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Project Nu.

VIDLER WATER COMPANY
FISH SPRINGS RANCH
WELLFIELD CONSTUCTION AND TESTING

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FISH SPRINGS RANCH
WELL FIELD CONSTRUCTION AND TESTING

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1.0 SUMMARY AND CONCLUSIONS

1. Six production wells were drilled for the *Vidler Water Company* at the Fish Springs Ranch in Honey Lake Valley, Nevada. *Lang Exploratory Drilling* drilled the wells, beginning at the northeast end of the property, and ending on the southwest. The wells were initially numbered #1 through #6, but prior to drilling, Wells #4 and #5 were misidentified on the property maps and reversed in their positions. Consequently, to avoid confusion, the wells were renamed. Beginning with the southwestern well and progressing to the northeast, the wells are Well A (formerly Well #1), Well B (#2), Well C (#3), Well D (#5), Well E (#4), and Well F (#6).

2. Preliminary well designs, including casing diameter, slot size and filter pack size were determined prior to drilling, based on information available from previous investigations and existing irrigation wells. The wells were drilled by a combination of direct mud-rotary and reverse mud-rotary methods. Direct rotary methods advanced the borehole to depths of sufficient water submergence to initiate the reverse-rotary method. This depth coincided with the depth of 32-inch-diameter intermediate well casing. Once the intermediate casing was installed and grouted in place, reverse-rotary methods advanced a 12¼-inch-diameter pilot hole below the casing shoe to the final depth of the borehole. Following acquisition of geophysical logs and formation samples to confirm the well design, the boreholes were reamed to a final diameter of 26 inches. Well A was drilled to a depth of 450 feet below the land surface (bls), Well B to 560, Well C to 415, Well D to 410, Well E to 520, and Well F to 500, feet bls. Wells B, D, E and F were completed using 16-inch-diameter casing and well screen. Because of the potential for higher yields, Well A was completed with both 18-inch and 16-inch-diameter casing and screen, while Well C was completed entirely with 18-inch-diameter casing and well screen.

3. The wells were completed in two general well fields, partially separated from each other by a ridge of volcanic bedrock, that have different geology and somewhat different sources of recharge. Wells D, E and F were completed in the northeastern well field near the mouth of Cottonwood Creek. This portion of the aquifer has a laterally-continuous stratigraphic sequence consisting of: 1) an upper layer of playa silt and clay to about 60 feet bls; 2) a relatively well-sorted fluvial/alluvial sequence of coarse, basaltic sand and gravel extending to a depth between 340 and 390 feet bls; underlain by 3) alternating layers of clay and clean, quartz-rich sand of granitic origin to their final depths. Wells A, B and C were completed in the southwestern well field. Well A encountered playa clay to 60 feet, underlain by clayey sand to 140 feet, which in turn is underlain by clean, coarse quartz sand of granitic origin to the bottom of the hole. Wells B and C were completed partially in basaltic bedrock. Well B intersected sand and gravel, with some clay to 60 feet, underlain by fractured, locally vesicular basalt flows to the hole bottom. Well C intersected mostly clay and silt to 60 feet, underlain by mostly sand and gravel of basaltic origin with some clay layers to 270 feet, underlain by a clayey weathered tuff or fault zone to 335 feet, underlain by fractured-basalts to the hole bottom.

4. The final well designs (depths of well casing, screened intervals, intermediate annular seal intervals, etc.) were based on the lithologic and geophysical logs of the pilot boreholes. The wells were completed using steel well casing with a wall thickness of 5/16-inch. *Ful Flo*™ louver well screen with an aperture width of 0.09-inch was

placed in selected intervals. The annular space surrounding the perforations was filled with a coarse filter pack or formation stabilizer sized to conform to the characteristics of the adjacent formation.

5. The wells were initially developed by air-lift pumping using the drill-rig compressor to remove the residual drilling mud, followed by swabbing and air-lift pumping with a dual-packer development tool. *Tackle™ or Aqua-Clear™* polymer drilling mud dispersants were then added to the well and swabbed to aid in mud removal, followed by extensive dual-packer development until the discharge was clean to the unaided eye. Finally, the end plug of the dual-packer assembly was removed and the assembly lowered to the well bottom to evacuate accumulated sand.

6. Pumping tests were performed on each of the wells. The test program included a step test and a constant-discharge test. The data were analyzed using the computer program AQTESOLV which invokes a range of analytical models incorporating well-bore storage, well efficiency, and well-bore skin; and unconfined, confined and dual-porosity conditions.

   a. The step test comprised four sequential steps of one-hour duration each. During the first step, the wells were pumped at about 1,000 gpm. Rates during the final step ranged from 2,000 to 2,857 gpm, except for Well A which was pumped at 4,000 gpm. Specific capacities were in the range of 45 to 78 gpm/ft of drawdown for Wells B, D, E, and F. Well C produced less, at 16 to 51 gpm/ft, while Well A ranged from 119 to 135 gpm/ft. All of the wells were determined to be highly efficient, with the exception of Well C, which exhibited a large positive skin factor. The positive skin may be indicative of the nature of the flow in the fractured basalt aquifer, irreversible formation damage caused by the drilling process, or unintentional location of the well within a less fractured and permeable portion of the bedrock aquifer.

   b. The constant-discharge test entailed pumping each well for up to 72 hours at rates of 2,000 to 2,500 gpm, except for Well A, which was pumped at 3,000 gpm. The transmissivity of the aquifer near the northeastern wellfield (wells D, E and F) ranged from 10,000 to 15,000 ft^2/day. At bedrock wells B and C, it ranged from 14,000 to 19,000 ft^2/day, while in Well A it was estimated at 24,000 ft^2/day. Storage Coefficients indicated the aquifer varies from unconfined to confined.

7. The sand content of the wells was measured with a Rossum™ sand tester during the pumping tests. All of the wells were documented to be sand free.

8. The long-term reliable yields of the wells are estimated to be:

   Well A (#1) - 3,000 gpm
   Well B (#2) - 2,000 gpm
   Well C (#3) - 1,500 gpm
   Well D (#5) - 1,500 gpm
   Well E (#4) - 2,250 gpm
   Well F (#6) - 2,000 gpm

The combined total discharge for the well field is 12,250 gpm. However, the initial phase of the project calls for pumping 8,000 acre-feet per year, which is equivalent to five wells, each pumping 1,000 gpm on average. Consequently, the well field will be pumped at approximately 41% of its capacity.

9. Water quality samples obtained from each well were analyzed for all required drinking water parameters. The results indicate that the water from each well meets all drinking water standards and has total dissolved solids ranging from 170 to 240 mg/L. Arsenic ranges from less than the analytical detection limit up to 0.007 mg/L, while iron, manganese, nitrate, and fluoride were either not detected or were present in very small concentrations well below their respective drinking water standards.

2.0 INTRODUCTION

Six municipal water-supply wells were drilled, constructed and test pumped for the *Vidler Water Company* of Carson City, Nevada in May, June, July, and August 2006. The wells are located in southeastern Honey Lake Valley on property owned by *Fish Springs Ranch LLC* (Figure 1). The well sites are present within Section 25, Township 26 North, Range 18 East, and Sections 10, 16, 29 and 30, Township 26 North, Range 19 East M.D.B.&M. The wells are located on various parcels, but are in general proximity to both Ranch Headquarters and Fish Springs Road (Figure 2).

The wells are part of the North Valleys Water Supply Project that will provide water for urban development primarily in the Stead and Lemmon Valleys area north of Reno. The approved project allows importation of 8,000 acre-feet of water per year (af/y), or about 5,000 gallons per minute (gpm) on a continuous basis. The new wells mostly replace existing irrigation wells and are designed to meet State of Nevada and Washoe County, municipal water-supply well criteria. Water collected from the six wells will be pumped approximately 31 miles within a 30-inch-diameter pipeline to terminal storage located at the summit of Matterhorn Drive, at the north end of Lemmon Valley.

The groundwater hydrology of the Fish Springs Ranch area has been extensively studied over the past 25 years, and the locations of the six new wells were previously established. For this project, Vidler retained *ECO:LOGIC Consulting Engineers* to:

- Provide well-site hydrogeologic and quality-assurance consulting services, including logging of subsurface samples collected during drilling. *Lang Exploratory Drilling* of Salt Lake City, Utah drilled and constructed the wells.
- Analyze the drilling and geophysical data, and provide final, optimized well designs;
- Oversee well construction to ensure completion as designed;
- Oversee vigorous well development to maximize their production potential;
- Design, coordinate and supervise aquifer stress tests performed by *Carson Pump* of Carson City, Nevada;
- Analyze the pumping test data, evaluate the hydraulic properties of the aquifer materials and assess each well's long-term performance; and
- Collect water samples at the end of well testing to evaluate the aquifer's water chemistry and confirm that it meets applicable drinking water standards.

