7.79 | 3.06 | 588 |
| TJC | 10/1/99 | 7:50 | 9:30 | 100 | 6.7 | 670 | 1,032 | 8,197 | 9:30 | 25.7 | 1,028 | 8.00 | 3.06 | 38 |
| TJC | 10/1/99 | 9:40 | 11:10 | 90 | 7.5 | 675 | 1,122 | 8,872 | 11:10 | 25.9 | 994 | 8.21 | 3.13 | 676 |
| TJC | 10/1/99 | 11:20 | 13:40 | 140 | 8.0 | 1,120 | 1,262 | 9,992 | 13:40 | 27.4 | 1,007 | 8.25 | 5.12 | 273 |
| fmf | 10/1/99 | 13:40 | 13:45 | 5 | 8.0 | 40 | 1,267 | 10,032 | -- | -- | -- | -- | -- | -- |
| fmf | 10/1/99 | 13:55 | 14:00 | 5 | 20 | 100 | 1,272 | 10,133 | -- | -- | -- | -- | -- | -- |
| fmf | 10/1/99 | 14:05 | 14:15 | 10 | 10 | 100 | 1,282 | 10,233 | -- | -- | -- | -- | -- | -- |
| fmf | 10/1/99 | 14:15 | | stop airlifting | | | | | | | | | | |

-- = Not measured

Table A-5
Well HC-5 Well Development Parameters During Phase I Development/Test Pumping
 (Page 1 of 3)

| Well Number: HC-5 | | Start Time/Date: 10/4/99 17:56 | | End Date/Time: 10/8/99 15:09 | | | | | | | | |
|--|-----------------|---|--------------------|-------------------------------------|------------------|-------------------------------|-----------------------------|------------------|--|-----------|----------|------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | | |
| Test Type: Phase I Pumping | | Initial SWL: 1,365.85 | | End SWL: Not Measured | | Datum: T.O.C. | | | | | | |
| Sample Team: Forsgren, Chavez, Fritts | | Sample Type: Grab | | | | | | | | | | |
| Testing Method: Submersible Pump | | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Sample Time (hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ^s (pCi/L) |
| fmf | 10/4/99 | 17:56 | | start pumping | | | | | | | | |
| fmf | 10/4/99 | 20:24 | 148 | 5.6 | 829 | 148 | 829 | 27.40 | 984 | 8.13 | -- | -- |
| fmf | 10/4/99 | 21:56 | 92 | 5.6 | 515 | 240 | 1,344 | 27.9 | 961 | 8.25 | 5.92 | 467 |
| fmf | 10/4/99 | 23:46 | 110 | 5.6 | 616 | 350 | 1,960 | 28.4 | 980 | 7.96 | -- | -- |
| TC | 10/5/99 | 0:45 | 59 | 5.6 | 330 | 409 | 2,290 | 28.5 | 970 | 7.99 | 6.00 | |
| TC | 10/5/99 | 2:45 | 120 | 5.6 | 672 | 529 | 2,962 | 28.9 | 966 | 8.07 | -- | -- |
| TC | 10/5/99 | 4:45 | 120 | 5.6 | 672 | 649 | 3,634 | 28.3 | 976 | 7.48 | 5.50 | 675 |
| TC | 10/5/99 | 6:51 | 126 | 5.6 | 706 | 775 | 4,340 | 29 | 950 | 7.19 | 3.23 | 950 |
| TC | 10/5/99 | 8:40 | 109 | 5.6 | 610 | 884 | 4,950 | 30.0 | 985 | 8.06 | -- | -- |
| TC | 10/5/99 | 10:51 | 131 | 5.6 | 734 | 1,015 | 5,684 | 30.5 | 975 | 7.18 | 3.23 | 950 |
| fmf | 10/5/99 | 13:07 | 136 | 5.6 | 762 | 1,151 | 6,446 | 31 | 997 | 8.01 | -- | -- |
| fmf | 10/5/99 | 14:53 | 106 | 5.6 | 594 | 1,257 | 7,039 | 30.9 | 987 | 7.67 | 0.00 | 1,075 |
| fmf | 10/5/99 | 17:11 | 138 | 5.6 | 773 | 1,395 | 7,812 | 30.6 | 990 | 7.89 | -- | -- |
| fmf | 10/5/99 | 19:40 | 149 | 5.6 | 834 | 1,544 | 8,646 | 29.8 | 984 | 8.02 | 0.00 | 800 |
| fmf | 10/5/99 | 20:54 | 74 | 5.6 | 414 | 1,618 | 9,061 | 29.7 | 983 | 8.12 | -- | -- |
| fmf | 10/5/99 | 23:00 | 126 | 5.6 | 706 | 1,744 | 9,766 | 29.7 | 983 | 8.14 | 0.00 | 225 |

Table A-5
Well HC-5 Well Development Parameters During Phase I Development/Test Pumping
 (Page 2 of 3)

| Initials | Date (mm/dd/yy) | Sample Time (hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|---------------------|--------------------|-------------------------------|------------------|-------------------------------|-----------------------------|------------------|--|-----------|----------|------------------------|
| TC | 10/6/99 | 0:35 | 95 | 5.6 | 532 | 1,839 | 10,298 | 29.6 | 950 | 8.02 | -- | -- |
| TC | 10/6/99 | 2:35 | 120 | 5.6 | 672 | 1,959 | 10,970 | 28.3 | 989 | 8.03 | 0.00 | 400 |
| TC | 10/6/99 | 4:35 | 120 | 5.6 | 672 | 2,079 | 11,642 | 29.1 | 985 | 6.8 | -- | -- |
| TC | 10/6/99 | 6:35 | 120 | 5.6 | 672 | 2,199 | 12,314 | 29.3 | 988 | 7.87 | 0.00 | 975 |
| TC | 10/6/99 | 8:30 | 115 | 5.6 | 644 | 2,314 | 12,958 | 29.8 | 925 | 7.79 | -- | -- |
| TC | 10/6/99 | 10:40 | 130 | 5.6 | 728 | 2,444 | 13,686 | 30.9 | 982 | 7.78 | 0.00 | 250 |
| fmf | 10/6/99 | 12:15 | 95 | 5.6 | 532 | 2,539 | 14,218 | 31.2 | 990 | 8.08 | -- | -- |
| fmf | 10/6/99 | 14:20 | 125 | 5.6 | 700 | 2,664 | 14,918 | 29.6 | 984 | 7.67 | 0.00 | 1,150 |
| fmf | 10/6/99 | 16:25 | 125 | 5.6 | 700 | 2,789 | 15,618 | 29.6 | 988 | 8.23 | -- | -- |
| fmf | 10/6/99 | 18:30 | 125 | 5.6 | 700 | 2,914 | 16,318 | 29.7 | 974 | 8.08 | 0.00 | 1,575 |
| fmf | 10/6/99 | 20:40 | 130 | 5.6 | 728 | 3,044 | 17,046 | 29.6 | 980 | 8.03 | -- | -- |
| fmf | 10/6/99 | 22:45 | 125 | 5.6 | 700 | 3,169 | 17,746 | 29.5 | 958 | 7.99 | 0.00 | -625 |
| TC | 10/7/99 | 1:15 | 150 | 5.6 | 840 | 3,319 | 18,586 | 29.3 | 980 | 7.42 | -- | -- |
| TC | 10/7/99 | 3:15 | 120 | 5.6 | 672 | 3,439 | 19,258 | 29.3 | 923 | 7.84 | 0.00 | 350 |
| TC | 10/7/99 | 5:15 | 120 | 5.6 | 672 | 3,559 | 19,930 | 29 | 958 | 7.92 | 0.00 | -100 |
| TC | 10/7/99 | 7:15 | 120 | 5.6 | 672 | 3,679 | 20,602 | 29.3 | 928 | 7.79 | -- | -- |
| JF | 10/7/99 | 9:20 | 125 | 5.6 | 700 | 3,804 | 21,302 | 29.8 | 982 | 8.2 | 0.00 | 675 |
| JF | 10/7/99 | 11:50 | 150 | 5.6 | 840 | 3,954 | 22,142 | 29.8 | 948 | 8.21 | -- | -- |
| fmf | 10/7/99 | 13:15 | 85 | 5.6 | 476 | 4,039 | 22,618 | 31.1 | 984 | 7.59 | 0.00 | 575 |
| fmf | 10/7/99 | 15:35 | 140 | 5.6 | 784 | 4,179 | 23,402 | 31 | 991 | 7.95 | -- | -- |
| fmf | 10/7/99 | 17:25 | 110 | 5.6 | 616 | 4,289 | 24,018 | 30.5 | 979 | 8.04 | 0.00 | 300 |

Table A-5
Well HC-5 Well Development Parameters During Phase I Development/Test Pumping
 (Page 3 of 3)

| Initials | Date (mm/dd/yy) | Sample Time (hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|---------------------|--------------------|-------------------------------|------------------|-------------------------------|-----------------------------|------------------|--|-----------|----------|------------------------|
| fmf | 10/7/99 | 19:30 | 125 | 5.6 | 700 | 4,414 | 24,718 | 29.9 | 964 | 8.03 | -- | -- |
| fmf | 10/7/99 | 21:15 | 105 | 5.6 | 588 | 4,519 | 25,306 | 29.8 | 973 | 8.17 | 0.00 | 0 |
| fmf | 10/7/99 | 23:25 | 130 | 5.6 | 728 | 4,649 | 26,034 | 30.1 | 981 | 8.19 | -- | -- |
| TC | 10/8/99 | 0:30 | 65 | 5.6 | 364 | 4,714 | 26,398 | 29.8 | 986 | 8.04 | 0.00 | -200 |
| TC | 10/8/99 | 2:35 | 125 | 5.6 | 700 | 4,839 | 27,098 | 28.6 | 977 | 8.08 | -- | -- |
| TC | 10/8/99 | 4:30 | 115 | 5.6 | 644 | 4,954 | 27,742 | 29.1 | 970 | 8.15 | 0.00 | -425 |
| TC | 10/8/99 | 6:30 | 120 | 5.6 | 672 | 5,074 | 28,414 | 29.5 | 971 | 7.54 | -- | -- |
| TC | 10/8/99 | 8:30 | 120 | 5.6 | 672 | 5,194 | 29,086 | 29.4 | 992 | 7.85 | 0.00 | 150 |
| TC | 10/8/99 | 10:45 | 135 | 5.6 | 756 | 5,329 | 29,842 | 30.6 | 986 | 7.78 | -- | -- |
| fmf | 10/8/99 | 12:35 | 110 | 5.6 | 616 | 5,439 | 30,458 | 31.2 | 990 | 8.06 | -- | -- |
| fmf | 10/8/99 | 15:00 | 145 | 5.6 | 812 | 5,584 | 31,270 | 31.5 | 994 | 7.91 | 0.00 | 1,200 |
| fmf | 10/8/99 | 15:09 | 9 | 5.6 | 50 | 5,593 | 31,321 | -- | -- | -- | -- | -- |
| fmf | 10/8/99 | 15:09 | | stop pumping | | | | | | | | |

-- = Not measured

**Table A-6
Well HC-5 Well Development Parameters During Miscellaneous Development/Test Pumping**

| | | | | | | | | | | | | | | |
|---------------------|--|---------------------------|---------------------------|---------------------------|---------------------------------|-------------------------|--------------------------------------|------------------------------------|----------------------------|-------------------------|---|------------------|-----------------|------------------------------|
| Well Number: | <u>HC-5</u> | Start Time/Date: | <u>10/9/99 10:00</u> | End Date/Time: | <u>10/10/99 17:30</u> | | | | | | | | | |
| Project No: | <u>799419.0056.0005</u> | Project Name: | <u>Project Shoal Area</u> | | | | | | | | | | | |
| Test Type: | <u>Miscellaneous Pumping</u> | Initial SWL: | 1,366 | End SWL: | Not Measured | | | | | | | | | |
| Sample Team: | <u>Fitts, Saavedra, Welcher</u> | Sample Type: | <u>Grab</u> | | | | | | | | | | | |
| Development Method: | <u>Pumping to Check Flouride Concentration</u> | | | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H³ (pCi/L) |
| JF | 10/9/99 | 10:00 | | start pumping | | | | | | | | | | |
| JF | 10/9/99 | 10:00 | 15:50 | 350 | 6 | 1,050 | 350 | 1,050 | 15:50 | 27.1 | 966 | 7.79 | 0.0 | 647 |
| JS | 10/9/99 | 15:50 | 15:58 | 8 | 6 | 24 | 358 | 1,074 | -- | -- | -- | -- | -- | -- |
| AMW | 10/10/99 | 16:30 | 17:30 | 60 | 6.7 | 180 | 418 | 1,254 | -- | -- | -- | -- | -- | -- |
| AMW | 10/10/99 | 17:30 | | stop pumping | | | | | | | | | | |

-- = Not measured

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 1 of 11)

| Well Number: HC-5 | | Start Time/Date: 10/11/99 14:15 | | End Date/Time: 10/27/99 18:00 | | | | | | | |
|---|--------------------------------------|---|-------------------------------------|--------------------------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | |
| Test Type: Phase II Pumping | | Initial SWL: Not Measured | | End SWL: Not Measured | | | | | | | |
| | | Datum: T.O.C. | | | | | | | | | |
| Sample Team: Chavez, Cherry, Coburn, Forsgren, Fritts, Welcher | | Sample Type: Grab | | | | | | | | | |
| Test Method: Submersible Pump | | | | | | | | | | | |
| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| | 10/11/99 14:15 | 0 | | start pumping | | | | | | | |
| tjc | 10/11/99 15:15 | 60 | 4.0 | 240 | 60 | 240 | 26.8 | 994 | 8.54 | 0.88 | 125 |
| tjc | 10/11/99 17:25 | 130 | 4.8 | 624 | 190 | 864 | 28.2 | 1,008 | 8.57 | 0.81 | 1,025 |
| amw | 10/11/99 19:25 | 120 | 4.8 | 576 | 310 | 1,440 | 28.6 | 984 | 8.34 | 5.70 | 1,175 |
| amw | 10/11/99 21:30 | 125 | 5.5 | 687 | 435 | 2,128 | 29.2 | 984 | 8.16 | 5.38 | 1,550 |
| amw | 10/11/99 23:30 | 120 | 5.4 | 648 | 555 | 2,775 | 28.9 | 987 | 8.32 | 5.20 | 525 |
| jf | 10/12/99 1:30 | 120 | 5.5 | 660 | 675 | 3,436 | 29.7 | 913 | 7.22 | 5.27 | 800 |
| jf | 10/12/99 3:30 | 120 | 5.4 | 648 | 795 | 4,084 | 29.2 | 980 | 7.20 | 5.38 | 675 |
| jf | 10/12/99 5:30 | 120 | 5.4 | 648 | 915 | 4,731 | 29.8 | 911 | 7.19 | 5.26 | 250 |
| jf | 10/12/99 7:30 | 120 | 5.9 | 708 | 1,035 | 5,440 | 29.0 | 969 | 7.75 | 4.92 | -750 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 2 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| tc | 10/12/99 9:30 | 120 | 5.5 | 660 | 1,155 | 6,100 | 30.7 | 972 | 7.65 | 4.85 | -175 |
| tjc | 10/12/99 11:30 | 120 | 6.0 | 720 | 1,275 | 6,819 | 30.4 | 969 | 7.32 | 4.85 | 350 |
| tjc | 10/12/99 13:30 | 120 | 6.0 | 720 | 1,395 | 7,540 | 31.5 | 992 | 7.23 | 5.20 | 550 |
| tjc | 10/12/99 15:30 | 120 | 6.0 | 720 | 1,515 | 8,260 | 29.8 | 1,013 | 7.28 | 5.06 | -325 |
| tjc | 10/12/99 17:35 | 125 | 6.0 | 750 | 1,640 | 9,010 | 28.9 | 1,016 | 7.44 | 5.02 | 525 |
| amw | 10/12/99 19:30 | 115 | 5.4 | 621 | 1,755 | 9,631 | 28.9 | 1,000 | 7.22 | 4.98 | 375 |
| amw | 10/12/99 21:30 | 120 | 5.5 | 660 | 1,875 | 10,291 | 30.0 | 985 | 7.60 | 5.02 | 450 |
| amw | 10/12/99 23:30 | 120 | 5.6 | 672 | 1,995 | 10,962 | 30.3 | 975 | 7.78 | 5.18 | -75 |
| jf | 10/13/99 1:30 | 120 | 5.4 | 648 | 2,115 | 11,611 | 29.9 | 981 | 7.30 | 4.74 | 575 |
| jf | 10/13/99 3:40 | 130 | 5.5 | 715 | 2,245 | 12,326 | 29.5 | 975 | 7.43 | 4.94 | 975 |
| jf | 10/13/99 5:40 | 120 | 5.4 | 648 | 2,365 | 12,974 | 29.8 | 998 | 7.47 | 4.98 | 625 |
| tc | 10/13/99 7:40 | 120 | 5.0 | 600 | 2,485 | 13,574 | 30.7 | 987 | 7.86 | 5.12 | 1,400 |
| tc | 10/13/99 9:40 | 120 | 5.0 | 600 | 2,605 | 14,174 | 30.7 | 1,001 | 7.82 | 4.65 | 1,225 |
| tjc | 10/13/99 11:30 | 110 | 5.5 | 605 | 2,715 | 14,778 | 30.8 | 1,014 | 8.01 | 4.69 | 50 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 3 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| tjc | 10/13/99 13:30 | 120 | 6.0 | 720 | 2,835 | 15,499 | 31.2 | 997 | 7.83 | 4.58 | 325 |
| amw | 10/13/99 15:30 | 120 | 5.3 | 636 | 2,955 | 16,135 | 31.2 | 995 | 7.91 | 4.54 | 350 |
| tjc | 10/13/99 17:30 | 120 | 6.0 | 720 | 3,075 | 16,854 | 30.4 | 984 | 7.68 | 4.73 | 300 |
| amw | 10/13/99 19:30 | 120 | 5.4 | 648 | 3,195 | 17,503 | 30.1 | 992 | 7.83 | 4.67 | 50 |
| amw | 10/13/99 21:30 | 120 | 5.4 | 648 | 3,315 | 18,151 | 30.4 | 978 | 7.85 | 4.56 | 25 |
| amw | 10/13/99 23:30 | 120 | 5.3 | 636 | 3,435 | 18,786 | 30.4 | 977 | 7.81 | 4.73 | 275 |
| jf | 10/14/99 1:30 | 120 | 5.6 | 672 | 3,555 | 19,459 | 29.4 | 1,001 | 7.78 | 4.71 | 350 |
| jf | 10/14/99 3:30 | 120 | 5.3 | 636 | 3,675 | 20,095 | 30.1 | 986 | 7.62 | 4.74 | 425 |
| jf | 10/14/99 5:30 | 120 | 5.4 | 648 | 3,795 | 20,742 | 30.0 | 983 | 7.75 | 4.51 | 350 |
| tc | 10/14/99 8:00 | 150 | 5.3 | 795 | 3,945 | 21,538 | 29.8 | 981 | 8.21 | 4.28 | -50 |
| tjc | 10/14/99 10:00 | 120 | 5.5 | 660 | 4,065 | 22,197 | 30.4 | 1,001 | 7.72 | 4.42 | 475 |
| tjc | 10/14/99 12:00 | 120 | 5.4 | 648 | 4,185 | 22,846 | 30.3 | 998 | 8.24 | 4.09 | 925 |
| amw | 10/14/99 14:00 | 120 | 5.2 | 624 | 4,305 | 23,470 | 31.5 | 1,001 | 7.88 | 4.36 | 975 |
| amw | 10/14/99 16:00 | 120 | 5.3 | 636 | 4,425 | 24,105 | 31.4 | 982 | 7.99 | 4.26 | 225 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 4 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| amw | 10/14/99 18:00 | 120 | 5.3 | 636 | 4,545 | 24,742 | 30.8 | 988 | 7.81 | 4.26 | 25 |
| amw | 10/14/99 20:00 | 120 | 5.2 | 624 | 4,665 | 25,366 | 30.7 | 971 | 8.07 | 4.28 | 925 |
| amw | 10/14/99 22:00 | 120 | 5.3 | 636 | 4,785 | 26,001 | 30.5 | 982 | 8.14 | 4.32 | 675 |
| fmf | 10/15/99 0:15 | 135 | 5.2 | 702 | 4,920 | 26,703 | 30.2 | 971 | 8.10 | 3.67 | 750 |
| fmf | 10/15/99 4:05 | 230 | 4.6 | 1,058 | 5,150 | 27,762 | 30.3 | 999 | 8.02 | 3.71 | 675 |
| fmf | 10/15/99 6:10 | 125 | 5.4 | 675 | 5,275 | 28,437 | 30.2 | 940 | 8.04 | -- | -- |
| fmf | 10/15/99 8:15 | 125 | 5.8 | 725 | 5,400 | 29,162 | 30.6 | 978 | 8.09 | 3.63 | 1,175 |
| fmf | 10/15/99 10:05 | 110 | 5.9 | 649 | 5,510 | 29,811 | 30.8 | 980 | 7.99 | -- | -- |
| fmf | 10/15/99 11:55 | 110 | 5.9 | 649 | 5,620 | 30,460 | 31.0 | 991 | 8.06 | 3.87 | 525 |
| tjc | 10/15/99 14:00 | 125 | 5.5 | 688 | 5,745 | 31,148 | 31.0 | 992 | 8.04 | 3.81 | 1,100 |
| amw | 10/15/99 16:00 | 120 | 5.5 | 660 | 5,865 | 31,807 | 30.4 | 977 | 7.96 | 3.59 | 825 |
| amw | 10/15/99 18:00 | 120 | 5.7 | 684 | 5,985 | 32,491 | 30.3 | 989 | 7.82 | 3.51 | 250 |
| amw | 10/15/99 20:00 | 120 | 5.3 | 636 | 6,105 | 33,127 | 30.2 | 978 | 7.49 | 3.53 | 225 |
| amw | 10/15/99 22:00 | 120 | 5.5 | 660 | 6,225 | 33,787 | 30.1 | 961 | 8.09 | 3.47 | 1,025 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 5 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| fmf | 10/16/99 0:15 | 135 | 5.4 | 729 | 6,360 | 34,516 | 30.0 | 950 | 8.15 | -- | -- |
| fmf | 10/16/99 2:00 | 105 | 5.4 | 567 | 6,465 | 35,083 | 30.1 | 969 | 8.11 | 3.28 | -27 |
| fmf | 10/16/99 4:05 | 125 | 5.6 | 700 | 6,590 | 35,783 | 29.6 | 960 | 8.10 | -- | -- |
| fmf | 10/16/99 6:10 | 125 | 5.4 | 675 | 6,715 | 36,458 | 30.0 | 968 | 8.16 | 3.26 | 632 |
| fmf | 10/16/99 8:00 | 110 | 5.5 | 605 | 6,825 | 37,063 | 30.0 | 963 | 8.22 | -- | -- |
| fmf | 10/16/99 10:05 | 125 | 5.6 | 700 | 6,950 | 37,763 | 30.5 | 973 | 7.27 | 3.32 | 1,158 |
| fmf | 10/16/99 11:55 | 110 | 5.4 | 594 | 7,060 | 38,357 | 30.4 | 990 | 7.66 | -- | -- |
| amw | 10/16/99 14:00 | 125 | 5.4 | 675 | 7,185 | 39,032 | 30.9 | 998 | 7.89 | 4.78 | 700 |
| tjc | 10/16/99 16:00 | 120 | 5.4 | 648 | 7,305 | 39,680 | 30.7 | 1,031 | 7.52 | 4.99 | -200 |
| tjc | 10/16/99 18:00 | 120 | 5.4 | 648 | 7,425 | 40,328 | 29.4 | 1,007 | 7.26 | 5.19 | 600 |
| amw | 10/16/99 20:00 | 120 | 5.5 | 660 | 7,545 | 40,988 | 30.3 | 972 | 7.80 | 5.13 | 500 |
| amw | 10/16/99 22:00 | 120 | 5.5 | 660 | 7,665 | 41,648 | 30.0 | 974 | 7.90 | 5.17 | 800 |
| amw | 10/17/99 0:00 | 120 | 5.6 | 672 | 7,785 | 42,321 | 30.0 | 987 | 7.65 | 4.83 | 1,225 |
| fmf | 10/17/99 2:10 | 130 | 5.5 | 715 | 7,915 | 43,036 | 30.0 | 980 | 8.03 | -- | -- |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 6 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| fmf | 10/17/99 4:05 | 115 | 5.4 | 621 | 8,030 | 43,657 | 30.4 | 991 | 8.06 | 4.86 | 1,400 |
| fmf | 10/17/99 6:00 | 115 | 5.8 | 667 | 8,145 | 44,324 | 30.2 | 931 | 8.04 | -- | -- |
| fmf | 10/17/99 8:10 | 130 | 5.5 | 715 | 8,275 | 45,039 | 30.5 | 979 | 8.13 | 4.85 | 325 |
| fmf | 10/17/99 10:00 | 110 | 5.7 | 627 | 8,385 | 45,665 | 30.8 | 986 | 8.08 | -- | -- |
| fmf | 10/17/99 11:55 | 115 | 5.6 | 644 | 8,500 | 46,310 | 31.2 | 985 | 8.14 | 4.94 | 275 |
| amw | 10/17/99 14:00 | 125 | 5.4 | 675 | 8,625 | 46,985 | 31.5 | 979 | 8.06 | 4.90 | -- |
| tjc | 10/17/99 16:00 | 120 | 5.4 | 648 | 8,745 | 47,632 | 31.5 | 974 | 7.63 | 4.83 | 1,475 |
| tjc | 10/17/99 18:05 | 125 | 5.5 | 687 | 8,870 | 48,320 | 30.4 | 997 | 7.89 | 4.75 | 1,350 |
| amw | 10/17/99 20:00 | 115 | 5.4 | 621 | 8,985 | 48,941 | 30.2 | 980 | 8.09 | 4.68 | -- |
| amw | 10/17/99 22:15 | 135 | 5.4 | 729 | 9,120 | 49,670 | 30.2 | 976 | 8.05 | 4.71 | 1,825 |
| fmf | 10/18/99 2:00 | 225 | 5.3 | 1,193 | 9,345 | 50,863 | 30.4 | 997 | 8.15 | 4.76 | 1,275 |
| fmf | 10/18/99 4:04 | 124 | 5.4 | 670 | 9,469 | 51,532 | 30.2 | 972 | 8.19 | -- | -- |
| fmf | 10/18/99 6:13 | 129 | 5.4 | 697 | 9,598 | 52,229 | 29.7 | 980 | 8.13 | 4.70 | 875 |
| fmf | 10/18/99 8:25 | 132 | 5.7 | 752 | 9,730 | 52,981 | 30.8 | 1,003 | 8.10 | -- | -- |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 7 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| fmf | 10/18/99 10:16 | 111 | 5.7 | 633 | 9,841 | 53,614 | 31.0 | 962 | 7.66 | 4.96 | 1,075 |
| tjc | 10/18/99 13:05 | 169 | 5.7 | 963 | 10,010 | 54,577 | 30.6 | 991 | 7.42 | 4.70 | 1,250 |
| tjc | 10/18/99 15:00 | 115 | 5.7 | 655 | 10,125 | 55,233 | 30.3 | 1,015 | 8.17 | 4.61 | 825 |
| tjc | 10/18/99 17:00 | 120 | 5.7 | 684 | 10,245 | 55,917 | 30.9 | 985 | 7.52 | 4.76 | 1,700 |
| amw | 10/18/99 19:00 | 120 | 5.3 | 636 | 10,365 | 56,553 | 30.4 | 982 | 8.08 | -- | -- |
| amw | 10/18/99 21:15 | 135 | 5.5 | 743 | 10,500 | 57,295 | 30.5 | 984 | 8.16 | 4.65 | 1,150 |
| amw | 10/18/99 23:00 | 105 | 5.5 | 578 | 10,605 | 57,873 | 30.2 | 983 | 8.07 | 4.74 | -- |
| fmf | 10/19/99 1:24 | 144 | 5.5 | 792 | 10,749 | 58,665 | 30.5 | 955 | 8.18 | 4.85 | -925 |
| fmf | 10/19/99 3:08 | 104 | 5.5 | 572 | 10,853 | 59,237 | 30.6 | 994 | 8.13 | -- | -- |
| fmf | 10/19/99 5:03 | 115 | 5.4 | 621 | 10,968 | 59,858 | 30.5 | 956 | 8.21 | 4.92 | -525 |
| fmf | 10/19/99 6:57 | 114 | 5.4 | 616 | 11,082 | 60,473 | 30.4 | 944 | 8.20 | -- | -- |
| fmf | 10/19/99 9:19 | 142 | 5.6 | 795 | 11,224 | 61,268 | 30.8 | 972 | 8.19 | 5.02 | 100 |
| amw | 10/19/99 13:20 | 241 | 5.5 | 1,325 | 11,465 | 62,594 | 31.9 | 984 | 7.34 | 4.92 | -325 |
| amw | 10/19/99 17:10 | 230 | 5.7 | 1,311 | 11,695 | 63,905 | 31.3 | 997 | 7.69 | 4.79 | -250 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 8 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| amw | 10/19/99 21:28 | 258 | 5.5 | 1,419 | 11,953 | 65,324 | 30.6 | 987 | 7.94 | 4.88 | -375 |
| fmf | 10/20/99 1:03 | 215 | 5.4 | 1,161 | 12,168 | 66,485 | 30.5 | 970 | 7.93 | 4.64 | -25 |
| fmf | 10/20/99 5:12 | 249 | 5.3 | 1,320 | 12,417 | 67,805 | 30.4 | 965 | 8.17 | 4.60 | 200 |
| fmf | 10/20/99 8:34 | 202 | 5.2 | 1,050 | 12,619 | 68,855 | 31.2 | 964 | 8.20 | 4.72 | 225 |
| tc | 10/20/99 13:44 | 310 | 5.3 | 1,643 | 12,929 | 70,498 | 30.3 | 1,004 | 8.00 | 4.37 | -625 |
| tc | 10/20/99 17:47 | 243 | 5.4 | 1,312 | 13,172 | 71,810 | 31.1 | 969 | 7.99 | 4.41 | -500 |
| tc | 10/20/99 21:38 | 231 | 5.3 | 1,224 | 13,403 | 73,035 | 30.0 | 934 | 7.89 | 4.47 | 925 |
| amw | 10/21/99 1:34 | 236 | 5.7 | 1,345 | 13,639 | 74,380 | 31.0 | 978 | 8.20 | 5.48 | 725 |
| amw | 10/21/99 5:30 | 236 | 5.7 | 1,345 | 13,875 | 75,725 | 30.8 | 982 | 7.98 | 5.36 | 525 |
| amw | 10/21/99 9:30 | 240 | 6.0 | 1,440 | 14,115 | 77,165 | 31.4 | 994 | 8.04 | 5.42 | 775 |
| tc | 10/21/99 13:30 | 240 | 5.0 | 1,200 | 14,355 | 78,365 | 31.9 | 987 | 7.80 | 5.85 | 25 |
| tc | 10/21/99 17:31 | 241 | 5.4 | 1,301 | 14,596 | 79,666 | 28.3 | 1,020 | 7.69 | 5.95 | -175 |
| tc | 10/21/99 21:38 | 247 | 5.2 | 1,284 | 14,843 | 80,951 | 29.8 | 961 | 7.69 | 5.86 | -150 |
| amw | 10/22/99 1:51 | 253 | 5.5 | 1,391 | 15,096 | 82,342 | 30.4 | 984 | 8.13 | 4.82 | 725 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 9 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ^s (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| amw | 10/22/99 5:30 | 219 | 5.5 | 1,205 | 15,315 | 83,547 | 30.8 | 984 | 8.13 | 4.82 | -675 |
| amw | 10/22/99 10:08 | 278 | 5.5 | 1,529 | 15,593 | 85,076 | 31.3 | 987 | 7.79 | 5.25 | 525 |
| tc | 10/22/99 13:22 | 194 | 5.5 | 1,067 | 15,787 | 86,143 | 32.0 | 971 | 7.71 | 5.30 | -700 |
| tc | 10/22/99 17:40 | 258 | 5.5 | 1,419 | 16,045 | 87,562 | 28.7 | 1,016 | 7.53 | 5.16 | -450 |
| tc | 10/22/99 21:37 | 237 | 5.4 | 1,280 | 16,282 | 88,841 | 30.4 | 957 | 8.01 | 4.99 | -850 |
| amw | 10/23/99 1:35 | 238 | 5.8 | 1,380 | 16,520 | 90,222 | 30.9 | 988 | 7.55 | 4.78 | -250 |
| amw | 10/23/99 5:30 | 235 | 5.5 | 1,293 | 16,755 | 91,514 | 30.8 | 989 | 8.07 | 4.78 | -600 |
| amw | 10/23/99 9:30 | 240 | 5.5 | 1,320 | 16,995 | 92,834 | 31.5 | 983 | 7.68 | 4.73 | 450 |
| amw | 10/23/99 13:37 | 247 | 5.5 | 1,358 | 17,242 | 94,193 | 31.4 | 994 | 7.98 | 4.62 | 725 |
| tc | 10/23/99 17:34 | 237 | 6.0 | 1,422 | 17,479 | 95,615 | 31.3 | 990 | 7.61 | 4.62 | 1,225 |
| tc | 10/23/99 21:34 | 240 | 5.5 | 1,320 | 17,719 | 96,935 | 30.6 | 972 | 7.98 | 4.56 | 975 |
| amw | 10/24/99 1:50 | 256 | 5.7 | 1,459 | 17,975 | 98,394 | 30.7 | 987 | 8.03 | 4.83 | 125 |
| amw | 10/24/99 5:50 | 240 | 5.9 | 1,416 | 18,215 | 99,810 | 30.4 | 985 | 8.03 | 4.83 | 775 |
| amw | 10/24/99 9:38 | 228 | 5.8 | 1,322 | 18,443 | 101,133 | 31.1 | 985 | 7.89 | 4.83 | 725 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 10 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| tc | 10/24/99 13:26 | 228 | 5.5 | 1,254 | 18,671 | 102,387 | 31.8 | 970 | 7.09 | 4.70 | 775 |
| tc | 10/24/99 17:42 | 256 | 5.5 | 1,408 | 18,927 | 103,795 | 30.6 | 924 | 7.37 | 4.60 | 850 |
| tc | 10/24/99 21:23 | 221 | 6.0 | 1,326 | 18,892 | 103,712 | 29.6 | 976 | 7.05 | 4.57 | 125 |
| amw | 10/25/99 1:35 | 252 | 5.7 | 1,436 | 19,179 | 105,231 | 31.2 | 975 | 7.94 | 4.70 | 400 |
| amw | 10/25/99 5:47 | 252 | 5.5 | 1,386 | 19,144 | 105,099 | 30.6 | 976 | 7.93 | 4.75 | -50 |
| amw | 10/25/99 9:40 | 233 | 5.8 | 1,351 | 19,377 | 106,450 | 31.6 | 972 | 7.91 | 4.79 | -- |
| bac | 10/25/99 13:36 | 236 | 5.8 | 1,369 | 19,613 | 107,819 | 32.0 | 989 | 8.02 | 4.53 | 1,650 |
| bac | 10/25/99 15:30 | 114 | 6.4 | 730 | 19,727 | 108,548 | 27.2 | 966 | 7.48 | -- | -- |
| bac | 10/25/99 17:30 | 120 | 6.4 | 768 | 19,847 | 109,316 | 29.3 | 968 | 7.08 | 4.51 | 1,350 |
| tc | 10/25/99 21:25 | 235 | 5.2 | 1,222 | 20,082 | 110,538 | 31.0 | 993 | 7.82 | 4.40 | 400 |
| tc | 10/26/99 1:24 | 239 | 5.3 | 1,267 | 20,321 | 111,805 | 30.5 | 961 | 7.51 | 4.64 | 475 |
| tc | 10/26/99 5:29 | 245 | 5.5 | 1,348 | 20,566 | 113,153 | 29.5 | 988 | 8.07 | 4.52 | 1,475 |
| bac | 10/26/99 7:35 | 126 | 5.5 | 693 | 20,692 | 113,845 | 30.5 | 942 | 7.47 | -- | -- |
| bac | 10/26/99 9:55 | 140 | 5.7 | 798 | 20,832 | 114,644 | 31.5 | 986 | 7.66 | 4.73 | 400 |