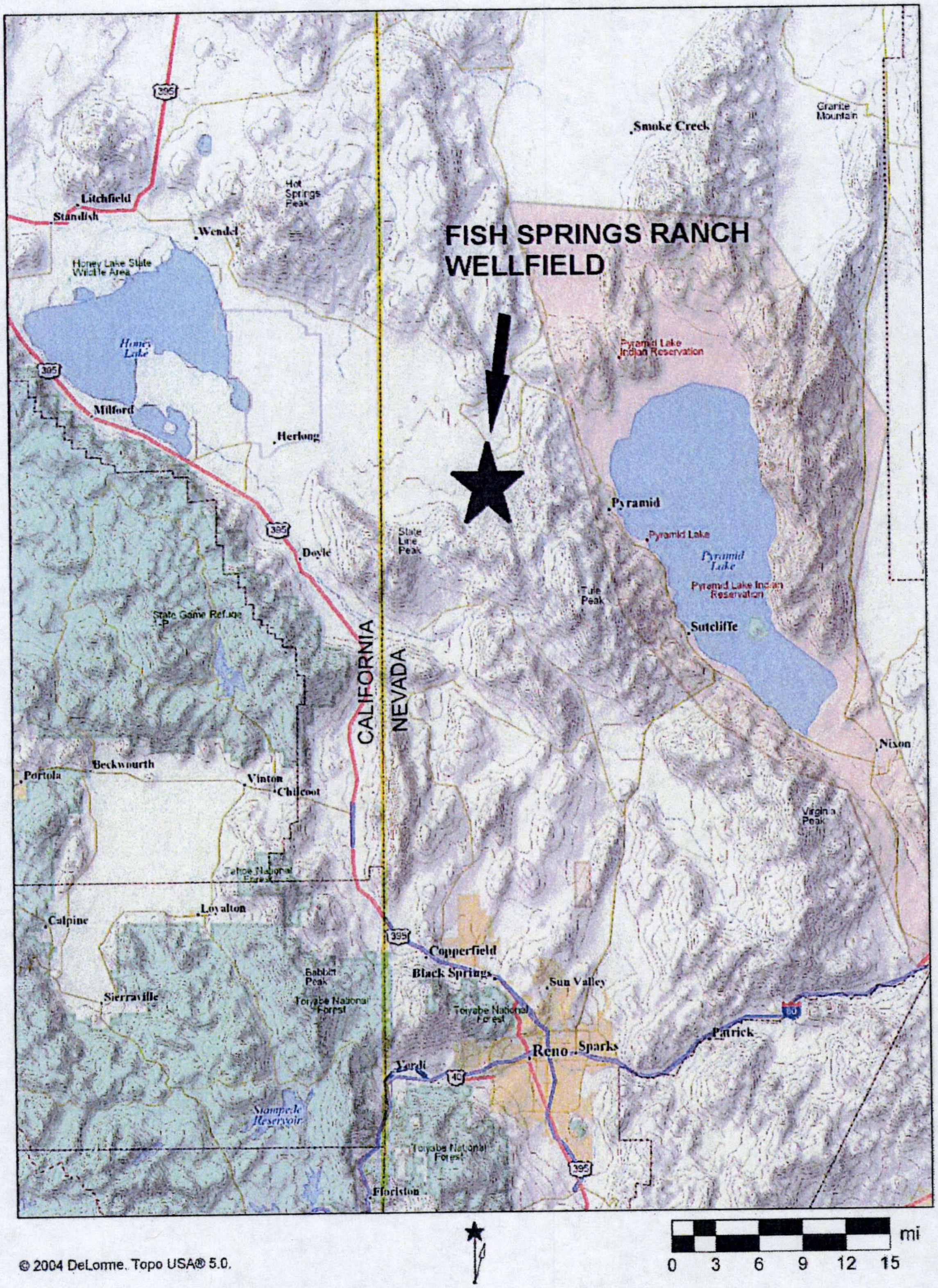

FIGURE 1: FISH SPRINGS RANCH PRODUCTION WELLS PROJECT LOCATION MAP.

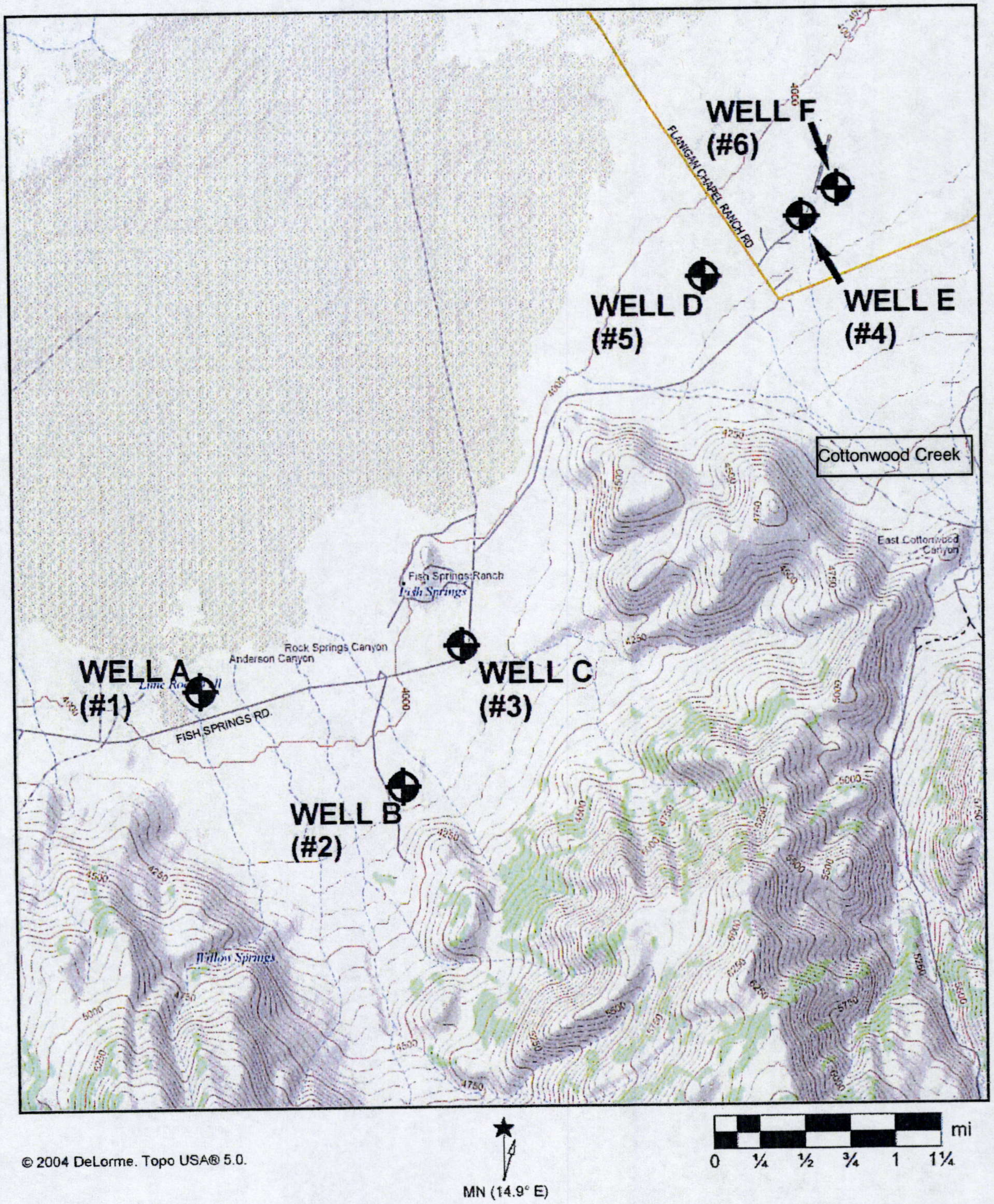

FIGURE 2: SITE MAP AND WELL LOCATIONS.

2.1 PREVIOUS INVESTIGATIONS

A complete list of all previous hydrogeologic investigations relevant to groundwater conditions in the vicinity of the Fish Springs Ranch well field can be found in the Environmental Impact Statement f*or the North Valleys Rights-of-Way Project – Fish Springs Ranch and Intermountain Water* (U.S. Department of Interior, Bureau of Land Management, 2005). Of these, the investigations that are particularly relevant to the production wells include the following:

- Washoe County reports describing installation of 26 test, observation, and monitoring wells.
- Washoe County extended duration pumping tests (up to 10 days) of existing irrigation wells and County test wells.
- William E Nork, Inc. 1991: A Synopsis of Drilling and Testing at Fish Springs Ranch and the Development of a Finite Element Model of Ground-Water Flow in Southeastern Honey Lake Valley, Washoe County, Nevada.
- Washoe County Department of Public Works, Utility Division, Reno, Nevada, August 1989: Aquifer Analysis Part 2 – Phase I, Well Field Development. Fish Springs Ranch, Honey Lake Valley, Nevada.
- Washoe County Department of Public Works, Utility Division, Reno, Nevada, July 1990: Exploratory Drilling and Testing, Phase II – Part 3, Well Field Development.
- Washoe County Department of Public Works, Utility Division, Reno, Nevada, May 1990: Letter Report To Desert Research Institute, 1990 Drilling and Testing Program at Fish Springs Ranch Schedule A, Honey Lake Valley, Nevada.