Table A-7
Well HC-5 Well Development Parameters During Phase II Development/Test Pumping
 (Page 11 of 11)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|---|--------------|-------------|---------------------------|
| bac | 10/26/99 12:35 | 160 | 5.8 | 928 | 20,992 | 115,572 | 31.6 | 944 | 7.53 | -- | -- |
| bac | 10/26/99 14:35 | 120 | 5.9 | 651 | 21,112 | 116,223 | 31.7 | 962 | 6.85 | 4.53 | 250 |
| bac | 10/26/99 16:35 | 120 | 5.8 | 674 | 21,232 | 116,897 | 30.9 | 959 | 7.07 | -- | -- |
| tc | 10/26/99 18:48 | 133 | 5.5 | 732 | 21,365 | 117,628 | 30.3 | 941 | 7.67 | 5.28 | 450 |
| tc | 10/26/99 22:31 | 223 | 5.3 | 1,182 | 21,588 | 118,810 | 30.5 | 989 | 8.08 | 5.06 | -475 |
| tc | 10/27/99 2:25 | 234 | 5.4 | 1,264 | 21,822 | 120,074 | 29.8 | 996 | 8.06 | 5.19 | 300 |
| tc | 10/27/99 6:23 | 238 | 5.5 | 1,309 | 22,060 | 121,383 | 29.9 | 989 | 8.05 | 5.32 | 1,075 |
| bac | 10/27/99 8:30 | 127 | 5.5 | 698 | 22,187 | 122,081 | 30.8 | 984 | 7.66 | -- | -- |
| bac | 10/27/99 10:30 | 120 | 5.5 | 660 | 22,307 | 122,741 | 31.7 | 931 | 7.58 | 4.84 | 852 |
| bac | 10/27/99 12:30 | 120 | 5.5 | 660 | 22,427 | 123,401 | 31.7 | 931 | 7.58 | 4.84 | 825 |
| bac | 10/27/99 15:57 | 207 | 6.2 | 1,283 | 22,634 | 124,684 | 31.3 | 980 | 7.61 | 1.03 | -- |
| tc | 10/27/99 17:58 | 121 | 5.5 | 666 | 22,755 | 125,350 | 31.1 | 972 | 7.86 | 4.81 | 725 |
| tc | 10/27/99 18:00 | 2 | -- | 11 | 22,757 | 125,361 | -- | -- | -- | -- | -- |
| tc | 10/27/99 18:00 | | stop pumping | | | | | | | | |

-- = Not measured

Table A-8
Well HC-5 Well Development Parameters During Phase III Development/Test Pumping
 (Page 1 of 3)

| | | | | | |
|--------------|--|------------------|---------------------------|----------------|---------------|
| Well Number: | <u>HC-5</u> | Start Time/Date: | 10/30/99 18:20 | End Date/Time: | 11/3/99 10:35 |
| Project No: | <u>799419.0056.0005</u> | Project Name: | <u>Project Shoal Area</u> | | |
| Test Type: | <u>Phase III Pumping</u> | Initial SWL: | Not Measured | End SWL: | Not Measured |
| | | | | Datum: | T.O.C. |
| Sample Team: | <u>Coburn, Welcher, Fritts, Chavez, Forsgren, Cherry, Saavedra, Roos</u> | Sample Type: | <u>Grab</u> | | |
| Test Method: | <u>Submersible Pump</u> | | | | |

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| jtr | 10/30/99 18:20 | | start pumping | | | | | | | | |
| jtr | 10/30/99 18:20 | 0 | 0.0 | 0 | 0 | 0 | -- | -- | -- | 4.61 | 2,050 |
| js | 10/30/99 22:20 | 240 | 5.5 | 1,320 | 240 | 1,320 | -- | -- | -- | 4.44 | 500 |
| js | 10/31/99 2:15 | 235 | 5.5 | 1,293 | 475 | 2,612 | -- | -- | -- | 4.66 | 475 |
| jtr | 10/31/99 6:20 | 245 | 5.5 | 1,348 | 720 | 3,960 | -- | -- | -- | 4.85 | 6,050 |
| jtr | 10/31/99 10:20 | 240 | 5.5 | 1,320 | 960 | 5,280 | -- | -- | -- | 5.02 | 2,150 |
| jtr | 10/31/99 14:15 | 235 | 5.5 | 1,293 | 1,195 | 6,572 | -- | -- | -- | 4.91 | 1,800 |
| js | 10/31/99 18:25 | 250 | 5.5 | 1,375 | 1,445 | 7,947 | -- | -- | -- | 5.15 | 1,025 |
| js | 10/31/99 22:25 | 240 | 5.5 | 1,320 | 1,685 | 9,268 | -- | -- | -- | 5.33 | 950 |
| js | 11/1/99 2:25 | 240 | 5.5 | 1,320 | 1,925 | 10,587 | -- | -- | -- | 5.54 | -75 |
| jtr | 11/1/99 6:30 | 245 | 5.3 | 1,294 | 2,170 | 11,881 | -- | -- | -- | 5.02 | 15 |

Table A-8
Well HC-5 Well Development Parameters During Phase III Development/Test Pumping
 (Page 2 of 3)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| jtr | 11/1/99 10:35 | 245 | 5.3 | 1,298 | 2,415 | 13,180 | 29.9 | 975 | 6.99 | 5.12 | 2,475 |
| jtr | 11/1/99 12:45 | 130 | 5.2 | 676 | 2,545 | 13,856 | 29.6 | 985 | 7.28 | -- | -- |
| jtr | 11/1/99 14:25 | 100 | 5.2 | 520 | 2,645 | 14,376 | 30.3 | 932 | 7.29 | 5.32 | -1,200 |
| jtr | 11/1/99 16:35 | 130 | 5.1 | 663 | 2,775 | 15,039 | 30.1 | 966 | 7.59 | -- | -- |
| jms | 11/1/99 18:35 | 120 | 5.2 | 624 | 2,895 | 15,663 | 29.0 | 994 | 7.62 | 5.16 | 200 |
| jms | 11/1/99 20:32 | 117 | 5.3 | 618 | 3,012 | 16,280 | 30.3 | 940 | 7.47 | -- | -- |
| jms | 11/1/99 22:25 | 113 | 5.3 | 597 | 3,125 | 16,877 | 29.8 | 991 | 7.60 | 5.06 | 1,350 |
| jms | 11/2/99 0:30 | 125 | 5.3 | 660 | 3,250 | 17,537 | 30.1 | 955 | 7.51 | -- | -- |
| jms | 11/2/99 2:25 | 115 | 5.3 | 607 | 3,365 | 18,144 | 30.5 | 963 | 7.47 | 5.78 | -150 |
| jms | 11/2/99 4:30 | 125 | 5.3 | 660 | 3,490 | 18,804 | 30.0 | 947 | 7.52 | -- | -- |
| jtr | 11/2/99 6:35 | 125 | 5.3 | 660 | 3,615 | 19,464 | 30.5 | 960 | 7.71 | 4.85 | 1,475 |
| jtr | 11/2/99 8:40 | 125 | 5.3 | 660 | 3,740 | 20,124 | 30.6 | 967 | 7.67 | -- | -- |
| jtr | 11/2/99 10:35 | 115 | 5.3 | 607 | 3,855 | 20,731 | 31.5 | 906 | 7.53 | 4.92 | 1,775 |
| jtr | 11/2/99 12:45 | 130 | 5.3 | 689 | 3,985 | 21,420 | 31.1 | 972 | 7.55 | -- | -- |
| jtr | 11/2/99 14:30 | 105 | 5.3 | 556 | 4,090 | 21,977 | 30.3 | 978 | 7.53 | 4.92 | 1,775 |
| jtr | 11/2/99 16:35 | 125 | 5.5 | 687 | 4,215 | 22,664 | 29.7 | 992 | 7.47 | -- | -- |

Table A-8
Well HC-5 Well Development Parameters During Phase III Development/Test Pumping
 (Page 3 of 3)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| jms | 11/2/99 18:30 | 115 | 5.2 | 598 | 4,330 | 23,262 | 30.5 | 964 | 7.44 | 5.02 | 300 |
| jms | 11/2/99 20:25 | 115 | 5.2 | 598 | 4,445 | 23,860 | 30.3 | 969 | 7.37 | -- | -- |
| jms | 11/2/99 22:25 | 120 | 4.8 | 570 | 4,565 | 24,430 | 31.1 | 972 | 7.65 | 5.08 | 925 |
| jms | 11/3/99 0:30 | 125 | 5.0 | 625 | 4,690 | 25,055 | 30.6 | 955 | 7.43 | -- | -- |
| jms | 11/3/99 2:25 | 115 | 4.8 | 546 | 4,805 | 25,602 | 30.5 | 978 | 7.67 | 5.12 | 875 |
| jms | 11/3/99 4:30 | 125 | 4.8 | 594 | 4,930 | 26,195 | 30.3 | 983 | 7.52 | -- | -- |
| jtr | 11/3/99 6:35 | 125 | 5.2 | 650 | 5,055 | 26,845 | 30.6 | 937 | 7.62 | 7.83 | 2,600 |
| jtr | 11/3/99 8:30 | 115 | 4.8 | 546 | 5,170 | 27,392 | 30.2 | 974 | 7.71 | -- | -- |
| jtr | 11/3/99 10:35 | 125 | 5.2 | 650 | 5,295 | 28,042 | 31.1 | 974 | 7.71 | 4.66 | 275 |
| jtr | 11/3/99 10:35 | | stop pumping | | | | | | | | |

-- = Not measured

**Table A-9
Well HC-5 Well Development Parameters During Phase IV Development/Test Pumping**

| Well Number: | HC-5 | Start Time/Date: | <u>11/11/99 15:00</u> | End Date/Time: | <u>11/12/99 21:02</u> | | | | | | |
|--------------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| Project No: | 799419.0056.0005 | Project Name: | Project Shoal Area | | | | | | | | |
| Test Type: | <u>Phase IV Pumping</u> | Initial SWL: | Not Measured | End SWL: | Not Measured | Datum: | T.O.C. | | | | |
| Sample Team: | <u>Chavez, Coburn</u> | Sample Type: | <u>Grab</u> | | | | | | | | |
| Test Method: | <u>Submersible Pump</u> | | | | | | | | | | |
| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| tc | 11/11/99 15:00 | | start pumping | | | | | | | | |
| tc | 11/11/99 15:30 | 30 | 5.9 | 178 | 30 | 178 | 20.6 | 955 | 9.27 | 4.70 | 425 |
| tc | 11/11/99 18:57 | 207 | 5.9 | 1,221 | 237 | 1,399 | 27.8 | 973 | 8.21 | 4.49 | 325 |
| tc | 11/11/99 22:55 | 238 | 5.9 | 1,404 | 475 | 2,804 | 27.8 | 985 | 7.98 | 4.65 | 1,150 |
| tjc | 11/12/99 4:00 | 305 | 5.9 | 1,799 | 780 | 4,603 | 28.8 | 943 | 7.93 | 4.68 | 1,600 |
| tjc | 11/12/99 8:04 | 244 | 5.9 | 1,440 | 1,024 | 6,043 | 29.1 | 957 | 7.96 | 4.67 | 1,800 |
| tc | 11/12/99 12:55 | 291 | 5.9 | 1,717 | 1,315 | 7,760 | 29.7 | 985 | 8.06 | 4.44 | 1,925 |
| tc | 11/12/99 16:54 | 239 | 5.9 | 1,410 | 1,554 | 9,170 | 29.5 | 979 | 8.13 | 4.42 | 1,125 |
| tc | 11/12/99 21:02 | 248 | 5.9 | 1,463 | 1,802 | 10,643 | 29.0 | 979 | 8.02 | 4.30 | 1,400 |
| tc | 11/12/99 21:02 | | stop pumping | | | | | | | | |

Table A-10
Well HC-5 Well Development Parameters During Phase V Development/Test Pumping
 (Page 1 of 2)

| | | | | | |
|--------------|-------------------------------|---------------------------|---------------------------|----------------|------------------------|
| Well Number: | HC-5 | Start Time/Date: | 11/15/99 16:30 | End Date/Time: | 11/22/99: 18:30 |
| Project No: | 799419.0056.0005 | Project Name: | Project Shoal Area | | |
| Test Type: | <u>Phase V Pumping</u> | Initial SWL: Not Measured | End SWL: Not Measured | Datum: T.O.C. | |
| Sample Team: | <u>Chavez, Saavedra, Roos</u> | Sample Type: | <u>Grab</u> | | |
| Test Method: | <u>Submersible Pump</u> | | | | |

| Initials | Date & Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous flow rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|------------------------------------|-----------------------|----------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| tc | 11/15/99 16:30 | | | start pumping | | | | | | | |
| tc | 11/15/99 16:41 | 11 | 5.0 | 55 | 11 | 55 | 16.8 | 974 | 8.48 | 4.48 | 700 |
| tc | 11/15/99 20:53 | 252 | 5.1 | 1,285 | 263 | 1,340 | 28.0 | 976 | 7.87 | 4.18 | 800 |
| jtr | 11/16/99 1:00 | 247 | 5.0 | 1,245 | 510 | 2,585 | 25.9 | 971 | 7.73 | 5.90 | 975 |
| jtr | 11/16/99 5:00 | 240 | 5.1 | 1,236 | 750 | 3,821 | 26.7 | 957 | 7.60 | 5.70 | 725 |
| jtr | 11/16/99 9:00 | 240 | 5.3 | 1,263 | 990 | 5,084 | 25.9 | 999 | 7.79 | 5.09 | 500 |
| jms | 11/16/99 15:15 | 375 | 5.6 | 2,100 | 1,365 | 7,184 | 30.3 | 498 | 7.60 | 5.42 | 575 |
| jms | 11/16/99 19:05 | 230 | 5.5 | 1,267 | 1,595 | 8,451 | 29.8 | 931 | 7.71 | 5.45 | 2,325 |
| jms | 11/16/99 23:00 | 235 | 5.6 | 1,325 | 1,830 | 9,776 | 29.8 | 959 | 7.76 | 5.40 | 775 |
| jtr | 11/17/99 3:00 | 240 | 5.4 | 1,292 | 2,070 | 11,068 | 29.1 | 948 | 7.78 | 5.27 | 875 |
| jtr | 11/17/99 7:00 | 240 | 5.6 | 1,353 | 2,310 | 12,421 | 29.3 | 977 | 7.66 | 5.51 | 425 |
| jtr | 11/17/99 11:00 | 240 | 5.5 | 1,322 | 2,550 | 13,743 | 26.8 | 1,008 | 7.69 | 5.44 | 1,725 |
| jms | 11/17/99 15:00 | 240 | 5.5 | 1,322 | 2,790 | 15,065 | 29.2 | 979 | 7.59 | 5.36 | -1,450 |
| jms | 11/17/99 19:00 | 240 | 5.4 | 1,292 | 3,030 | 16,357 | 28.0 | 988 | 7.65 | 5.36 | -775 |
| jms | 11/17/99 23:00 | 240 | 5.5 | 1,322 | 3,270 | 17,679 | 27.8 | 965 | 7.55 | 5.27 | -1,525 |
| jtr | 11/18/99 3:00 | 240 | 5.5 | 1,322 | 3,510 | 19,001 | 27.1 | 982 | 7.59 | 5.89 | 1,600 |
| jtr | 11/18/99 7:00 | 240 | 5.6 | 1,353 | 3,750 | 20,354 | 26.8 | 971 | 7.74 | 5.81 | 2,325 |
| jtr | 11/18/99 11:00 | 240 | 5.5 | 1,322 | 3,990 | 21,676 | 28.1 | 933 | 7.71 | 5.30 | 1,675 |
| jms | 11/18/99 15:00 | 240 | 5.8 | 1,386 | 4,230 | 23,062 | 29.7 | 969 | 7.75 | 5.50 | -125 |
| jms | 11/18/99 19:00 | 240 | 5.6 | 1,353 | 4,470 | 24,416 | 29.1 | 972 | 7.74 | 5.36 | 100 |
| jms | 11/18/99 23:00 | 240 | 5.6 | 1,353 | 4,710 | 25,769 | 30.1 | 987 | 7.73 | 5.54 | 325 |

Table A-10
Well HC-5 Well Development Parameters During Phase V Development/Test Pumping
 (Page 2 of 2)

| Initials | Date & Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| jtr | 11/19/99 3:00 | 240 | 5.5 | 1,322 | 4,950 | 27,091 | 26.5 | 994 | 7.71 | 5.92 | 1,925 |
| jtr | 11/19/99 7:00 | 240 | 5.6 | 1,353 | 5,190 | 28,444 | 27.2 | 954 | 7.63 | 5.38 | 400 |
| jtr | 11/19/99 11:00 | 240 | 5.5 | 1,322 | 5,430 | 29,766 | 29.0 | 965 | 7.77 | 5.28 | 1,325 |
| jms | 11/19/99 15:00 | 240 | 5.6 | 1,353 | 5,670 | 31,120 | 30.4 | 967 | 7.86 | 5.36 | 550 |
| jms | 11/19/99 19:00 | 240 | 5.4 | 1,292 | 5,910 | 32,411 | 29.5 | 952 | 7.75 | 5.48 | 875 |
| jms | 11/19/99 23:00 | 240 | 5.4 | 1,292 | 6,150 | 33,703 | 30.0 | 977 | 7.77 | 5.48 | 125 |
| jtr | 11/20/99 3:00 | 240 | 5.5 | 1,322 | 6,390 | 35,025 | 27.0 | 973 | 7.74 | 5.13 | 375 |
| jtr | 11/20/99 7:00 | 240 | 5.5 | 1,322 | 6,630 | 36,347 | 27.5 | 982 | 7.82 | 5.23 | 275 |
| jtr | 11/20/99 11:00 | 240 | 5.6 | 1,353 | 6,870 | 37,700 | 30.2 | 934 | 7.81 | 5.84 | 825 |
| jms | 11/20/99 15:00 | 240 | 5.5 | 1,322 | 7,110 | 39,022 | 30.4 | 968 | 7.89 | 5.22 | 700 |
| jms | 11/20/99 19:00 | 240 | 5.5 | 1,322 | 7,350 | 40,344 | 29.7 | 975 | 7.88 | 5.36 | 1,050 |
| jms | 11/20/99 23:00 | 240 | 5.4 | 1,292 | 7,590 | 41,636 | 29.6 | 969 | 7.97 | 5.44 | 350 |
| tc | 11/21/99 2:58 | 238 | 5.5 | 1,311 | 7,828 | 42,947 | 26.8 | 1,005 | 7.71 | 5.47 | 1,375 |
| tc | 11/21/99 6:50 | 232 | 5.6 | 1,308 | 8,060 | 44,255 | 27.7 | 973 | 8.03 | 5.45 | 1,575 |
| tc | 11/21/99 10:58 | 248 | 5.9 | 1,468 | 8,308 | 45,724 | 25.6 | 952 | 8.05 | 5.16 | 350 |
| jms | 11/21/99 19:05 | 487 | 5.3 | 2,563 | 8,795 | 48,287 | 28.9 | 997 | 7.98 | 5.13 | 725 |
| jms | 11/21/99 23:05 | 240 | 5.4 | 1,292 | 9,035 | 49,579 | 26.8 | 1,003 | 7.97 | 5.34 | 1,125 |
| tc | 11/22/99 2:57 | 232 | 5.4 | 1,249 | 9,267 | 50,828 | 25.6 | 965 | 8.00 | 5.27 | 950 |
| tc | 11/22/99 7:01 | 244 | 5.3 | 1,284 | 9,511 | 52,112 | 25.9 | 982 | 8.03 | 4.96 | 625 |
| tc | 11/22/99 10:55 | 234 | 5.9 | 1,386 | 9,745 | 53,497 | 28.6 | 937 | 7.99 | 5.15 | 1,025 |
| jms | 11/22/99 14:52 | 237 | 5.5 | 1,305 | 9,982 | 54,803 | 29.8 | 982 | 7.92 | 5.19 | 825 |
| jms | 11/22/99 17:30 | 158 | 5.4 | 850 | 10,140 | 55,653 | 30.0 | 935 | 7.92 | 5.23 | -300 |
| tc | 11/22/99 18:30 | | | stop pumping | | | | | | | |

Table A-11
Well HC-5 Well Development Parameters During Phase VI Development/Test Pumping
 (Page 1 of 2)

| Well Number: HC-5 | | Start Time/Date: <u>11/30/99 17:00</u> | | End Date/Time: in progress | | | | | | | |
|--------------------------------------|--------------------------------|---|-------------------------------|----------------------------|-------------------------------|-----------------------------|------------------|--|-----------|----------|------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | |
| Test Type: <u>Phase VI Pumping</u> | | Initial SWL: Not Measured | | End SWL: Not Measured | | | | | | | |
| Sample Team: <u>Chavez, Saavedra</u> | | Datum: T.O.C. | | | | | | | | | |
| Test Method: <u>Submersible Pump</u> | | Sample Type: <u>Grab</u> | | | | | | | | | |
| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| tc | 11/30/99 17:00 | 0 | | start test | | | | | | 5.15 | 225 |
| tc | 11/30/99 21:00 | 240 | 5.4 | 1,292 | 240 | 1,292 | -- | -- | -- | 5.33 | 1,000 |
| jms | 12/1/99 1:00 | 240 | 5.3 | 1,263 | 480 | 2,555 | -- | -- | -- | 5.11 | 250 |
| jms | 12/1/99 5:00 | 240 | 5.4 | 1,292 | 720 | 3,847 | -- | -- | -- | 5.33 | 2,900 |
| jms | 12/1/99 9:00 | 240 | 5.3 | 1,263 | 960 | 5,110 | -- | -- | -- | 5.35 | 300 |
| tc | 12/1/99 13:00 | 240 | 5.8 | 1,386 | 1,200 | 6,496 | -- | -- | -- | 5.24 | 450 |
| tc | 12/1/99 17:00 | 240 | 5.5 | 1,322 | 1,440 | 7,818 | -- | -- | -- | 5.39 | -25 |
| tc | 12/1/99 21:00 | 240 | 5.8 | 1,386 | 1,680 | 9,205 | -- | -- | -- | 5.33 | 1,000 |
| jms | 12/2/99 1:00 | 240 | 5.4 | 1,292 | 1,920 | 10,497 | -- | -- | -- | 5.11 | 2,250 |
| jms | 12/2/99 5:00 | 240 | 5.5 | 1,322 | 2,160 | 11,819 | -- | -- | -- | 4.96 | 250 |
| jms | 12/2/99 9:00 | 240 | 5.4 | 1,292 | 2,400 | 13,110 | -- | -- | -- | 5.28 | 1,000 |
| tc | 12/2/99 13:00 | 240 | 5.4 | 1,292 | 2,640 | 14,402 | -- | -- | -- | 4.94 | 1,100 |
| tc | 12/2/99 17:00 | 240 | 5.5 | 1,322 | 2,880 | 15,724 | -- | -- | -- | 5.15 | 450 |
| tc | 12/2/99 21:00 | 240 | 5.5 | 1,322 | 3,120 | 17,046 | -- | -- | -- | 5.11 | 600 |
| jms | 12/3/99 1:00 | 240 | 5.4 | 1,292 | 3,360 | 18,338 | -- | -- | -- | 5.09 | 1,025 |
| jms | 12/3/99 5:15 | 240 | 5.4 | 1,292 | 3,600 | 19,630 | -- | -- | -- | 4.92 | 250 |
| jms | 12/3/99 9:00 | 255 | 5.4 | 1,373 | 3,855 | 21,002 | -- | -- | -- | 5.06 | 600 |
| | 12/3/99 9:00 | | | stop pumping | | | | | | | |
| | 12/3/99 13:30 | | | start pumping | | | | | | | |

Table A-11
Well HC-5 Well Development Parameters During Phase VI Development/Test Pumping
 (Page 2 of 2)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (°C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|---------------------|--|--------------|-------------|---------------------------|
| tc | 12/3/99 14:00 | 30 | 5.4 | 161 | 3,885 | 3,885 | -- | -- | -- | 5.04 | 1,775 |
| tc | 12/3/99 18:00 | 240 | 5.5 | 1,322 | 4,125 | 4,125 | -- | -- | -- | 5.11 | 50 |
| tc | 12/3/99 22:00 | 240 | 6.6 | 1,579 | 4,365 | 4,365 | -- | -- | -- | 5.24 | 300 |
| jms | 12/4/99 2:00 | 240 | 5.4 | 1,292 | 4,605 | 4,605 | -- | -- | -- | 5.11 | 1,600 |
| jms | 12/4/99 6:00 | 240 | 5.4 | 1,292 | 4,845 | 4,845 | -- | -- | -- | 5.35 | 1,300 |
| jms | 12/4/99 10:10 | 250 | 5.4 | 1,346 | 5,095 | 5,095 | -- | -- | -- | 5.09 | -- |
| tc | 12/4/99 14:00 | 230 | 6.8 | 1,556 | 5,325 | 5,325 | -- | -- | -- | 4.85 | 1,225 |
| tc | 12/4/99 18:00 | 240 | 7.0 | 1,672 | 5,565 | 5,565 | -- | -- | -- | 5.09 | 1,725 |
| tc | 12/4/99 22:00 | 240 | 7.0 | 1,672 | 5,805 | 5,805 | -- | -- | -- | 5.04 | 550 |
| jms | 12/5/99 2:05 | 245 | 6.8 | 1,658 | 6,050 | 6,050 | -- | -- | -- | 5.28 | 575 |
| jms | 12/5/99 6:00 | 235 | 6.8 | 1,590 | 6,285 | 6,285 | -- | -- | -- | 5.17 | 625 |
| jms | 12/5/99 10:02 | 242 | 6.8 | 1,638 | 6,527 | 6,527 | -- | -- | -- | 5.04 | 325 |
| tc | 12/5/99 14:00 | 238 | 6.6 | 1,566 | 6,765 | 6,765 | -- | -- | -- | 5.40 | 850 |
| tc | 12/5/99 18:00 | 240 | 6.6 | 1,579 | 7,005 | 7,005 | -- | -- | -- | 5.44 | 600 |
| tc | 12/5/99 22:00 | 240 | 6.6 | 1,579 | 7,245 | 7,245 | -- | -- | -- | 5.44 | 625 |
| jms | 12/6/99 2:00 | 240 | 6.8 | 1,624 | 7,485 | 7,485 | -- | -- | -- | 5.31 | 950 |
| jms | 12/6/99 6:05 | 245 | 6.8 | 1,658 | 7,730 | 7,730 | -- | -- | -- | 5.79 | 1,500 |
| | 12/7/99 | | | In progress, IT suspends monitoring | | | | | | | |

-- = Not measured

**Table A-12
Well HC-5 Water Balance**

| Total Amount of Water Delivered to HC-5 by Lang Drilling (6/17-8/18) | | credit | debit | balance |
|---|---|---------------|--------------|----------------|
| 629,400 | gallons of water used to drill HC-5 | 629,400 | 0 | 629,400 |
| HC-5 Fluids Discharged during Drilling | | | | |
| 7/5/1999 | 35,000 | | | |
| 7/27/1999 | 35,000 | | | |
| 8/3/1999 | 35,000 | | | |
| 8/24/1999 | 35,000 | | | |
| 140,000 | gallons of HC-5 fluid transferred to infiltration basin | 0 | 140,000 | 489,400 |
| Fluid Discharged during Conventional Airlifting | | | | |
| 18,785 | gallons of water discharged during conventional airlift development (8/19-20) | 0 | 18,785 | 470,615 |
| Fluid Discharged during Eductor Airlifting | | | | |
| 10,223 | gallons of water discharged during eductor airlifting (9/30-10/1) | 0 | 10,223 | 460,392 |
| Fluid Discharged during Phase I Pumping | | | | |
| 31,321 | gallons of water discharged during Phase I pumping (10/4-8) | 0 | 31,321 | 429,071 |
| Fluid Discharged during Miscellaneous Pumping | | | | |
| 1,254 | gallons of water discharged during miscellaneous pumping (10/9-10) | 0 | 1,254 | 427,817 |
| Fluid Discharged during Phase II Pumping | | | | |
| 125,361 | gallons of water discharged during Phase II pumping (10/11-27) | 0 | 125,361 | 302,456 |
| Fluid Discharged during Phase III Pumping | | | | |
| 28,042 | gallons of water discharged during Phase III pumping (10/30-11/3) | 0 | 28,042 | 274,414 |
| Fluid Discharged during Phase IV Pumping | | | | |
| 10,643 | gallons of water discharged during Phase IV pumping (11/11-12) | 0 | 10,643 | 263,771 |
| Fluid Discharged during Phase V Pumping | | | | |
| 55,653 | gallons of water discharged during Phase V pumping (11/15-22) | 0 | 55,653 | 208,118 |
| Fluid Discharged during Phase VI Pumping | | | | |
| 45,786 | gallons of water discharged during Phase VI pumping (11/30-12/6 in progress) | 0 | 45,786 | 162,332 |

Table A-13
Well HC-5 Water Level Measurements

| Date and Time | Depth to Water (ft) | Water Level Elevation (ft msl) | Comments |
|----------------------|----------------------------|---------------------------------------|---|
| 9/30/99 18:02 | 1,365.1 | 3,882.28 | Static water level measured during airlift development |
| 10/4/99 18:02 | 1,365.85 | 3,881.53 | Static water level measured prior to development/test pumping |
| 10/9/99 10:00 | 1,366 | 3,881.38 | Static water level measured prior to development/test pumping |

Table A-14
Well HC-5 Downhole Geophysical Data Collected
 (Page 1 of 2)

| Geophysical Tool | Date | Top of Interval (ft bgs) | Bottom of Interval (ft bgs) | Interval (ft) | Contractor |
|--|-----------|-----------------------------|--------------------------------|------------------|-------------|
| Phase I | | | | | |
| Acoustic Borehole Televiwer/Deviation | 6/28/1999 | 2.5 | 1,199.5 | 1,197 | Colog, Inc. |
| 3-Arm Caliper | 6/28/1999 | 80 | 1,197 | 1,117 | Colog, Inc. |
| Temperature/ Δ Temperature | 6/28/1999 | 900 | 1,200 | 300 | Colog, Inc. |
| Formation Density | 6/28/1999 | 889 | 1,197 | 308 | Colog, Inc. |
| Natural Gamma/Guard Resistivity/Epithermal Neutron | 6/28/1999 | 0 | 1,197 | 1,197 | Colog, Inc. |
| Spectral Gamma Ray (K, U, Th) | 6/28/1999 | 78 | 1,174 | 1,096 | Colog, Inc. |
| Phase II | | | | | |
| 3-Arm Caliper | 7/31/1999 | 1,191 | 1,209 | 18 | DRI |
| 3-Arm Caliper | 8/1/1999 | 474 | 2,694 | 2,220 | DRI |
| 3-Arm Caliper | 8/3/1999 | 1,200 | 2,694 | 1,494 | DRI |
| 3-Arm Caliper | 8/7/1999 | 1,200 | 3,206 | 2,006 | Colog, Inc. |
| 3-Arm Caliper | 8/14/1999 | 3,124 | 3,570 | 446 | Colog, Inc. |
| Temperature/ Δ Temperature | 8/8/1999 | 1,330 | 3,430 | 2,100 | Colog, Inc. |
| Temperature/ Δ Temperature | 8/14/1999 | 2,600 | 3,572 | 972 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 8/8/1999 | 1,344 | 2,628 | 1,284 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 8/12/1999 | 2,738 | 3,206 | 468 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 8/14/1999 | 2,530 | 3,566 | 1,036 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 8/9/1999 | 1,200 | 2,645 | 1,445 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 8/11/1999 | 2,641 | 2,913 | 272 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 8/12/1999 | 2,913 | 2,993 | 80 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 8/12/1999 | 2,993 | 3,109 | 116 | Colog, Inc. |

Table A-14
Well HC-5 Downhole Geophysical Data Collected
 (Page 2 of 2)

| Geophysical Tool | Date | Top of Interval (ft bgs) | Bottom of Interval (ft bgs) | Interval (ft) | Contractor |
|---------------------------------|-----------|-----------------------------|--------------------------------|------------------|-------------|
| Guard Resistivity/Natural Gamma | 8/12/1999 | 3,109 | 3,208 | 99 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 8/14/1999 | 2,600 | 3,570 | 970 | Colog, Inc. |
| Spectral Gamma Ray (K, U, Th) | 8/9/1999 | 1,200 | 2,604 | 1,404 | Colog, Inc. |
| Spectral Gamma Ray (K, U, Th) | 8/14/1999 | 2,550 | 3,566 | 1,016 | Colog, Inc. |
| Borehole Radar | 8/9/1999 | 1,203 | 2,394 | 1,191 | DRI/PRG |
| Geochem | 8/10/1999 | 1,320 | 2,639 | 1,319 | DRI |
| Stressed Thermal Flow | 8/10/1999 | na | na | na | DRI |
| Formation Density | 8/10/1999 | 1,200 | 2,639 | 1,439 | Colog, Inc. |
| Epithermal Neutron | 8/10/1999 | 1,316 | 2,585 | 1,269 | Colog, Inc. |
| Stressed Thermal Flow | 8/11/1999 | 1,340 | 2,635 | 1,295 | DRI |
| Spinner Flow Measurement | 8/12/1999 | 2,740 | 3,206 | 466 | DRI |
| 4-Pi Density | 8/22/1999 | 0 | 3,562 | 3,562 | Colog, Inc. |

na = Not applicable

Table A-15
Well HC-5 Tritium Activities
 (Page 1 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 6/26/99 9:30 | 950 | -98 | 537 | -- |
| 6/26/99 10:40 | -- | -- | -- | 415 |
| 6/26/99 11:30 | 975 | 171 | -195 | -- |
| 6/26/99 14:00 | 1,000 | -171 | -24 | -- |
| 6/26/99 23:15 | -- | -- | -- | 463 |
| 6/26/99 23:15 | -- | -- | -- | -146 |
| 6/27/99 6:05 | 1,033 | 2,390 | 2,463 | -- |
| 6/27/99 6:45 | -- | -- | -- | 342 |
| 6/27/99 8:10 | 1,058 | 1,610 | 2,927 | -- |
| 6/27/99 10:15 | 1,080 | 2,220 | 1,756 | -- |
| 6/27/99 11:10 | -- | -- | -- | 1,375 |
| 6/27/99 12:45 | 1,100 | 975 | 900 | -- |
| 6/27/99 14:00 | -- | -- | -- | 1,300 |
| 6/27/99 15:45 | 1,140 | 725 | 7,025 | -- |
| 6/27/99 16:35 | -- | -- | -- | 1,500 |
| 6/27/99 17:45 | 1,170 | 1,050 | 725 | -- |
| 6/27/99 18:45 | -- | -- | -- | 850 |
| 6/27/99 20:15 | -- | -- | -- | 1,400 |
| 6/27/99 20:30 | 1,200 | 600 | 900 | -- |
| 7/1/99 11:35 | -- | -- | -- | 1,675 |
| 7/1/99 12:00 | 1,240 | 275 | 400 | -- |
| 7/1/99 14:30 | 1,280 | 950 | 350 | -- |
| 7/3/99 6:45 | 1,305 | 700 | 450 | -- |
| 7/3/99 9:20 | 1,352 | 400 | 625 | -- |
| 7/3/99 11:50 | 1,393 | 150 | -75 | -- |
| 7/3/99 12:20 | -- | -- | -- | 11,325 |
| 7/3/99 12:20 | -- | -- | -- | -250 |
| 7/3/99 15:20 | 1,430 | 100 | 375 | -- |
| 7/3/99 17:59 | 1,480 | 175 | -350 | -- |
| 7/3/99 20:10 | 1,520 | 575 | 50 | -- |
| 7/3/99 23:45 | -- | -- | -- | 500 |
| 7/4/99 1:45 | 1,569 | 575 | 400 | -- |

Table A-15
Well HC-5 Tritium Activities
 (Page 2 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/4/99 2:50 | -- | -- | -- | 150 |
| 7/4/99 3:10 | 1,580 | 225 | -675 | -- |
| 7/4/99 4:40 | 1,590 | 2,575 | 300 | -- |
| 7/4/99 6:10 | 1,602 | -75 | -25 | -- |
| 7/4/99 7:25 | 1,611 | 3,825 | -300 | -- |
| 7/4/99 8:35 | 1,620 | 550 | -150 | -- |
| 7/4/99 11:05 | 1,633 | -275 | 2,400 | -- |
| 7/4/99 13:10 | 1,645 | -425 | -25 | -- |
| 7/4/99 15:15 | 1,665 | 250 | -1,125 | -- |
| 7/5/99 5:05 | 1,678 | 775 | 150 | -- |
| 7/5/99 5:45 | -- | -- | -- | 350 |
| 7/7/99 13:25 | 1,700 | 150 | -75 | -- |
| 7/7/99 13:30 | -- | -- | -- | -300 |
| 7/7/99 14:35 | -- | -- | -- | 300 |
| 7/7/99 15:35 | 1,721 | 375 | 475 | -- |
| 7/7/99 16:30 | 1,730 | 275 | 75 | -- |
| 7/7/99 18:30 | 1,744 | 250 | 325 | -- |
| 7/7/99 20:35 | 1,756 | 250 | 400 | -- |
| 7/7/99 21:20 | -- | -- | -- | 700 |
| 7/7/99 23:30 | 1,778 | 800 | 200 | -- |
| 7/8/99 2:00 | 1,791 | 325 | 575 | -- |
| 7/8/99 4:00 | 1,800 | 425 | 200 | -- |
| 7/8/99 6:15 | 1,809 | 325 | 925 | -- |
| 7/9/99 13:00 | 1,823 | 825 | 700 | -- |
| 7/9/99 13:05 | -- | -- | -- | 1,450 |
| 7/9/99 15:00 | 1,830 | 925 | 1,000 | -- |
| 7/9/99 17:15 | 1,843 | 1,475 | 1,100 | -- |
| 7/9/99 19:30 | 1,852 | 2,025 | 525 | -- |
| 7/9/99 22:15 | 1,860 | 250 | 725 | -- |
| 7/10/99 2:00 | 1,885 | 775 | 775 | -- |
| 7/10/99 2:40 | -- | -- | -- | 1,150 |
| 7/10/99 4:10 | 1,900 | 550 | 1,175 | -- |

Table A-15
Well HC-5 Tritium Activities
 (Page 3 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/10/99 7:00 | 1,913 | 225 | 725 | -- |
| 7/10/99 20:00 | 1,914 | 525 | 900 | -- |
| 7/10/99 20:35 | -- | -- | -- | 1,500 |
| 7/10/99 21:35 | -- | -- | -- | 1,375 |
| 7/10/99 22:35 | 1,923 | 900 | 750 | -- |
| 7/10/99 23:05 | -- | -- | -- | 1,025 |
| 7/11/99 0:50 | 1,932 | 85 | 1,000 | -- |
| 7/11/99 2:30 | -- | -- | -- | 975 |
| 7/11/99 3:00 | 1,938 | 950 | 1,125 | -- |
| 7/11/99 5:30 | 1,945 | 200 | 800 | -- |
| 7/11/99 8:30 | 1,957 | 1,200 | 575 | -- |
| 7/11/99 14:00 | 1,964 | -275 | 575 | -- |
| 7/11/99 14:10 | -- | -- | -- | 825 |
| 7/11/99 16:15 | 1,979 | 0 | 650 | -- |
| 7/11/99 16:20 | -- | -- | -- | 1,250 |
| 7/11/99 17:35 | -- | -- | -- | 1,000 |
| 7/11/99 18:30 | 1,988 | 500 | 900 | -- |
| 7/11/99 20:35 | 1,999 | 1,000 | 775 | -- |
| 7/11/99 22:40 | 2,016 | 975 | 225 | -- |
| 7/12/99 1:00 | 2,038 | 500 | 0 | -- |
| 7/12/99 4:00 | 2,050 | 425 | -150 | -- |
| 7/12/99 5:10 | -- | -- | -- | 825 |
| 7/12/99 6:00 | 2,060 | 25 | 400 | -- |
| 7/12/99 9:20 | 2,075 | 600 | 350 | -- |
| 7/12/99 10:30 | 2,080 | 300 | 0 | -- |
| 7/12/99 10:40 | -- | -- | -- | 650 |
| 7/12/99 14:30 | 2,100 | -25 | 700 | -- |
| 7/12/99 17:00 | 2,105 | 900 | 1,000 | -- |
| 7/12/99 19:00 | 2,109 | 875 | 675 | -- |
| 7/12/99 20:00 | -- | -- | -- | 2,800 |
| 7/12/99 20:00 | -- | -- | -- | 450 |
| 7/12/99 21:00 | 2,119 | 800 | 450 | -- |

Table A-15
Well HC-5 Tritium Activities
 (Page 4 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/12/99 23:00 | 2,128 | 325 | -400 | -- |
| 7/13/99 1:45 | 2,140 | 325 | -175 | -- |
| 7/13/99 20:00 | 2,150 | -300 | -800 | -- |
| 7/13/99 22:00 | 2,164 | 225 | 75 | -- |
| 7/14/99 0:15 | 2,176 | 700 | 200 | -- |
| 7/14/99 4:00 | 2,196 | 200 | 75 | -- |
| 7/14/99 6:10 | 2,207 | 25 | 950 | -- |
| 7/14/99 9:00 | 2,226 | 825 | 525 | -- |
| 7/14/99 11:25 | 2,240 | 550 | 225 | -- |
| 7/14/99 13:38 | 2,252 | 1,025 | -325 | -- |
| 7/14/99 16:00 | 2,268 | 425 | 750 | -- |
| 7/14/99 20:00 | 2,289 | 250 | 1,975 | -- |
| 7/14/99 21:10 | 2,297 | -425 | 725 | -- |
| 7/15/99 0:20 | 2,308 | -500 | -933 | -33 |
| 7/15/99 4:55 | 2,321 | 333 | 100 | -- |
| 7/15/99 7:22 | 2,330 | -400 | 667 | -- |
| 7/15/99 10:00 | 2,339 | -400 | -333 | -- |
| 7/15/99 13:07 | 2,352 | 800 | -400 | -- |
| 7/15/99 15:00 | 2,362 | 450 | 575 | -- |
| 7/15/99 18:00 | 2,375 | -125 | 400 | 950 |
| 7/15/99 20:15 | 2,387 | -75 | -275 | -- |
| 7/15/99 20:30 | -- | -- | -- | 550 |
| 7/15/99 22:00 | 2,395 | -625 | 125 | -- |
| 7/16/99 1:15 | 2,416 | -200 | -175 | -- |
| 7/16/99 1:30 | -- | -- | -- | 150 |
| 7/16/99 4:20 | 2,436 | 350 | 400 | -- |
| 7/16/99 5:45 | -- | -- | -- | 2,600 |
| 7/16/99 6:30 | 2,449 | -125 | -100 | -- |
| 7/16/99 9:00 | 2,447 | 275 | 750 | 750 |
| 7/16/99 11:00 | 2,488 | 175 | 525 | -- |
| 7/16/99 13:12 | 2,508 | 300 | 1,250 | -- |
| 7/16/99 14:35 | -- | -- | -- | 1,125 |

Table A-15
Well HC-5 Tritium Activities
 (Page 5 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/16/99 15:04 | 2,516 | 325 | 25 | -- |
| 7/16/99 16:45 | -- | -- | -- | 1,000 |
| 7/16/99 17:00 | 2,537 | 500 | 375 | -- |
| 7/16/99 18:00 | -- | -- | -- | 325 |
| 7/16/99 18:55 | 2,556 | 325 | 500 | -- |
| 7/16/99 20:00 | 2,570 | 675 | -75 | -- |
| 7/16/99 22:00 | 2,590 | 675 | 275 | -- |
| 7/17/99 0:45 | -- | -- | -- | 650 |
| 7/17/99 2:45 | 2,618 | 600 | -25 | -- |
| 7/17/99 4:00 | -- | -- | -- | 1,150 |
| 7/17/99 5:00 | 2,635 | -50 | 3,175 | -- |
| 7/17/99 7:00 | 2,647 | 1,350 | 550 | -- |
| 7/17/99 8:40 | -- | -- | -- | 1,025 |
| 7/17/99 9:30 | 2,663 | 150 | -100 | -- |
| 7/17/99 10:40 | -- | -- | -- | 100 |
| 7/17/99 11:50 | 2,690 | 550 | 350 | -- |
| 7/17/99 13:30 | -- | -- | -- | -50 |
| 7/17/99 14:20 | 2,710 | -500 | 525 | -- |
| 7/17/99 16:45 | 2,727 | -325 | -500 | -- |
| 7/17/99 19:00 | 2,745 | 75 | -175 | -- |
| 7/17/99 20:57 | 2,761 | 125 | 2,150 | -- |
| 7/17/99 23:00 | 2,778 | 275 | -325 | 550 |
| 7/18/99 2:00 | 2,795 | -300 | 1,125 | -- |
| 7/18/99 19:20 | -- | -- | -- | 325 |
| 7/18/99 21:00 | 2,795 | 250 | 325 | -- |
| 7/18/99 23:00 | -- | -- | -- | -275 |
| 7/18/99 23:05 | 2,810 | 625 | 300 | -- |
| 7/19/99 0:30 | 2,820 | 187 | -375 | -- |
| 7/19/99 1:40 | -- | -- | -- | -560 |
| 7/19/99 3:00 | 2,835 | -936 | -510 | -- |
| 7/19/99 5:10 | 2,852 | -480 | 350 | -- |
| 7/19/99 7:30 | 2,873 | -53 | 160 | -- |

Table A-15
Well HC-5 Tritium Activities
 (Page 6 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/19/99 8:35 | -- | -- | -- | -400 |
| 7/19/99 9:35 | 2,887 | -133 | -350 | -- |
| 7/19/99 11:45 | -- | -- | -- | -25 |
| 7/19/99 11:50 | 2,900 | -125 | 525 | -- |
| 7/19/99 13:20 | -- | -- | -- | 475 |
| 7/19/99 15:05 | -- | -- | -- | 75 |
| 7/19/99 15:15 | 2,919 | 225 | 800 | -- |
| 7/19/99 16:25 | -- | -- | -- | 200 |
| 7/19/99 17:40 | -- | -- | -- | 575 |
| 7/19/99 18:00 | 2,934 | 175 | 6,000 | -- |
| 7/19/99 23:35 | -- | -- | -- | -25 |
| 7/20/99 0:05 | 2,945 | 775 | 425 | -- |
| 7/20/99 2:00 | 2,958 | -400 | 1,725 | -- |
| 7/20/99 2:05 | -- | -- | -- | 625 |
| 7/20/99 4:00 | 2,970 | 325 | 675 | -- |
| 7/20/99 18:40 | -- | -- | -- | 300 |
| 7/20/99 20:40 | -- | -- | -- | 650 |
| 7/20/99 21:02 | 2,982 | 950 | 450 | -- |
| 7/20/99 22:10 | -- | -- | -- | 750 |
| 7/20/99 22:55 | 2,993 | 0 | 600 | -- |
| 7/21/99 1:05 | -- | -- | -- | -350 |
| 7/21/99 2:00 | 3,010 | -900 | -500 | -- |
| 7/21/99 4:00 | 3,030 | -225 | -275 | -- |
| 7/21/99 4:30 | -- | -- | -- | 475 |
| 7/21/99 6:00 | 3,041 | -25 | 425 | -- |
| 7/21/99 8:00 | 3,058 | 50 | 225 | -- |
| 7/21/99 8:20 | -- | -- | -- | 700 |
| 7/21/99 10:00 | 3,086 | 350 | 975 | -- |
| 7/21/99 14:00 | 3121 | 875 | 775 | -- |
| 7/21/99 15:10 | -- | -- | -- | 1,225 |
| 7/21/99 16:05 | 3,140 | 1,000 | 500 | -- |
| 7/22/99 9:00 | -- | -- | -- | 475 |

Table A-15
Well HC-5 Tritium Activities
 (Page 7 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/22/99 13:55 | 3,169 | 450 | 125 | -- |
| 7/22/99 15:32 | -- | -- | -- | 400 |
| 7/22/99 16:00 | 3,186 | 700 | 750 | -- |
| 7/22/99 18:26 | -- | -- | -- | 425 |
| 7/22/99 19:12 | 3,207 | 525 | 650 | -- |
| 7/22/99 21:00 | 3,220 | 25 | 825 | -- |
| 7/22/99 21:50 | -- | -- | -- | 200 |
| 7/22/99 23:00 | 3,235 | -125 | 100 | -- |
| 7/23/99 1:00 | 3,245 | 25 | 825 | -- |
| 7/23/99 2:15 | -- | -- | -- | 550 |
| 7/23/99 3:00 | 3,259 | 300 | 450 | -- |
| 7/23/99 5:00 | 3,277 | -275 | -425 | -- |
| 7/23/99 7:00 | 3,290 | -25 | -300 | -- |
| 7/23/99 7:55 | -- | -- | -- | -825 |
| 7/23/99 9:05 | 3,310 | -1,525 | -625 | -- |
| 7/23/99 11:15 | 3,325 | -25 | -975 | -- |
| 7/23/99 12:35 | -- | -- | -- | -1,300 |
| 7/23/99 13:00 | 3,338 | -575 | -500 | -- |
| 7/23/99 16:00 | 3,353 | -1,150 | -1,875 | -- |
| 7/23/99 17:00 | -- | -- | -- | -1,200 |
| 7/23/99 18:00 | 3,370 | -850 | -1,200 | -- |
| 7/23/99 20:00 | 3,386 | -1,300 | -1,175 | -- |
| 7/23/99 23:00 | 3,407 | 650 | -100 | 225 |
| 7/24/99 2:05 | 3,436 | 600 | -375 | -- |
| 7/24/99 4:05 | 3,451 | 550 | 0 | -- |
| 7/24/99 6:00 | 3,469 | -100 | 1,125 | -- |
| 7/24/99 8:00 | 3,486 | -50 | 625 | -- |
| 7/24/99 10:00 | 3,505 | -250 | 325 | -- |
| 7/24/99 10:40 | -- | -- | -- | 150 |
| 7/24/99 11:45 | -- | -- | -- | 725 |
| 7/24/99 12:30 | 3,522 | 825 | 1,050 | -- |
| 7/24/99 14:30 | 3,536 | 525 | 125 | -- |

Table A-15
Well HC-5 Tritium Activities
 (Page 8 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/24/99 17:00 | -- | -- | -- | 150 |
| 7/24/99 18:30 | 3,558 | 775 | 875 | -- |
| 7/24/99 21:30 | -- | -- | -- | 600 |
| 7/25/99 16:30 | -- | -- | -- | 300 |
| 7/25/99 17:20 | -- | -- | -- | 100 |
| 7/25/99 17:50 | -- | -- | -- | -175 |
| 7/25/99 18:10 | -- | -- | -- | -25 |
| 7/25/99 18:20 | -- | -- | -- | 100 |
| 7/25/99 18:50 | -- | -- | -- | 275 |
| 7/25/99 19:15 | -- | -- | -- | 350 |
| 7/25/99 22:40 | -- | -- | -- | -25 |
| 7/26/99 3:00 | -- | -- | -- | 650 |
| 7/26/99 3:30 | -- | -- | -- | -350 |
| 7/26/99 4:30 | -- | -- | -- | 100 |
| 7/26/99 6:20 | -- | -- | -- | 225 |
| 7/26/99 13:30 | -- | -- | -- | 150 |
| 7/26/99 22:00 | -- | -- | -- | 225 |
| 7/26/99 23:40 | -- | -- | -- | -125 |
| 7/26/99 23:40 | -- | -- | -- | -375 |
| 7/27/99 3:35 | -- | -- | -- | 175 |
| 7/27/99 5:00 | -- | -- | -- | -375 |
| 7/27/99 6:30 | -- | -- | -- | 425 |
| 7/27/99 7:55 | -- | -- | -- | 1,100 |
| 7/29/99 20:37 | -- | -- | -- | 725 |
| 7/29/99 21:00 | -- | -- | -- | 75 |
| 7/29/99 22:00 | -- | -- | -- | -625 |
| 7/29/99 3:20 | -- | -- | -- | -1,075 |
| 7/29/99 3:30 | -- | -- | -- | 600 |
| 7/29/99 4:45 | -- | -- | -- | -50 |
| 7/29/99 5:40 | -- | -- | -- | -300 |
| 7/29/99 0:00 | -- | -- | -- | -375 |
| 7/29/99 7:05 | -- | -- | -- | 2,350 |

Table A-15
Well HC-5 Tritium Activities
 (Page 9 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 7/29/99 20:35 | -- | -- | -- | 2,525 |
| 7/29/99 20:37 | -- | -- | -- | 725 |
| 7/29/99 21:00 | -- | -- | -- | 75 |
| 7/29/99 22:00 | -- | -- | -- | -625 |
| 7/29/99 23:30 | -- | -- | -- | 50 |
| 7/29/99 23:40 | -- | -- | -- | 875 |
| 7/30/99 12:45 | 1,200 | 425 | -800 | -- |
| 7/30/99 14:15 | 1,200 | -475 | -275 | -- |
| 7/30/99 17:05 | -- | -- | -- | -25 |
| 7/30/99 17:50 | 1,240 | -775 | -25 | -- |
| 7/31/99 23:45 | -- | -- | -- | -50 |
| 8/1/99 4:40 | -- | -- | -- | 875 |
| 8/2/99 13:24 | -- | -- | -- | -675 |
| 8/2/99 14:40 | -- | -- | -- | -75 |
| 8/2/99 14:45 | -- | -- | -- | 325 |
| 8/2/99 16:00 | -- | -- | -- | 225 |
| 8/2/99 16:25 | -- | -- | -- | 75 |
| 8/2/99 17:25 | -- | -- | -- | -200 |
| 8/2/99 18:10 | -- | -- | -- | 550 |
| 8/2/99 18:45 | -- | -- | -- | 600 |
| 8/2/99 19:25 | -- | -- | -- | 200 |
| 8/2/99 20:35 | -- | -- | -- | 50 |
| 8/3/99 0:20 | -- | -- | -- | -25 |
| 8/3/99 1:00 | -- | -- | -- | -525 |
| 8/3/99 4:40 | -- | -- | -- | 100 |
| 8/3/99 5:10 | -- | -- | -- | 575 |
| 8/3/99 6:12 | -- | -- | -- | 125 |
| 8/3/99 6:30 | -- | -- | -- | 125 |
| 8/3/99 8:40 | -- | -- | -- | 250 |
| 8/3/99 9:50 | -- | -- | -- | 25 |
| 8/3/99 22:35 | -- | -- | -- | 1,225 |
| 8/4/99 1:10 | -- | -- | -- | 1,550 |

Table A-15
Well HC-5 Tritium Activities
 (Page 10 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 8/4/99 7:45 | -- | -- | -- | 1,825 |
| 8/4/99 8:25 | -- | -- | -- | 1,150 |
| 8/4/99 10:30 | -- | -- | -- | 1,400 |
| 8/4/99 11:00 | -- | -- | -- | 1,025 |
| 8/4/99 12:20 | -- | -- | -- | 875 |
| 8/4/99 13:45 | -- | -- | -- | 1,250 |
| 8/4/99 17:25 | -- | -- | -- | 350 |
| 8/4/99 21:40 | -- | -- | -- | 700 |
| 8/5/99 0:30 | -- | -- | -- | 1,100 |
| 8/5/99 1:15 | -- | -- | -- | 1,075 |
| 8/5/99 3:05 | -- | 975 | 475 | -- |
| 8/5/99 3:10 | -- | -- | -- | 575 |
| 8/5/99 4:30 | -- | -- | -- | 650 |
| 8/5/99 5:15 | -- | 1,050 | 1,100 | -- |
| 8/5/99 7:15 | 3,370 | 950 | 1,500 | -- |
| 8/5/99 7:20 | -- | -- | -- | 3,350 |
| 8/5/99 9:30 | 3,397 | 1,625 | 750 | -- |
| 8/5/99 10:15 | -- | -- | -- | -525 |
| 8/5/99 13:25 | -- | -- | -- | -50 |
| 8/5/99 16:25 | -- | -- | -- | 600 |
| 8/5/99 22:30 | -- | -- | -- | -125 |
| 8/5/99 22:35 | -- | -- | -- | 375 |
| 8/6/99 8:20 | -- | -- | -- | -300 |
| 8/6/99 14:00 | -- | -- | -- | -425 |
| 8/6/99 14:05 | 3,345 | 150 | 725 | -- |
| 8/6/99 15:55 | 3,472 | 50 | 500 | -- |
| 8/6/99 17:25 | -- | -- | -- | 175 |
| 8/6/99 17:30 | 3,505 | 775 | 100 | -- |
| 8/6/99 18:20 | -- | -- | -- | 2,175 |
| 8/6/99 18:20 | -- | -- | -- | 300 |
| 8/6/99 20:05 | 3,530 | -400 | 0 | -- |
| 8/6/99 20:10 | -- | -- | -- | -300 |

Table A-15
Well HC-5 Tritium Activities
 (Page 11 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 8/7/99 4:00 | -- | -- | -- | 325 |
| 8/7/99 8:00 | -- | -- | -- | 300 |
| 8/7/99 9:00 | -- | -- | -- | 475 |
| 8/9/99 8:20 | -- | -- | -- | -275 |
| 8/10/99 10:30 | -- | -- | -- | 700 |
| 8/10/99 10:30 | -- | -- | -- | 500 |
| 8/10/99 13:00 | -- | -- | -- | -300 |
| 8/11/99 9:15 | -- | -- | -- | 1,050 |
| 8/12/99 2:15 | -- | -- | -- | 550 |
| 8/12/99 2:50 | -- | -- | -- | 675 |
| 8/12/99 20:10 | -- | -- | -- | 550 |
| 8/12/99 20:20 | -- | -- | -- | 525 |
| 8/12/99 21:10 | -- | -- | -- | 775 |
| 8/12/99 22:10 | -- | -- | -- | 675 |
| 8/12/99 23:20 | -- | -- | -- | 425 |
| 8/13/99 3:30 | -- | -- | -- | 75 |
| 8/13/99 7:20 | -- | -- | -- | 75 |
| 8/13/99 10:20 | -- | -- | -- | -250 |
| 8/13/99 13:30 | -- | -- | -- | 125 |
| 8/13/99 13:35 | -- | 350 | 25 | -- |
| 8/13/99 14:30 | -- | -- | -- | 500 |

Table A-15
Well HC-5 Tritium Activities
 (Page 12 of 12)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 8/13/99 15:55 | -- | -- | -- | 425 |
| 8/13/99 16:05 | -- | 200 | 75 | -- |
| 8/13/99 18:45 | -- | -- | -- | 250 |
| 8/13/99 18:50 | -- | 800 | 475 | -- |
| 8/13/99 22:00 | -- | 850 | -- | 575 |
| 8/14/99 5:20 | -- | -- | -- | 675 |
| 8/14/99 5:55 | -- | -- | -- | 950 |
| 8/14/99 6:38 | -- | -- | -- | 825 |
| 8/14/99 7:45 | -- | -- | -- | 850 |
| 8/14/99 9:10 | -- | -- | -- | 825 |
| 8/15/99 19:00 | -- | -- | -- | 625 |
| 8/15/99 19:05 | -- | 250 | -- | -- |
| 8/16/99 7:35 | -- | -- | -- | 400 |
| 8/16/99 9:05 | -- | -- | -- | 750 |
| 8/16/99 14:10 | -- | -- | -- | 550 |
| 8/16/99 20:30 | -- | -- | -- | -25 |
| 8/17/99 1:30 | -- | -- | -- | 825 |
| 8/17/99 1:45 | -- | -- | -- | 1,300 |
| 8/17/99 9:20 | -- | -- | -- | 25 |
| 8/17/99 9:20 | -- | -- | -- | 350 |
| 8/17/99 13:40 | -- | -- | -- | 75 |
| 8/17/99 17:45 | -- | -- | -- | -325 |
| 8/18/99 8:30 | -- | -- | -- | 575 |
| 8/18/99 14:00 | -- | -- | -- | 325 |

-- = Not measured

Table A-16
Alpha and Beta Activity Measurements of
Well HC-5 Drill Cuttings
 (Page 1 of 2)

| Depth (ft) | Alpha Measurement (dpm) | Beta Measurement (dpm) |
|------------|-------------------------|------------------------|
| 100 | 45.5 | 931 |
| 200 | 34.1 | 875 |
| 300 | 0 | 1,004 |
| 400 | 5.4 | 1,013 |
| 500 | 10.9 | 995 |
| 600 | 10.9 | 1,024 |
| 700 | 0 | 1,028 |
| 800 | 21.7 | 1,072 |
| 900 | 5.4 | 967 |
| 1,000 | 5.4 | 1,048 |
| 1,100 | 0 | 1,019 |
| 1,200 | 10.9 | 895 |
| 1,387 | 22.7 | 1,383 |
| 1,580 | 45.5 | 1,315 |
| 1,610 | 51.1 | 1,403 |
| 1,673 | 45.5 | 1,304 |
| 1,700 | 27.2 | 1,578 |
| 1,750 | 48.9 | 1,532 |
| 1,790 | 10.9 | 1,271 |
| 1,810 | 32.6 | 1,304 |
| 1,830 | 38.0 | 1,606 |
| 1,910 | 54.4 | 1,619 |
| 2,010 | 54.4 | 1,435 |
| 2,100 | 16.3 | 1,389 |
| 2,160 | 61.8 | 1,348 |
| 2,250 | 40.8 | 1,573 |
| 2,300 | 43.5 | 1,440 |
| 2,400 | 51.1 | 1,274 |
| 2,500 | 40.8 | 1,400 |
| 2,550 | 41 | 1,300 |
| 2,610 | 32.6 | 1,503 |

Table A-16
Alpha and Beta Activity Measurements of
Well HC-5 Drill Cuttings
(Page 2 of 2)

| Depth (ft) | Alpha Measurement (dpm) | Beta Measurement (dpm) |
|------------|-------------------------|------------------------|
| 2,660 | 51.1 | 1,207 |
| 2,710 | 43 | 1,035 |
| 2,800 | 73.9 | 1,000 |
| 2,850 | 148 | 1,336 |
| 2,950 | 0.0 | 1,480 |
| 3,010 | 30 | 1,350 |
| 3,050 | 10 | 1,250 |
| 3,110 | 20 | 1,230 |
| 3,160 | 20 | 1,200 |
| 3,200 | 49 | 1,453 |
| 3,290 | 60 | 1,466 |
| 3,350 | 54 | 1,429 |
| 3,400 | 21.7 | 1,426 |
| 3,450 | 59.8 | 1,706 |
| 3,520 | 16.3 | 1,499 |

dpm = Disintegrations per minute

Table A-17
Well HC-5 Drilling Fluid Additives

(Page 1 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|--|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| <u>Mobilization and Setup</u> | | | | | | | | | | |
| 6/17/99 | days | -- | -- | 7,800 | -- | -- | -- | -- | -- | -- |
| 6/18/99 | M to N | -- | -- | 5,200 | 1 | -- | -- | -- | -- | 1 |
| | | | Subtotal | 13,000 | 1 | 0 | 0 | 0 | 0 | 1 |
| <u>24-in. Conventional, Mud-Rotary Drilling and Install 20-in. Casing</u> | | | | | | | | | | |
| 6/18/99 | N to M | 0 | 30 | 2,600 | -- | -- | -- | -- | -- | -- |
| 6/19/99 | M to N | 30 | 100 | 0 | -- | -- | -- | -- | -- | -- |
| 6/19/99 | N to M | 100 | 100 | 2,600 | -- | -- | -- | -- | -- | -- |
| 6/20/99 | M to N | 100 | 100 | 0 | -- | -- | -- | -- | -- | -- |
| | | | Subtotal | 5,200 | 0 | 0 | 0 | 0 | 0 | 0 |
| <u>17 1/2-in. Air-Hammer, Reverse-Circulation Drilling</u> | | | | | | | | | | |
| 6/20/99 | N to M | 100 | 180 | 2,600 | -- | 1 | 1 | -- | -- | -- |
| 6/21/99 | M to N | 180 | 270 | 7,800 | -- | 1 | 1 | -- | -- | -- |
| 6/21/99 | N to M | 270 | 305 | 2,600 | -- | 1 | 3 | -- | -- | -- |
| 6/22/99 | M to N | 305 | 350 | 0 | -- | 1 | 2 | -- | -- | -- |
| 6/22/99 | N to M | 350 | 373 | 5,200 | -- | 1 | 1 | -- | -- | -- |
| | | | Subtotal | 18,200 | 0 | 5 | 8 | 0 | 0 | 0 |
| <u>17 1/2-in. Air, Reverse-Circulation Drilling with Tricone</u> | | | | | | | | | | |
| 6/23/99 | M to N | 373 | 400 | 0 | -- | -- | 1 | -- | -- | -- |
| 6/23/99 | N to M | 400 | 560 | 7,800 | -- | 1 | 2 | 1 | -- | -- |
| 6/24/99 | M to N | 560 | 665 | 5,200 | | 2 | 2 | -- | -- | -- |
| 6/24/99 | N to M | 665 | 785 | 10,400 | 45 | 2 | 4 | -- | -- | -- |
| 6/25/99 | M to N | 785 | 880 | 10,400 | -- | 1 | 4 | -- | -- | -- |
| 6/25/99 | N to M | 880 | 880 | 0 | -- | -- | 1 | -- | -- | -- |
| 6/26/99 | M to N | 880 | 980 | 5,200 | -- | 1 | 3 | 1 | -- | -- |

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Appendix A

1999 Well Installation Report, Project Shoal Area, Churchill County, Nevada

Table A-17
Well HC-5 Drilling Fluid Additives
 (Page 2 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|--|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| | | | Subtotal | 39,000 | 45 | 7 | 17 | 2 | 0 | 0 |
| <u>17 1/2-in. Flooded-Reverse Drilling with Tricone</u> | | | | | | | | | | |
| 6/26/99 | N to M | 980 | 1,020 | 13,000 | 71 | 1 | 2 | -- | 1 | 2 |
| 6/27/99 | M to N | 1,020 | 1,090 | 5,200 | 4 | -- | -- | -- | -- | 2 |
| 6/27/99 | N to M | 1,090 | 1,200 | 7,800 | 68 | -- | -- | -- | 1 | 2 |
| | | | Subtotal | 26,000 | 143 | 1 | 2 | 0 | 2 | 6 |
| <u>Collect Downhole Geophysical Data, Install 13 3/8-in. Casing</u> | | | | | | | | | | |
| 6/28/99 | M to N | 1,200 | 1,200 | 2,600 | -- | -- | -- | -- | -- | -- |
| 6/28/99 | N to M | 1,200 | 1,200 | 0 | -- | -- | -- | -- | -- | -- |
| 6/29/99 | M to N | 1,200 | 1,200 | 0 | -- | -- | -- | -- | -- | -- |
| 6/29/99 | N to M | 1,200 | 1,200 | 0 | -- | -- | -- | -- | -- | -- |
| 6/30/99 | M to N | 1,200 | 1,200 | 0 | -- | -- | -- | -- | -- | -- |
| 6/30/99 | N to M | 1,200 | 1,200 | 0 | -- | -- | -- | -- | -- | -- |
| | | | Subtotal | 2,600 | 0 | 0 | 0 | 0 | 0 | 0 |
| <u>12 1/4-in. Air, Reverse-Circulation Drilling with Tricone</u> | | | | | | | | | | |
| 7/1/99 | M to N | 1,200 | 1,225 | 2,600 | -- | 1 | 1 | -- | -- | -- |
| 7/1/99 | N to M | 1,225 | 1,295 | 10,400 | -- | 1 | 1 | 1 | -- | -- |
| | | | Subtotal | 13,000 | 0 | 2 | 2 | 1 | 0 | 0 |
| <u>Collect Water Level Data</u> | | | | | | | | | | |
| 7/2/99 | M to N | 1,295 | 1,295 | 2,600 | -- | -- | -- | -- | -- | -- |
| 7/2/99 | N to M | 1,295 | 1,295 | 2,600 | -- | -- | -- | -- | -- | -- |
| | | | Subtotal | 5,200 | 0 | 0 | 0 | 0 | 0 | 0 |
| <u>12 1/4-in. Flooded-Reverse Circulation Drilling with Tricone</u> | | | | | | | | | | |
| 7/3/99 | M to N | 1,295 | 1,390 | 2,600 | -- | 1 | -- | 1 | 4 | 4 |
| 7/3/99 | N to M | 1,390 | 1,550 | 2,600 | -- | -- | -- | -- | 2 | -- |

Table A-17
Well HC-5 Drilling Fluid Additives
 (Page 3 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|---------|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| 7/4/99 | M to N | 1,550 | 1,640 | 5,200 | -- | 1 | -- | -- | 1 | -- |
| 7/4/99 | N to M | 1,640 | 1,673 | 0 | -- | -- | -- | -- | 3 | 1 |
| 7/5/99 | M to N | 1,673 | 1,690 | 0 | -- | -- | -- | -- | 1 | -- |
| 7/5/99 | N to M | Not on site | Not on site | 0 | -- | -- | -- | -- | -- | -- |
| 7/6/99 | M to N | 1,690 | 1,690 | 0 | -- | -- | -- | -- | -- | -- |
| 7/6/99 | N to M | 1,690 | 1,690 | 0 | -- | -- | -- | -- | -- | -- |
| 7/7/99 | M to N | 1,690 | 1,690 | 2,600 | -- | -- | -- | -- | -- | -- |
| 7/7/99 | N to M | 1,690 | 1,780 | 5,200 | -- | -- | -- | -- | 1 | 1 |
| 7/8/99 | M to N | 1,780 | 1,818 | 0 | -- | 1 | -- | -- | -- | -- |
| 7/8/99 | N to M | 1,818 | 1,818 | 0 | -- | -- | -- | -- | -- | -- |
| 7/9/99 | M to N | 1,818 | 1,820 | 0 | -- | -- | -- | -- | -- | -- |
| 7/9/99 | N to M | 1,820 | 1,875 | 0 | -- | -- | -- | -- | 1 | -- |
| 7/10/99 | M to N | 1,875 | 1,912 | 7,800 | -- | -- | -- | -- | 1 | -- |
| 7/10/99 | N to M | 1,912 | 1,927 | 2,600 | -- | -- | -- | -- | 3 | 1 |
| 7/11/99 | M to N | 1,927 | 1,960 | 2,600 | -- | -- | -- | -- | -- | -- |
| 7/11/99 | N to M | 1,960 | 2,025 | 5,200 | -- | 1 | -- | -- | 2 | 1 |
| 7/12/99 | M to N | 2,025 | 2,085 | 5,200 | -- | 1 | -- | -- | 2 | 1 |
| 7/12/99 | N to M | 2,085 | 2,130 | 2,600 | -- | 2 | -- | -- | 2 | -- |
| 7/13/99 | M to N | 2,130 | 2,143 | 0 | -- | -- | -- | -- | -- | -- |
| 7/13/99 | N to M | 2,143 | 2,175 | 0 | -- | 2 | -- | -- | -- | -- |
| 7/14/99 | M to N | 2,175 | 2,245 | 0 | -- | -- | -- | -- | -- | 1 |
| 7/14/99 | N to M | 2,245 | 2,305 | 2,600 | -- | -- | -- | -- | -- | -- |
| 7/15/99 | M to N | 2,305 | 2,350 | 0 | -- | -- | -- | -- | 1 | 1 |
| 7/15/99 | N to M | 2,350 | 2,410 | 5,200 | -- | -- | -- | -- | 3 | 1 |
| 7/16/99 | M to N | 2,410 | 2,495 | 5,200 | -- | -- | -- | -- | 2 | 1 |

Table A-17
Well HC-5 Drilling Fluid Additives
 (Page 4 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|--|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| 7/16/99 | N to M | 2,495 | 2,605 | 10,400 | -- | -- | -- | -- | 3 | -- |
| 7/17/99 | M to N | 2,605 | 2,690 | 10,400 | -- | 1 | -- | -- | 1 | 1 |
| 7/17/99 | N to M | 2,690 | 2,785 | 5,200 | -- | -- | -- | -- | 1 | -- |
| 7/18/99 | M to N | 2,785 | 2,805 | 0 | -- | -- | -- | -- | -- | -- |
| 7/18/99 | N to M | 2,805 | 2,815 | 5,200 | -- | -- | -- | -- | 5 | -- |
| 7/19/99 | M to N | 2,815 | 2,900 | 5,200 | -- | 1 | -- | -- | 2 | -- |
| 7/19/99 | N to M | 2,900 | 2,925 | 13,000 | -- | 1 | -- | -- | 4 | 1 |
| 7/20/99 | M to N | 2,925 | 2,970 | 2,600 | -- | -- | -- | -- | -- | -- |
| 7/20/99 | N to M | 2,970 | 3,000 | 7,800 | -- | 1 | -- | -- | 3 | 2 |
| 7/21/99 | M to N | 3,000 | 3,105 | 7,800 | -- | 2 | -- | -- | 2 | 1 |
| 7/21/99 | N to M | 3,105 | 3,150 | 2,600 | -- | -- | -- | -- | -- | -- |
| 7/22/99 | M to N | 3,150 | 3,160 | 5,200 | -- | -- | -- | -- | 2 | 1 |
| 7/22/99 | N to M | 3,160 | 3,240 | 7,800 | -- | -- | -- | -- | 3 | 1 |
| 7/23/99 | M to N | 3,240 | 3,330 | 5,200 | -- | -- | -- | -- | 3 | 2 |
| 7/23/99 | N to M | 3,330 | 3,415 | 7,800 | -- | -- | -- | -- | 3 | 1 |
| 7/24/99 | M to N | 3,415 | 3,520 | 5,200 | -- | 1 | -- | -- | 3 | -- |
| 7/24/99 | N to M | 3,520 | 3,565 | 2,600 | -- | -- | -- | -- | 3 | 2 |
| | | | subtotal | 161,200 | 0 | 16 | 0 | 1 | 67 | 25 |
| <u>Drill Bridges and Fill by Flooded, Reverse-Circulation</u> | | | | | | | | | | |
| 7/25/99 | M to N | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 7/25/99 | N to M | 3,565 | 3,565 | 13,000 | -- | -- | -- | -- | 8 | 3 |
| 7/26/99 | M to N | 3,565 | 3,565 | 7,800 | -- | 1 | -- | -- | 3 | 1 |
| 7/26/99 | N to M | 3,565 | 3,565 | 7,800 | -- | -- | -- | -- | 6 | 3 |
| 7/27/99 | M to N | 3,565 | 3,565 | 10,400 | -- | -- | -- | -- | 3 | 1 |
| 7/27/99 | N to M | 3,565 | 3,565 | 0 | -- | -- | -- | -- | 1 | -- |