2.2 PROJECT CHRONOLOGY

The drilling program was completed between May and August 2006, as detailed in Table 1.

TABLE 1: PROJECT CHRONOLOGY

Date	Activity
May 1-4, 2006	Lang mobilized drilling equipment to the site.
May 5-17	Drill, construct and develop Well F (#6).
May 18-June 3	Drill, construct and develop Well D (#5).
June 4-17	Drill, construct and develop Well E (#4).
June 18-July 1	Drill, construct and develop Well C (#3).
July 2-July 6	The pilot hole for Well A (#1) was drilled, and geophysical logs acquired.
July 2	Step test of Well F.
July 3-6	Constant discharge test of Well F.
July 7-22	Drill, construct and develop Well B (#2).
July 10	Step test of Well D.
July 11-14	Constant discharge test of Well D.
July 18	Step test of Well E.
July 19-22	Constant discharge test of Well D.
July 23-August 1	Ream, construct and develop Well A.
July 27	Step test of Well B.
July 28-31	Constant discharge test of Well B.
August 4	Step test of Well C.
August 5-8	Constant discharge test of Well C.
August 13	Step test of Well A.
August 14-17	Constant discharge test of Well A.

3.0 WELL DRILLING AND CONSTRUCTION

The aquifer materials in the vicinity of the Fish Springs Ranch well field vary from unconsolidated alluvial, fluvial and beach-sand deposits to fractured basaltic volcanic rocks. Comprehensive aquifer stress testing of the existing irrigation wells by the Washoe County Department of Water Resources (*nee* the Utility Division) demonstrated that both of these materials were highly permeable and that individual wells could be expected to reliably yield more than 1,000 gpm.

Preliminary well designs, including casing diameter, slot size and filter pack size, were prepared prior to drilling based on information available from previous investigations, Washoe County test wells and the irrigation wells. The design included three casing strings: 40-inch-diameter surface conductor casing, 32-inch-diameter intermediate casing, and either 16-inch or 18-inch-diameter production casing and well screen. Surface conductor casing was to be installed to approximately 20 feet bls. The intermediate casing was to be installed to depths of 45 to 105 feet.

The production casing and well screen diameter was selected based on anticipated well yields for each site and common pump dimensions (Driscoll, 1986). The 16-inch-diameter casing and screen was selected for wells with anticipated yields of 1,000 to 2,000 gpm, while the 18-inch-diameter casing was selected for wells that were anticipated to yield more than 2,000 gpm. The well casing was low-carbon steel with a 5/16-inch (0.3125-inch) wall thickness to provide structural integrity, extend the life of the wells, and provide a small degree of corrosion resistance. Well screen was 5/16-inch wall thickness, mild steel, *Ful-Flo*™ louver with 0.09-inch slot aperture width, manufactured by the *Roscoe Moss Company*.

Lang Exploratory Drilling of Salt Lake City, Utah, a division of *Boart Longyear,* drilled and constructed the wells using a combination of direct mud-rotary and flooded, dual-tube reverse-circulation methods. The mud-rotary method was used to drill the upper portion of the wells to ensure borehole stability during installation of the intermediate casing. Once the intermediate casing was installed, reverse circulation was used to drill 12¼-inch pilot holes to the total depth. The principal advantage of the combination of the intermediate casing and flooded dual-tube reverse-circulation was that the borehole could be advanced without maintaining the drilling fluid level at the land surface, as conventional mud rotary methods require, which could result in invasion of drill mud into the aquifer.

As the borehole advanced, an on-site ECO:LOGIC geologist collected and logged formation samples, or drill cuttings, from the drilling-fluid return for each five-foot interval penetrated by the borehole, and prepared a descriptive log of the formation samples. Prior to well construction, a selection of drill samples representing finer-grained materials from each boring were submitted to a laboratory for grain-size distribution analysis, largely to confirm that the pre-determined filter pack and screen aperture width were appropriate. After completion of the pilot hole, *Dewey Data* acquired a suite of borehole geophysical logs, which included spontaneous potential, point, long- and short-normal resistivity, natural gamma, and caliper.

Based on the geologic and geophysical logs, the final well designs were completed, and the holes were reamed to 26-inch-diameter to their final depth using reverse circulation methods. In limited instances, it was necessary to temporarily revert back to direct mud-rotary methods because of bit plugging.

The drilling fluid was comprised of water, with additives such as bentonite or polymers to maintain the optimal characteristics of the fluids, and control viscosity and swelling of clay, etc. All drilling fluids were contained in aboveground tanks. The drilling fluid system was equipped with shaker screens and desanders to separate the drill cuttings and suspended solids from the drilling fluid. Removal of the solids from the drilling fluid helped to maintain optimum fluid properties, facilitated collection of representative samples of the formation material, and maintained the integrity of the borehole while minimizing formation damage arising from the drilling process. Drill cuttings were dispersed at the land surface on the owner's property. The drilling fluids were disposed of on the property by evaporation and desiccation in shallow depressions.

Following well construction and extensive development using a dual-packer assembly, each well was subjected to a battery of well performance and aquifer-stress tests, which included a four-step step test, and a 72-hour constant discharge test. The entire testing sequence required approximately five to 10 days for each well. Groundwater pumped from the wells was piped a distance away from each well site, discharged onto the land surface and allowed to flow out onto the playa. A temporary NPDES Permit to allow the discharge was obtained from the Nevada Division of Environmental Protection.

Details of the drilling activities at each well site are provided in the following sections.

3.1 WELL F (#6) DRILLING

A 46-inch-diameter borehole was drilled to a depth of 25 feet bls using direct mud rotary methods, and 40-inch surface casing was installed to 23 feet bls and cemented in place. A 38-inch-diameter borehole was then drilled to 80 feet bls using direct mud rotary methods, and 32-inch intermediate casing was installed to a depth of 75 feet bls and cemented in place. After centering the borehole with a 14-inch-diameter centering stabilizer, a 12¼-inch pilot hole was advanced to a depth of 150 feet bls using direct mud rotary methods. *Lang* then changed to the dual tube, reverse circulation method. The initial target depth for Well F was 350 feet, but the pilot borehole was drilled to 450 feet bls because geologic samples indicated permeable materials extended to at least that depth. *Dewey Data* then acquired borehole geophysical logs. The final borehole was ultimately reamed to 500 feet bls based on interpretation of the geologic and geophysical logs. The geophysical logs are provided for comparison with the lithology and well construction details in Figure 3, while the data files are provided in EXCEL format in Appendix A.

3.1.1 Chronology

Date	Activity
May 1-4	Lang mobilized drilling equipment to the site.
May 5	A 46-inch-diameter borehole was drilled to 25 feet, and 25 feet of 40-inch-diameter surface casing was cemented in place.
May 6	A 38-inch-diameter borehole was drilled from 25 to 80 feet, and 80 feet of 32-inch-diameter intermediate casing was installed.
May 7	The 32-inch-diameter intermediate casing was cemented in place.
May 8	A 12¼-inch-diameter borehole was drilled to 150 feet, where the drilling method was switched from direct rotary to reverse rotary. The 12¼-inch-diameter pilot hole was advanced to a depth of 390 feet.

ECO:LOGIC Engineering
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Project: Fish Springs Ranch
Well: Production Well F (#6)
Location: NE 1/4, SW1/4 Section 10, T.26N., R.19E.
Coordinates (UTM): 2583340E 4446730N (approx)
Borehole Depth: 500 feet Diameter: 46" to 20 ft., 38" to 75 ft, 26" to 500 ft
Drilling Contractor: Lang Exploration and Well
Logged by: Mark Hanneman, Bryan Kearney
Completion Date: 5/19/06

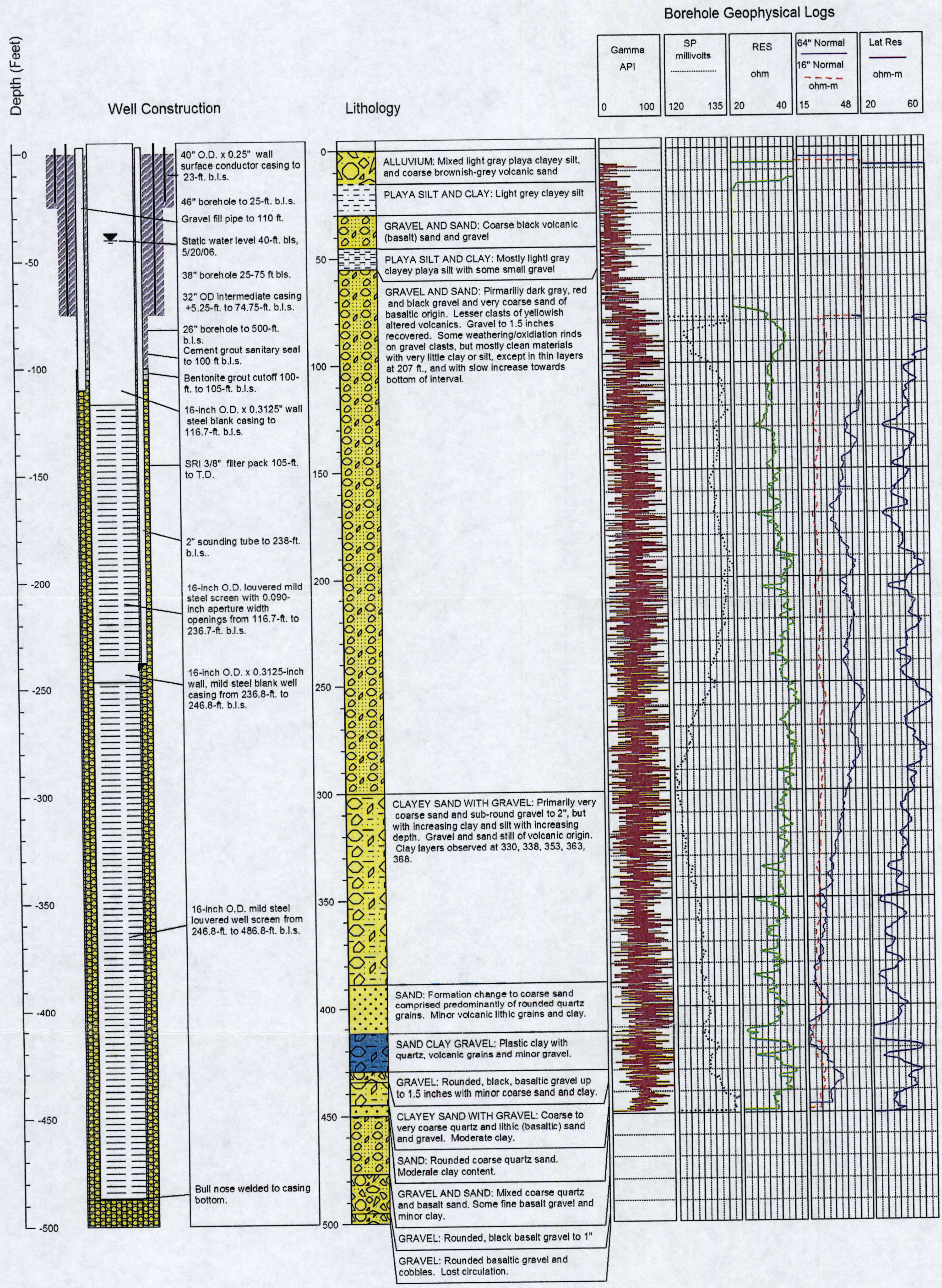

FIGURE 3: WELL F (#6) CONSTRUCTION DETAILS, LITHOLOGY, AND BOREHOLE GEOPHYSICAL LOGS.

Date	Activity
May 9	The pilot hole was advanced to 450 feet, geophysical logs were acquired, and the hole was reamed to 26-inch-diameter to a depth of 150 feet
May 10	The borehole was reamed to the final depth of 500 feet.
May 11	16-inch-diameter steel casing was installed to a depth of 490 feet. The gravel fill tube and sounding tube were installed.
May 12	The filter pack was installed.
May 13	Well development was initiated by running the open-ended drill string inside the 16-inch casing and airlifting the drilling mud from the well.
May 14-16	Development continued with a dual-packer tool and the addition of Tackle™ mud dispersant. The dispersant was swabbed in the screened intervals then airlifted out with the dual-packer tool.
May 17	Well development was completed by running the open-ended drill string to the bottom of the casing and airlifting accumulated sand from the bottom.
July 2	The step test was performed.
July 3-6	The constant discharge test was performed.

3.1.2 Lithology

An abbreviated geologic log is provided in Figure 3, while the complete field lithologic log is provided in Appendix B.

Wells D, E and F were drilled in the northeastern well field on the alluvial fan of Cottonwood Creek below the mouth of Cottonwood Canyon, and have similar lithology. The borehole penetrated an upper zone comprised of two layers of playa silt/clay separated by gravel layers, underlain by coarse fluvial/alluvial deposits of basaltic gravel and coarse sand, with thin interbeds of finer-grained silt and clay, to about 390 feet bls. Rounded gravel up to 1.5-inch-diameter consisted mainly of dark grey, red and black basalt, with lesser clasts of yellow, altered volcanics. These basaltic rocks are prevalent in the mountains drained by Cottonwood Creek to the south. The sand-size fraction was mostly coarse to very coarse with a composition similar to the gravels. Clay and silt content gradually increased below a depth of 300 feet bls. Below 390 feet, the lithology changed to include beds of well-rounded, coarse, quartz sand, and beds of quartz sand mixed with volcanic sand. The quartz sand is likely derived from erosion of granitic rocks located several miles to the southwest.

Samples were submitted to a laboratory for grain size distribution analysis from 135-140 feet and from 390-395 feet bls. Results are provided in Appendix C.

3.1.3 Well F Construction Details

The well casing depth and the intervals completed with louver screen were determined following examination of the formation materials and comparison with the borehole geophysical logs. The well was completed with 16-inch outside diameter (O.D.) steel casing with 5/16-inch wall thickness. *Ful Flo* Louver Well Screens with 0.09-inch slot aperture were placed from 116.7 feet to a depth of 486.8 feet, except for a length of blank casing from 236.8 to 246.8 feet, which serves as the well's pump chamber. The annular space surrounding the perforated intervals was filled with SRI 3/8-inch gravel filter pack. Well construction details are illustrated in Figure 3 and summarized in Table 2.

TABLE 2: WELL F (#6) CONSTRUCTION DETAILS.

Item	Depth	Description
Surface Casing	0-23 feet bls	40-inch O.D. x 0.50-inch wall thickness mild steel.
Intermediate Casing	0-75 feet bls	32-inch O.D. x 0.375-inch wall thickness mild steel.
Blank casing	+2 to 116.7 feet bls 236.8 to 246.8 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel. Blank at 236.8-246.8 to serve as pump chamber.
Perforated casing	116.7 to 236.8 feet bls 246.8 to 486.8 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers. A steel "bull nose" was welded to the bottom of the casing string.
External sounding tube	+2 to 238 feet	2-inch-diameter steel pipe attached to casing using four-ft long connector.
Gravel fill pipe	+2 to 110	3-inch-diameter steel pipe
Filter pack	105 to 500 feet bls	Silica Resources, Inc. (SRI) ⅜-inch filter pack. The filter pack was placed using a tremie pipe and fluid was circulated through the tremie during installation.
Bentonite chip cutoff	100 to 105 feet bls	Bentonite chips, placed using a tremie pipe. Fluid was circulated through the tremie during installation.
Sanitary Seal	Land surface to 100 feet bls	Neat cement grout in the annulus surrounding the well casing from the land surface to 100 feet bls, placed by pumping via a tremie pipe. The annulus surrounding the surface casing and the intermediate casing was also sealed with cement grout.

3.2 WELL D (#5) DRILLING

A 46-inch-diameter borehole was drilled to a depth of 25 feet bls using direct mud rotary methods, and 40-inch surface casing was installed to 25 feet bls and cemented in place. A 38-inch-diameter borehole was then drilled to a depth of 101 feet bls using direct mud rotary methods, and 32-inch intermediate casing was installed to a depth of 100 feet bls and cemented in place. After centering the borehole with a 14-inch centering stabilizer, a 12¼-inch pilot hole was advanced to a depth of 130 feet bls using direct mud rotary methods. The driller then changed to the dual tube, reverse circulation method to drill the borehole from 130 feet to the final depth. The initial target depth for Well D was 300 feet, but the borehole was ultimately drilled to 410 feet bls based on the geologic logging, which indicated permeable materials extending to at least that depth. *Dewey Data* then acquired borehole geophysical logs. The geophysical logs are provided for comparison with the lithology and well construction details in Figure 4, while the data files are provided in EXCEL format in Appendix A.