Table A-17
Well HC-5 Drilling Fluid Additives
 (Page 5 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|---|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| 7/28/99 | M to N | Not on site | Not on site | 0 | -- | -- | -- | -- | -- | -- |
| 7/28/99 | N to M | Not on site | Not on site | 0 | -- | -- | -- | -- | -- | -- |
| 7/29/99 | M to N | 3,565 | 3,565 | 13,800 | -- | -- | -- | -- | 6 | 1 |
| 7/29/99 | N to M | 3,565 | 3,565 | 14,200 | -- | -- | -- | -- | 6 | 3 |
| 7/30/99 | M to N | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| | | | subtotal | 67,000 | 0 | 1 | 0 | 0 | 33 | 12 |
| <u>Drill Bridges and Fill by Conventional, Mud-Rotary, Cement and Redrill Hole</u> | | | | | | | | | | |
| 7/30/99 | N to M | 3,565 | 3,565 | 5,200 | -- | -- | -- | -- | 2 | 1 |
| 7/31/99 | M to N | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 7/31/99 | N to M | 3,565 | 3,565 | 3,000 | -- | -- | -- | -- | 1 | -- |
| | | | subtotal | 8,200 | 0 | 0 | 0 | 0 | 3 | 1 |
| <u>Drill Bridges and Fill by Flooded, Reverse-Circulation</u> | | | | | | | | | | |
| 8/1/99 | M to N | 3,565 | 3,565 | 0 | -- | -- | -- | -- | 1 | -- |
| 8/1/99 | N to M | 3,565 | 3,565 | 3,000 | -- | -- | -- | -- | -- | -- |
| 8/2/99 | M to N | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 8/2/99 | N to M | 3,565 | 3,565 | 33,600 | -- | 2 | -- | -- | 10 | 5 |
| 8/3/99 | M to N | 3,565 | 3,565 | 25,000 | -- | -- | -- | -- | 5 | 2 |
| 8/3/99 | N to M | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 8/4/99 | M to N | 3,565 | 3,565 | 0 | -- | -- | -- | -- | 1 | 1 |
| 8/4/99 | N to M | 3,565 | 3,565 | 21,600 | -- | -- | -- | -- | 3 | 1 |
| 8/5/99 | M to N | 3,565 | 3,565 | 16,800 | -- | -- | -- | -- | 6 | 2 |
| 8/5/99 | N to M | 3,565 | 3,565 | 16,400 | -- | -- | -- | -- | 5 | 2 |
| 8/6/99 | M to N | 3,565 | 3,565 | 2,600 | -- | 1 | -- | -- | 3 | -- |
| 8/6/99 | N to M | 3,565 | 3,565 | 13,800 | -- | 1 | -- | -- | 4 | 2 |
| | | | subtotal | 132,800 | 0 | 4 | 0 | 0 | 38 | 15 |

Table A-17
Well HC-5 Drilling Fluid Additives
 (Page 6 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|--|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| Collect Downhole Geophysical Data, Drill Bridges and Fill | | | | | | | | | | |
| 8/7/99 | M to N | 3,565 | 3,565 | 11,600 | -- | -- | -- | -- | 5 | 1 |
| 8/7/99 | N to M | 3,565 | 3,565 | 0 | -- | 2 | -- | -- | 3 | -- |
| 8/8/99 | M to N | 3,565 | 3,565 | 5,600 | -- | -- | -- | -- | -- | -- |
| 8/8/99 | N to M | 3,565 | 3,565 | 3,000 | -- | -- | -- | -- | -- | -- |
| 8/9/99 | M to N | 3,565 | 3,565 | 8,200 | -- | 1 | -- | -- | 1 | -- |
| 8/9/99 | N to M | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 8/10/99 | M to N | 3,565 | 3,565 | 5,200 | -- | -- | -- | -- | -- | -- |
| 8/10/99 | N to M | 3,565 | 3,565 | 7,800 | -- | -- | -- | -- | -- | -- |
| 8/11/99 | M to N | 3,565 | 3,565 | 2,600 | -- | 1 | -- | -- | -- | -- |
| 8/11/99 | N to M | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 8/12/99 | M to N | 3,565 | 3,565 | 5,600 | -- | -- | -- | -- | -- | 1 |
| 8/12/99 | N to M | 3,565 | 3,565 | 10,800 | 123 | -- | -- | -- | -- | -- |
| 8/13/99 | M to N | 3,565 | 3,565 | 11,200 | 66 | -- | -- | -- | 1 | -- |
| 8/13/99 | N to M | 3,565 | 3,565 | 19,800 | 150 | -- | -- | -- | -- | -- |
| 8/14/99 | M to N | 3,565 | 3,565 | 16,800 | 105 | -- | -- | -- | -- | -- |
| 8/14/99 | N to M | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 8/15/99 | M to N | 3,565 | 3,565 | 2,600 | 27 | -- | -- | -- | -- | -- |
| | | | subtotal | 110,800 | 471 | 4 | 0 | 0 | 10 | 2 |
| Construct Well | | | | | | | | | | |
| 8/15/99 | N to M | 3,565 | 3,565 | 0 | -- | -- | -- | -- | -- | -- |
| 8/16/99 | M to N | 3,565 | 3,565 | 2,600 | -- | 1 | -- | -- | -- | -- |
| 8/16/99 | N to M | 3,565 | 3,565 | 8,200 | -- | -- | -- | -- | -- | -- |
| 8/17/99 | M to N | 3,565 | 3,565 | 8,600 | -- | -- | -- | -- | -- | -- |
| 8/17/99 | N to M | 3,565 | 3,565 | 2,600 | -- | -- | -- | -- | -- | -- |

Table A-17
Well HC-5 Drilling Fluid Additives
 (Page 7 of 7)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Defoamer Used (5-gallon pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|---------|--------|------------------|----------------|---------------------------|--|---|--|--------------------------------|---|-------------------------------|
| 8/18/99 | M to N | 3,565 | 3,565 | 2,600 | -- | -- | -- | -- | -- | -- |
| 8/18/99 | N to M | 3,565 | 3,565 | 2,600 | -- | -- | -- | -- | -- | -- |
| | | | subtotal | 27,200 | 0 | 1 | 0 | 0 | 0 | 0 |
| | | | TOTAL | 629,400 | 660 | 41 | 29 | 4 | 153 | 62 |

-- = Not applicable

Table A-18
Fluid Management Samples and Results from Drilling, Well Development, and Testing of Well HC-5
 (Page 1 of 3)

| Sample Number | Sample Date | Sample Source | Gross Alpha (pCi/L) | Gross Beta (pCi/L) | Tritium (pCi/L) | Dissolved Lead (mg/L) | Comments |
|---|-------------|---------------|---------------------|--------------------|-----------------|-----------------------|---------------------------|
| <i>Drilling and Initial Well Development</i> | | | | | | | |
| PSF00008 | 6/29/99 | HC-5 well | 74 ± 10 | 83.4 ± 9.6 | -180 ± 130 | ND | |
| PSF00012 (DUP) | 6/29/99 | HC-5 well | 66.7 ± 9.1 | 79.1 ± 9.1 | -110 ± 130 | ND | |
| PSF00013 (FB) | 6/29/99 | -- | 0.47 ± 0.45 | -0.31 ± 0.63 | -80 ± 130 | ND | |
| PSF00014 | 7/5/99 | HC-5 well | 193 ± 46 | 226 ± 35 | -200 ± 170 | ND | |
| PSF00014 | -- | HC-5 well | 35.6 ± 6.1 | 24.3 ± 4.6 | -- | -- | Re-filtered & re-analyzed |
| PSF00015(DUP) | 7/5/99 | HC-5 well | 148 ± 41 | 198 ± 34 | -100 ± 170 | ND | |
| PSF00015(DUP) | -- | HC-5 well | 40.7 ± 7.1 | 24.5 ± 5.2 | -- | -- | Re-filtered & re-analyzed |
| PSF00016 (FB) | 7/5/99 | -- | 4.4 ± 1.5 | 3.1 ± 1.7 | -210 ± 170 | ND | |
| PSF00017 | 7/27/99 | HC-5 well | 184 ± 29 | 171 ± 23 | -90 ± 190 | 0.0069 | |
| PSF00017 | -- | HC-5 well | 35.1 ± 7.3 | 39.4 ± 6.1 | -- | -- | Re-filtered & re-analyzed |
| PSF00018(DUP) | 7/27/99 | HC-5 well | 188 ± 30 | 197 ± 25 | 20 ± 200 | 0.016 | |
| PSF00018(DUP) | -- | HC-5 well | 23.4 ± 6.0 | 22.6 ± 4.1 | -- | -- | Re-filtered & re-analyzed |
| PSF00019 (FB) | 7/27/99 | -- | 3.35 ± 0.81 | 2.81 ± 0.84 | -40 ± 200 | ND | |
| PSF00020 | 8/3/99 | HC-5 well | 12.5 ± 8.2 | 90 ± 12 | -70 ± 170 | ND | |
| PSF00021(DUP) | 8/3/99 | HC-5 well | 9.5 ± 7.5 | 75 ± 11 | -40 ± 170 | ND | |
| PSF00022 (FB) | 8/3/99 | -- | -2.5 ± 3.3 | 1.2 ± 6.6 | 30 ± 170 | ND | |
| <i>Airlift Development</i> | | | | | | | |
| PSF00023 | 8/24/99 | HC-5 well | 14 ± 6.2 | 26.8 ± 5 | 0 ± 190 | 0.0013 | |
| PSF00024 (DUP) | 8/24/99 | HC-5 well | 15.3 ± 5.8 | 33.3 ± 5.3 | 20 ± 190 | 0.0013 | |
| PSF00025(FB) | 8/24/99 | -- | -2.2 ± 2.8 | 3.2 ± 3.2 | 200 ± 200 | 0.0013 | |

Table A-18
Fluid Management Samples and Results from Drilling, Well Development, and Testing of Well HC-5
 (Page 2 of 3)

| Sample Number | Sample Date | Sample Source | Gross Alpha (pCi/L) | Gross Beta (pCi/L) | Tritium (pCi/L) | Dissolved Lead (mg/L) | Comments |
|---------------------------------|-------------|---------------------|---------------------|--------------------|-----------------|-----------------------|----------|
| Development/Test Pumping | | | | | | | |
| PSF00035 (FB) | 10/11/99 | -- | 4.5 ± 2.2 | 5.1 ± 1.5 | -30 ± 210 | ND | |
| PSF00036 (DUP) | 10/11/99 | HC-5 well | 4 ± 2.3 | 4.2 ± 1.5 | 30 ± 210 | ND | |
| PSF00037 | 10/11/99 | HC-5 well | 1.4 ± 1.2 | 1.7 ± 1.4 | -110 ± 200 | ND | |
| PSF00038 | 10/15/99 | HC-5 well | 4.2 ± 1.8 | 3.1 ± 1.3 | -120 ± 210 | ND | |
| PSF00039 | 10/15/99 | HC-5 and HC-7 wells | 6.9 ± 2.1 | 8 ± 1.6 | -80 ± 210 | ND | |
| PSF00040 (DUP) | 10/15/99 | HC-5 and HC-7 wells | 4.5 ± 2.3 | 8.5 ± 1.7 | -130 ± 210 | ND | |
| PSF00041 (FB) | 10/15/99 | -- | 1.1 ± 1.1 | -1.25 ± 1.3 | -130 ± 210 | ND | |
| PSF00042 | 10/22/99 | HC-5 well | 5.6 ± 2.5 | 7.8 ± 1.9 | -120 ± 210 | ND | |
| PSF00043 (DUP) | 10/22/99 | HC-5 well | -0.3 ± 2.3 | 4.3 ± 1.8 | -10 ± 210 | ND | |
| PSF00044(FB) | 10/22/99 | -- | -0.4 ± 1.1 | -0.51 ± 1.7 | -130 ± 210 | ND | |
| PSF00045 | 11/1/99 | HC-5 well | 7.9 ± 2.7 | 8.2 ± 2.1 | -90 ± 200 | ND | |
| PSF00046 (DUP) | 11/1/99 | HC-5 well | 4.6 ± 2.1 | 5.6 ± 2 | -40 ± 200 | ND | |
| PSF00047 (FB) | 11/1/99 | -- | 2.7 ± 1.2 | 0.59 ± 1.3 | -30 ± 200 | ND | |
| PSF00051 | 11/3/99 | HC-5 well | 1.4 ± 1.8 | 4.1 ± 1.5 | -40 ± 200 | ND | |
| PSF00052 (DUP) | 11/3/99 | HC-5 well | 1.4 ± 1.7 | 5.6 ± 1.6 | 30 ± 200 | ND | |
| PSF00053 (FB) | 11/3/99 | -- | -0.68 ± 0.76 | 0.21 ± 0.91 | 70 ± 200 | ND | |
| PSF00054 | 11/15/99 | HC-5 and HC-7wells | 38.4 ± 5.3 | 7.3 ± 1.9 | 90 ± 200 | ND | |
| PSF00055 (DUP) | 11/15/99 | HC-5 and HC-7wells | 35.8 ± 5 | 4.6 ± 1.6 | -90 ± 200 | ND | |
| PSF00056 (FB) | 11/15/99 | -- | 0.1 ± 1.1 | 0.41 ± 1.4 | 70 ± 200 | ND | |

Table A-18
Fluid Management Samples and Results from Drilling, Well Development, and Testing of Well HC-5
 (Page 3 of 3)

| Sample Number | Sample Date | Sample Source | Gross Alpha (pCi/L) | Gross Beta (pCi/L) | Tritium (pCi/L) | Dissolved Lead (mg/L) | Comments |
|----------------|-------------|---------------|---------------------|--------------------|-----------------|-----------------------|----------|
| PSF00060 | 11/22/99 | HC-5 well | 2.6 ± 1.7 | 2.7 ± 1.6 | -10 ± 200 | ND | |
| PSF00061 (DUP) | 11/22/99 | HC-5 well | 2.5 ± 1.7 | 1.5 ± 1.6 | -20 ± 200 | ND | |
| PSF00062 (FB) | 11/22/99 | -- | -0.1 ± 1.1 | -0.46 ± 1.4 | -80 ± 200 | ND | |
| PSF00069 | 12/6/99 | HC-5 well | 3.9 ± 1.7 | 3.4 ± 1.4 | -120 ± 210 | ND | |

FB = Field blank
 DUP = Field duplicate
 ND = Not detected
 -- = Not applicable



Appendix B
Well HC-6 Data

Table B-1
Well HC-6 Chronology
 (Page 1 of 2)

| Date and Time | Depth (ft) | Activity |
|--------------------|------------|---|
| 9/22/99 to 9/24/99 | | Move from HC-8 location to HC-6 location |
| 9/24/99 20:00 | 0 | Begin drilling HC-6 with 24-in. tricone bit by conventional mud rotary method using bentonite-based fluid |
| 9/25/99 6:10 | 100 | Complete 24-in. hole to 100 ft |
| 9/25/99 17:15 | 100 | Complete installation and grouting of 20-in. conductor casing to 100 ft |
| 9/26/99 4:00 | 100 | Begin drilling 10-in. hole by air, reverse-circulation method with downhole hammer at 100 ft |
| 9/26/99 13:35 | 362 | Stop drilling at 362 ft, trip out drill string to find air problem |
| 9/26/99 14:00 | 362 | Resume drilling 10-in. hole at 362 ft |
| 9/27/99 9:25 | 760 | Stop drilling at 760 ft to repair seals on drive head |
| 9/27/99 10:05 | 760 | Resume drilling 10-in. hole at 760 ft |
| 9/28/99 0:00 | 1,240 | Complete 10-in. hole to total depth of 1,240 ft |
| 9/28/99 0:55 | 1,240 | Complete cleaning hole prior to DRI collecting water level data |
| 9/28/99 8:15 | 1,240 | DRI completes water level monitoring (983.1 ft), resume airlifting hole |
| 9/28/99 8:50 | 1,240 | Finish airlifting hole, DRI resumes water level monitoring |
| 9/28/99 11:35 | 1,240 | DRI completes water level monitoring, trip drill string out of hole |
| 9/28/99 17:15 | 1,240 | Trip in drill string to 1,220 ft with open-face bit, prepare to airlift hole |
| 9/28/99 17:30 | 1,240 | Airlift hole from 1,220 ft |
| 9/28/99 19:15 | 1,240 | Stop airlifting, DRI resumes water level monitoring |
| 9/29/99 5:55 | 1,240 | DRI completes water level monitoring (979.1 ft), resume airlifting hole |
| 9/29/99 9:00 | 1,240 | Complete airlifting hole, trip out drill string to 980 ft, DRI prepares to collect downhole video data from 980 to 1,240 ft |
| 9/29/99 10:55 | 1,240 | DRI completes collecting downhole video data, prepare to trip drill string out of hole |
| 9/29/99 12:30 | 1,240 | Drill string out of hole, DRI prepares to collect downhole video data from surface to 1,000 ft |
| 9/29/99 14:00 | 1,240 | DRI completes collecting downhole video data, Colog prepares to collect downhole geophysical data |
| 9/30/99 12:00 | 1,240 | Colog completes collecting downhole geophysical data, prepare to install well casing |
| 9/30/99 18:30 | 1,240 | Start well casing in hole |
| 9/30/99 23:35 | 1,240 | Hang well casing at design depth of 1,233.7 ft bgs, slotted interval 1,115.98 to 1,233.7 ft bgs, prepare to install filter pack |
| 10/1/99 4:35 | 1,240 | Complete installation of 3/8-in. gravel to 1,105 ft bgs, prepare to install 6/9 sand |
| 10/1/99 7:10 | 1,240 | Complete installation of 6/9 sand to 975 ft bgs, prepare to install 3/8-in. gravel to design depth of 970 ft |
| 10/1/99 8:00 | 1,240 | Complete filter pack installation to design depth of 970 ft bgs, prepare to pull tremie and install grout seal |
| 10/1/99 14:30 | 1,240 | Complete installation of cement grout seal from surface to 69 ft bgs (top of cement basket) |

Table B-1
Well HC-6 Chronology
 (Page 2 of 2)

| Date and Time | Depth (ft) | Activity |
|----------------|------------|--|
| 10/2/99 8:45 | | Prepare to install pump in HC-6 |
| 10/2/99 10:30 | | Start HC-6 pump installation |
| 10/2/99 16:30 | | Pump installed to 1,208 ft |
| 10/2/99 17:47 | | Start pump development/aquifer test |
| 10/4/99 14:56 | | Complete pump development/aquifer test |
| 10/4/99 15:15 | | Start removal of pump |
| 10/5/99 11:30 | | Complete pump removal |
| 10/7/99 18:45 | | Colog prepares to rerun deviation survey |
| 10/7/99 20:30 | | Colog finishes deviation survey |
| 10/8/99 12:30 | | DRI/PRG prepares to collect borehole radar data |
| 10/8/99 19:15 | | DRI/PRG finishes collecting borehole radar data |
| 10/14/99 8:00 | | DRI/PRG prepares to collect borehole radar data |
| 10/14/99 16:00 | | DRI/PRG finishes collecting borehole radar data |
| 10/15/99 7:30 | | DRI/PRG prepares to collect crosshole borehole radar (tomography) data between HC-6 and HC-7 |
| 10/15/99 12:00 | | DRI/PRG finishes collecting crosshole borehole radar (tomography) data between HC-6 and HC-7, unsuccessful |
| 10/18/99 11:30 | | DRI/PRG prepares to collect crosshole borehole radar (tomography) data between HC-6 and HC-7 |
| 10/18/99 14:00 | | DRI/PRG finishes collecting crosshole borehole radar (tomography) data between HC-6 and HC-7, unsuccessful |
| 11/3/99 17:51 | | DRI begins injecting NaI, NaH ¹³ CO ₃ , and D ₂ O |
| 11/10/99 17:00 | | DRI begins injecting LiCl, LiBr, PFBA, and NaOH |
| 11/28/99 16:00 | | DRI begins injecting CsCl |

**Table B-2
Well HC-6 Fluoride Concentrations During Drilling**

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 9/25/99 0:30 | -- | -- | -- | -- | -- | 25.8 | 37.10 | TC |
| 9/25/99 0:45 | 66 | -- | -- | 25.3 | 7.23 | -- | -- | TC |
| 9/25/99 4:35 | 91 | -- | -- | 25.2 | 5.99 | -- | -- | TC |
| 9/26/99 16:13 | -- | -- | -- | -- | -- | 26 | 35.50 | TC |
| 9/26/99 6:15 | 170 | 26.00 | 25.20 | 25.3 | 4.12 | -- | -- | TC |
| 9/26/99 6:25 | -- | -- | -- | -- | -- | 25.2 | 6.03 | TC |
| 9/26/99 8:30 | 256 | 25.60 | 7.64 | 25.4 | 3.26 | -- | -- | TC |
| 9/26/99 10:00 | 302 | 25.60 | 3.74 | 25.3 | 3.26 | -- | -- | TC |
| 9/26/99 14:10 | 365 | 25.40 | 3.15 | 25.2 | 0.97 | -- | -- | TC |
| 9/26/99 15:30 | 386 | 26.10 | 11.70 | 26.2 | 2.04 | -- | -- | TC |
| 9/26/99 19:30 | 470 | 24.60 | 23.20 | 25.4 | 5.73 | -- | -- | TC |
| 9/27/99 2:35 | 613 | 25.60 | 38.90 | 25.5 | 14.9 | -- | -- | TJC |
| 9/27/99 7:30 | 706 | 25.40 | 37.00 | 25.6 | 2.54 | -- | -- | TJC |
| 9/27/99 10:40 | 780 | 25.70 | 27.40 | 25.7 | 1.52 | -- | -- | TJC |
| 9/27/99 14:20 | 900 | 25.50 | 35.70 | 25.4 | 5.7 | -- | -- | TC |
| 9/27/99 15:20 | 940 | 25.20 | 36.00 | 25.7 | 19.2 | -- | -- | TC |
| 9/27/99 16:20 | 975 | 25.10 | 30.60 | 25.4 | 1.95 | -- | -- | TC |
| 9/27/99 17:20 | 1,013 | 24.20 | 42.30 | 24.4 | 8.79 | -- | -- | TC |
| 9/27/99 18:20 | 1,048 | 24.60 | 34.70 | 24.8 | 0.89 | -- | -- | TC |
| 9/27/99 19:20 | 1,080 | 24.80 | 31.30 | 24.9 | 1.36 | -- | -- | TC |
| 9/27/99 20:25 | 1,110 | 25.10 | 25.80 | 24.8 | 1.63 | -- | -- | TC |
| 9/27/99 21:20 | 1,140 | 24.00 | 13.60 | 24.6 | 1.21 | -- | -- | TC |
| 9/27/99 22:20 | 1,170 | 24.00 | 22.90 | 24.4 | 1.62 | -- | -- | TC |
| 9/27/99 23:13 | -- | -- | -- | -- | -- | 25.9 | 43.80 | TJC |
| 9/27/99 23:35 | 1,220 | 26.10 | 39.10 | 25.3 | 17.6 | -- | -- | TJC |

-- = Not measured

**Table B-3
Well HC-6 Well Development Parameters During Airlifting**

| | | | | | | | | | | | |
|--|------------------------|---|--------------------------|------------------------------------|--|-------------------------|--------------------------------------|------------------------------------|----------------------------|-----------------|------------------------------|
| Well Number: HC-6 | | Start Time/Date: <u>9/28/99 0:00</u> | | End Date/Time: <u>9/29/99 8:58</u> | | | | | | | |
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | |
| Test Type: <u>Airlift Development</u> | | Initial SWL: 983.1 | | End SWL: 979.1 | | | | | | | |
| Sample Team: <u>Welcher, Dunn-West</u> | | Sample Type: <u>Grab</u> | | | | | | | | | |
| Development Method: <u>Airlift through Drill Rods in Open Borehole</u> | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured (or estimated) Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | F (mg/L) | H³ (pCi/L) |
| AMW | 9/28/99 | 0:00 | | start pumping | | | | | | | |
| AMW | 9/28/99 | 0:00 | 0:55 | 55 | 20 | 1,100 | 55 | 1,100 | -- | -- | -- |
| AMW | 9/28/99 | 8:20 | 8:28 | 8 | 100 | 800 | 63 | 1,900 | 8:28 | 1.45 | -559 |
| AMW | 9/28/99 | 8:28 | 8:37 | 9 | 5 | 45 | 72 | 1,945 | 8:37 | 1.14 | -412 |
| AMW | 9/28/99 | 8:37 | 8:43 | 6 | 5 | 30 | 78 | 1,975 | 8:43 | 1.15 | -617 |
| AMW | 9/28/99 | 8:43 | 8:45 | 2 | 5 | 10 | 80 | 1,985 | -- | -- | -- |
| SDW | 9/28/99 | 17:30 | 17:37 | 7 | 50 | 350 | 87 | 2,335 | 17:30 | 0.0 | -233 |
| SDW | 9/28/99 | 17:37 | 17:40 | 3 | 40 | 120 | 90 | 2,455 | 17:37 | 0.0 | 700 |
| SDW | 9/28/99 | 17:40 | 17:45 | 5 | 30 | 150 | 95 | 2,605 | 17:45 | 0.0 | 500 |
| SDW | 9/28/99 | 17:45 | 17:55 | 10 | 15 | 150 | 105 | 2,755 | -- | -- | -- |
| SDW | 9/28/99 | 17:55 | 18:00 | 5 | 15 | 75 | 110 | 2,830 | 18:00 | 0.0 | 1,167 |
| SDW | 9/28/99 | 18:00 | 18:05 | 5 | 10 | 50 | 115 | 2,880 | -- | -- | -- |
| SDW | 9/28/99 | 18:05 | 19:00 | 55 | 6 | 330 | 170 | 3,210 | -- | -- | -- |
| SDW | 9/28/99 | 19:00 | 19:15 | 15 | 6 | 90 | 185 | 3,300 | -- | -- | -- |
| AMW | 9/29/99 | 5:55 | 6:20 | 25 | 20 | 500 | 210 | 3,800 | 6:20 | 0.476 | 88 |
| AMW | 9/29/99 | 6:20 | 8:18 | 118 | 20 | 2,360 | 328 | 6,160 | -- | -- | -- |
| AMW | 9/29/99 | 8:18 | 8:47 | 29 | 20 | 580 | 357 | 6,740 | 8:47 | 0.514 | 118 |
| AMW | 9/29/99 | 8:47 | 8:58 | 11 | 20 | 220 | 368 | 6,960 | 8:58 | 0.395 | -30 |
| AMW | 9/29/99 | 8:58 | | stop pumping | | | | | | | |

-- = Not measured
SWL = Static water level

Table B-4
Well HC-6 Well Development Parameters During Pumping
 (Page 1 of 2)

| | | | | | |
|-----------------|--|------------------|---------------------------|----------------|----------------------------|
| Well Number: | HC-6 | Start Time/Date: | <u>10/2/99 17:57</u> | End Date/Time: | <u>10/4/99 14:56</u> |
| Project No: | 799419.0056.0005 | Project Name: | Project Shoal Area | | |
| Test Type: | <u>Pumping</u> | Initial SWL: | Not Measured | End SWL: | Not Measured Datum: T.O.C. |
| Sample Team: | <u>Chavez, Cherry, Coburn, Forsgren, Welcher</u> | Sample Type: | <u>Grab</u> | | |
| Testing Method: | <u>Submersible Pump</u> | | | | |

| Initials | Date (mm/dd/yy) | Time (hh:mm) | Totalizer Reading (gallons) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Volume (gallons) | Cumulative Duration (minutes) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------|-----------------------------|--------------------|-------------------------------|------------------|-----------------------------|-------------------------------|-------------------------|--|-----------|----------|------------------------|
| fmf | 10/2/99 | 17:57 | 422,992 | | start pumping | | | | | | | | |
| fmf | 10/2/99 | 20:40 | 423,675 | 163 | 4.2 | 683 | 683 | 163 | 22.8 | 1,063 | 7.54 | -- | -- |
| fmf | 10/2/99 | 21:46 | 423,940 | 66 | 4.0 | 265 | 948 | 229 | 22.6 | 1,051 | 7.82 | 0.00 | 515 |
| fmf | 10/2/99 | 23:43 | 424,400 | 117 | 3.9 | 460 | 1,408 | 346 | 22.7 | 1,052 | 7.72 | -- | -- |
| TJC | 10/3/99 | 1:30 | 424,981 | 107 | 5.4 | 581 | 1,989 | 453 | 22.2 | 1,030 | 7.40 | 0.05 | 515 |
| TJC | 10/3/99 | 3:30 | 425,300 | 120 | 2.7 | 319 | 2,308 | 573 | 22.4 | 1,063 | 7.45 | 0.03 | 636 |
| TJC | 10/3/99 | 5:45 | 425,640 | 135 | 2.5 | 340 | 2,648 | 708 | 21.8 | 1,060 | 7.46 | 0.00 | 818 |
| TJC | 10/3/99 | 7:30 | 426,205 | 105 | 5.4 | 565 | 3,213 | 813 | 22.7 | 1,060 | 7.39 | 0.03 | 0 |
| TJC | 10/3/99 | 9:55 | 426,774 | 145 | 3.9 | 569 | 3,782 | 958 | 23.7 | 1,103 | 7.42 | 0.03 | 151 |
| AMW | 10/3/99 | 11:12 | 427,058 | 77 | 3.7 | 284 | 4,066 | 1,035 | -- | -- | -- | -- | -- |
| fmf | 10/3/99 | 12:40 | 427,397 | 88 | 3.9 | 339 | 4,405 | 1,123 | 24.1 | 1,123 | 7.58 | -- | -- |
| fmf | 10/3/99 | 14:04 | 427,716 | 84 | 3.8 | 319 | 4,724 | 1,207 | 24.0 | 1,112 | 7.11 | 0.42 | 546 |
| fmf | 10/3/99 | 16:29 | 428,263 | 145 | 3.8 | 547 | 5,271 | 1,352 | 23.7 | 1,115 | 7.45 | -- | -- |
| fmf | 10/3/99 | 18:09 | 428,635 | 100 | 3.7 | 372 | 5,643 | 1,452 | 23.3 | 1,114 | 7.30 | 0.47 | 61 |
| fmf | 10/3/99 | 20:20 | 429,127 | 131 | 3.8 | 492 | 6,135 | 1,583 | 22.8 | 1,102 | 7.53 | -- | -- |
| fmf | 10/3/99 | 22:28 | 429,604 | 128 | 3.7 | 477 | 6,612 | 1,711 | 22.7 | 1,085 | 7.59 | 0.33 | 1,037 |

B-5

Appendix B

1999 Well Installation Report, Project Shoal Area, Churchill County, Nevada

Table B-4
Well HC-6 Well Development Parameters During Pumping
 (Page 2 of 2)

| Initials | Date (mm/dd/yy) | Time (hh:mm) | Totalizer Reading (gallons) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Volume (gallons) | Cumulative Duration (minutes) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------|-----------------------------|--------------------|-------------------------------|------------------|-----------------------------|-------------------------------|-------------------------|--|-----------|----------|------------------------|
| TC | 10/4/99 | 0:39 | 430,092 | 131 | 3.7 | 488 | 7,100 | 1,842 | 22.5 | 1,095 | 7.59 | -- | -- |
| TC | 10/4/99 | 2:36 | 430,546 | 117 | 3.9 | 454 | 7,554 | 1,959 | 21.1 | 1,043 | 7.55 | 0.33 | 1,333 |
| TC | 10/4/99 | 4:39 | 430,735 | 123 | 1.5 | 189 | 7,743 | 2,082 | 25.6 | 1,092 | 7.50 | -- | -- |
| TC | 10/4/99 | 6:45 | 431,251 | 126 | 4.1 | 516 | 8,259 | 2,208 | 21.9 | 1,061 | 7.64 | 0.71 | 1,167 |
| TC | 10/4/99 | 8:45 | 431,603 | 120 | 2.9 | 352 | 8,611 | 2,328 | 22.7 | 1,052 | 7.57 | -- | -- |
| BAC | 10/4/99 | 10:45 | 432,146 | 120 | 4.5 | 543 | 9,154 | 2,448 | 23.8 | 1,119 | 7.48 | 0.40 | 1,000 |
| fmf | 10/4/99 | 13:25 | 432,628 | 160 | 3.0 | 482 | 9,636 | 2,608 | 23.9 | 1,113 | 6.84 | -- | -- |
| fmf | 10/4/99 | 14:56 | 432,960 | 91 | 3.6 | 332 | 9,968 | 2,699 | 24.0 | 1,108 | 7.54 | 0.38 | 123 |
| fmf | 10/4/99 | 14:56 | | | stop pumping | | | | | | | | |

-- = Not measured
 S.U. = Standard units

**Table B-5
Well HC-6 Water Balance**

| | | Credit | Debit | Balance |
|---|--|--------|--------|---------|
| Total Amount of Water Delivered to HC-6 by Lang Drilling (9/22-10/1) | | | | |
| 36,400 | gallons of water used to drill HC-6 | 31,200 | 0 | 31,200 |
| HC-6 Fluids Discharged during Drilling | | | | |
| 17,683 | gallons of HC-6 fluid discharged during drilling | 0 | 17,683 | 13,517 |
| Fluid Discharged during Airlifting | | | | |
| 6,960 | gallons of water discharged during airlift development (9/28-29) | 0 | 6,960 | 6,557 |
| Fluid Discharged during Pumping | | | | |
| 9,968 | gallons of water discharged during aquifer test (10/2-4) | 0 | 9,968 | -3,411 |

**Table B-6
Well HC-6 Water Level Measurements**

| Date | Depth to Water (ft) | Water Level Elevation (ft msl) | Comments |
|---------------|---------------------|--------------------------------|---|
| 9/28/99 8:00 | 983.1 | 4,245.62 | Static water level measured prior to airlift development |
| 9/29/99 5:24 | 979.1 | 4,249.62 | Static water level measured prior to airlift development |
| 10/14/99 7:45 | 980 | 4,248.72 | Static water level measured post development/test pumping |

msl = Mean sea level

Table B-7
Well HC-6 Downhole Geophysical Data Collected

| Geophysical Tool | Date | Top of Interval (ft bgs) | Bottom of Interval (ft bgs) | Interval (ft) | Contractor |
|--|---------|--------------------------|-----------------------------|---------------|-------------|
| 3-Arm Caliper | 9/29/99 | 87 | 1,238 | 1,151 | Colog, Inc. |
| Temperature/ Δ Temperature | 9/29/99 | 980 | 1,237 | 257 | Colog, Inc. |
| Natural Gamma/Guard Resistivity/Epithermal Neutron | 9/29/99 | 0 | 1,238 | 1,238 | Colog, Inc. |
| Formation Density | 9/29/99 | 980 | 1,236 | 256 | Colog, Inc. |
| Spectral Gamma Ray (K, U, Th) | 9/29/99 | 87 | 1,228 | 1,141 | Colog, Inc. |
| Acoustic Borehole Televiewer | 9/30/99 | 981 | 1,235 | 254 | Colog, Inc. |
| Deviation | 9/30/99 | 0 | 1,232 | 1,232 | Colog, Inc. |

K = Potassium
U = Uranium
Th = Thorium

Table B-8
Well HC-6 Tritium Activities During Drilling
(Page 1 of 2)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|-----------------------------------|---------------------|-------------------------|-------------------------|---------------------|
| 9/25/99 0:30 | -- | -- | -- | 1,033 |
| 9/25/99 0:45 | 66 | -- | 2,533 | -- |
| 9/25/99 4:35 | 91 | -- | 1,667 | -- |
| 9/26/99 6:15 | 170 | 500 | 1,267 | -- |
| 9/26/99 6:25 | -- | -- | -- | 267 |
| 9/26/99 8:30 | 256 | -100 | 433 | -- |
| 9/26/99 10:00 | 302 | 1,167 | 433 | -- |
| 9/26/99 14:10 | 365 | 367 | -67 | -- |
| 9/26/99 15:10 | 386 | 267 | -533 | -- |
| 9/26/99 16:13 | -- | -- | -- | 133 |
| 9/26/99 17:30 | 425 | 1,033 | 767 | -- |
| 9/26/99 19:30 | 470 | 667 | 933 | -- |
| 9/26/99 21:30 | 512 | 1,000 | 800 | -- |
| 9/27/99 14:20 | 900 | 467 | 67 | -- |
| 9/27/99 16:20 | 975 | 833 | 467 | -- |
| 9/27/99 18:20 | 1,048 | 33 | 33 | -- |
| 9/27/99 20:25 | 1,110 | 567 | 867 | -- |
| 9/27/99 22:20 | 1,170 | 467 | 867 | -- |