ECO:LOGIC Engineering
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Project: Fish Springs Ranch
Well: Production Well D (#5)
Location: NW 1/4, NE 1/4 Section 16, T.26N., R.19E.
Coordinates (UTM): 256730.64E 4445861.76N
Borehole Depth: 410 feet Diameter: 46" to 25 ft., 38" to 101 ft, 26" to 410 ft
Drilling Contractor: Lang Exploration and Well
Logged by: Bryan Kearney, M. Hannneman
Completion Date: 6/03/06

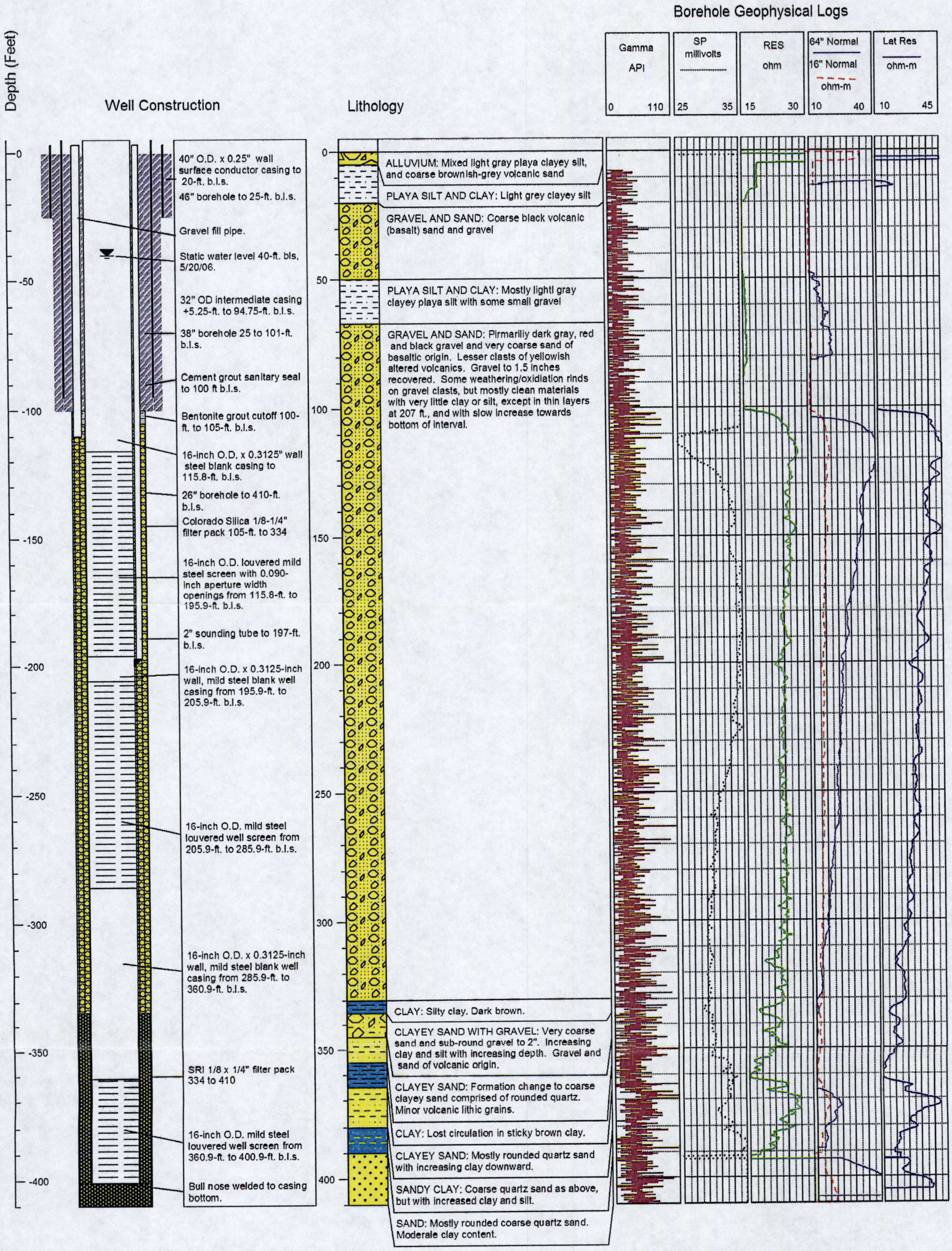

FIGURE 4: WELL D (#5) CONSTRUCTION DETAILS, LITHOLOGY, AND BOREHOLE GEOPHYSICAL LOGS.

3.2.1 Chronology

Date	Activity
May 14-16	Lang mobilized drilling equipment to the site.
May 18	A 46-inch-diameter borehole was drilled to 25 feet, and 25 feet of 40-inch-diameter surface casing was cemented in place.
May 19	A 38-inch-diameter borehole was drilled from 25 to 101 feet.
May 20	The 32-inch-diameter intermediate casing was installed and cemented in place.
May 22	A 12¼-inch-diameter borehole was drilled to 130 feet, where the drilling method was switched from direct rotary to reverse rotary. The 12¼-inch-diameter pilot hole was advanced to a depth of 390 feet.
May 23	Geophysical logs were acquired, and reaming to 26-inch diameter started.
May 24	The borehole was reamed to a depth of 410 feet.
May 25	16-inch steel casing was installed to a depth of 400 feet. The gravel fill tube and sounding tube were installed, and filter pack was installed.
May 26	Well development was initiated by running the open-ended drill string inside the 16-inch casing and airlifting the drilling mud from the well.
May 27-June 2	Development continued with a dual packer tool and the addition of "Tackle" mud dispersant. The dispersant was swabbed in the screened intervals, and then airlifted out with the dual packer tool.
June 3	Well development was completed by running the open ended drill string to the bottom of the casing and airlifting accumulated sand from the bottom.
July 10	The step test was performed.
July 11-14	The constant discharge test was performed.

3.2.2 Lithology

An abbreviated geologic log is provided in Figure 4 and the complete field lithologic log is provided in Appendix B.

Well D is located in the northeastern well field, which has relatively consistent stratigraphy. Similar to Wells E and F, the borehole penetrated an upper zone comprised of two layers of playa silt/clay separated by layers of sand and gravel; underlain by unconsolidated fluvial/alluvial deposits comprised of rounded gravel and coarse sand of basaltic origin to 345 feet bls. The quantity of silt and clay gradually increased below 330 ft. Gravels were typically clean, ranged from pebbles to small cobbles, and consisted mainly of dark grey, red and black basalt, with lesser clasts of yellow, altered volcanics. The sand-size fraction was mostly coarse to very coarse with a composition similar to the gravels. Below 345 feet, the lithology changed to include beds of well-rounded, coarse, quartz sand of granitic origin, and beds of quartz sand mixed with clay, silt and volcanic sand. From 355 to 365 feet, sticky clay was present which plugged the drill bit and prevented circulation of drilling fluid.

Samples were submitted to a laboratory for grain size distribution analysis from 280-290, 360-365 and 370-375 feet bls. Results are provided in Appendix C.

3.2.3 Well D (#5) Construction Details

The well casing depth and intervals completed with louver screen were determined following examination of the formation materials and comparison with the borehole geophysical logs. The well was completed with 16-inch O.D. steel casing with 5/16-inch wall thickness to a depth of 400 feet bls. *Ful Flo* Louver Well Screens were selectively placed below a depth of 115 feet bls. The annular space surrounding the perforated intervals was filled with gravel filter pack. Well construction details are illustrated in Figure 4 and summarized in Table 3.

TABLE 3: WELL D (#5) CONSTRUCTION DETAILS.

Item	Depth	Description
Surface Casing	0-25 feet bls	40-inch O.D. x 0.50-inch wall thickness mild steel.
Intermediate Casing	0-100 feet bls	32-inch O.D. x 0.375-inch wall thickness mild steel.
Blank casing	+2 to 115.8 feet bls 195.9 to 205.9 feet bls 285.9 to 360.9 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel. Blank at 195.9-205.9 to serve as pump chamber.
Perforated casing	115.8 to 195.9 feet bls 205.9 to 285.9 feet bls 360.9 to 400.9 feet bls	16 -inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers. A steel "bull nose" was welded to the bottom of the casing string.
External sounding tube	+2 to 197 feet	2-inch-diameter steel pipe attached to casing using four-ft long connector.
Gravel fill pipe	+2 to 110	3-inch-diameter steel pipe
Filter pack	105 to 410 feet bls	SRI ⅛ x ¼ filter pack from 410 to 334 feet bls, Colorado Silica ⅛ x ¼ filter pack from 334 to 105 feet bls. The filter pack was placed using a tremie pipe and fluid was circulated through the tremie during installation.
Bentonite chip cutoff	100 to 105 feet bls	Bentonite chips placed using a tremie pipe. Fluid was circulated through the tremie during installation.
Sanitary Seal	Land surface to 100 feet bls	Neat cement grout in the annulus surrounding the production casing from the land surface to 100 feet bls, placed by pumping via a tremie pipe. The annular space surrounding the surface casing and intermediate casing was also sealed with cement grout.

3.3 WELL E (#4) DRILLING

A 46-inch-diameter borehole was drilled to a depth of 22 feet bls using direct mud rotary methods, and 40-inch surface casing was installed to 20 feet bls and cemented in place. A 38-inch-diameter borehole was then drilled to a depth of 102 feet bls using direct mud rotary methods, and 32-inch intermediate casing was installed to a depth of 101 feet bls and cemented in place. After centering the borehole with a 14-inch centering stabilizer, a 12¼-inch pilot hole was advanced to a depth of 130 feet bls using direct mud rotary methods. The contractor then changed to the reverse rotary method to drill the borehole from 130 feet to the final depth. The initial target depth for Well E was 300 feet, but the borehole was ultimately drilled to 520 feet bls based on the geologic logs, which indicated permeable materials extending to at least that depth. *Dewey Data* then acquired borehole geophysical logs. The geophysical logs are provided for comparison with the lithology and well construction details in Figure 5, while the data files are provided in EXCEL format in Appendix A.

3.3.1 Chronology

Date	Activity
June 3	Lang mobilized drilling equipment to the site.
June 4	A 46-inch-diameter borehole was drilled to 22 feet, and 20 feet of 40-inch-diameter surface casing was cemented in place.
June 4	A 38-inch-diameter borehole was drilled from 22 to 101 feet.
June 5	32-inch-diameter intermediate casing was installed to 101 feet and cementing began.
June 6-7	The 32-inch-diameter intermediate casing was cemented in place.
June 7-8	A 12¼-inch-diameter borehole was drilled to 130 feet, where the drilling method was switched from direct rotary to reverse rotary. The 12¼-inch-diameter pilot hole was advanced to a depth of 510 feet, geophysical logs were acquired, and reaming to 26-inch-diameter began.
June 9	The hole was reamed to 26-inch-diameter to a depth of 520 feet and a caliper log was acquired. 16-inch steel casing was installed to a depth of 510 feet. The gravel fill tube and sounding tube were installed.
June 9-10	The filter pack was installed.
June 11	Well development was initiated by running the open-ended drill string inside the 16-inch casing and airlifting the drilling mud from the well.
June 12-17	Development continued with a dual packer tool and the addition of "Tackle" mud dispersant. The dispersant was swabbed in the screened intervals then airlifted out with the dual packer tool.
June 17	Well development was completed by running the open-ended drill string to the bottom of the casing and airlifting accumulated sand from the bottom.
July 18	The step test was performed.
July 19-22	The constant discharge test was performed.

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Project: Fish Springs Ranch
Well: Production Well E (#4)
Location: NW 1/4, SW 1/4 Section 10, T.26N., R.19E.
Coordinates (UTM): 257881.79E 4446440.71N
Borehole Depth: 520 feet Diameter: 46" to 22 ft., 38" to 102 ft, 26" to 520 ft
Drilling Contractor: Lang Exploration and Well
Logged by: Bryan Kearney, Peter Sinclair
Completion Date: 6/11/06

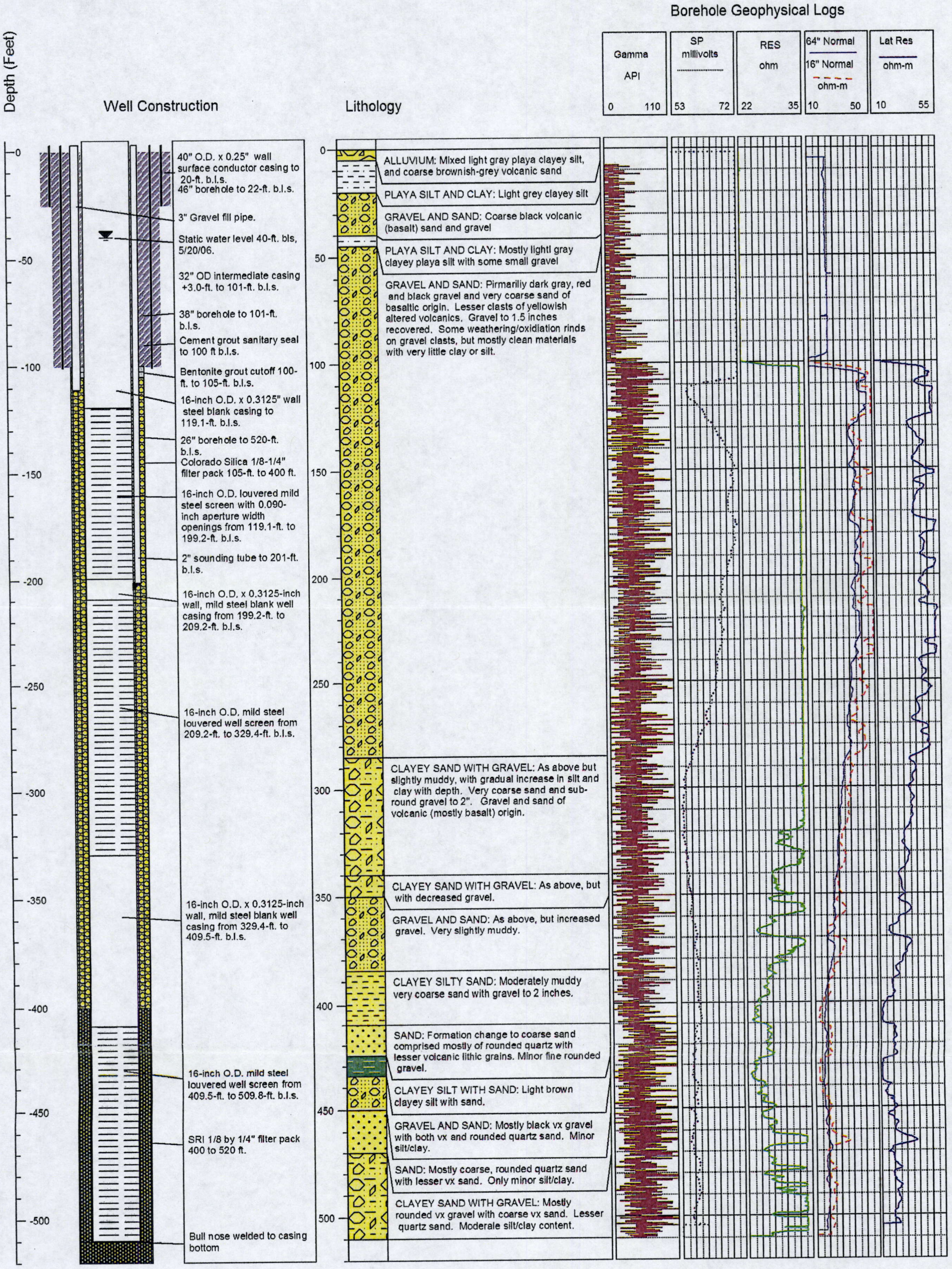

FIGURE 5: WELL E (#4) CONSTRUCTION DETAILS, LITHOLOGY, AND BOREHOLE GEOPHYSICAL LOGS.

3.3.2 Lithology

An abbreviated geologic log is provided in Figure 5 and the complete field lithologic log is provided in Appendix B.

Well E is located in the northeastern well field, which has relatively consistent stratigraphy. As in Wells D and F, the borehole penetrated an upper zone comprised of two layers of playa silt/clay separated by layers of sand and gravel; underlain by unconsolidated fluvial/alluvial deposits comprised of rounded gravel and coarse sand of basaltic origin to 285 feet bls. Below that, the quantity of silt and clay gradually increased with increasing depth to 410 ft bls. Gravels were typically clean, ranged from pebbles to small cobbles, and consisted mainly of dark grey, red and black basalt, with lesser clasts of yellow, altered volcanics. The sand-size fraction was mostly coarse to very coarse with a composition similar to the gravels. Below 410 feet, the lithology changed to include beds of well-rounded, coarse, quartz sand of granitic origin, and beds of quartz sand mixed with gravel, clay, silt and sand derived from volcanic rock.

Samples were submitted to a laboratory for grain size distribution analysis from 410-415 feet and from 460-465 feet bls. Results are provided in Appendix C.

3.3.3 Well E (#4) Construction Details

The well casing depth and the intervals completed with louver screen were determined following examination of the formation materials and comparison with the borehole geophysical logs. The well was completed with 16-inch outside diameter (O.D.) steel casing with 5/16-inch wall thickness. *Ful Flo*, Louver Well Screens were selectively placed below a depth of 119 feet to a depth of 510 feet bls. The annular space surrounding the perforated intervals was filled with a gravel filter pack. Figure 5 and Table 4 provide the well construction details.