Table B-8
Well HC-6 Tritium Activities During Drilling
 (Page 2 of 2)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|---------------------------|----------------------------|-------------------------------|------------------------|
| 9/27/99 23:13 | -- | -- | -- | -735 |
| 9/27/99 23:35 | 1,220 | 500 | -967 | -- |
| 9/28/99 17:30 | 1,220 | -- | -233 | -- |
| 9/28/99 17:37 | 1,220 | -- | 700 | -- |
| 9/28/99 17:45 | 1,220 | -- | 500 | -- |
| 9/28/99 18:00 | 1,220 | -- | 1,167 | -- |
| 9/29/99 6:20 | -- | -- | 88 | -- |
| 9/29/99 6:20 | -- | -- | 529 | -- |
| 9/29/99 8:47 | -- | -- | 118 | -- |
| 9/29/99 8:58 | -- | -- | -30 | -- |

-- = Not measured

Table B-9
**Alpha and Beta Activity Measurements of
 Well HC-6 Drill Cuttings**

| Depth (ft) | Alpha Measurement (dpm) | Beta Measurement (dpm) |
|---------------|----------------------------|---------------------------|
| 100 | 19.6 | 1,155 |
| 200 | 45.8 | 1,139 |
| 320 | 6.5 | 1,171 |
| 400 | 6.5 | 835 |
| 400 | 39.2 | 1,283 |
| 500 | 52.3 | 1,130 |
| 620 | 26.1 | 1,247 |
| 710 | 6.5 | 744 |

dpm = Disintegrations per minute

**Table B-10
Well HC-6 Drilling Fluid Additives**

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Soda Ash Used (50-pound bags) |
|---|--------|------------------|----------------|---------------------------|--|---|--|-------------------------------|
| 24-in. Conventional, Mud-Rotary Drilling and Install 20-in. Casing | | | | | | | | |
| 9/22/99 | N to M | 0 | 0 | 2,600 | -- | -- | -- | -- |
| 9/23/99 | M to N | 0 | 0 | 7,800 | 41 | -- | -- | 1 |
| 9/23/99 | N to M | 0 | 0 | -- | -- | -- | -- | -- |
| 9/24/99 | M to N | 0 | 0 | -- | -- | -- | -- | -- |
| 9/24/99 | N to M | 0 | 57 | -- | 14 | -- | -- | -- |
| 9/25/99 | M to N | 57 | 100 | 5,200 | 9 | -- | -- | -- |
| 9/25/99 | N to M | 100 | 100 | -- | -- | 1 | 1 | -- |
| | | | Subtotal | 15,600 | 64 | 1 | 1 | 1 |
| 10-in. Air-Hammer, Reverse-Circulation Drilling | | | | | | | | |
| 9/26/99 | M to N | 100 | 340 | 2,600 | -- | -- | -- | -- |
| 9/26/99 | N to M | 340 | 575 | 5,200 | -- | 1 | -- | -- |
| 9/27/99 | M to N | 575 | 820 | -- | -- | -- | -- | -- |
| 9/27/99 | N to M | 820 | 1,220 | 5,200 | -- | 1 | -- | -- |
| 9/28/99 | M to N | 1,220 | 1,240 | -- | -- | -- | -- | -- |
| | | | Subtotal | 13,000 | 0 | 2 | 0 | 0 |
| Collect Water Level Data and Downhole Geophysical Data | | | | | | | | |
| 9/28/99 | N to M | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 9/29/99 | M to N | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 9/29/99 | N to M | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 9/30/99 | M to N | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| | | | Subtotal | 0 | 0 | 0 | 0 | 0 |
| Construct Well | | | | | | | | |
| 9/30/99 | N to M | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 10/1/99 | M to N | 1,240 | 1,240 | 2,600 | 1 | -- | -- | -- |
| | | | Subtotal | 2,600 | 1 | 0 | 0 | 0 |
| | | | TOTAL | 31,200 | 65 | 3 | 1 | 1 |

-- = Not applicable

**Table B-11
Fluid Management Samples and Results from Drilling, Well Development,
and Testing of Well HC-6**

| Sample Number | Sample Date | Sample Source | Gross Alpha (pCi/L) | Gross Beta (pCi/L) | Tritium (pCi/L) | Dissolved Lead (mg/L) | Comments |
|----------------|-------------|---------------|------------------------|-----------------------|--------------------|--------------------------|----------|
| PSF00032 (FB) | 10/5/99 | -- | 1.75 ± 0.8 | 2.4 ± 1.1 | 40 ± 220 | ND | |
| PSF00033 (DUP) | 10/5/99 | HC-6 Well | 8.6 ± 2.3 | 10.4 ± 1.7 | 100 ± 220 | ND | |
| PSF00034 | 10/5/99 | HC-6 Well | 9.1 ± 2.4 | 10.4 ± 1.7 | -30 ± 210 | ND | |

FB = Field blank
DUP = Field duplicate
ND = Not detected
-- = Not applicable



Appendix C
Well HC-7 Data

Table C-1
Well HC-7 Chronology
 (Page 1 of 2)

| Date and Time | Depth (ft) | Activity |
|--------------------|------------|---|
| 9/30/99 to 10/3/99 | | Move from HC-6 location to HC-7 location |
| 10/3/99 7:00 | 0 | Begin drilling HC-7 with 24-in. tricone bit |
| 10/3/99 12:40 | 100 | Complete 24-in. hole to 100 ft |
| 10/3/99 21:15 | 100 | Complete installation and grouting of 20-in. conductor casing |
| 10/4/99 6:45 | 100 | Began drilling 10-in. hole by air, RC method with downhole hammer |
| 10/5/99 9:45 | 923 | Trip out drill string to check potential bit problem |
| 10/5/99 20:40 | 923 | Resume drilling 10-in. hole |
| 10/6/99 4:15 | 1,240 | Complete 10-in. hole |
| 10/6/99 5:10 | 1,240 | Complete flushing hole prior to DRI collecting water level data |
| 10/6/99 8:45 | 1,240 | DRI finishes collecting water level data (approximately 1,000 ft), trip out drill string |
| 10/6/99 14:30 | 1,240 | Trip in drill string to 1,220 ft with open-face bit, preparing to airlift hole |
| 10/6/99 14:46 | 1,240 | Airlift hole from 1,220 ft |
| 10/6/99 17:03 | 1,240 | Stop airlifting, trip out drill string to 980 ft, DRI prepares to run video log from 980 to 1,240 ft |
| 10/6/99 18:45 | 1,240 | DRI completes video logging, prepare to trip drill string out of hole |
| 10/6/99 20:10 | 1,240 | Drill string out of hole, DRI prepares to run video log from surface to 1,000 ft |
| 10/6/99 22:25 | 1,240 | DRI completes video logging, Colog prepares to collect downhole geophysical data |
| 10/7/99 18:30 | 1,240 | Colog completes collecting downhole geophysical data, prepare to install well casing |
| 10/7/99 21:30 | 1,240 | Start well casing in hole |
| 10/7/99 23:45 | 1,240 | Hang well casing at depth of 1,225.1 ft bgs, top of screen at 1,106.47 ft bgs, prepare to install filter pack |
| 10/8/99 2:30 | 1,240 | Plug tremie while installing filter pack, pull tremie |
| 10/8/99 8:00 | 1,240 | Start filter pack in from surface |
| 10/8/99 10:30 | 1,240 | Complete installation of 3/8-in. gravel to 1,100 ft bgs, prepare to install 6/9 sand |
| 10/8/99 11:35 | 1,240 | Complete installation of 6/9 sand to 980 ft bgs, prepare to pull tremie |
| 10/8/99 13:10 | 1,240 | Colog prepares to collect 4 pi data |
| 10/8/99 14:15 | 1,240 | Colog finishes collecting 4 pi data |
| 10/8/99 16:00 | 1,240 | Prepare to install grout seal |
| 10/8/99 20:45 | 1,240 | Complete installation of cement grout seal from surface to 66 ft bgs (top of cement basket) |
| 10/12/99 7:30 | | DRI/PRG prepares to collect borehole radar data |
| 10/12/99 19:00 | | DRI/PRG finishes collecting borehole radar data |
| 10/13/99 10:00 | | DRI/PRG prepares to collect borehole radar data |

Table C-1
Well HC-7 Chronology
(Page 2 of 2)

| Date and Time | Depth (ft) | Activity |
|----------------------|-------------------|--|
| 10/13/99 16:30 | | DRI/PRG finishes collecting borehole radar data |
| 10/15/99 7:30 | | DRI/PRG prepares to collect crosshole borehole radar (tomography) data between HC-6 and HC-7 |
| 10/15/99 12:00 | | DRI/PRG finishes collecting crosshole borehole radar (tomography) data between HC-6 and HC-7, unsuccessful |
| 10/18/99 11:30 | | DRI/PRG prepares to collect crosshole borehole radar (tomography) data between HC-6 and HC-7 |
| 10/18/99 14:00 | | DRI/PRG finishes collecting crosshole borehole radar (tomography) data between HC-6 and HC-7, unsuccessful |
| 10/18/99 14:40 | | Start HC-7 pump installation |
| 10/19/99 11:00 | | Pump installed to 1,208 ft |
| 10/27/99 19:00 | | Start Phase I development/test pumping |
| 10/28/99 6:00 | | Stop Phase I development/test pumping |
| 10/28/99 20:30 | | Start Phase II development/test pumping |
| 11/29/99 | | Phase II development/test pumping in progress, IT suspends monitoring |

**Table C-2
Well HC-7 Fluoride Concentrations During Drilling**

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 10/3/99 19:10 | -- | -- | -- | -- | -- | 25.00 | 31.00 | JS |
| 10/4/99 9:12 | 196 | 25.60 | 19.00 | 25.50 | 18.00 | -- | -- | TC |
| 10/4/99 10:10 | -- | -- | -- | -- | -- | 25.30 | 36.90 | TC |
| 10/4/99 12:10 | 300 | 26.00 | 31.30 | 25.60 | 28.50 | -- | -- | JS |
| 10/4/99 13:30 | -- | -- | -- | -- | -- | 25.9 | 24.9 | JS |
| 10/4/99 15:15 | 420 | 25.90 | 31.10 | 25.30 | 17.40 | -- | -- | JS |
| 10/4/99 18:30 | 500 | 25.60 | 2.28 | 25.70 | 28.30 | -- | -- | JS |
| 10/4/99 23:00 | 600 | 25.70 | 28.30 | 25.60 | 2.58 | -- | -- | JS |
| 10/5/99 2:20 | 700 | 26.30 | 20.40 | 26.30 | 1.65 | -- | -- | TC |
| 10/5/99 5:05 | 800 | 26.10 | 12.60 | 26.00 | 1.42 | -- | -- | TC |
| 10/5/99 6:05 | 835 | 26.00 | 6.77 | 25.70 | 0.39 | -- | -- | TC |
| 10/5/99 7:10 | 870 | 25.10 | 4.94 | 25.10 | 0.08 | -- | -- | TC |
| 10/5/99 8:10 | 905 | 25.70 | 4.03 | 25.50 | 0.45 | -- | -- | TC |
| 10/5/99 9:15 | 922 | 25.20 | 4.46 | 25.40 | 3.20 | -- | -- | TC |
| 10/5/99 21:35 | 943 | 25.80 | 0.00 | 25.70 | 0.00 | -- | -- | JS |
| 10/5/99 22:35 | 982 | 25.30 | 0.00 | 25.60 | 0.00 | -- | -- | JS |
| 10/5/99 23:40 | -- | -- | -- | -- | -- | 25.8 | 32.4 | JS |
| 10/6/99 10:22 | 1,022 | 26.70 | 0.00 | 26.30 | 0.00 | -- | -- | TC |
| 10/6/99 1:00 | 1,070 | 26.60 | 0.00 | 26.30 | 0.00 | -- | -- | TC |
| 10/6/99 2:00 | 1,120 | 26.50 | 8.49 | 26.60 | 0.00 | -- | -- | TC |
| 10/6/99 3:00 | 1,170 | 27.00 | 37.70 | 26.70 | 0.00 | -- | -- | TC |
| 10/6/99 4:05 | 1,220 | 26.50 | 36.40 | 26.70 | 0.00 | -- | -- | TC |

-- = Not measured

**Table C-3
Well HC-7 Well Development Parameters During Airlifting**

| | | | | | | | |
|---------------------|--|------------------|---------------------------|----------------|----------------------|--------|--------|
| Well Number: | HC-7 | Start Time/Date: | <u>10/6/99 4:15</u> | End Date/Time: | <u>10/6/99 17:03</u> | | |
| Project No: | 799419.0056.0005 | Project Name: | Project Shoal Area | | | | |
| Test Type: | <u>Airlift Development</u> | Initial SWL: | 1,156 | End SWL: | 997 | Datum: | T.O.C. |
| Sample Team: | <u>Forsgren, Fritts</u> | Sample Type: | <u>Grab</u> | | | | |
| Development Method: | <u>Airlift through Drill Rods in Open Borehole</u> | | | | | | |

| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------------|-------------------|--------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|-------------------------|--|-----------|----------|------------------------|
| JF | 10/6/99 | 4:15 | | start airlifting | | | | | | | | | | |
| JF | 10/6/99 | 4:15 | 5:15 | 60 | 25 | 1,500 | 60 | 1,500 | -- | -- | -- | -- | -- | -- |
| fmf | 10/6/99 | 14:46 | 15:00 | 14 | 33.7 | 472 | 74 | 1,972 | -- | -- | -- | -- | -- | -- |
| fmf | 10/6/99 | 15:00 | 15:10 | 10 | 33.7 | 337 | 84 | 2,309 | 15:10 | 15.6 | 1,450 | 7.49 | -- | -- |
| fmf | 10/6/99 | 15:10 | 15:15 | 5 | 14.2 | 71 | 89 | 2,380 | 15:15 | -- | -- | -- | 0.0 | 1,030 |
| fmf | 10/6/99 | 15:15 | 15:45 | 30 | 9.2 | 276 | 119 | 2,656 | 15:45 | 15.2 | 1,440 | 7.89 | -- | -- |
| fmf | 10/6/99 | 15:45 | 16:15 | 30 | 8.3 | 249 | 149 | 2,905 | 16:15 | 15.3 | 1,450 | 8.00 | -- | -- |
| fmf | 10/6/99 | 16:15 | 16:45 | 30 | 7.9 | 237 | 179 | 3,142 | 16:45 | 14.9 | 1,452 | 8.04 | 0.0 | 1,455 |
| fmf | 10/6/99 | 16:45 | 17:03 | 18 | 7.9 | 142 | 197 | 3,284 | -- | -- | -- | -- | -- | -- |
| fmf | 10/6/99 | 17:03 | | stop airlifting | | | | | | | | | | |

-- = Not measured

Table C-4
Well HC-7 Well Development Parameters During Phase I Development/Test Pumping

| | | | | | |
|-----------------|-------------------------|------------------|---------------------------|----------------|----------------------|
| Well Number: | <u>HC-7</u> | Start Time/Date: | <u>10/27/99 19:00</u> | End Date/Time: | <u>10/28/99 6:00</u> |
| Project No: | <u>799419.0056.0005</u> | Project Name: | <u>Project Shoal Area</u> | | |
| Test Type: | <u>Phase I Pumping</u> | Initial SWL: | Not measured | End SWL: | Not measured |
| Sample Team: | <u>Chavez</u> | Datum: | M.P. | | |
| Testing Method: | <u>Submersible Pump</u> | | | | |

| Initials | Date (mm/dd/yy) | Time (hh:mm) | Instantaneous Flow Rate (gpm) | Duration (minutes) | Volume (gallons) | Cumulative Volume (gallons) | Cumulative Duration (minutes) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------|-------------------------------|--------------------|------------------|-----------------------------|-------------------------------|---------------|------------------------|
| tc | 10/27/99 | 19:00 | 3 | | | | | start pumping | |
| tc | 10/27/99 | 22:00 | 3 | 180 | 540 | 540 | 180 | 1.12 | 600 |
| tc | 10/28/99 | 2:10 | 3 | 250 | 750 | 1,290 | 430 | 0.41 | -400 |
| tc | 10/28/99 | 5:35 | 3 | 205 | 615 | 1,905 | 635 | 0.00 | 850 |
| tc | 10/28/99 | 6:00 | 3 | 25 | 75 | 1,980 | 660 | stop pumping | |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 1 of 8)

| Well Number: HC-7 | | Start Time/Date: <u>10/28/99 20:30</u> | | End Date/Time: <u>in progress</u> | | | | | | | |
|--|--------------------------------|---|-------------------------------|-----------------------------------|-------------------------------|-----------------------------|-------------------------|--|-----------|----------|------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | |
| Test Type: <u>Phase II Pumping</u> | | Initial SWL: 978.7 | | End SWL: Not Measured Datum: M.P. | | | | | | | |
| Sample Team: <u>Chavez, Cherry, Coburn, Roos, Saavadra</u> | | Sample Type: <u>Grab</u> | | | | | | | | | |
| Testing Method: <u>Submersible Pump</u> | | | | | | | | | | | |
| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| jtr | 10/28/99 20:30 | | start pumping | | | | | | | | |
| jtr | 10/29/99 6:35 | 605 | 3.3 | 1,997 | 605 | 1,997 | 21.3 | 1,344 | 7.51 | ---- | ---- |
| bac | 10/29/99 8:35 | 120 | 3.2 | 384 | 725 | 2,381 | 22.6 | 1,338 | 7.27 | 0.00 | 0 |
| bac | 10/29/99 10:50 | 135 | 3.3 | 446 | 860 | 2,826 | 22.4 | 1,421 | 7.35 | ---- | ---- |
| jtr | 10/29/99 13:10 | 140 | 3.3 | 462 | 1,000 | 3,288 | 23.1 | 1,389 | 7.26 | 0.00 | 600 |
| jtr | 10/29/99 15:15 | 125 | 3.1 | 387 | 1,125 | 3,675 | 22.9 | 1,375 | 7.16 | ---- | ---- |
| jtr | 10/29/99 17:30 | 135 | 3.1 | 419 | 1,260 | 4,094 | 22.3 | 1,381 | 7.16 | 0.00 | 850 |
| tc | 10/29/99 21:22 | 232 | 3.1 | 719 | 1,492 | 4,813 | 21.4 | 1,369 | 7.15 | 0.00 | 1,400 |
| tc | 10/29/99 23:20 | 118 | 3.1 | 366 | 1,610 | 5,179 | 21.5 | 1,345 | 7.16 | ---- | ---- |
| tc | 10/30/99 1:20 | 120 | 3.2 | 384 | 1,730 | 5,563 | 21.8 | 1,408 | 7.22 | 0.00 | 1,900 |
| tc | 10/30/99 5:26 | 246 | 3.3 | 812 | 1,976 | 6,375 | 21.6 | 1,406 | 7.20 | 0.00 | 1,325 |
| jtr | 10/30/99 7:30 | 124 | 3.0 | 372 | 2,100 | 6,747 | 20.7 | 1,466 | 7.45 | ---- | ---- |
| jtr | 10/30/99 10:10 | 160 | 3.0 | 475 | 2,260 | 7,222 | 22.8 | 1,383 | 7.36 | 0.00 | 900 |
| jtr | 10/30/99 12:10 | 120 | 3.0 | 360 | 2,380 | 7,582 | 23.2 | 1,382 | 7.34 | ---- | ---- |
| jtr | 10/30/99 14:10 | 120 | 3.1 | 372 | 2,500 | 7,954 | 22.8 | 1,443 | 7.39 | 0.00 | 975 |
| jtr | 10/30/99 16:20 | 130 | 3.0 | 386 | 2,630 | 8,340 | 23.1 | 1,392 | 7.39 | ---- | ---- |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 2 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|----------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| jtr | 10/30/99 18:10 | 110 | 3.0 | 330 | 2,740 | 8,670 | 22.6 | 1,380 | 7.32 | 0.00 | 350 |
| jms | 10/30/99 20:15 | 125 | 3.0 | 375 | 2,865 | 9,050 | 22.2 | 1,373 | 7.33 | ---- | ---- |
| jms | 10/30/99 22:15 | 120 | 3.0 | 360 | 2,985 | 9,410 | 21.7 | 1,395 | 7.31 | 0.00 | 300 |
| jms | 10/31/99 0:20 | 125 | 3.1 | 387 | 3,110 | 9,798 | 22.0 | 1,347 | 7.32 | ---- | ---- |
| jms | 10/31/99 2:19 | 119 | 3.0 | 357 | 3,229 | 10,155 | 21.9 | 1,371 | 7.34 | 0.00 | 475 |
| jms | 10/31/99 4:25 | 126 | 3.1 | 391 | 3,355 | 10,545 | 22.0 | 1,365 | 7.32 | ---- | ---- |
| jtr | 10/31/99 6:25 | 120 | 3.1 | 372 | 3,475 | 10,917 | 21.9 | 1,366 | 7.34 | 0.00 | 1,100 |
| jtr | 10/31/99 8:25 | 120 | 3.1 | 372 | 3,595 | 11,289 | 22.5 | 1,389 | 7.31 | ---- | ---- |
| jtr | 10/31/99 10:25 | 120 | 3.0 | 360 | 3,715 | 11,649 | 23.2 | 1,374 | 7.31 | 0.00 | 1,375 |
| jtr | 10/31/99 12:15 | 110 | 3.0 | 330 | 3,825 | 11,979 | 23.3 | 1,357 | 7.28 | ---- | ---- |
| jtr | 10/31/99 14:20 | 125 | 3.0 | 375 | 3,950 | 12,354 | 23.1 | 1,367 | 6.85 | 0.00 | 1,800 |
| jtr | 10/31/99 16:15 | 115 | 3.1 | 357 | 4,065 | 12,711 | 22.4 | 1,392 | 6.83 | ---- | ---- |
| js | 10/31/99 18:30 | 135 | 3.1 | 419 | 4,200 | 13,129 | 22.3 | 1,359 | 6.94 | 0.00 | 75 |
| js | 10/31/99 20:35 | 125 | 3.0 | 375 | 4,325 | 13,504 | 22.3 | 1,395 | 6.43 | ---- | ---- |
| js | 10/31/99 22:30 | 115 | 3.0 | 345 | 4,440 | 13,849 | 22.1 | 1,355 | 6.54 | 0.00 | -275 |
| js | 11/1/99 0:25 | 115 | 3.0 | 345 | 4,555 | 14,194 | 22.2 | 1,346 | 6.49 | ---- | ---- |
| js | 11/1/99 2:30 | 125 | 3.0 | 375 | 4,680 | 14,569 | 22.1 | 1,377 | 6.44 | 0.00 | 1,850 |
| js | 11/1/99 4:30 | 120 | 3.1 | 372 | 4,800 | 14,941 | 22.1 | 1,359 | 6.51 | ---- | ---- |
| jtr | 11/1/99 6:35 | 125 | 3.0 | 375 | 4,925 | 15,316 | 22.3 | 1,347 | 6.47 | 0.00 | -2,225 |
| jtr | 11/1/99 8:35 | 120 | 3.0 | 360 | 5,045 | 15,676 | 22.2 | 1,357 | 6.58 | ---- | ---- |
| jtr | 11/1/99 10:40 | 125 | 3.0 | 375 | 5,170 | 16,051 | 22.7 | 1,377 | 7.01 | 0.00 | 550 |
| jtr | 11/1/99 12:50 | 130 | 3.0 | 390 | 5,300 | 16,441 | 22.8 | 1,360 | 7.03 | ---- | ---- |
| jtr | 11/1/99 14:30 | 100 | 3.0 | 300 | 5,400 | 16,741 | 22.9 | 1,346 | 7.04 | 0.00 | -1,725 |

C-7

Appendix C

1999 Well Installation Report, Project Shoal Area, Churchill County, Nevada

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 3 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| jtr | 11/1/99 16:40 | 130 | 3.4 | 442 | 5,530 | 17,183 | 21.4 | 1,354 | 7.22 | ---- | ---- |
| jms | 11/1/99 18:40 | 120 | 3.0 | 360 | 5,650 | 17,543 | 22.1 | 1,397 | 7.22 | 0.02 | 925 |
| jms | 11/1/99 20:39 | 119 | 3.0 | 357 | 5,769 | 17,900 | 21.7 | 1,367 | 7.18 | ---- | ---- |
| jms | 11/1/99 22:30 | 111 | 3.1 | 344 | 5,880 | 18,244 | 22.1 | 1,385 | 7.27 | 0.02 | 800 |
| jms | 11/2/99 0:35 | 125 | 3.1 | 387 | 6,005 | 18,632 | 22.0 | 1,371 | 7.22 | ---- | ---- |
| jms | 11/2/99 2:30 | 115 | 3.1 | 356 | 6,120 | 18,988 | 21.6 | 1,364 | 7.24 | 0.28 | 800 |
| jms | 11/2/99 4:35 | 125 | 3.1 | 385 | 6,245 | 19,373 | 21.9 | 1,355 | 7.17 | ---- | ---- |
| jtr | 11/2/99 6:40 | 125 | 3.0 | 371 | 6,370 | 19,745 | 22.1 | 1,373 | 7.34 | 0.23 | 1,500 |
| jtr | 11/2/99 8:50 | 130 | 3.0 | 386 | 6,500 | 20,131 | 22.7 | 1,353 | 7.24 | ---- | ---- |
| jtr | 11/2/99 10:40 | 110 | 3.0 | 330 | 6,610 | 20,461 | 23.1 | 1,347 | 7.15 | 0.26 | 1,275 |
| jtr | 11/2/99 12:50 | 130 | 2.6 | 343 | 6,740 | 20,804 | 23.4 | 1,374 | 7.19 | ---- | ---- |
| jtr | 11/2/99 14:35 | 105 | 3.2 | 336 | 6,845 | 21,140 | 23.2 | 1,366 | 7.18 | 0.27 | 3,800 |
| jtr | 11/2/99 16:40 | 125 | 3.1 | 387 | 6,970 | 21,527 | 21.2 | 1,426 | 7.28 | ---- | ---- |
| jms | 11/2/99 18:35 | 115 | 3.1 | 356 | 7,085 | 21,884 | 21.8 | 1,392 | 7.26 | 0.30 | 2,300 |
| jms | 11/2/99 20:30 | 115 | 3.1 | 356 | 7,200 | 22,240 | 21.2 | 1,365 | 7.20 | ---- | ---- |
| jms | 11/2/99 22:30 | 120 | 3.0 | 360 | 7,320 | 22,600 | 21.8 | 1,367 | 7.24 | 0.32 | 975 |
| jms | 11/3/99 0:35 | 125 | 3.0 | 375 | 7,445 | 22,975 | 21.7 | 1,364 | 7.22 | ---- | ---- |
| jms | 11/3/99 2:30 | 115 | 3.0 | 345 | 7,560 | 23,320 | 21.4 | 1,375 | 7.27 | 0.37 | 1,200 |
| jms | 11/3/99 4:35 | 125 | 3.0 | 375 | 7,685 | 23,695 | 21.2 | 1,359 | 7.23 | ---- | ---- |
| jms | 11/3/99 6:40 | 125 | 3.0 | 375 | 7,810 | 24,070 | 21.9 | 1,410 | 7.30 | 0.00 | 1,375 |
| jtr | 11/3/99 10:30 | 230 | 3.0 | 690 | 8,040 | 24,760 | 23.6 | 1,358 | 7.32 | 0.0 | -125 |
| tc | 11/3/99 15:05 | 275 | 2.1 | 569 | 8,315 | 25,330 | 23.1 | 1,400 | 7.20 | 0.00 | 1,275 |
| tc | 11/3/99 19:00 | 235 | 2.1 | 494 | 8,550 | 25,823 | 21.4 | 1,408 | 7.25 | 0.00 | 1,100 |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 4 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| jms | 11/3/99 23:00 | 240 | 3.0 | 720 | 8,790 | 26,543 | 21.7 | 1,361 | 7.20 | 0.81 | 1,125 |
| jms | 11/4/99 3:00 | 240 | 3.0 | 720 | 9,030 | 27,263 | 20.7 | 1,378 | 7.19 | 0.21 | -175 |
| jms | 11/4/99 7:00 | 240 | 3.0 | 720 | 9,270 | 27,983 | 21.8 | 1,373 | 7.20 | 0.14 | -275 |
| tc | 11/4/99 11:00 | 240 | 3.0 | 720 | 9,510 | 28,703 | 23.5 | 1,390 | 7.19 | 0.00 | 875 |
| tc | 11/4/99 15:00 | 240 | 2.1 | 504 | 9,750 | 29,207 | 23.3 | 1,393 | 7.21 | 0.00 | 1,525 |
| tc | 11/4/99 18:58 | 238 | 2.2 | 524 | 9,988 | 29,731 | 21.8 | 1,396 | 7.20 | 0.00 | 500 |
| jms | 11/4/99 23:00 | 242 | 2.3 | 557 | 10,230 | 30,287 | 21.5 | 1,375 | 7.19 | 0.00 | 600 |
| jms | 11/5/99 3:00 | 240 | 2.3 | 552 | 10,470 | 30,839 | 20.8 | 1,366 | 7.21 | 0.00 | 1,425 |
| jms | 11/5/99 7:00 | 240 | 2.1 | 504 | 10,710 | 31,343 | 21.3 | 1,382 | 7.18 | 0.00 | 600 |
| tc | 11/5/99 11:30 | 270 | 6.8 | 756 | 10,980 | 32,099 | 23.7 | 1,373 | 7.17 | 0.00 | 1,000 |
| tc | 11/5/99 15:00 | 210 | 3.4 | 714 | 11,190 | 32,813 | 23.1 | 1,407 | 7.19 | 0.00 | 625 |
| tc | 11/5/99 19:00 | 240 | 2.8 | 672 | 11,430 | 33,485 | 21.9 | 1,406 | 7.23 | 0.00 | 475 |
| tc | 11/5/99 23:00 | 240 | 3.0 | 720 | 11,670 | 34,205 | 21.7 | 1,403 | 7.23 | 0.00 | 950 |
| jms | 11/6/99 3:00 | 240 | 2.8 | 672 | 11,910 | 34,877 | 21.5 | 1,377 | 6.43 | 0.00 | 2,150 |
| jms | 11/6/99 7:00 | 240 | 2.8 | 672 | 12,150 | 35,549 | 21.9 | 1,355 | 6.55 | 0.00 | 1,200 |
| tc | 11/6/99 15:00 | 480 | 3.0 | 1,440 | 12,630 | 36,989 | 23.2 | 1,399 | 7.19 | 0.00 | 875 |
| tc | 11/6/99 19:00 | 240 | 2.8 | 672 | 12,870 | 37,661 | 22.0 | 1,398 | 7.12 | 0.00 | 600 |
| tc | 11/6/99 23:05 | 245 | 2.8 | 686 | 13,115 | 38,347 | 22.1 | 1,381 | 7.19 | 0.00 | 825 |
| jms | 11/7/99 3:00 | 235 | 2.8 | 658 | 13,350 | 39,005 | 21.8 | 1,356 | 7.18 | 0.26 | 650 |
| jms | 11/7/99 7:00 | 240 | 2.9 | 696 | 13,590 | 39,701 | 22.2 | 1,358 | 6.97 | 0.22 | 450 |
| jms | 11/7/99 11:00 | 240 | 2.9 | 696 | 13,830 | 40,397 | 22.6 | 1,399 | 7.03 | 0.31 | 600 |
| tc | 11/7/99 15:00 | 240 | 2.8 | 672 | 14,070 | 41,069 | 22.7 | 1,394 | 7.26 | 0.25 | 1,225 |
| tc | 11/7/99 19:00 | 240 | 2.9 | 696 | 14,310 | 41,765 | 22.0 | 1,380 | 7.44 | 0.27 | 750 |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 5 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|----------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| tc | 11/7/99 22:50 | 230 | 2.8 | 644 | 14,540 | 42,409 | 21.6 | 1,396 | 7.21 | 0.33 | 775 |
| jms | 11/8/99 2:57 | 247 | 2.9 | 716 | 14,787 | 43,126 | 21.6 | 1,391 | 7.07 | 0.31 | 425 |
| jms | 11/8/99 6:55 | 238 | 2.8 | 666 | 15,025 | 43,792 | 21.8 | 1,344 | 7.18 | 0.29 | 1,125 |
| jms | 11/8/99 11:00 | 245 | 2.9 | 711 | 15,270 | 44,503 | 23.4 | 1,367 | 7.19 | 0.28 | 725 |
| tc | 11/8/99 14:55 | 235 | 2.9 | 681 | 15,505 | 45,184 | 22.5 | 1,390 | 7.26 | 0.23 | 800 |
| tc | 11/8/99 18:59 | 244 | 2.8 | 683 | 15,749 | 45,867 | 21.6 | 1,383 | 7.24 | 0.23 | 975 |
| tc | 11/8/99 22:57 | 238 | 2.8 | 666 | 15,987 | 46,534 | 21.4 | 1,399 | 7.27 | 0.29 | -200 |
| jms | 11/9/99 3:00 | 243 | 2.8 | 680 | 16,230 | 47,214 | 21.3 | 1,356 | 7.18 | 0.22 | -575 |
| jms | 11/9/99 7:00 | 240 | 2.8 | 672 | 16,470 | 47,886 | 21.5 | 1,359 | 7.07 | 0.20 | 525 |
| jms | 11/9/99 11:00 | 240 | 2.8 | 672 | 16,710 | 48,558 | 22.6 | 1,364 | 7.10 | 0.27 | 100 |
| tc | 11/9/99 14:56 | 236 | 3.0 | 708 | 16,946 | 49,266 | 22.3 | 1,393 | 7.32 | 0.19 | 525 |
| tc | 11/9/99 18:58 | 242 | 2.9 | 702 | 17,188 | 49,968 | 21.5 | 1,392 | 7.27 | 0.31 | 1,000 |
| tc | 11/9/99 22:57 | 239 | 2.9 | 693 | 17,427 | 50,661 | 22.0 | 1,390 | 7.29 | 0.23 | 1,100 |
| jms | 11/10/99 2:55 | 238 | 2.8 | 666 | 17,665 | 51,327 | 21.5 | 1,366 | 7.21 | 0.23 | 1,975 |
| jms | 11/10/99 7:05 | 250 | 2.8 | 700 | 17,915 | 52,027 | 21.3 | 1,392 | 7.23 | 0.26 | 1,375 |
| jms | 11/10/99 11:50 | 285 | 2.8 | 798 | 18,200 | 52,825 | 22.5 | 1,360 | 7.22 | 0.22 | -50 |
| tc | 11/10/99 15:00 | 190 | --- | 532 | 18,390 | 53,357 | 22.6 | 1,382 | 7.33 | 0.16 | 675 |
| tc | 11/10/99 18:56 | 236 | 3.0 | 708 | 18,626 | 54,065 | 22.1 | 1,384 | 7.30 | 0.23 | 475 |
| tc | 11/10/99 22:55 | 239 | 2.8 | 669 | 18,865 | 54,735 | 21.9 | 1,369 | 7.30 | 0.25 | 650 |
| jms | 11/11/99 3:00 | 245 | 2.8 | 686 | 19,110 | 55,421 | 21.5 | 1,354 | 7.22 | 0.19 | 650 |
| jms | 11/11/99 6:55 | 235 | 2.8 | 658 | 19,345 | 56,079 | 21.8 | 1,377 | 7.27 | 0.22 | 850 |
| jms | 11/11/99 11:00 | 245 | 2.8 | 686 | 19,590 | 56,765 | 22.9 | 1,362 | 7.32 | 0.26 | 1,200 |
| tc | 11/11/99 14:45 | 225 | 2.8 | 630 | 19,815 | 57,395 | 23.0 | 1,376 | 7.37 | 0.12 | 1,450 |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 6 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| tc | 11/11/99 18:52 | 247 | 3.0 | 741 | 20,062 | 58,166 | 22.0 | 1,384 | 7.39 | 0.20 | 1,025 |
| tc | 11/11/99 22:50 | 238 | 3.0 | 714 | 20,300 | 58,880 | 21.8 | 1,381 | 7.36 | 0.19 | 475 |
| tjc | 11/12/99 3:50 | 300 | 3.0 | 891 | 20,600 | 59,771 | 21.9 | 1,391 | 7.40 | 0.12 | 1,675 |
| tjc | 11/12/99 8:00 | 250 | 3.0 | 575 | 20,850 | 60,346 | 23.1 | 1,357 | 7.79 | 0.15 | 2,750 |
| tc | 11/12/99 12:50 | 290 | 3.2 | 913 | 21,140 | 61,260 | 23.4 | 1,370 | 7.41 | 0.11 | 225 |
| tc | 11/12/99 16:50 | 240 | 3.0 | 720 | 21,380 | 61,980 | 22.2 | 1,387 | 7.40 | 0.21 | 1,475 |
| tc | 11/12/99 20:56 | 246 | 3.0 | 738 | 21,626 | 62,718 | 21.4 | 1,387 | 7.39 | 0.14 | 1,425 |
| tjc | 11/13/99 0:00 | 184 | 3.0 | 546 | 21,810 | 63,264 | 21.9 | 1,340 | 7.52 | 0.03 | 525 |
| tjc | 11/13/99 5:00 | 300 | 3.0 | 891 | 22,110 | 64,155 | 22.0 | 1,362 | 7.51 | 0.04 | -125 |
| tjc | 11/13/99 8:57 | 237 | 3.2 | 747 | 22,347 | 64,902 | 22.9 | 1,363 | 7.59 | 0.03 | 950 |
| tc | 11/13/99 12:53 | 236 | 3.0 | 701 | 22,583 | 65,603 | 23.4 | 1,379 | 7.48 | 0.63 | 1,400 |
| tc | 11/13/99 16:59 | 246 | 3.0 | 731 | 22,829 | 66,333 | 21.4 | 1,401 | 7.40 | 0.20 | 1,000 |
| tc | 11/13/99 20:54 | 235 | 3.0 | 686 | 23,064 | 67,020 | 22.3 | 1,371 | 7.48 | 0.29 | 725 |
| tjc | 11/14/99 0:33 | 219 | 3.0 | 650 | 23,283 | 67,670 | 21.4 | 1,372 | 7.49 | 0.00 | 825 |
| tjc | 11/14/99 5:15 | 282 | 3.1 | 874 | 23,565 | 68,544 | 22.1 | 1,351 | 7.52 | 0.00 | 1,000 |
| tjc | 11/14/99 9:05 | 230 | 3.0 | 690 | 23,795 | 69,234 | 22.5 | 1,343 | 7.51 | 0.00 | 675 |
| tc | 11/14/99 13:36 | 271 | 3.0 | 805 | 24,066 | 70,039 | 23.2 | 1,341 | 7.39 | 0.00 | 950 |
| tc | 11/14/99 17:13 | 217 | 3.0 | 651 | 24,283 | 70,690 | 22.3 | 1,365 | 7.34 | 0.21 | 750 |
| tc | 11/14/99 20:55 | 222 | 3.0 | 659 | 24,288 | 70,698 | 22.0 | 1,350 | 7.33 | 0.12 | 525 |
| tjc | 11/15/99 0:45 | 230 | 3.0 | 683 | 24,513 | 71,373 | 21.8 | 1,344 | 7.34 | 0.21 | 550 |
| tjc | 11/15/99 5:10 | 265 | 3.0 | 795 | 24,553 | 71,493 | 22.2 | 1,300 | 7.32 | 0.20 | 375 |
| tjc | 11/15/99 8:03 | 173 | 3.0 | 514 | 24,726 | 72,007 | 22.2 | 1,342 | 7.38 | 0.21 | 475 |
| tc | 11/15/99 13:02 | 299 | 2.6 | 789 | 25,025 | 72,797 | 23.2 | 1,367 | 7.47 | 0.20 | 1,125 |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 7 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| tc | 11/15/99 16:46 | 224 | 2.6 | 582 | 25,249 | 73,379 | 22.1 | 1,362 | 7.50 | 0.25 | 375 |
| tc | 11/15/99 20:48 | 242 | 3.0 | 726 | 25,491 | 74,105 | 21.8 | 1,381 | 7.35 | 0.34 | 350 |
| jtr | 11/16/99 1:05 | 257 | 2.5 | 642 | 25,748 | 74,748 | 22.1 | 1,345 | 7.26 | 0.42 | 1,375 |
| jtr | 11/16/99 5:05 | 240 | 2.4 | 648 | 25,988 | 75,396 | 21.2 | 1,344 | 7.10 | 0.39 | 1,550 |
| jtr | 11/16/99 9:05 | 240 | 2.7 | 648 | 26,228 | 76,044 | 22.1 | 1,356 | 7.26 | 0.34 | 1,600 |
| jms | 11/16/99 15:20 | 375 | 2.6 | 975 | 26,603 | 77,019 | 22.5 | 1,337 | 7.27 | 0.26 | 375 |
| jms | 11/16/99 19:10 | 230 | 2.7 | 621 | 26,833 | 77,640 | 21.9 | 1,375 | 7.27 | 0.25 | 400 |
| jms | 11/16/99 23:05 | 235 | 2.7 | 635 | 27,068 | 78,274 | 21.5 | 1,368 | 7.27 | 0.27 | 325 |
| jtr | 11/17/99 3:05 | 240 | 2.6 | 624 | 27,308 | 78,898 | 21.1 | 1,316 | 7.26 | 0.31 | 700 |
| jtr | 11/17/99 7:05 | 240 | 2.5 | 600 | 27,548 | 79,498 | 21.6 | 1,346 | 7.21 | 0.24 | 1,700 |
| jtr | 11/17/99 11:05 | 240 | 2.7 | 648 | 27,788 | 80,146 | 21.2 | 1,395 | 7.32 | 0.35 | 900 |
| jms | 11/17/99 15:05 | 240 | 2.6 | 624 | 28,028 | 80,770 | 21.6 | 1,347 | 7.23 | 0.19 | -775 |
| jms | 11/17/99 19:05 | 240 | 2.6 | 624 | 28,268 | 81,394 | 20.4 | 1,343 | 7.24 | 0.36 | -1,000 |
| jms | 11/17/99 23:05 | 240 | 2.6 | 624 | 28,508 | 82,018 | 20.1 | 1,356 | 7.27 | 0.21 | -1,450 |
| jtr | 11/18/99 3:05 | 240 | 2.7 | 648 | 28,748 | 82,666 | 20.2 | 1,351 | 7.29 | 0.00 | 1,500 |
| jtr | 11/18/99 7:05 | 240 | 2.6 | 624 | 28,988 | 83,290 | 20.6 | 1,339 | 7.34 | 0.00 | 1,450 |
| jtr | 11/18/99 11:05 | 240 | 2.6 | 624 | 29,228 | 83,914 | 21.4 | 1,348 | 7.26 | 0.00 | 8,050 |
| jms | 11/18/99 15:05 | 240 | 2.7 | 648 | 29,468 | 84,562 | 21.7 | 1,358 | 7.31 | 0.00 | 1,525 |
| jms | 11/18/99 19:05 | 240 | 2.6 | 624 | 29,708 | 85,186 | 21.2 | 1,352 | 7.38 | 0.00 | 675 |
| jms | 11/18/99 23:05 | 240 | 2.7 | 648 | 29,948 | 85,834 | 21.9 | 1,392 | 7.30 | 0.00 | 900 |
| jtr | 11/19/99 3:05 | 240 | 2.6 | 624 | 30,188 | 86,458 | 21.1 | 1,394 | 7.33 | 0.27 | 1,725 |
| jtr | 11/19/99 7:05 | 240 | 2.6 | 624 | 30,428 | 87,082 | 20.8 | 1,378 | 7.25 | 0.21 | 1,700 |
| jtr | 11/19/99 11:05 | 240 | 2.8 | 672 | 30,668 | 87,754 | 22.8 | 1,344 | 7.31 | 0.23 | 975 |

Table C-5
Well HC-7 Well Development Parameters During Phase II Development/Test Pumping
 (Page 8 of 8)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous flow rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) | | |
|----------|--------------------------------------|-----------------------|----------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|--|--|
| jms | 11/19/99 15:05 | 240 | 2.6 | 624 | 30,908 | 88,378 | 22.5 | 1,352 | 7.38 | 0.16 | 1,425 | | |
| jms | 11/19/99 19:05 | 240 | 2.4 | 576 | 31,148 | 88,954 | 21.8 | 1,335 | 7.36 | 0.20 | 1,275 | | |
| jms | 11/19/99 23:05 | 240 | 2.4 | 576 | 31,388 | 89,530 | 22.0 | 1,348 | 7.35 | 0.18 | 875 | | |
| jtr | 11/20/99 3:05 | 240 | 2.4 | 576 | 31,628 | 90,106 | 21.5 | 1,352 | 7.34 | 0.20 | 300 | | |
| jtr | 11/20/99 7:05 | 240 | 2.4 | 576 | 31,868 | 90,682 | 21.2 | 1,366 | 7.34 | 0.19 | -450 | | |
| jtr | 11/20/99 11:05 | 240 | 2.4 | 576 | 32,108 | 91,258 | 22.7 | 1,351 | 7.38 | 0.20 | 475 | | |
| jms | 11/20/99 15:05 | 240 | 2.2 | 528 | 32,348 | 91,786 | 22.6 | 1,364 | 7.40 | 0.18 | 1,450 | | |
| jms | 11/20/99 19:05 | 240 | 2.2 | 528 | 32,588 | 92,314 | 21.4 | 1,356 | 7.44 | 0.93 | 1,500 | | |
| jms | 11/20/99 23:05 | 240 | 2.2 | 528 | 32,828 | 92,842 | 21.6 | 1,347 | 7.50 | 0.12 | 1,575 | | |
| tc | 11/21/99 3:05 | 240 | 2.2 | 528 | 33,068 | 93,370 | 21.5 | 1,394 | 7.32 | 0.22 | 700 | | |
| tc | 11/21/99 6:57 | 232 | 2.4 | 557 | 33,300 | 93,927 | 21.1 | 1,362 | 7.42 | 0.26 | 900 | | |
| tc | 11/21/99 11:02 | 245 | 2.4 | 588 | 33,545 | 94,515 | 21.1 | 1,361 | 7.51 | 0.33 | 850 | | |
| jms | 11/21/99 19:10 | 488 | 2.2 | 1,074 | 34,033 | 95,588 | 21.4 | 1,364 | 7.48 | 0.06 | -275 | | |
| jms | 11/21/99 23:10 | 240 | 2.3 | 552 | 34,273 | 96,140 | 19.5 | 1,390 | 7.45 | 0.16 | 600 | | |
| tc | 11/22/99 3:00 | 230 | 2.3 | 529 | 34,503 | 96,669 | 18.6 | 1,360 | 7.43 | 0.33 | 1,250 | | |
| tc | 11/22/99 6:55 | 235 | 2.3 | 541 | 34,738 | 97,210 | 20.7 | 1,372 | 7.40 | 0.10 | 1,025 | | |
| tc | 11/22/99 10:59 | 244 | 2.2 | 537 | 34,982 | 97,747 | 22.2 | 1,362 | 7.50 | 0.17 | 975 | | |
| jms | 11/22/99 14:57 | 238 | 2.4 | 571 | 35,220 | 98,318 | 21.7 | 1,337 | 7.53 | 0.30 | 375 | | |
| jms | 11/22/99 17:35 | 158 | 2.4 | 379 | 35,378 | 98,697 | 20.5 | 1,367 | 7.47 | 0.53 | 275 | | |
| bac | 11/27/99 0:00 | 6,145 | 2.4 | 14,748 | 41,523 | 113,445 | --- | --- | --- | --- | --- | | |
| jms | 11/29/99 0:00 | 2,880 | 2.4 | 6,912 | 44,403 | 120,357 | --- | --- | --- | --- | --- | | |
| | 11/29/99 | | | | In progress, IT suspends monitoring | | | | | | | | |

--- = Not measured

S.U. = Standard units

**Table C-6
Well HC-7 Water Balance**

| | | Credit | Debit | Balance |
|--|---|--------|---------|----------|
| Total Amount of Water Delivered to HC-7 by Lang Drilling (10/1-8) | | | | |
| 20,800 | gallons of water used to drill HC-7 | 20,800 | 0 | 20,800 |
| HC-7 Fluids Discharged during Drilling | | | | |
| 10,917 | gallons of HC-6 fluid discharged during drilling | 0 | 10,917 | 9,883 |
| Fluid Discharged during Airlifting | | | | |
| 3,284 | gallons of water discharged during airlift development (10/6) | 0 | 3,284 | 6,599 |
| Fluid Discharged during Phase I Pumping | | | | |
| 1,980 | gallons of water discharged during pump testing (10/2-4) | 0 | 1,980 | 6,599 |
| Fluid Discharged during Phase II Pumping | | | | |
| | gallons of water discharged during aquifer test (10/28-11/29 in progress) | 0 | 120,357 | -113,758 |

**Table C-7
Well HC-7 Water Level Measurements**

| Date | Depth to Water (ft) | Water Level Elevation (ft msl) | Comments |
|----------------|---------------------|--------------------------------|--|
| 10/6/99 4:15 | 1,156 | 4,073.73 | Static water level measured prior to airlift development of open borehole |
| 10/6/99 17:03 | 997 | 4,232.73 | Static water level measured from video log post airlift development of open borehole |
| 10/14/99 7:45 | 978.6 | 4,251.13 | Static water level measured post airlift development |
| 10/28/99 20:30 | 978.7 | 4,251.03 | Static water level measured prior to development/test pumping |

msl = Mean sea level

Table C-8
Well HC-7 Downhole Geophysical Data Collected

| Geophysical Tool | Date | Top of Interval (ft bgs) | Bottom of Interval (ft bgs) | Interval (ft) | Contractor |
|--|---------|--------------------------|-----------------------------|---------------|-------------|
| Temperature/ Δ Temperature | 10/6/99 | 981 | 1,240 | 259 | Colog, Inc. |
| 3-Arm Caliper | 10/7/99 | 90 | 1,240 | 1,150 | Colog, Inc. |
| Spectral Gamma Ray (K, U, Th) | 10/7/99 | 90 | 1,235 | 1,145 | Colog, Inc. |
| Acoustic Borehole Viewer | 10/7/99 | 981 | 1,238 | 257 | Colog, Inc. |
| Deviation | 10/7/99 | 110 | 1,235 | 1,125 | Colog, Inc. |
| Natural Gamma/Guard Resistivity/Epithermal Neutron | 10/7/99 | 85 | 1,238 | 1,153 | Colog, Inc. |
| Formation Density | 10/7/99 | 85 | 1,240 | 1,155 | Colog, Inc. |

K = Potassium
U = Uranium
Th = Thorium

Table C-9
Well HC-7 Tritium Activities During Drilling

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|-----------------------------------|---------------------|-------------------------|-------------------------|---------------------|
| 10/4/99 10:10 | -- | -- | -- | 1,400 |
| 10/4/99 12:10 | 300 | 1,212 | 189 | -- |
| 10/4/99 13:30 | -- | -- | -- | 8,182 |
| 10/4/99 15:15 | 420 | -91 | 243 | -- |
| 10/5/99 5:05 | 800 | 1,637 | 849 | -- |
| 10/5/99 7:10 | 870 | 1,182 | 758 | -- |
| 10/5/99 9:15 | 922 | 1,243 | 1,425 | -- |
| 10/5/99 22:35 | 982 | 233 | -300 | -- |
| 10/5/99 22:55 | -- | -- | -- | 267 |
| 10/6/99 1:00 | 1,070 | 546 | 151 | -- |
| 10/6/99 3:00 | 1,170 | 576 | 666 | -- |

-- = Not measured

Table C-10
Alpha and Beta Activity Measurement of
Well HC-7 Drill Cuttings

| Depth (ft) | Alpha Measurement (dpm) | Beta Measurement (dpm) |
|-----------------------|------------------------------------|-----------------------------------|
| 240 | 26.1 | 1,150 |
| 320 | 26 | 900 |
| 420 | 13.1 | 1,276 |
| 500 | 6.5 | 1,074 |
| 550 | 71.9 | 1,081 |
| 600 | 21.6 | 1,180 |
| 650 | 32.4 | 1,275 |
| 700 | 21.6 | 1,139 |
| 750 | 5.4 | 1,194 |
| 800 | 27.0 | 1,198 |
| 850 | 10.8 | 1,198 |
| 900 | 16.2 | 1,178 |
| 950 | 43.2 | 1,301 |
| 1,000 | 37.8 | 1,170 |
| 1,050 | 27.0 | 1,172 |
| 1,100 | 48.7 | 1,176 |
| 1,150 | 21.6 | 1,299 |
| 1,200 | 16.2 | 1,279 |

dpm = Disintegrations per minute

**Table C-11
Well HC-7 Drilling Fluid Additives**

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gallon pails) | Quik Foam [®] Used (5-gallon pails) | Soda Ash Used (50-pound bags) |
|---|--------|------------------|----------------|---------------------------|--|---|--|-------------------------------|
| 24-in. Conventional, Mud-Rotary Drilling and Install 20-in. Casing | | | | | | | | |
| 10/1/99 | M to N | 0 | 0 | 5,200 | -- | -- | -- | -- |
| 10/1/99 | N to M | 0 | 0 | -- | 35 | -- | -- | 2 |
| 10/2/99 | M to N | 0 | 0 | -- | -- | -- | -- | -- |
| 10/2/99 | N to M | 0 | 0 | -- | -- | -- | -- | -- |
| 10/3/99 | M to N | 0 | 90 | -- | 6 | -- | -- | -- |
| 10/3/99 | N to M | 90 | 100 | 2,600 | 11 | -- | -- | -- |
| | | | Subtotal | 7,800 | 52 | 0 | 0 | 2 |
| 10-in. Air-Hammer, Reverse-Circulation Drilling | | | | | | | | |
| 10/4/99 | M to N | 100 | 300 | 2,600 | -- | -- | -- | -- |
| 10/4/99 | N to M | 300 | 625 | 5,200 | -- | 1 | -- | -- |
| 10/5/99 | M to N | 625 | 925 | -- | -- | -- | -- | -- |
| 10/5/99 | N to M | 925 | 1,040 | 2,600 | -- | -- | -- | -- |
| 10/6/99 | M to N | 1,040 | 1,240 | 2,600 | -- | -- | -- | -- |
| | | | Subtotal | 13,000 | 0 | 1 | 0 | 0 |
| Collect Water Level Data and Downhole Geophysical Data | | | | | | | | |
| 10/6/99 | N to M | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 10/7/99 | M to N | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 10/7/99 | N to M | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| | | | Subtotal | 0 | 0 | 0 | 0 | 0 |
| Construct Well | | | | | | | | |
| 10/8/99 | M to N | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| 10/8/99 | N to M | 1,240 | 1,240 | -- | -- | -- | -- | -- |
| | | | Subtotal | 0 | 0 | 0 | 0 | 0 |
| | | | TOTAL | 20,800 | 52 | 1 | 0 | 2 |

-- = Not applicable

Table C-12
Fluid Management Samples and Results from Drilling, Well Development, and Testing of Well HC-7

| Sample Number | Sample Date | Sample Source | Gross Alpha (pCi/L) | Gross Beta (pCi/L) | Tritium (pCi/L) | Dissolve Lead (mg/L) | Comments |
|----------------|-------------|---------------|---------------------|--------------------|-----------------|----------------------|----------|
| PSF00048 | 11/1/99 | HC-7 Well | 4.7 ± 2.2 | 3.7 ± 1.5 | -10 ± 200 | ND | |
| PSF00050 | 11/3/99 | HC-7 Well | 42.9 ± 5.7 | 5.8 ± 1.8 | -60 ± 200 | ND | |
| PSF00057 | 11/19/99 | HC-7 Well | 57.2 ± 7 | 4.1 ± 1.8 | -100 ± 200 | ND | |
| PSF00058 (DUP) | 11/19/99 | HC-7 Well | 57 ± 7 | 3.2 ± 1.8 | -40 ± 200 | ND | |
| PSF00059 (FB) | 11/19/99 | ---- | -0.8 ± 1 | -0.06 ± 1.4 | -140 ± 200 | ND | |
| PSF00063 | 11/30/99 | HC-7 Well | 56.8 ± 7 | 5 ± 1.9 | -60 ± 200 | ND | |
| PSF00064 (DUP) | 11/30/99 | HC-7 Well | 54.6 ± 6.8 | 6.7 ± 1.9 | 0 ± 200 | ND | |
| PSF00065 (FB) | 11/30/99 | ---- | -0.2 ± 1.2 | 0.63 ± 1.4 | 10 ± 200 | ND | |
| PSF00066 | 12/6/99 | HC-7 Well | 58.6 ± 7.2 | 6.5 ± 1.9 | -190 ± 210 | ND | |
| PSF00067 (DUP) | 12/6/99 | HC-7 Well | 59 ± 7.2 | 6.4 ± 1.9 | -90 ± 210 | ND | |
| PSF00068 (FB) | 12/6/99 | ---- | 0.8 ± 1 | 0.84 ± 1.3 | -170 ± 210 | ND | |

FB = Field blank
 DUP = Field duplicate
 ND = Not detected
 ---- Not applicable



Appendix D
Well HC-8 Data

Table D-1
Well HC-8 Chronology
 (Page 1 of 4)

| Date and Time | Depth (ft) | Activity |
|--------------------|------------|--|
| 8/19/99 to 8/21/99 | | Move from HC-5 location to HC-8 location |
| 8/21/99 23:30 | 0 | Begin drilling HC-8 with 24-in. tricone bit by conventional mud-rotary methods |
| 8/22/99 8:05 | 100 | Complete 24-in. borehole to 100 ft |
| 8/22/99 21:20 | 100 | Complete installation and grouting of 20-in. conductor casing to 100 ft |
| 8/23/99 13:30 | 100 | Begin drilling 10-in. hole at 100 ft by air, reverse-circulation method with downhole hammer using polymer-based fluid |
| 8/25/99 12:20 | 1,280 | Drill 10-in. hole to 1,280 ft |
| 8/25/99 18:00 | 1,280 | DRI collecting water level and downhole video data |
| 8/25/99 23:00 | 1,280 | DRI decides to continue drilling to 1,420 ft (no water encountered), trip drill string in |
| 8/26/99 5:20 | 1,280 | Resume drilling at 1,280 ft (10 ft of fill encountered) |
| 8/26/99 6:45 | 1,287 | Problems drilling, trip out drill string from 1,287 ft, discover and repair broken foot valve |
| 8/26/99 13:00 | 1,287 | Resume drilling at 1,287 ft after replacing foot valve and tripping drill string in |
| 8/26/99 17:00 | 1,312 | Problems drilling, trip out drill string from 1,312 ft |
| 8/26/99 20:15 | 1,312 | DRI collecting water level data |
| 8/27/99 8:25 | 1,312 | DRI finishes collecting water level data (depth to water 1,225 ft), trip drill string in to drill to 1,345 ft |
| 8/27/99 13:20 | 1,312 | Resume drilling at 1,312 ft with slick drill string (hammer and bit only), 6 ft of fill encountered |
| 8/27/99 15:00 | 1,348 | Stop drilling at 1,348 ft, DRI collecting water level data |
| 8/27/99 16:00 | 1,348 | No water encountered, resume drilling to 1,466 ft |
| 8/27/99 20:00 | 1,466 | Stop drilling at 1,466 ft, DRI collecting water level data |
| 8/27/99 22:00 | 1,466 | Trip out drill string from 1,466 ft to allow DRI to collect water level data overnight |
| 8/28/99 1:00 | 1,466 | DRI collecting water level and downhole video data and performing slug test |
| 8/28/99 18:00 | 1,466 | No water encountered, trip drill string in, resume drilling at 1,466 ft (3 ft of fill encountered) |
| 8/28/99 22:25 | 1,586 | Stop drilling at 1,586 ft, DRI collecting water level data |
| 8/29/99 0:00 | 1,586 | No water encountered, resume drilling at 1,586 ft |
| 8/29/99 3:35 | 1,686 | Stop drilling at 1,686 ft, DRI collecting water level data, performing slug test, and airlifting hole |
| 8/29/99 13:30 | 1,686 | Trip out drill string from 1,686 ft, prepare to collect downhole geophysical data |
| 8/29/99 16:00 | 1,686 | Colog collecting downhole geophysical data |
| 8/30/99 7:00 | 1,686 | Complete collection of downhole geophysical data, trip drill string in with tricone bit to continue drilling to 2,790 ft |
| 8/30/99 15:50 | 1,686 | Resume drilling at 1,686 ft by air, reverse-circulation method with tricone bit (4 ft of fill encountered) |
| 8/30/99 19:00 | 1,697 | Stop drilling at 1,697 ft, trip out drill string to change to hammer bit due to slow penetration rate |

Table D-1
Well HC-8 Chronology
 (Page 2 of 4)

| Date and Time | Depth (ft) | Activity |
|---------------|------------|--|
| 8/31/99 9:15 | 1,697 | Resume drilling at 1,697 ft by air, reverse-circulation method with hammer bit (27 ft of fill encountered) |
| 9/1/99 19:30 | 2,370 | Stop drilling at 2,370 ft, repair air-dump valve, measure water level to determine how Lang to drill remainder of hole |
| 9/1/99 22:50 | 2,370 | Resume drilling at 2,370 ft |
| 9/2/99 5:30 | 2,470 | Stop drilling at 2,470 ft, trip drill string out, wait for new hammer bit and auxiliary compressor to continue hole by air, reverse-circulation method |
| 9/3/99 6:30 | 2,130 | Trip in drill string with hammer bit to 2,130 ft, encountered bridge, hole conditions deteriorating |
| 9/3/99 9:45 | 2,090 | Stop drilling at 2,090 ft, trip out drill string and change from hammer to tricone bit and flooded-reverse method to drill out bridges |
| 9/4/99 6:30 | 1,630 | Booster broke down while tripping drill string in, numerous bridges between 890 and 1,630 ft, plug tricone bit/collars |
| 9/4/99 13:20 | 1,630 | Trip out drill string from 1,630 ft to clear bit/collars |
| 9/4/99 17:35 | 1,630 | Clear bit/collars with BHA hanging in hole, trip drill string back in |
| 9/4/99 22:30 | 1,390 | Decide bit/collars plugged, trip out drill string from 1,390 ft |
| 9/5/99 3:30 | 1,390 | Clear bit/collars, trip drill string back in with mill-tooth tricone bit |
| 9/6/99 11:30 | 2,470 | Drill string at 2,470 ft, drilled fill 1,565-1,810; 1,870-1,890; 1,970-2,470 ft; trip out drill string from 2,470 ft to change to button tricone |
| 9/7/99 3:40 | 2,470 | Resume drilling at 2,470 ft by flooded, reverse-circulation method with carbide-button tricone bit, encountered 10 ft of fill |
| 9/7/99 14:30 | 2,530 | Stop drilling at 2,530 ft, hole called by DOE, trip out drill string from 2,530 ft |
| 9/7/99 22:30 | 2,530 | Colog collecting downhole geophysical data |
| 9/8/99 2:30 | 750 | Hole bridged at 750 ft, trip open-ended drill string in to clear bridge |
| 9/8/99 5:25 | 750 | Plug drill string, trip out drill string from 750 ft |
| 9/8/99 10:50 | 750 | Resume drilling fill with mill-tooth tricone at 750 ft |
| 9/8/99 15:00 | 2,518 | Drill string at 2,518 ft, drilled out fill 750-765 and 860-880 ft and floated in to bottom, trip out drill string to resume logging |
| 9/8/99 20:15 | 2,518 | DRI collecting caliper data to determine hole status |
| 9/8/99 20:50 | 869 | Hole bridged at 869 ft, trip open-ended drill string in to clear bridge |
| 9/9/99 1:30 | 880 | Plug drill string from 880 ft, trip out drill string |
| 9/9/99 4:00 | 880 | Colog collecting ATV data |
| 9/9/99 10:30 | 436 | Colog collected ATV data to bridge at 436 ft, trip open-ended drill string in to 880 ft to clear hole for collection downhole video data |
| 9/9/99 15:00 | 880 | DRI completes video log, many large caverns, decide to cement/sand up the hole to stabilize it |
| 9/10/99 14:25 | 425 | Finish cementing/sanding hole from 425 feet to 800 ft |
| 9/11/99 5:15 | 425 | Plugged drill string while tripping in at 425 ft, trip out drill string, unplug, trip in drill string |

Table D-1
Well HC-8 Chronology
 (Page 3 of 4)

| Date and Time | Depth (ft) | Activity |
|---------------|------------|--|
| 9/11/99 7:25 | 425 | Start drilling cement/sand at 425 ft by reverse-circulation method |
| 9/11/99 20:55 | 900 | Finish drilling cement/sand plug and slough to 900 ft, float rods down to 1,100 ft, trip drill string out from 1,100 ft |
| 9/12/99 0:15 | 1,100 | Trip drill string in to 2,509 ft with mill-tooth tricone to clear bridges, 21 ft of fill encountered, trip out drill string |
| 9/12/99 8:20 | 2,509 | Colog and DRI collecting downhole geophysical data, DRI monitoring water levels, only able to log to 2,069 ft |
| 9/14/99 6:30 | 2,060 | Trip in open-faced drill string to clear bridges to 2,140 ft, trip out drill string to 2,080 ft |
| 9/14/99 14:40 | 2,274 | DRI finishes collecting caliper data from 2,075 to 2,275 ft, trip drill string in to clear bridges to 2,490 ft |
| 9/14/99 17:25 | 2,490 | Tripped drill string out to 2,060 ft, DRI and Colog resume collecting downhole geophysical data below 2,060 ft |
| 9/15/99 12:20 | 2,490 | Finish collecting downhole geophysical data below 2,060 ft, trip out drill string to surface |
| 9/15/99 15:45 | 2,490 | Colog resumes collecting downhole geophysical data above 2,060 ft |
| 9/16/99 1:25 | 2,490 | Colog finishes collecting downhole geophysical data, DRI injecting fluids and collecting water level data |
| 9/16/99 9:30 | 2,490 | DRI finishes collecting water level data, begins collecting borehole radar data |
| 9/19/99 22:00 | 2,490 | DRI finishes collecting borehole radar data to 2,060 ft, run sinker bar to confirm open hole, bridge at 751 ft |
| 9/16/99 23:30 | 751 | Trip in open-faced drill string to clear bridges below 751 ft, hit more bridges below, trip out drill string from 835 ft |
| 9/17/99 2:35 | 835 | Trip in drill string to 2,449 ft with mill-tooth tricone bit to clear bridges below 835 ft, 80 ft of fill encountered, flush hole with bentonite mud |
| 9/17/99 9:40 | 2,449 | Drill string at 2,449 ft, trip out drill string from 2,449 ft |
| 9/17/99 18:30 | 2,449 | Drill string out of hole, set up to construct well |
| 9/18/99 13:07 | | Casing installed to 2,441.3 feet bgs, screened interval 2,294.44 to 2,410.92 ft bgs, set up to install filter pack |
| 9/19/99 6:50 | | Complete installation of 3/8-in. gravel to 2,247 ft, 6/9 sand to 2,222 ft, and 20/40 sand to 2,200 ft, set up to install grout seal |
| 9/21/99 12:40 | | Complete installation of cement grout seal, prepare for airlift development |
| 9/21/99 16:45 | | Begin airlift development |
| 9/23/99 16:15 | | Finish airlift development, trip out airline |
| 10/1/99 11:10 | | Colog collecting 4 pi data |
| 10/1/99 16:00 | | Colog finishes collecting 4 pi data |
| 10/1/99 16:30 | | DRI/PRG prepares to collect borehole radar data |
| 10/1/99 21:00 | | DRI/PRG finishes collecting borehole radar data |

Table D-1
Well HC-8 Chronology
(Page 4 of 4)

| Date and Time | Depth (ft) | Activity |
|----------------------|-------------------|--|
| 10/7/99 8:30 | | DRI/PRG prepares to collect borehole radar data |
| 10/7/99 17:30 | | DRI/PRG finishes collecting borehole radar data |
| 10/16/99 12:30 | | Start HC-8 pump installation |
| 10/17/99 16:30 | | Pump installed to 1,992 ft, sounding tube at 1,950 ft, airline at 1,595 ft |
| 10/18/99 7:44 | | Start Phase I development/test pumping |
| 10/18/99 10:20 | | Stop Phase I development/test pumping |
| 10/19/99 9:30 | | Start Phase II development/test pumping, pre-test depth to water 1,370.48 ft |
| 10/29/99 17:25 | | Stop Phase II development/test pumping |
| 11/11/99 14:30 | | Start Phase III development/test pumping |
| 11/14/99 16:00 | | Stop Phase III development/test pumping |

BHA = Bottom Hole Assembly
ATV = Acoustic Televiewer

Table D-2
Well HC-8 Fluoride Concentrations During Drilling
 (Page 1 of 5)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/21/99 9:30 | 0 | -- | -- | -- | -- | 25.60 | 14.50 | JS |
| 8/21/99 15:07 | 0 | -- | -- | -- | -- | 25.00 | 13.90 | JS |
| 8/21/99 18:15 | 0 | -- | -- | -- | -- | 24.90 | 13.90 | JS |
| 8/21/99 7:00 | 0 | -- | -- | -- | -- | 25.90 | 32.80 | JS |
| 8/23/99 13:40 | 108 | 25.50 | 13.20 | 27.10 | 0.00 | -- | -- | TC |
| 8/23/99 16:50 | 180 | -- | -- | -- | -- | 25.70 | 8.85 | TC |
| 8/23/99 18:00 | 205 | 25.10 | 20.30 | 25.70 | 10.90 | -- | -- | TC |
| 8/23/99 19:00 | 230 | -- | -- | -- | -- | 26.00 | 35.70 | TC |
| 8/23/99 20:40 | 300 | 25.80 | 28.10 | 25.60 | 1.25 | -- | -- | TC |
| 8/23/99 23:05 | 380 | -- | -- | -- | -- | 24.90 | 35.00 | TC |
| 8/23/99 23:55 | 400 | 25.40 | 35.20 | 25.20 | 5.00 | -- | -- | JS |
| 8/24/99 8:50 | 480 | -- | -- | -- | -- | 27.90 | 42.20 | JS |
| 8/24/99 9:30 | 500 | 28.10 | 38.20 | 27.70 | 1.78 | -- | -- | JS |
| 8/24/99 14:40 | 580 | -- | -- | -- | -- | 26.10 | 30.30 | PG |
| 8/24/99 15:20 | 600 | 26.10 | 37.10 | 25.80 | 6.37 | -- | -- | PG |
| 8/24/99 19:00 | 700 | 24.90 | 30.40 | 24.50 | 10.70 | -- | -- | PG |
| 8/24/99 21:30 | 740 | -- | -- | -- | -- | 25.70 | 33.40 | PG |
| 8/24/99 23:15 | 800 | 25.10 | 31.60 | 24.20 | 0.98 | -- | -- | PG |
| 8/25/99 1:55 | 900 | 25.80 | 28.80 | 26.00 | 0.43 | -- | -- | PG |
| 8/25/99 3:30 | 975 | -- | -- | -- | -- | 25.50 | 33.80 | PG |
| 8/25/99 4:25 | 1,000 | 25.30 | 33.10 | 25.50 | 0.93 | -- | -- | PG |
| 8/25/99 5:35 | 1,045 | 25.50 | 38.40 | 25.70 | 13.30 | -- | -- | PG |
| 8/25/99 6:40 | 1,080 | 24.80 | 33.90 | 24.80 | 5.56 | -- | -- | PG |
| 8/25/99 7:50 | 1,130 | 25.30 | 21.10 | 25.50 | 2.74 | -- | -- | PG |
| 8/25/99 9:05 | 1,175 | 25.80 | 36.10 | 25.60 | 2.22 | -- | -- | PG |

Table D-2
Well HC-8 Fluoride Concentrations During Drilling
 (Page 2 of 5)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/25/99 9:10 | 1,175 | -- | -- | -- | -- | 25.90 | 50.20 | PG |
| 8/25/99 10:35 | 1,220 | 25.90 | 35.50 | 25.70 | 9.01 | -- | -- | PG |
| 8/25/99 11:50 | 1,265 | 25.70 | 42.70 | 25.90 | 10.80 | -- | -- | PG |
| 8/26/99 5:30 | 1,283 | 25.70 | 33.10 | 25.70 | 25.30 | -- | -- | TJC |
| 8/26/99 6:30 | 1,287 | 25.90 | 31.30 | 25.70 | 27.90 | -- | -- | TJC |
| 8/26/99 6:45 | 1,287 | -- | -- | -- | -- | 25.70 | 38.50 | TJC |
| 8/27/99 13:20 | 1,312 | 25.00 | 25.70 | 24.80 | 7.20 | -- | -- | JR |
| 8/27/99 14:20 | 1,346 | 26.90 | 26.50 | 26.70 | 15.70 | -- | -- | JR |
| 8/27/99 17:10 | 1,383 | 25.80 | 25.00 | 25.90 | 6.00 | -- | -- | JR |
| 8/27/99 18:10 | 1,410 | 25.70 | 25.50 | 26.00 | 19.20 | -- | -- | JR |
| 8/27/99 19:05 | 1,446 | 25.60 | 25.60 | 25.50 | 4.38 | -- | -- | JR |
| 8/27/99 21:12 | 1,348 | -- | -- | -- | -- | 26.00 | 33.10 | JR |
| 8/28/99 18:10 | 1,476 | 25.60 | 24.20 | 25.10 | 1.80 | -- | -- | JR |
| 8/28/99 19:30 | 1,506 | 25.20 | 25.20 | 23.40 | 5.83 | -- | -- | JR |
| 8/28/99 19:40 | 1,506 | -- | -- | 24.70 | 6.27 | -- | -- | JR |
| 8/28/99 20:55 | 1,546 | 24.50 | 24.60 | 24.80 | 5.70 | -- | -- | JR |
| 8/28/99 22:15 | 1,586 | 25.00 | 24.70 | 25.30 | 0.00 | -- | -- | JR |
| 8/28/99 22:25 | 1,586 | -- | -- | -- | -- | 25.00 | 38.00 | JR |
| 8/29/99 0:30 | 1,590 | 25.00 | 36.80 | 25.00 | 3.79 | -- | -- | JR |
| 8/29/99 1:30 | 1,626 | 25.00 | 36.70 | 25.00 | 12.40 | -- | -- | JR |
| 8/29/99 2:30 | 1,646 | 25.00 | 35.70 | 25.00 | 4.07 | -- | -- | JR |
| 8/29/99 3:30 | 1,682 | 25.00 | 22.90 | 25.00 | 16.90 | -- | -- | JR |
| 8/29/99 3:40 | 1,686 | -- | -- | -- | -- | 25.00 | 28.70 | JR |
| 8/29/99 4:10 | 1,686 | -- | -- | 25.00 | 19.60 | -- | -- | JR |
| 8/29/99 9:45 | 1,686 | -- | -- | 25.00 | 27.30 | -- | -- | JR |