TABLE 4: WELL E (#4) CONSTRUCTION DETAILS.

Item	Depth	Description
Surface Casing	0-20 feet bls	40-inch O.D. x 0.50-inch wall thickness mild steel.
Intermediate Casing	0-100.9 feet bls	32-inch O.D. x 0.375-inch wall thickness mild steel.
Blank casing	+2 to 119.1 feet bls 199.2 to 209.2 feet bls 329.4 to 409.5 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel. Blank at 199.2-209.2 to serve as pump chamber.
Perforated casing	119.1 to 199.2 feet bls 209.2 to 329.4 feet bls 409.5 to 509.8 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers. A steel "bull nose" was welded to the bottom of the casing string.
External sounding tube	+2 to 201 feet	2-inch-diameter steel pipe attached to casing using four-ft long connector.
Gravel fill pipe	+2 to 110 feet bls	3-inch-diameter steel pipe
Filter pack	105 to 520 feet bls	SRI ⅛ x ¼-inch filter pack from 520 to 400 feet, and Colorado Silica ⅛ x ¼-inch filter pack from 400 to 105

Item	Depth	Description
		feet. The filter pack was placed using a tremie pipe and fluid was circulated through the tremie during installation.
Bentonite chip cutoff	100 to 105 feet bls	Bentonite chips placed using a tremie pipe. Fluid was circulated through the tremie during installation.
Sanitary Seal	Land surface to 100 feet bls	Neat cement grout from the land surface to 100 feet bls surrounding the production casing placed by pumping via a tremie pipe. The annular space surrounding the surface casing and intermediate casing was also sealed with cement grout.

3.4 WELL C (#3) DRILLING

A 46-inch-diameter borehole was drilled to a depth of 22 feet bls using direct mud rotary methods, and 40-inch surface casing was installed to 21 feet bls and cemented in place. A 38-inch-diameter borehole was then drilled to a depth of 105 feet bls using direct mud rotary methods, and 32-inch intermediate casing was installed to a depth of 105 feet bls and cemented in place. After centering the borehole with a 14-inch centering stabilizer, a 12¼-inch pilot hole was advanced to a depth of 112 feet bls using direct mud rotary methods. The contractor then changed to the reverse rotary method to drill the borehole from 112 feet to 132 feet. Due to the amount of clay in this interval, the contractor switched back to direct rotary from 132 feet to 272 feet. The contractor then changed to the reverse rotary method to drill the borehole from 272 feet to 412 feet. *Dewey Data* then acquired borehole geophysical logs. Figure 6 provides the geophysical logs compared with the lithology and well construction details, while Appendix A provides the data files in EXCEL format.

3.4.1 Chronology

Date	Activity
June 17-18	Lang mobilized drilling equipment to the site.
June 18	A 46-inch-diameter borehole was drilled to 22 feet, and 21 feet of 40-inch-diameter surface casing was cemented in place.
June 19	A 38-inch-diameter borehole was drilled from 25 to 105 feet, and 105 feet of 32-inch-diameter intermediate casing was installed.
June 20	The 32-inch-diameter intermediate casing was cemented in place.
June 21	A 12¼-inch-diameter borehole was drilled to 112 feet, where the drilling method was switched from direct rotary to reverse rotary. The 12¼-inch-diameter pilot hole was advanced to a depth of 131 feet, where clay plugging required the drilling method switch back to direct rotary.
June 22	The pilot hole was advanced to 272 feet, where the drilling method was switched to reverse rotary. The borehole was advanced to 412 feet.

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Project: Fish Springs Ranch
Well: Production Well C (#3)
Location: NW 1/4, NW 1/4 Section 29, T.26N., R.19E.
Coordinates (UTM): 254556.29E 4442640.94N
Borehole Depth: 415 feet Diameter: 46" to 22 ft., 38" to 105 ft, 26" to 415 ft
Drilling Contractor: Lang Exploration and Well
Logged by: Bryan Kearney, Dale Bugenig
Completion Date: 7/1/06

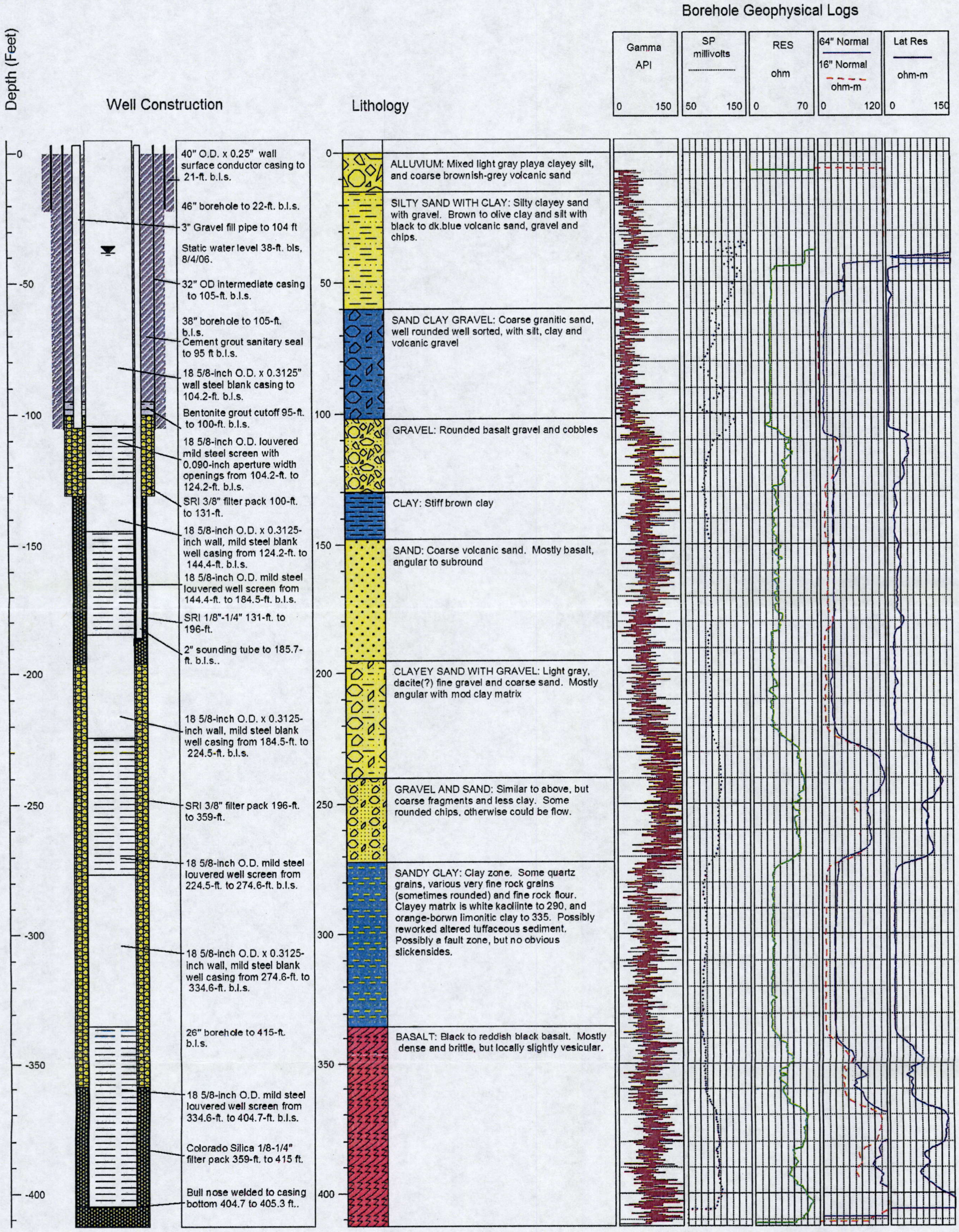

FIGURE 6: WELL C (#3) CONSTRUCTION DETAILS, LITHOLOGY, AND BOREHOLE GEOPHYSICAL LOGS.

Date	Activity
June 23	Geophysical logs were acquired, and the hole was reamed to 26-inch-diameter to a depth of 290 feet.
June 24	The hole was reamed to 26-inch-diameter to a depth of 415 feet, and the gravel fill tube was installed.
June 25	18⅝-inch O.D. steel casing was installed to a depth of 405 feet. The sounding tube was installed, and installation of the filter pack started.
June 26	The filter pack was installed, and well development was initiated by running the open ended drill string inside the 18⅝-inch casing and airlifting the drilling mud from the well.
June 27-July 1	Development continued with a dual packer tool and the addition of "Tackle" mud dispersant. The dispersant was swabbed in the screened intervals then airlifted out with the dual packer tool. July 1 – Well development was completed by running the open ended drill string to the bottom of the casing and airlifting accumulated sand from the bottom.
August 4	The step test was performed.
August 5-8	The constant discharge test was performed.