Table D-2
Well HC-8 Fluoride Concentrations During Drilling
 (Page 3 of 5)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 8/29/99 9:50 | 1,686 | -- | -- | 25.00 | 24.90 | -- | -- | JR |
| 8/29/99 9:58 | 1,686 | -- | -- | 25.00 | 27.10 | -- | -- | JR |
| 8/29/99 10:30 | 1,686 | -- | -- | 25.00 | 25.90 | -- | -- | JR |
| 8/30/99 18:00 | 1,696 | 25.00 | 23.40 | 25.00 | 13.70 | -- | -- | TJC |
| 8/31/99 8:55 | 1,690 | -- | -- | -- | -- | 25.00 | 35.20 | TJC |
| 8/31/99 13:35 | 1,790 | 25.00 | 33.30 | 25.00 | 2.85 | -- | -- | TJC |
| 8/31/99 14:45 | 1,811 | 25.00 | 33.70 | 25.00 | 19.20 | -- | -- | TJC |
| 8/31/99 16:10 | 1,838 | 25.00 | 31.40 | 25.00 | 20.00 | -- | -- | TJC |
| 8/31/99 16:20 | 1,840 | -- | -- | -- | -- | 24.90 | 36.70 | TJC |
| 8/31/99 17:30 | 1,880 | 25.00 | 28.20 | 25.00 | 30.60 | -- | -- | TJC |
| 8/31/99 20:15 | 1,930 | 25.00 | 27.60 | 25.00 | 18.60 | -- | -- | TJC |
| 8/31/99 21:50 | 1,972 | 24.90 | 24.90 | 24.90 | 22.50 | -- | -- | TJC |
| 8/31/99 23:15 | 2,015 | 24.90 | 24.90 | 24.90 | 6.87 | -- | -- | TJC |
| 8/31/99 23:30 | 2,030 | -- | -- | -- | -- | 24.90 | 36.70 | TJC |
| 9/1/99 1:05 | 2,052 | 25.00 | 38.50 | 25.00 | 13.00 | -- | -- | TJC |
| 9/1/99 2:55 | 2,100 | 25.00 | 30.20 | 25.00 | 10.70 | -- | -- | TJC |
| 9/1/99 5:10 | 2,156 | 25.00 | 33.70 | 25.00 | 9.98 | -- | -- | TJC |
| 9/1/99 6:00 | 2,188 | -- | -- | -- | -- | 25.00 | 43.60 | TJC |
| 9/1/99 6:10 | 2,190 | 25.00 | 34.70 | 25.00 | 2.01 | -- | -- | TJC |
| 9/1/99 7:20 | 2,212 | 25.00 | 36.70 | 25.00 | 11.60 | -- | -- | TJC |
| 9/1/99 8:20 | 2,232 | 25.00 | 34.70 | 25.00 | 35.90 | -- | -- | TJC |
| 9/1/99 9:20 | 2,250 | 25.00 | 30.50 | 25.00 | 4.29 | -- | -- | TJC |
| 9/1/99 11:35 | 2,296 | 25.00 | 35.20 | 25.00 | 2.85 | -- | -- | TJC |
| 9/1/99 12:15 | 2,310 | -- | -- | -- | -- | 25.00 | 39.70 | TJC |
| 9/1/99 15:40 | 2,325 | 25.00 | 37.10 | 25.00 | 4.96 | -- | -- | TJC |

Table D-2
Well HC-8 Fluoride Concentrations During Drilling
 (Page 4 of 5)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 9/1/99 17:25 | 2,343 | 25.00 | 40.90 | 25.00 | 6.54 | -- | -- | TJC |
| 9/1/99 18:50 | 2,354 | 25.00 | 43.20 | 25.00 | 13.30 | -- | -- | TJC |
| 9/1/99 23:15 | 2,375 | 25.00 | 37.40 | 25.00 | 6.32 | -- | -- | TJC |
| 9/1/99 23:45 | 2,381 | -- | -- | -- | -- | 25.00 | 34.10 | TJC |
| 9/2/99 1:00 | 2,395 | 25.00 | 32.20 | 25.00 | 1.68 | -- | -- | TJC |
| 9/2/99 2:00 | 2,415 | 25.00 | 36.20 | 25.00 | 2.99 | -- | -- | TJC |
| 9/2/99 3:00 | 2,432 | 25.00 | 34.20 | 25.00 | 3.42 | -- | -- | TJC |
| 9/2/99 3:50 | 2,432 | -- | -- | -- | -- | 25.00 | 39.00 | TJC |
| 9/2/99 4:15 | 2,452 | 25.00 | 34.80 | 25.00 | 6.46 | -- | -- | TJC |
| 9/2/99 5:00 | 2,465 | 25.00 | 35.20 | 25.00 | 5.89 | -- | -- | TJC |
| 9/2/99 5:30 | 2,470 | -- | -- | -- | -- | 25.00 | 39.50 | TJC |
| 9/3/99 9:00 | 2,030 | 0.00 | 0.00 | 25.20 | 0.00 | -- | -- | JS |
| 9/4/99 20:00 | 2,470 | -- | -- | -- | -- | 25.40 | 35.00 | TC |
| 9/4/99 21:40 | 2,470 | -- | -- | -- | -- | 25.50 | 38.50 | TC |
| 9/5/99 9:10 | 1,580 | -- | -- | -- | -- | 25.10 | 34.60 | TC |
| 9/5/99 23:00 | 2,070 | -- | -- | -- | -- | 25.40 | 34.20 | TC |
| 9/5/99 23:25 | 2,090 | 25.40 | 16.70 | 25.40 | 19.10 | -- | -- | TC |
| 9/6/99 11:45 | 2,470 | 25.70 | 13.30 | 25.90 | 16.30 | -- | -- | TJC |
| 9/6/99 21:25 | 2,470 | -- | -- | -- | -- | 25.40 | 36.60 | TJC |
| 9/7/99 0:00 | 2,470 | -- | -- | -- | -- | 25.60 | 35.70 | TC |
| 9/7/99 3:15 | 2,470 | 25.70 | 14.80 | 25.60 | 12.90 | -- | -- | TC |
| 9/7/99 4:15 | 2,473 | 24.50 | 19.30 | 26.10 | 11.80 | -- | -- | TC |
| 9/7/99 5:15 | 2,480 | 25.90 | 10.50 | 26.60 | 12.80 | -- | -- | TC |
| 9/7/99 6:20 | 2,487 | 26.20 | 17.40 | 26.50 | 17.80 | -- | -- | TC |
| 9/7/99 7:30 | 2,493 | 25.50 | 12.80 | 26.70 | 10.10 | -- | -- | TC |

Table D-2
Well HC-8 Fluoride Concentrations During Drilling
 (Page 5 of 5)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (degrees C) | Injection Fluid (mg/L) | Discharge Fluid (degrees C) | Discharge Fluid (mg/L) | Water Truck (degrees C) | Water Truck (mg/L) | Analyst |
|--------------------------------------|------------------------|--------------------------------|---------------------------|--------------------------------|---------------------------|----------------------------|-----------------------|---------|
| 9/7/99 8:30 | 2,497 | 26.40 | 12.80 | 26.30 | 11.00 | 25.60 | 33.50 | TC |
| 9/7/99 9:30 | 2,502 | 25.60 | 14.30 | 26.00 | 12.60 | -- | -- | TC |
| 9/7/99 10:30 | 2,509 | 26.30 | 13.80 | 26.20 | 13.70 | -- | -- | TJC |
| 9/7/99 11:30 | 2,513 | 25.40 | 16.50 | 26.40 | 12.90 | -- | -- | TJC |
| 9/7/99 12:50 | 2,521 | 26.50 | 7.03 | 26.60 | 7.03 | -- | -- | TJC |
| 9/8/99 2:35 | 2,530 | -- | -- | -- | -- | 26.60 | 4.77 | TC |
| 9/8/99 5:40 | 2,530 | -- | -- | -- | -- | 26.60 | 1.51 | TC |
| 9/8/99 7:50 | 2,530 | -- | -- | -- | -- | 26.60 | 2.10 | TC |
| 9/8/99 10:25 | 2,530 | -- | -- | -- | -- | 26.60 | 30.90 | TC |
| 9/9/99 0:35 | 2,530 | -- | -- | -- | -- | 26.00 | 33.10 | TC |
| 9/9/99 9:45 | 2,530 | -- | -- | -- | -- | 26.00 | 32.90 | TC |
| 9/11/99 17:00 | 790 | 26.2 | 37.70 | 25.70 | 2.87 | -- | -- | TC |
| 9/11/99 19:55 | 2,530 | -- | -- | -- | -- | 26.20 | 33.70 | TC |
| 9/17/99 3:30 | 2,530 | -- | -- | -- | -- | 26.40 | 22.50 | JS |
| 9/17/99 6:30 | 2,530 | -- | -- | -- | -- | 26.10 | 5.31 | JS |
| 9/17/99 7:35 | 2,530 | -- | -- | -- | -- | 26.40 | 3.03 | JS |
| 9/17/99 16:30 | NA | -- | -- | -- | -- | 25.20 | 36.30 | TC |
| 9/17/99 13:30 | NA | -- | -- | -- | -- | 26.00 | 18.20 | TC |
| 9/17/99 19:35 | NA | -- | -- | -- | -- | 25.80 | 30.40 | TC |
| 9/17/99 20:40 | NA | -- | -- | -- | -- | 25.60 | 31.90 | TC |
| 9/17/99 21:35 | NA | -- | -- | -- | -- | 25.30 | 32.40 | TC |
| 9/23/99 11:00 | NA | -- | -- | -- | -- | 26.80 | 52.20 | JS |

-- = Not measured

Table D-3
Well HC-8 Well Development Parameters During Airlifting
 (Page 1 of 4)

| Well Number: HC-8 | | Start Time/Date: <u>9/21/99 16:45</u> | | End Date/Time: <u>9/23/99 16:10</u> | | | | | | | | | | |
|---|-----------------|---|-------------------|-------------------------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|-------------------------|--|-----------|----------|------------------------|
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | | | | | | | | | | |
| Test Type: <u>Airlift Development</u> | | Initial SWL: Not Measured | | End SWL: 1,375.8 | | | | | | | | | | |
| Sample Team: <u>Forsgren, Dunn-West</u> | | Datum: T.O.C. | | | | | | | | | | | | |
| Sample Type: <u>Grab</u> | | Development Method: <u>Conventional Airlift with AQ Airline</u> | | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| SDW | 9/21/99 | 16:45 | | start airlifting | | | | | | | | | | |
| SDW | 9/21/99 | 16:45 | 16:46 | 1 | 20 | 20 | 1 | 20 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 17:18 | 17:23 | 5 | 20 | 100 | 6 | 120 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 17:50 | 17:58 | 8 | 20 | 160 | 14 | 280 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 18:28 | 18:48 | 20 | 20 | 400 | 34 | 680 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 19:05 | 19:15 | 10 | 20 | 200 | 44 | 880 | 19:15 | 29.1 | 1,281 | 8.52 | 12.9 | -167 |
| SDW | 9/21/99 | 19:15 | 19:40 | 25 | 20 | 500 | 69 | 1,380 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 19:40 | 20:30 | 50 | 2.5 | 125 | 119 | 1,505 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 20:49 | 21:00 | 11 | 20 | 220 | 130 | 1,725 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 21:00 | 21:10 | 10 | 12 | 120 | 140 | 1,845 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 21:10 | 21:15 | 5 | 7 | 35 | 145 | 1,880 | 21:15 | 25.3 | 1,052 | 8.38 | 13.9 | -733 |
| SDW | 9/21/99 | 21:30 | 21:45 | 15 | 7 | 105 | 160 | 1,985 | -- | -- | -- | -- | -- | -- |
| SDW | 9/21/99 | 21:45 | 23:15 | 90 | 5 | 450 | 250 | 2,435 | 23:15 | 25.1 | 747 | 9.27 | 10.3 | 267 |
| SDW | 9/21/99 | 23:15 | 23:45 | 30 | 5 | 150 | 280 | 2,585 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 0:20 | 0:50 | 30 | 5 | 150 | 310 | 2,735 | -- | -- | -- | -- | -- | -- |

Table D-3
Well HC-8 Well Development Parameters During Airlifting
 (Page 2 of 4)

| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ² (pCi/L) |
|----------|-----------------|--------------------|-------------------|--------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|-------------------------|--|-----------|----------|------------------------|
| fmf | 9/22/99 | 1:18 | 1:40 | 22 | 10.5 | 231 | 332 | 2,966 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 1:40 | 2:12 | 32 | 5 | 160 | 364 | 3,126 | 1:50 | 23.8 | 1,022 | 8.49 | 6.3 | 25 |
| fmf | 9/22/99 | 2:12 | 2:23 | 11 | 5 | 55 | 375 | 3,181 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 3:00 | 3:45 | 45 | 9.0 | 405 | 420 | 3,586 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 3:45 | 3:50 | 5 | 3.1 | 15 | 425 | 3,602 | 3:50 | 22.8 | 911 | 8.57 | 4.9 | 350 |
| fmf | 9/22/99 | 3:50 | 5:00 | 70 | 3.1 | 217 | 495 | 3,819 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 5:30 | 6:15 | 45 | 9.0 | 405 | 540 | 4,224 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 6:15 | 6:25 | 10 | 3.0 | 30 | 550 | 4,254 | 6:25 | 22.4 | 880 | 8.78 | 4.2 | 200 |
| fmf | 9/22/99 | 6:25 | 7:00 | 35 | 3.0 | 105 | 585 | 4,359 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 7:32 | 7:52 | 20 | 8.1 | 162 | 605 | 4,521 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 7:52 | 8:25 | 33 | 5.0 | 165 | 638 | 4,686 | 8:25 | 23.5 | 891 | 9.09 | 3.7 | 150 |
| fmf | 9/22/99 | 8:25 | 8:30 | 5 | 5.0 | 25 | 643 | 4,711 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 8:52 | 9:09 | 17 | 8.5 | 145 | 660 | 4,855 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 9:27 | 9:55 | 28 | 12 | 336 | 688 | 5,191 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 9:55 | 10:15 | 20 | 5 | 100 | 708 | 5,291 | 10:15 | 23.9 | 1,055 | 8.32 | 5.8 | 700 |
| fmf | 9/22/99 | 10:15 | 10:27 | 12 | 5 | 60 | 720 | 5,351 | -- | -- | -- | -- | -- | -- |
| fmf | 9/22/99 | 10:54 | 11:50 | 56 | 7 | 392 | 776 | 5,743 | -- | -- | -- | -- | -- | -- |
| SDW | 9/22/99 | 13:10 | 13:15 | 5 | 8.5 | 43 | 781 | 5,786 | 13:15 | 26.2 | 1,258 | 7.48 | 3.76 | 433 |
| SDW | 9/22/99 | 13:15 | 14:10 | 55 | 8.5 | 468 | 836 | 6,253 | -- | -- | -- | -- | -- | -- |
| SDW | 9/22/99 | 14:15 | 15:15 | 60 | 4 | 240 | 896 | 6,493 | 15:15 | 26.7 | 1,256 | 8.71 | 3.29 | 833 |
| SDW | 9/22/99 | 15:15 | 15:30 | 15 | 4 | 60 | 911 | 6,553 | -- | -- | -- | -- | -- | -- |

Table D-3
Well HC-8 Well Development Parameters During Airlifting
 (Page 3 of 4)

| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------------|-------------------|--------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|-------------------------|--|-----------|----------|------------------------|
| SDW | 9/22/99 | 17:10 | 17:15 | 5 | 10 | 50 | 916 | 6,603 | 17:15 | 26.2 | 1,191 | 8.33 | 2.27 | 567 |
| SDW | 9/22/99 | 17:15 | 18:30 | 75 | 10 | 750 | 991 | 7,353 | -- | -- | -- | -- | -- | -- |
| SDW | 9/22/99 | 19:25 | 19:45 | 20 | 12 | 240 | 1,011 | 7,593 | 19:45 | 23.8 | 1,135 | 8.78 | 2.86 | 1,433 |
| SDW | 9/22/99 | 19:45 | 21:45 | 120 | 12 | 1,440 | 1,131 | 9,033 | 21:45 | 24.9 | 1,228 | 8.67 | 3.38 | 433 |
| SDW | 9/22/99 | 21:45 | 21:50 | 5 | 12 | 60 | 1,136 | 9,093 | -- | -- | -- | -- | -- | -- |
| SDW | 9/22/99 | 22:35 | 23:50 | 75 | 10 | 750 | 1,211 | 9,843 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 0:53 | 1:09 | 16 | 10.9 | 174 | 1,227 | 10,017 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 1:40 | 2:00 | 20 | 7 | 140 | 1,247 | 10,157 | 2:00 | 24.6 | 861 | 7.08 | 2.83 | -200 |
| fmf | 9/23/99 | 2:00 | 2:10 | 10 | 7 | 70 | 1,257 | 10,227 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 2:40 | 3:10 | 30 | 11.1 | 333 | 1,287 | 10,560 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 3:40 | 4:10 | 30 | 8.1 | 243 | 1,317 | 10,803 | 4:10 | 26.5 | 868 | 7.35 | 2.4 | 425 |
| fmf | 9/23/99 | 4:10 | 4:15 | 5 | 8.1 | 41 | 1,322 | 10,844 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 4:30 | 5:45 | 75 | 6.2 | 465 | 1,397 | 11,309 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 5:45 | 6:30 | 45 | 3.5 | 158 | 1,442 | 11,466 | 6:30 | 25.6 | 843 | 8.33 | 2.16 | 825 |
| fmf | 9/23/99 | 6:30 | 7:00 | 30 | 3.5 | 105 | 1,472 | 11,571 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 7:15 | 8:25 | 70 | 6.1 | 427 | 1,542 | 11,998 | -- | -- | -- | -- | -- | -- |
| fmf | 9/23/99 | 8:25 | 8:30 | 5 | 6.1 | 30 | 1,547 | 12,029 | 8:30 | 26 | 823 | 8.35 | 1.95 | 100 |
| fmf | 9/23/99 | 8:30 | 10:50 | 140 | 3.2 | 448 | 1,687 | 12,477 | 10:50 | 26.5 | 842 | 7.94 | 3.14 | 375 |
| fmf | 9/23/99 | 10:50 | 12:30 | 100 | 3.2 | 320 | 1,787 | 12,797 | 12:30 | 25.4 | 838 | 7.94 | 0.1 | 1,267 |
| SDW | 9/23/99 | 13:20 | 13:25 | 5 | 3.1 | 16 | 1,792 | 12,812 | 13:25 | 25.9 | 924 | 7.16 | -- | -- |
| SDW | 9/23/99 | 13:25 | 14:30 | 65 | 3.1 | 201 | 1,857 | 13,014 | 14:30 | 25.7 | 854 | 8.1 | -- | -- |

Table D-3
Well HC-8 Well Development Parameters During Airlifting
 (Page 4 of 4)

| Initials | Date (mm/dd/yy) | Start Time (hh:mm) | Stop Time (hh:mm) | Duration (minutes) | Measured Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Sample Time (hh:mm) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|-----------------|--------------------|-------------------|--------------------|--------------------------|------------------|-------------------------------|-----------------------------|---------------------|-------------------------|--|-----------|----------|------------------------|
| SDW | 9/23/99 | 14:30 | 15:00 | 30 | 3.1 | 93 | 1,887 | 13,107 | 15:00 | 25.4 | 866 | 8.15 | 1.27 | 1,433 |
| SDW | 9/23/99 | 15:00 | 15:30 | 30 | 3.1 | 93 | 1,917 | 13,200 | 15:30 | 25.6 | 874 | 8.17 | -- | -- |
| SDW | 9/23/99 | 15:30 | 16:00 | 30 | 3.1 | 93 | 1,947 | 13,293 | 16:00 | 25.2 | 855 | 8.71 | 0.66 | 900 |
| SDW | 9/23/99 | 16:00 | 16:10 | 10 | 3.1 | 31 | 1,957 | 13,324 | -- | -- | -- | -- | -- | -- |
| SDW | 9/23/99 | 16:10 | | stop airlifting | | | | | | | | | | |

-- = Not measured
 S.U. = Standard units

**Table D-4
Well HC-8 Well Development Parameters During Phase I Development/Test Pumping**

| Well Number: | <u>HC-8</u> | Start Time/Date: | <u>10/18/1999 08:12</u> | End Date/Time: | <u>10/18/99 10:30</u> | | | | | | | |
|-----------------|-------------------------|---------------------|---------------------------|-------------------------------|-----------------------|-------------------------------|-----------------------------|-------------------------|--|-----------|----------|------------------------|
| Project No: | <u>799419.0056.0005</u> | Project Name: | <u>Project Shoal Area</u> | | | | | | | | | |
| Test Type: | <u>Phase I Pumping</u> | Initial SWL: | Not Measured | End SWL: | Not Measured | Datum: | M.P. | | | | | |
| Sample Team: | <u>Forsgren</u> | Sample Type: | <u>Grab</u> | | | | | | | | | |
| Testing Method: | <u>Submersible Pump</u> | | | | | | | | | | | |
| Initials | Date (mm/dd/yy) | Sample Time (hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
| fmf | 10/18/99 | 8:12 | | start pumping | | | | | | | | |
| fmf | 10/18/99 | 8:20 | 8 | 3.11 | 25 | 8 | 25 | 17.8 | 875 | 7.00 | 2.45 | 675 |
| fmf | 10/18/99 | 9:15 | 55 | -- | 171 | 63 | 196 | 23.6 | 865 | 6.87 | -- | -- |
| fmf | 10/18/99 | 10:20 | 65 | 2.05 | 134 | 128 | 329 | 23.8 | 856 | 7.49 | 1.91 | 975 |
| fmf | 10/18/99 | 10:30 | 10 | -- | 21 | 138 | 350 | -- | -- | -- | -- | -- |
| fmf | 10/18/99 | 10:30 | | stop pumping | | | | | | | | |

-- = Not measured
S.U. = Standard units
SWL = Static water level

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 1 of 7)

| | | | | | |
|---|--|---|--|--------------------------------------|--|
| Well Number: HC-8 | | Start Time/Date: <u>10/19/99 09:30</u> | | End Date/Time: <u>10/29/99 17:25</u> | |
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | |
| Test Type: <u>Phase II Pumping</u> | | Initial SWL: 1,370.48 ft | | End SWL: Not Measured Datum: M.P. | |
| Sample Team: <u>Forsgren, Welcher, Chavez, Cherry, Roos</u> | | Sample Type: <u>Grab</u> | | | |
| Testing Method: <u>Submersible Pump</u> | | | | | |

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro-Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------|--------------------|------------------|-------------------------------|------------------|-------------------------------|-----------------------------|-------------------------|--|-----------|----------|------------------------|
| fmf | 10/19/99 9:35 | | -- | 4.1 | | | | | start pumping | | | |
| fmf | 10/19/99 10:00 | 25 | 66.9 | 3.6 | 89 | 25 | 89 | 18.2 | 863 | 7.79 | 2.05 | 275 |
| fmf | 10/19/99 11:10 | 70 | 97.9 | 2.4 | 170 | 95 | 259 | 24.2 | 912 | 7.77 | -- | -- |
| amw | 10/19/99 13:30 | 140 | 123 | 1.9 | 270 | 235 | 529 | 24.8 | 908 | 7.54 | 3.00 | -575 |
| amw | 10/19/99 15:00 | 90 | 130 | 1.8 | 164 | 325 | 694 | 25.3 | 903 | 7.10 | 2.90 | -350 |
| amw | 10/19/99 17:20 | 140 | 128 | 1.9 | 260 | 465 | 953 | 24.8 | 881 | 7.54 | 2.51 | 25 |
| amw | 10/19/99 19:10 | 110 | 131 | 1.8 | 200 | 575 | 1,153 | 23.9 | 878 | 7.66 | 2.50 | -300 |
| amw | 10/19/99 21:15 | 125 | 125 | 1.9 | 238 | 700 | 1,391 | 23.8 | 862 | 7.79 | 2.00 | -725 |
| amw | 10/19/99 23:15 | 120 | 130 | 1.8 | 219 | 820 | 1,610 | 24.0 | 855 | 7.71 | 1.87 | -- |
| fmf | 10/20/99 1:25 | 130 | 137 | 1.7 | 225 | 950 | 1,835 | 24.2 | 834 | 7.97 | 1.45 | 525 |
| fmf | 10/20/99 3:05 | 100 | 138 | 1.7 | 172 | 1,050 | 2,008 | 23.9 | 823 | 7.89 | -- | -- |
| fmf | 10/20/99 5:09 | 124 | 134.3 | 1.8 | 219 | 1,174 | 2,227 | 24.1 | 811 | 7.88 | 1.37 | 475 |
| fmf | 10/20/99 7:05 | 116 | 133.56 | 1.8 | 206 | 1,290 | 2,433 | 24.2 | 837 | 7.93 | -- | -- |
| fmf | 10/20/99 8:30 | 85 | 138.36 | 1.7 | 146 | 1,375 | 2,579 | 25.4 | 824 | 7.85 | 1.47 | -400 |
| fmf | 10/20/99 9:45 | 75 | -- | 1.7 | 128 | 1,450 | 2,707 | -- | stop pumping | -- | -- | -- |
| fmf | 10/20/99 10:15 | 30 | | | | | | | start pumping | | | |

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 2 of 7)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| fmf | 10/20/99 11:25 | 70 | 133.07 | 1.8 | 125 | 1,520 | 2,832 | 25.8 | 847 | 7.83 | -- | -- |
| tc | 10/20/99 13:42 | 137 | 138 | 1.7 | 236 | 1,657 | 3,068 | 27 | 829 | 7.79 | 1.27 | -275 |
| tc | 10/20/99 17:38 | 236 | 134 | 1.8 | 418 | 1,893 | 3,486 | 25.6 | 841 | 7.69 | 1.00 | -200 |
| tc | 10/20/99 19:48 | 130 | 133.03 | 1.8 | 232 | 2,023 | 3,718 | 24.3 | 832 | 7.79 | -- | -- |
| tc | 10/20/99 21:34 | 106 | 133.1 | 1.8 | 189 | 2,129 | 3,907 | 23.8 | 844 | 7.64 | 4.47 | 925 |
| amw | 10/20/99 23:30 | 116 | 138 | 1.7 | 200 | 2,245 | 4,107 | 24.3 | 847 | 7.89 | -- | -- |
| amw | 10/21/99 1:15 | 105 | 138 | 1.7 | 181 | 2,350 | 4,288 | 24.1 | 846 | 7.94 | 2.34 | 825 |
| amw | 10/21/99 3:30 | 135 | 137 | 1.7 | 234 | 2,485 | 4,522 | 24.3 | 843 | 7.53 | -- | -- |
| amw | 10/21/99 5:15 | 105 | 138 | 1.7 | 181 | 2,590 | 4,703 | 24.3 | 847 | 7.93 | 1.56 | 900 |
| amw | 10/21/99 7:30 | 135 | 133 | 1.8 | 241 | 2,725 | 4,944 | 24.2 | 842 | 7.82 | -- | -- |
| amw | 10/21/99 9:20 | 110 | 140 | 1.7 | 187 | 2,835 | 5,131 | 25.6 | 848 | 7.65 | 1.62 | 600 |
| amw | 10/21/99 11:30 | 130 | 142 | 1.7 | 218 | 2,965 | 5,348 | 26.2 | 845 | 7.77 | -- | -- |
| tc | 10/21/99 13:30 | 120 | 140 | 1.7 | 204 | 3,085 | 5,552 | 26.7 | 847 | 7.84 | -- | -- |
| tc | 10/21/99 15:20 | 110 | 139 | 1.7 | 188 | 3,195 | 5,740 | 26.2 | 851 | 7.25 | -- | -- |
| tc | 10/21/99 17:23 | 123 | 138 | 1.7 | 212 | 3,318 | 5,952 | 25.7 | 845 | 7.31 | 1.68 | -350 |
| tc | 10/21/99 21:35 | 252 | 139 | 1.7 | 431 | 3,570 | 6,383 | 24.2 | 814 | 7.36 | 1.64 | -250 |
| tc | 10/21/99 23:30 | 115 | 140 | 1.7 | 195 | 3,685 | 6,578 | 24.4 | 830 | 7.65 | -- | -- |
| amw | 10/22/99 1:30 | 120 | 136 | 1.7 | 210 | 3,805 | 6,787 | 24.3 | 837 | 7.86 | 1.16 | -550 |
| amw | 10/22/99 3:30 | 120 | 135 | 1.8 | 211 | 3,925 | 6,999 | 24.5 | 841 | 7.82 | --- | --- |
| amw | 10/22/99 5:15 | 105 | 136 | 1.7 | 183 | 4,030 | 7,182 | 24.4 | 841 | 7.80 | 1.14 | 425 |
| amw | 10/22/99 7:30 | 135 | 133 | 1.8 | 241 | 4,165 | 7,423 | 24.6 | 838 | 7.83 | --- | --- |

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 3 of 7)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| amw | 10/22/99 10:15 | 165 | 140 | 1.7 | 280 | 4,330 | 7,703 | 25.9 | 843 | 7.89 | 1.18 | -250 |
| amw | 10/22/99 11:25 | 70 | 139 | 1.7 | 120 | 4,400 | 7,823 | 26.4 | 844 | 7.77 | --- | --- |
| tc | 10/22/99 13:30 | 125 | 145 | 1.6 | 205 | 4,525 | 8,028 | 26.8 | 821 | 7.46 | 1.37 | -525 |
| tc | 10/22/99 15:30 | 120 | 139 | 1.7 | 205 | 4,645 | 8,233 | 26.5 | 840 | 7.82 | --- | --- |
| tc | 10/22/99 17:30 | 120 | 140 | 1.7 | 204 | 4,765 | 8,436 | 25.4 | 841 | 7.87 | 1.25 | -75 |
| tc | 10/22/99 19:35 | 125 | 148 | 1.6 | 201 | 4,890 | 8,637 | 24.3 | 832 | 7.39 | --- | --- |
| tc | 10/22/99 21:28 | 113 | 141 | 1.7 | 190 | 5,003 | 8,828 | 23.8 | 835 | 7.39 | 1.43 | -525 |
| tc | 10/22/99 23:28 | 120 | 142 | 1.7 | 201 | 5,123 | 9,028 | 23.9 | 801 | 7.52 | --- | --- |
| amw | 10/23/99 1:20 | 112 | 134 | 1.8 | 199 | 5,235 | 9,227 | 24.5 | 843 | 7.58 | 1.09 | 425 |
| amw | 10/23/99 3:30 | 130 | 135 | 1.8 | 229 | 5,365 | 9,456 | 24.7 | 835 | 7.39 | --- | --- |
| amw | 10/23/99 5:20 | 110 | 135 | 1.8 | 194 | 5,475 | 9,649 | 24.7 | 838 | 7.50 | 1.07 | 250 |
| amw | 10/23/99 7:20 | 120 | 132 | 1.8 | 216 | 5,595 | 9,865 | 24.5 | 829 | 7.56 | --- | --- |
| amw | 10/23/99 9:40 | 140 | 140 | 1.7 | 238 | 5,735 | 10,103 | 25.5 | 834 | 7.78 | 1.03 | 625 |
| amw | 10/23/99 11:30 | 110 | 141 | 1.7 | 185 | 5,845 | 10,288 | 26.0 | 838 | 7.60 | --- | --- |
| amw | 10/23/99 13:25 | 115 | 139 | 1.7 | 197 | 5,960 | 10,485 | 27.0 | 843 | 7.54 | 0.85 | 225 |
| tc | 10/23/99 15:26 | 121 | 142 | 1.7 | 202 | 6,081 | 10,687 | 26.7 | 832 | 7.49 | --- | --- |
| tc | 10/23/99 17:25 | 119 | 145 | 1.6 | 195 | 6,200 | 10,882 | 25.1 | 840 | 7.16 | 0.93 | 975 |
| tc | 10/23/99 19:30 | 125 | 146 | 1.6 | 203 | 6,325 | 11,086 | 22.4 | 865 | 7.48 | --- | --- |
| tc | 10/23/99 21:30 | 120 | 143 | 1.7 | 199 | 6,445 | 11,285 | 24 | 815 | 7.77 | 1.19 | 900 |
| tc | 10/23/99 23:26 | 116 | 141 | 1.7 | 195 | 6,561 | 11,481 | 23.3 | 832 | 7.68 | --- | --- |
| amw | 10/24/99 1:30 | 124 | 134 | 1.8 | 220 | 6,685 | 11,700 | 24.5 | 815 | 8.05 | 0.97 | 1,225 |

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 4 of 7)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| amw | 10/24/99 3:40 | 130 | 136 | 1.7 | 227 | 6,815 | 11,928 | 24.6 | 831 | 7.91 | --- | --- |
| amw | 10/24/99 5:35 | 115 | 137 | 1.7 | 199 | 6,930 | 12,127 | 24.5 | 830 | 8.00 | 1.02 | 0.0 |
| amw | 10/24/99 7:30 | 115 | 134 | 1.8 | 204 | 7,045 | 12,331 | 24.7 | 815 | 7.55 | --- | --- |
| amw | 10/24/99 9:20 | 110 | 138 | 1.7 | 189 | 7,155 | 12,520 | 26.3 | 838 | 7.85 | 1.08 | 625 |
| amw | 10/24/99 11:30 | 130 | 139 | 1.7 | 222 | 7,285 | 12,743 | 26.2 | 838 | 7.67 | --- | --- |
| tc | 10/24/99 13:35 | 125 | 144 | 1.7 | 206 | 7,410 | 12,949 | 26.8 | 816 | 7.14 | 0.94 | 25 |
| tc | 10/24/99 15:33 | 118 | 145 | 1.6 | 193 | 7,528 | 13,142 | 27.4 | 823 | 7.07 | --- | --- |
| tc | 10/24/99 17:37 | 124 | 143 | 1.7 | 206 | 7,652 | 13,348 | 25.1 | 820 | 6.99 | 0.95 | 100 |
| tc | 10/24/99 19:35 | 118 | 139 | 1.7 | 202 | 7,770 | 13,550 | 24.7 | 814 | 7.56 | --- | --- |
| tc | 10/24/99 21:35 | 120 | 146 | 1.6 | 195 | 7,890 | 13,745 | 24.0 | 826 | 7.23 | 1.04 | 875 |
| tc | 10/24/99 23:35 | 120 | 141 | 1.7 | 202 | 8,010 | 13,947 | 23.6 | 827 | 7.19 | --- | --- |
| amw | 10/25/99 1:20 | 105 | 138 | 1.7 | 181 | 8,115 | 14,128 | 24.6 | 835 | 7.90 | 0.96 | 675 |
| amw | 10/25/99 3:35 | 135 | 139 | 1.7 | 231 | 8,250 | 14,359 | 24.7 | 830 | 7.94 | --- | --- |
| amw | 10/25/99 5:30 | 115 | 135 | 1.8 | 202 | 8,365 | 14,561 | 24.3 | 830 | 8.00 | 0.93 | 650 |
| amw | 10/25/99 7:35 | 125 | 140 | 1.7 | 212 | 8,490 | 14,773 | 24.8 | 818 | 7.85 | --- | --- |
| amw | 10/25/99 9:25 | 110 | 141 | 1.7 | 185 | 8,600 | 14,959 | 25.9 | 823 | 7.94 | 1.00 | 1,478 |
| amw | 10/25/99 11:40 | 135 | 143 | 1.7 | 224 | 8,735 | 15,183 | 26.4 | 839 | 7.59 | --- | --- |
| amw | 10/25/99 13:25 | 105 | 141 | 1.7 | 177 | 8,840 | 15,360 | 26.7 | 833 | 7.92 | 0.82 | 250 |
| bac | 10/25/99 15:41 | 136 | 142 | 1.7 | 228 | 8,976 | 15,588 | 27.6 | 830 | 7.25 | --- | --- |
| bac | 10/25/99 17:30 | 109 | 137 | 1.7 | 189 | 9,085 | 15,777 | 24.5 | 860 | 7.33 | 0.88 | 1,000 |
| tc | 10/25/99 19:30 | 120 | 147 | 1.6 | 194 | 9,205 | 15,971 | 24.7 | 820 | 7.19 | --- | --- |

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 5 of 7)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| tc | 10/25/99 21:20 | 110 | 145 | 1.6 | 180 | 9,315 | 16,151 | 24.6 | 839 | 7.43 | 0.92 | 3,750 |
| tc | 10/25/99 23:30 | 130 | 140 | 1.7 | 221 | 9,445 | 16,372 | 24.5 | 821 | 7.87 | --- | --- |
| tc | 10/26/99 1:37 | 127 | 135 | 1.8 | 224 | 9,572 | 16,595 | 23.5 | 835 | 7.80 | 0.95 | 500 |
| tc | 10/26/99 3:23 | 106 | 142 | 1.7 | 177 | 9,678 | 16,772 | 23.9 | 836 | 7.96 | --- | --- |
| tc | 10/26/99 5:23 | 120 | 141 | 1.7 | 202 | 9,798 | 16,975 | 23.4 | 836 | 7.94 | 0.96 | 1,550 |
| bac | 10/26/99 7:42 | 139 | 143 | 1.7 | 231 | 9,937 | 17,206 | 24.2 | 782 | 7.41 | --- | --- |
| bac | 10/26/99 10:05 | 143 | 151 | 1.6 | 225 | 10,080 | 17,431 | 25.8 | 807 | 7.62 | 0.95 | 450 |
| bac | 10/26/99 12:45 | 160 | 144 | 1.7 | 264 | 10,240 | 17,695 | 26.7 | 780 | 6.98 | --- | --- |
| bac | 10/26/99 14:40 | 115 | 141 | 1.7 | 194 | 10,355 | 17,888 | 27.1 | 742 | 7.15 | 0.89 | -300 |
| bac | 10/26/99 16:50 | 130 | 143 | 1.7 | 216 | 10,485 | 18,104 | 25.0 | 724 | 7.14 | --- | --- |
| tc | 10/26/99 18:40 | 110 | 139 | 1.6 | 176 | 10,595 | 18,280 | 25.6 | 731 | 7.10 | 0.97 | 525 |
| tc | 10/26/99 20:25 | 105 | 144 | 1.7 | 173 | 10,700 | 18,454 | 24 | 837 | 7.89 | --- | --- |
| tc | 10/26/99 22:26 | 121 | 140 | 1.7 | 205 | 10,821 | 18,659 | 23.8 | 827 | 7.86 | 1.02 | -275 |
| tc | 10/27/99 0:30 | 124 | 140 | 1.7 | 210 | 10,945 | 18,869 | 23.5 | 821 | 7.23 | --- | --- |
| tc | 10/27/99 2:37 | 127 | 139 | 1.7 | 217 | 11,072 | 19,086 | 23.8 | 840 | 8.00 | 1.02 | 25 |
| tc | 10/27/99 4:27 | 110 | 138 | 1.7 | 189 | 11,182 | 19,276 | 24.5 | 832 | 7.99 | --- | --- |
| tc | 10/27/99 6:20 | 113 | 139 | 1.7 | 193 | 11,295 | 19,469 | 23.9 | 839 | 8.01 | 1.14 | 700 |
| bac | 10/27/99 8:35 | 135 | 142 | 1.7 | 226 | 11,430 | 19,695 | 24.2 | 452 | 7.75 | 1.46 | 700 |
| bac | 10/27/99 10:40 | 125 | 137 | 1.7 | 217 | 11,555 | 19,912 | 25 | 791 | 7.75 | 0.86 | 775 |
| bac | 10/27/99 12:35 | 115 | 138 | 1.7 | 198 | 11,670 | 20,110 | 26.7 | 435 | 7.61 | 1.06 | 50 |
| bac | 10/27/99 15:57 | 202 | 148 | 1.6 | 324 | 11,872 | 20,434 | 26 | 806 | 7.76 | 1.03 | 575 |

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 6 of 7)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| tc | 10/27/99 18:00 | 123 | 138 | 1.7 | 212 | 11,995 | 20,646 | 26.1 | 731 | 7.89 | --- | --- |
| tc | 10/27/99 20:03 | 123 | 140 | 1.7 | 209 | 12,118 | 20,855 | 25.3 | 823 | 7.85 | 0.76 | 1,450 |
| tc | 10/27/99 22:01 | 118 | 142 | 1.7 | 197 | 12,236 | 21,052 | 25.2 | 822 | 7.77 | --- | --- |
| tc | 10/28/99 0:00 | 119 | 142 | 1.7 | 199 | 12,355 | 21,251 | 24.8 | 837 | 7.92 | 0.77 | 925 |
| tc | 10/28/99 2:05 | 125 | 141 | 1.7 | 211 | 12,480 | 21,462 | 24.7 | 832 | 7.80 | --- | --- |
| tc | 10/28/99 4:02 | 117 | 140 | 1.7 | 199 | 12,597 | 21,660 | 24.2 | 835 | 7.81 | 0.78 | 458 |
| jtr | 10/28/99 6:20 | 138 | 143 | 1.7 | 229 | 12,735 | 21,890 | 23.1 | 847 | 7.58 | --- | --- |
| jtr | 10/28/99 8:00 | 100 | 144 | 1.7 | 165 | 12,835 | 22,055 | 24.8 | 792 | 7.30 | 0.31 | 650 |
| bac | 10/28/99 10:30 | 150 | 143 | 1.7 | 249 | 12,985 | 22,304 | 24.8 | 717 | 7.20 | 0.17 | 300 |
| bac | 10/28/99 12:30 | 120 | 139 | 1.7 | 205 | 13,105 | 22,509 | 25.6 | 814 | 7.40 | --- | --- |
| bac | 10/28/99 14:32 | 122 | 141 | 1.7 | 206 | 13,227 | 22,715 | 25.7 | 793 | 7.37 | 0.14 | 875 |
| bac | 10/28/99 16:45 | 133 | 142 | 1.7 | 223 | 13,360 | 22,937 | 25 | 768 | 7.47 | --- | --- |
| tc | 10/28/99 18:43 | 118 | 140 | 1.7 | 200 | 13,478 | 23,137 | 24.1 | 799 | 7.52 | 0.14 | 743 |
| tc | 10/28/99 20:45 | 122 | 139 | 1.7 | 209 | 13,600 | 23,346 | 23.9 | 777 | 7.49 | --- | --- |
| tc | 10/28/99 22:49 | 124 | 133 | 1.8 | 222 | 13,724 | 23,567 | 23.1 | 811 | 7.49 | 0.19 | 650 |
| tc | 10/29/99 0:49 | 120 | 137 | 1.7 | 208 | 13,844 | 23,775 | 23.6 | 748 | 7.46 | --- | --- |
| tc | 10/29/99 2:35 | 106 | 140 | 1.7 | 180 | 13,950 | 23,955 | 23.6 | 802 | 7.48 | 0.13 | 1,125 |
| tc | 10/29/99 4:45 | 130 | 137 | 1.7 | 225 | 14,080 | 24,181 | 23.1 | 815 | 7.49 | --- | --- |
| jtr | 10/29/99 6:30 | 105 | 144 | 1.7 | 173 | 14,185 | 24,354 | 23 | 835 | 8.03 | 0 | 1,175 |
| jtr | 10/29/99 8:40 | 130 | 147 | 1.6 | 210 | 14,315 | 24,564 | 25 | 825 | 7.63 | --- | --- |

Table D-5
Well HC-8 Well Development Parameters During Phase II Development/Test Pumping
 (Page 7 of 7)

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Seconds per 15 L | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ³ (pCi/L) |
|----------|--------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| bac | 10/29/99 10:49 | 129 | 146 | 1.6 | 210 | 14,444 | 24,774 | 25.3 | 815 | 7.52 | 0.0758 | 750 |
| jtr | 10/29/99 13:05 | 136 | 136 | 1.7 | 238 | 14,580 | 25,012 | 26.1 | 802 | 7.48 | --- | --- |
| jtr | 10/29/99 15:10 | 125 | 131 | 1.8 | 227 | 14,705 | 25,238 | 25.5 | 457 | 7.44 | 0 | 1,700 |
| jtr | 10/29/99 17:25 | 135 | 143 | 1.7 | 224 | 14,840 | 25,463 | 24.2 | 826 | 7.37 | --- | --- |
| jtr | 10/29/99 17:25 | stop pumping | | | | | | | | | | |

-- = Not measured
 SWL = Static water level
 S.U. = Standard units
 L = Liter

**Table D-6
Well HC-8 Well Development Parameters During Phase III Development/Test Pumping**

| | | | | | |
|---|--|---|--|-------------------------------|--|
| Well Number: HC-8 | | Start Time/Date: <u>11/11/99 14:30</u> | | End Date/Time: 11/14/99 16:00 | |
| Project No: 799419.0056.0005 | | Project Name: Project Shoal Area | | | |
| Test Type: <u>Phase III Pumping</u> | | Initial SWL: 1,367.01 | | End SWL: 1,697.1 | |
| Sample Team: <u>Chavez, Coburn</u> | | Sample Type: <u>Grab</u> | | Datum: M.P. | |
| Testing Method: <u>Submersible Pump</u> | | | | | |

| Initials | Date and Time (mm/dd/yy hh:mm) | Duration (minutes) | Instantaneous Flow Rate (gpm) | Volume (gallons) | Cumulative Duration (minutes) | Cumulative Volume (gallons) | Temperature (degrees C) | Electrical Conductivity (micro- Siemens/cm) | pH (S.U.) | F (mg/L) | H ^s (pCi/L) |
|----------|--------------------------------------|-----------------------|-------------------------------------|---------------------|-------------------------------------|-----------------------------------|----------------------------|--|--------------|-------------|---------------------------|
| | 11/11/99 14:30 | | start pumping | | | | | | | | |
| tc | 11/11/99 14:30 | 0 | 4.0 | 0 | 0 | 0 | 16.5 | 816 | 8.10 | 0.649 | 250 |
| tc | 11/11/99 19:11 | 281 | 2.1 | 596 | 281 | 596 | 22.9 | 818 | 8.13 | 0.992 | 350 |
| tc | 11/11/99 23:02 | 231 | 2.2 | 499 | 512 | 1,095 | 23.8 | 829 | 7.96 | 1.1 | 675 |
| tjc | 11/12/99 4:05 | 303 | 2.1 | 643 | 815 | 1,738 | 24.4 | 814 | 7.92 | 0.944 | 1,275 |
| tjc | 11/12/99 8:07 | 242 | 2.2 | 532 | 1,057 | 2,270 | 24.6 | 822 | 7.94 | 0.847 | 2,250 |
| tc | 11/12/99 13:02 | 295 | 2.1 | 615 | 1,352 | 2,885 | 26.1 | 834 | 7.98 | 0.79 | 1,375 |
| tc | 11/12/99 17:00 | 238 | 2.0 | 475 | 1,590 | 3,360 | 24.8 | 824 | 8.00 | 0.76 | 1,750 |
| tc | 11/12/99 21:08 | 248 | 2.1 | 531 | 1,838 | 3,891 | 24.4 | 820 | 8.05 | 0.72 | 1,325 |
| tjc | 11/13/99 0:10 | 182 | 2.2 | 400 | 2,020 | 4,292 | 24.5 | 817 | 7.99 | 0.624 | -125 |
| tjc | 11/13/99 5:13 | 303 | 2.1 | 632 | 2,323 | 4,923 | 24.2 | 815 | 7.97 | 0.594 | -75 |
| tjc | 11/13/99 9:05 | 232 | 2.2 | 501 | 2,555 | 5,424 | 26.4 | 821 | 7.99 | 0.589 | 550 |
| tc | 11/13/99 12:57 | 232 | 2.1 | 488 | 2,787 | 5,912 | 26.5 | 820 | 8.03 | 0.06 | 1,100 |
| tc | 11/13/99 17:05 | 248 | 2.1 | 517 | 3,035 | 6,429 | 24.5 | 818 | 8.07 | 0.58 | 575 |
| tc | 11/13/99 20:58 | 233 | 2.2 | 513 | 3,268 | 6,942 | 24.8 | 815 | 8.04 | 0.57 | 550 |
| tjc | 11/14/99 0:34 | 216 | 2.1 | 462 | 3,484 | 7,404 | 24.4 | 821 | 8.00 | 0.527 | 725 |
| tjc | 11/14/99 5:22 | 288 | 2.2 | 634 | 3,772 | 8,037 | 24.2 | 822 | 8.01 | 0.517 | 900 |
| tjc | 11/14/99 9:09 | 227 | 2.1 | 469 | 3,999 | 8,506 | 26.1 | 807 | 8.01 | 0.514 | 1,375 |
| tc | 11/14/99 13:03 | 234 | 1.9 | 445 | 4,233 | 8,951 | 26.6 | 817 | 7.90 | 0.489 | 325 |
| tc | 11/14/99 16:00 | | stop pumping | | | | | | | | |

S.U. = Standard units

**Table D-7
Well HC-8 Water Balance**

| | | Credit | Debit | Balance |
|---|--|---------|--------|---------|
| Total Amount of Water Delivered to HC-8 by Lang Drilling (8/21-9/21) | | | | |
| 169,000 | gallons of water used to drill HC-8 | 176,800 | 0 | 176,800 |
| HC-8 Fluids Transferred to Infiltration Basin | | | | |
| 9/7/99 | 58,765 | | | |
| 9/22/99 | 35,000 | | | |
| 93,765 | gallons of HC-8 fluid transferred to infiltration basin | 0 | 93,765 | 83,035 |
| Fluid Discharged during Airlift Development | | | | |
| 13,324 | gallons of water discharged during initial airlift development (9/21-23) | 0 | 13,324 | 69,711 |
| Fluid Discharged during Phase I Pumping | | | | |
| 350 | gallons of water discharged during development/test pumping (10/18/99) | 0 | 350 | 69,361 |
| Fluid Discharged during Phase II Pumping | | | | |
| 25,463 | gallons of water discharged during test pumping (10/19-29) | 0 | 25,463 | 43,898 |
| Fluid Discharged during Phase III Pumping | | | | |
| 8,951 | gallons of water discharged during test pumping (11/11-14) | 0 | 8,951 | 34,947 |

**Table D-8
Well HC-8 Water Level Measurements**

| Date | Depth to Water (ft) | Water Level Elevation (ft msl) | Comments |
|----------------|---------------------|--------------------------------|--|
| 9/24/99 20:27 | 1,375.8 | 3,884.11 | Static water level measured post initial airlift development |
| 10/19/99 9:35 | 1,370.48 | 3,889.43 | Static water level measured post initial development/test pumping |
| 11/11/99 14:30 | 1,367.01 | 3,892.9 | Static water level measured prior to development/test pumping |
| 11/14/99 16:00 | 1,697.1 | 3,562.81 | Pumping water level measured at conclusion of development/test pumping |

msl = Mean sea level

**Table D-9
Well HC-8 Downhole Geophysical Data Collected**

| Geophysical Tool | Date | Top of Interval (ft bgs) | Bottom of Interval (ft bgs) | Interval (ft) | Contractor |
|---------------------------------------|-----------|-----------------------------|--------------------------------|------------------|-------------|
| Phase I | | | | | |
| Video | 8/25/1999 | 0 | 1,273 | 1,273 | DRI |
| Video | 8/28/1999 | 0 | 1,450 | 1,450 | DRI |
| 3-Arm Caliper | 8/29/1999 | 80 | 1,681 | 1,601 | Colog, Inc. |
| Natural Gamma/Epithermal Neutron | 8/29/1999 | 80 | 1,681 | 1,601 | Colog, Inc. |
| Spectral Gamma Ray (K, U, Th) | 8/29/1999 | 80 | 1,680 | 1,600 | Colog, Inc. |
| Deviation | 8/29/1999 | 100 | 1,677 | 1,577 | Colog, Inc. |
| Phase II | | | | | |
| Temperature/ Δ Temperature | 9/7/1999 | 500 | 751 | 251 | Colog, Inc. |
| Temperature/ Δ Temperature | 9/12/1999 | 1,095 | 2,069 | 974 | Colog, Inc. |
| Temperature/ Δ Temperature | 9/15/1999 | 2,060 | 2,484 | 424 | Colog, Inc. |
| 3-Arm Caliper | 9/8/1999 | 72 | 869 | 797 | DRI |
| 3-Arm Caliper | 9/12/1999 | 1,630 | 2,070 | 440 | Colog, Inc. |
| 1-Arm Caliper | 9/13/1999 | 50 | 2,060 | 2,010 | Colog, Inc. |
| 3-Arm Caliper | 9/14/1999 | 67 | 2,054 | 1,987 | DRI |
| 3-Arm Caliper | 9/14/1999 | 2,070 | 2,274 | 204 | DRI |
| 3-Arm Caliper | 9/14/1999 | 2,047 | 2,479 | 432 | DRI |
| Guard Resistivity/Natural Gamma | 9/8/1999 | 0 | 750 | 750 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 9/12/1999 | 1,630 | 2,066 | 436 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 9/15/1999 | 2,060 | 2,482 | 422 | Colog, Inc. |
| Guard Resistivity/Natural Gamma | 9/12/1999 | 920 | 1,680 | 760 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 9/9/1999 | 100 | 439 | 339 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 9/12/1999 | 910 | 1,320 | 410 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 9/14/1999 | 2,060 | 2,480 | 420 | Colog, Inc. |
| Acoustic Borehole Televiwer/Deviation | 9/15/1999 | 875 | 2,474 | 1,599 | Colog, Inc. |
| Video | 9/9/1999 | 0 | 743 | 743 | DRI |
| Stressed Thermal Flow | 9/13/1999 | 100 | 2,060 | 1,960 | DRI |
| Formation Density | 9/13/1999 | 48 | 2,060 | 2,012 | Colog, Inc. |
| Formation Density | 9/15/1999 | 2,060 | 2,483 | 423 | Colog, Inc. |
| Compensated Neutron | 9/15/1999 | 2,060 | 2,482 | 422 | Colog, Inc. |
| Compensated Neutron | 9/15/1999 | 870 | 2,140 | 1,270 | Colog, Inc. |
| Borehole Radar | 9/16/1999 | 100 | 2,060 | 1,960 | DRI/PRG |
| 4-Pi Density | 10/0/1999 | 80 | 2,440 | 2,360 | Colog, Inc. |

K = Potassium
U = Uranium
Th = Thorium

Table D-10
Well HC-8 Tritium Activities During Drilling
 (Page 1 of 3)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 8/21/99 9:30 | -- | -- | -- | 650 |
| 8/21/99 15:07 | -- | -- | -- | 225 |
| 8/21/99 18:15 | -- | -- | -- | 225 |
| 8/22/99 7:00 | -- | -- | -- | 525 |
| 8/23/99 16:50 | -- | -- | -- | 750 |
| 8/23/99 19:00 | -- | -- | -- | 650 |
| 8/23/99 23:05 | -- | -- | -- | -400 |
| 8/23/99 23:55 | 400 | 525 | 225 | -- |
| 8/24/99 8:50 | -- | -- | -- | 825 |
| 8/24/99 9:30 | 500 | 825 | 225 | -- |
| 8/24/99 14:40 | -- | -- | -- | 725 |
| 8/24/99 21:30 | -- | -- | -- | 1,150 |
| 8/25/99 1:55 | 900 | 250 | 975 | |
| 8/25/99 3:30 | -- | -- | -- | 1,025 |
| 8/25/99 4:25 | 1,000 | 1,325 | 0 | -- |
| 8/25/99 6:40 | 1,080 | 450 | 525 | -- |
| 8/25/99 9:05 | 1,175 | 1,300 | 650 | -- |
| 8/25/99 9:10 | -- | -- | -- | 850 |
| 8/25/99 10:35 | 1,220 | -225 | 225 | -- |
| 8/25/99 11:50 | 1,265 | -275 | 800 | -- |
| 8/26/99 5:30 | 1,283 | 125 | -375 | -- |
| 8/26/99 6:45 | -- | -- | -- | 225 |
| 8/27/99 13:20 | 1,312 | 50 | 800 | -- |
| 8/27/99 17:10 | 1,383 | -475 | -350 | -- |
| 8/27/99 18:05 | 1,446 | -25 | 175 | -- |
| 8/28/99 18:10 | 1,476 | 525 | -200 | -- |
| 8/28/99 20:55 | 1,546 | -475 | -400 | -- |
| 8/28/99 22:15 | 1,586 | -375 | -125 | -- |
| 8/28/99 22:25 | -- | -- | -- | 50 |
| 8/29/99 0:30 | 1,590 | 500 | 325 | -- |

Table D-10
Well HC-8 Tritium Activities During Drilling
 (Page 2 of 3)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 8/29/99 2:30 | 1,646 | 600 | 425 | -- |
| 8/29/99 3:40 | -- | -- | -- | 450 |
| 8/29/99 9:45 | 1,686 | -- | 1,050 | -- |
| 8/29/99 9:50 | 1,686 | -- | 350 | -- |
| 8/29/99 9:58 | 1,686 | -- | 350 | -- |
| 8/29/99 10:30 | 1,686 | -- | 925 | -- |
| 8/30/99 8:55 | -- | -- | -- | 900 |
| 8/30/99 18:00 | 1,696 | 350 | 1,150 | -- |
| 8/31/99 13:35 | 1,790 | 800 | 1,300 | -- |
| 8/31/99 16:10 | 1,838 | 950 | 1,200 | -- |
| 8/31/99 16:20 | -- | -- | -- | 1,475 |
| 8/31/99 20:15 | 1,930 | 1,300 | 775 | -- |
| 8/31/99 23:15 | 2,015 | 1,125 | 1,250 | -- |
| 8/31/99 23:30 | -- | -- | -- | 1,050 |
| 9/1/99 1:05 | 2,052 | 1,175 | 1,250 | -- |
| 9/1/99 2:55 | 2,100 | 675 | 1,425 | -- |
| 9/1/99 5:10 | 2,156 | 1,500 | 1,025 | -- |
| 9/1/99 6:00 | -- | -- | -- | 1,325 |
| 9/1/99 6:10 | 2,190 | 1,350 | 1,375 | -- |
| 9/1/99 7:20 | 2,212 | 675 | 275 | -- |
| 9/1/99 9:20 | 2,250 | 325 | -175 | -- |
| 9/1/99 11:35 | 2,296 | 350 | 525 | -- |
| 9/1/99 12:15 | -- | -- | -- | 475 |
| 9/1/99 17:25 | 2,343 | 275 | 125 | -- |
| 9/1/99 23:45 | -- | -- | -- | 600 |
| 9/2/99 1:00 | 2,395 | 425 | 350 | -- |
| 9/2/99 3:00 | 2,432 | 1,050 | 700 | -- |
| 9/2/99 3:50 | -- | -- | -- | 675 |
| 9/2/99 5:00 | 2,465 | 50 | 0 | -- |
| 9/2/99 5:30 | -- | -- | -- | 700 |
| 9/3/99 6:45 | 2,000 | -- | 1,525 | -- |
| 9/3/99 9:00 | 2,030 | 0 | 725 | -- |

Table D-10
Well HC-8 Tritium Activities During Drilling
 (Page 3 of 3)

| Sample Date/Time (mm/dd/yy hh:mm) | Sample Depth (feet) | Injection Fluid (pCi/L) | Discharge Fluid (pCi/L) | Water Truck (pCi/L) |
|--------------------------------------|------------------------|----------------------------|----------------------------|------------------------|
| 9/4/99 20:00 | -- | -- | -- | 650 |
| 9/4/99 21:40 | -- | -- | -- | 400 |
| 9/5/99 9:10 | -- | -- | -- | 175 |
| 9/5/99 23:25 | 2,090 | -225 | 525 | -- |
| 9/6/99 11:45 | 2,470 | 1,450 | 950 | -- |
| 9/6/99 21:25 | -- | -- | -- | 3,075 |
| 9/6/99 23:00 | -- | -- | -- | 500 |
| 9/7/99 0:00 | -- | -- | -- | 400 |
| 9/7/99 3:15 | 2,470 | 200 | 825 | -- |
| 9/7/99 5:15 | 2,480 | 750 | 1,100 | -- |
| 9/7/99 7:30 | 2,493 | 1,025 | 1,125 | -- |
| 9/7/99 8:30 | -- | -- | -- | 1,075 |
| 9/7/99 9:30 | 2,502 | 875 | 1,525 | -- |
| 9/7/99 11:30 | 2,513 | 0 | 375 | -- |
| 9/8/99 2:35 | -- | -- | -- | 950 |
| 9/8/99 5:40 | -- | -- | -- | 825 |
| 9/8/99 7:50 | -- | -- | -- | 650 |
| 9/8/99 10:25 | -- | -- | -- | 750 |
| 9/9/99 0:35 | -- | -- | -- | 567 |
| 9/9/99 9:45 | -- | -- | -- | 1,067 |
| 9/11/99 17:00 | 790 | 1,133 | 33.33 | -- |
| 9/11/99 19:55 | -- | -- | -- | 3,800 |
| 9/17/99 3:30 | -- | -- | -- | 325 |
| 9/17/99 6:30 | -- | -- | -- | 1,525 |
| 9/17/99 7:35 | -- | -- | -- | 1,700 |
| 9/17/99 16:30 | -- | -- | -- | 500 |

-- = Not measured

Table D-11
Alpha and Beta Activity Measurements of
Well HC-8 Drill Cuttings

| Depth (ft) | Alpha Measurements (dpm) | Beta Measurements (dpm) |
|------------|--------------------------|-------------------------|
| 450 | 51 | 1,134 |
| 500 | 51.1 | 1,239 |
| 550 | 51.1 | 1,110 |
| 600 | 34.1 | 1,257 |
| 650 | 17.1 | 1,183 |
| 700 | 28.4 | 1,207 |
| 750 | 11.4 | 1,317 |
| 800 | 51.1 | 1,211 |
| 850 | 22.7 | 1,205 |
| 900 | 34.1 | 1,442 |
| 950 | 34.1 | 1,155 |
| 1,000 | 28.4 | 1,330 |
| 1,050 | 28.4 | 1,259 |
| 1,100 | 56.8 | 1,037 |
| 1,150 | 28.4 | 1,175 |
| 1,200 | 34.1 | 1,140 |
| 1,250 | 28.4 | 1,410 |
| 1,300 | 17.0 | 1,239 |
| 1,348 | 51.1 | 1,278 |
| 1,400 | 68.2 | 1,183 |
| 1,450 | 39.8 | 1,103 |
| 1,620 | 45.5 | 1,131 |
| 2,500 | 196 | 1,166 |

dpm = Disintegrations per minute

Table D-12
Well HC-8 Drilling Fluid Additives

(Page 1 of 4)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gal pails) | Quik Foam [®] Used (5-gal pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|---|--------|------------------|----------------|---------------------------|--|--|---|---|-------------------------------|
| 24-in. Conventional, Mud-Rotary Drilling and Install 20-in. Casing | | | | | | | | | |
| 8/21/99 | N to M | 0 | 10 | 7,800 | 1 | 1 | -- | -- | -- |
| 8/22/99 | M to N | 10 | 100 | 2,600 | 13 | -- | -- | -- | -- |
| 8/22/99 | N to M | 100 | 100 | -- | -- | -- | -- | -- | -- |
| | | | subtotal | 10,400 | 14 | 1 | 0 | 0 | 0 |
| 10-in. Air-Hammer, Reverse-Circulation Drilling | | | | | | | | | |
| 8/23/99 | M to N | 100 | 100 | -- | -- | -- | -- | -- | -- |
| 8/23/99 | N to M | 100 | 400 | 7,800 | -- | 1 | 2 | -- | -- |
| 8/24/99 | M to N | 400 | 520 | 2,600 | -- | 1 | -- | -- | -- |
| 8/24/99 | N to M | 520 | 820 | 7,800 | -- | -- | -- | -- | -- |
| 8/25/99 | M to N | 820 | 1,260 | 5,200 | -- | 2 | 1 | -- | -- |
| 8/25/99 | N to M | 1,260 | 1,280 | -- | -- | -- | -- | -- | -- |
| 8/26/99 | M to N | 1,280 | 1,287 | 2,600 | -- | -- | -- | -- | -- |
| 8/26/99 | N to M | 1,287 | 1,312 | -- | -- | -- | -- | -- | -- |
| 8/27/99 | M to N | 1,312 | 1,312 | -- | -- | -- | -- | -- | -- |
| 8/27/99 | N to M | 1,312 | 1,466 | 2,600 | -- | -- | -- | -- | -- |
| 8/28/99 | M to N | 1,466 | 1,466 | -- | -- | -- | -- | -- | -- |
| 8/28/99 | N to M | 1,466 | 1,586 | 2,600 | -- | -- | -- | -- | -- |
| 8/29/99 | M to N | 1,586 | 1,686 | 2,600 | -- | -- | -- | -- | -- |
| 8/29/99 | N to M | 1,686 | 1,686 | -- | -- | -- | -- | -- | -- |
| 8/30/99 | M to N | 1,686 | 1,686 | -- | -- | -- | -- | -- | -- |
| 8/30/99 | N to M | 1,686 | 1,698 | -- | -- | -- | -- | -- | -- |
| 8/31/99 | M to N | 1,698 | 1,760 | 2,600 | -- | 1 | -- | -- | -- |
| 8/31/99 | N to M | 1,760 | 2,030 | 5,200 | -- | 1 | 1 | -- | -- |

Table D-12
Well HC-8 Drilling Fluid Additives
 (Page 2 of 4)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gal pails) | Quik Foam [®] Used (5-gal pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|---|--------|------------------|----------------|---------------------------|--|--|---|---|-------------------------------|
| 9/1/99 | M to N | 2,030 | 2,305 | 5,200 | -- | -- | -- | -- | -- |
| 9/1/99 | N to M | 2,305 | 2,390 | 2,600 | -- | -- | -- | -- | 1 |
| 9/2/99 | M to N | 2,390 | 2,470 | 10,400 | -- | -- | -- | 5 | 1 |
| 9/2/99 | N to M | 2,470 | 2,470 | 2,600 | -- | -- | -- | -- | -- |
| 9/3/99 | M to N | 2,470 | 2,470 | -- | -- | -- | -- | -- | -- |
| | | | subtotal | 62,400 | 0 | 6 | 4 | 5 | 2 |
| 9 7/8-in. Tricone, Flooded Reverse-Circulation Drilling | | | | | | | | | |
| 9/3/99 | N to M | 2,470 | 2,470 | 2,600 | -- | -- | -- | -- | 1 |
| 9/4/99 | M to N | 2,470 | 2,470 | -- | -- | -- | -- | -- | -- |
| 9/4/99 | N to M | 2,470 | 2,470 | 7,800 | -- | 1 | -- | 2 | 2 |
| 9/5/99 | M to N | 2,470 | 2,470 | 5,200 | -- | -- | -- | 1 | -- |
| 9/5/99 | N to M | 2,470 | 2,470 | 2,600 | -- | -- | -- | -- | -- |
| 9/6/99 | M to N | 2,470 | 2,470 | -- | -- | -- | -- | -- | -- |
| 9/6/99 | N to M | 2,470 | 2,470 | 7,800 | -- | -- | -- | 2 | 1 |
| 9/7/99 | M to N | 2,470 | 2,515 | 2,600 | -- | -- | -- | 2 | 1 |
| 9/7/99 | N to M | 2,515 | 2,530 | 2,600 | -- | -- | -- | -- | -- |
| | | | subtotal | 31,200 | 0 | 1 | 0 | 7 | 5 |
| Collect Downhole Geophysical Data, Cement and Redrill Hole | | | | | | | | | |
| 9/8/99 | M to N | 2,530 | 2,530 | 10,400 | -- | -- | -- | 2 | 1 |
| 9/8/99 | N to M | 2,530 | 2,530 | 10,400 | -- | -- | -- | 3 | 1 |
| 9/9/99 | M to N | 2,530 | 2,530 | 2,600 | -- | -- | -- | 1 | -- |
| 9/9/99 | N to M | 2,530 | 2,530 | 2,600 | -- | -- | -- | -- | -- |
| 9/10/99 | M to N | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/10/99 | N to M | 2,530 | 2,530 | 5,200 | -- | -- | -- | -- | -- |

Table D-12
Well HC-8 Drilling Fluid Additives
 (Page 3 of 4)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gal pails) | Quik Foam [®] Used (5-gal pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|-----------------------|--------|------------------|----------------|---------------------------|--|--|---|---|-------------------------------|
| 9/11/99 | M to N | 420 | 570 | -- | -- | 1 | -- | -- | -- |
| 9/11/99 | N to M | 570 | 1,100 | 5,200 | -- | -- | -- | -- | -- |
| 9/12/99 | M to N | 1,100 | 2,509 | -- | -- | -- | -- | -- | -- |
| 9/12/99 | N to M | 2,509 | 2,510 | -- | -- | -- | -- | -- | -- |
| 9/13/99 | M to N | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/13/99 | N to M | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/14/99 | M to N | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/14/99 | N to M | 2,530 | 2,530 | 2,600 | -- | -- | -- | 1 | -- |
| 9/15/99 | M to N | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/15/99 | N to M | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/16/99 | M to N | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/16/99 | N to M | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/17/99 | M to N | 2,530 | 2,530 | 10,400 | 80 | -- | -- | -- | -- |
| 9/17/99 | N to M | 2,530 | 2,530 | 2,600 | 45 | -- | -- | -- | -- |
| | | | subtotal | 52,000 | 125 | 1 | 0 | 7 | 2 |
| Construct Well | | | | | | | | | |
| 9/18/99 | M to N | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/18/99 | N to M | 2,530 | 2,530 | 10,400 | -- | -- | -- | -- | -- |
| 9/19/99 | M to N | 2,530 | 2,530 | 2,600 | -- | -- | -- | -- | -- |
| 9/19/99 | N to M | 2,530 | 2,530 | 2,600 | -- | -- | -- | -- | -- |

Table D-12
Well HC-8 Drilling Fluid Additives
 (Page 4 of 4)

| Date | Shift | Start Depth (ft) | End Depth (ft) | Water Delivered (gallons) | Quik Gel [®] Used (50-pound bags) | EZ Mud [®] Used (5-gal pails) | Quik Foam [®] Used (5-gal pails) | Drispac [®] Used (50-pound bags) | Soda Ash Used (50-pound bags) |
|---------|--------|------------------|----------------|---------------------------|--|--|---|---|-------------------------------|
| 9/20/99 | M to N | 2,530 | 2,530 | 2,600 | -- | -- | -- | -- | -- |
| 9/20/99 | N to M | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| 9/21/99 | M to N | 2,530 | 2,530 | 2,600 | -- | -- | -- | -- | -- |
| 9/21/99 | N to M | 2,530 | 2,530 | -- | -- | -- | -- | -- | -- |
| | | | subtotal | 20,800 | 0 | 0 | 0 | 0 | 0 |
| | | | TOTAL | 176,800 | 139 | 9 | 4 | 19 | 9 |

-- = Not applicable

Table D-13
Fluid Management Samples and Results from Drilling, Well Development, and Testing of Well HC-8

| Sample Number | Sample Date | Sample Source | Gross Alpha (pCi/L) | Gross Beta (pCi/L) | Tritium (pCi/L) | Dissolved Lead (mg/L) | Comments |
|----------------|-------------|---------------|---------------------|--------------------|-----------------|-----------------------|----------|
| PSF00026 | 9/7/99 | HC-8 Well | 20.2 ± 7.5 | 29.1 ± 5.2 | ND | ND | |
| PSF00027 (DUP) | 9/7/99 | HC-8 Well | 19.3 ± 6.4 | 29.2 ± 5.4 | ND | ND | |
| PSF00028 (FB) | 9/7/99 | ---- | ND | ND | ND | ND | |
| PSF00029 | 9/22/99 | HC-8 Well | 21.3 ± 6.9 | 46.4 ± 7 | 230 ± 210 | 0.027 | |
| PSF00030 (DUP) | 9/22/99 | HC-8 Well | 27.5 ± 7.9 | 51 ± 7.6 | 80 ± 200 | 0.028 | |
| PSF00031 (FB) | 9/22/99 | ---- | -2.8 ± 3.7 | -4.44 ± 4.6 | 140 ± 200 | ND | |

FB = Field blank
 DUP = Field duplicate
 ND = Not detected
 ---- = Not applicable

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