3.4.2 Lithology

Figure 6 provides an abbreviated geologic log, while the complete field lithologic log is provided in Appendix B.

The geology in this area differs from that present in the area of Wells D, E and F. The upper 275 feet of the borehole penetrated unconsolidated alluvial deposits comprising gravel, sand, silt and clay, and mixtures of these materials. The sand and gravel were basaltic, but were not as coarse or as well-rounded as in Wells D-F. From 275 to 335 a light-colored zone of dense sandy clay of undetermined origin (possibly devitrified volcanic ash, or weathered fault gouge(?)) was intersected. Below that, the lower borehole penetrated fractured basalt flows that were mostly brittle and locally vesicular. The driller reported significant circulation loss occurred at 370 feet. The lower quartz sands present in Wells D, E and F were not present.

Samples were submitted to a laboratory for grain size distribution analysis from 155-160 feet and from 175-180 feet bls. Results are provided in Appendix C.

3.4.3 Well C (#3) Construction Details

The well casing depth and the intervals completed with louver casing for Well 3 were determined based on the formation samples comparison with the borehole geophysical logs, and the known productivity of the nearby irrigation well. Because of the high transmissivity and yield of that well, Well C was completed with 18 5/8-inch outside diameter (O.D.) steel casing with 5/16 inch wall thickness to a depth of 405 feet. *Ful Flo* Louver Well Screens were selectively placed below a depth of 105 feet. The annular space surrounding the perforated intervals was filled with a gravel filter pack. Well construction details are illustrated in Figure 6 and summarized in Table 5.

TABLE 5: WELL C (#3)CONSTRUCTION DETAILS.

Item	Depth	Description
Surface Casing	0-21 feet bls	40-inch O.D. x 0.50-inch wall thickness mild steel.
Intermediate Casing	0-105 feet bls	32-inch O.D. x 0.375-inch wall thickness mild steel.
Blank casing	+2 to 104.2 feet bls 124.2 to 144.4 feet bls 184.5 to 224.5 feet bls 274.6 to 334.6 feet bls	18 ⅝-inch O.D. x 0.3125-inch wall thickness mild steel. Blank at 184.5-224.5 to serve as pump chamber.
Perforated casing	104.2 to 124.2 feet bls 144.4 to 184.5 feet bls 224.5 to 274.6 feet bls 334.6 to 404.7 feet bls	18 ⅝-inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers. A steel "bull nose" was welded to the bottom of the casing string.
External sounding tube	+2 to 185.7 feet	2-inch-diameter steel pipe attached to casing using four-ft long connector.
Gravel fill pipe	+2 to 105 feet bls	3-inch-diameter steel pipe
Filter pack	100 to 415 feet bls	SRI ⅜ filter pack from100 to 131 feet and from 196 to 359 feet., SRI ⅛ x ¼ from 131 to 196 feet, and Colorado Silica ⅛ x ¼ from 359 to 415 feet. The filter pack was placed using a tremie pipe and fluid was circulated through the tremie during installation.
Bentonite chip cutoff	95 to 100 feet bls	Bentonite chips placed using a tremie pipe. Fluid was circulated through the tremie during installation.
Sanitary Seal	Land surface to 95 feet bls	Neat cement grout from the land surface to 95 feet bls, placed by pumping via a tremie pipe. The annulus surrounding the surface and intermediate casing was also sealed with cement grout.

3.5 WELL B (#2) DRILLING

A 46-inch-diameter borehole was drilled to a depth of 22 feet bls using direct mud rotary methods, and 40-inch surface casing was installed to 22 feet bls and cemented in place. A 38-inch-diameter borehole was then drilled to a depth of 102 feet bls using direct mud rotary methods, and 32-inch intermediate casing was installed to a depth of 100 feet bls and cemented in place. After centering the borehole with a 14-inch centering stabilizer, a 12¼-inch pilot hole was advanced to a depth of 105 feet bls using direct mud rotary methods. The contractor then changed to the reverse rotary method to drill the borehole from 105 feet to the final depth. The initial target depth for Well B was 500 feet, but the borehole was ultimately drilled to 560 feet. Borehole geophysical logs were then acquired by *Dewey Data*. The geophysical logs are provided for comparison with the lithology and well construction details in Figure 7, while the data files are provided in EXCEL format in Appendix A.

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10381 Double R Boulevard
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Project: Fish Springs Ranch
Well: Production Well B (#2)
Location: SE 1/4, SE 1/4 Section 30, T.26N., R.19E.
Coordinates (UTM): 254060.27E 4441262.93N
Borehole Depth: 560 feet Diameter: 46" to 22 ft., 38" to 102 ft, 26" to 520 ft
Drilling Contractor: Lang Exploration and Well
Logged by: Bryan Kearney, Zsolt Rosta
Completion Date: 7/21/06

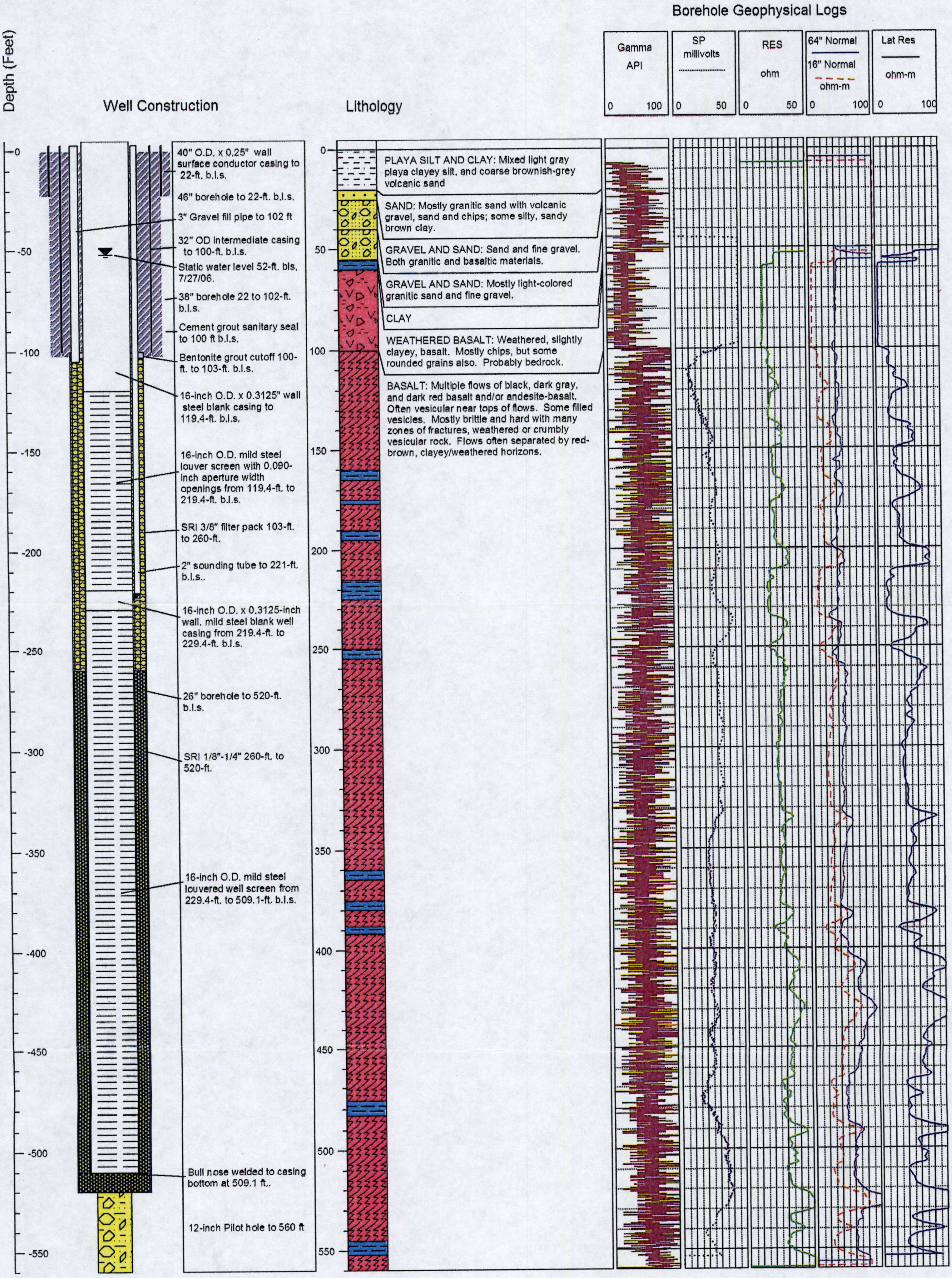

FIGURE 7: WELL B (#2) CONSTRUCTION DETAILS, LITHOLOGY, AND BOREHOLE GEOPHYSICAL LOGS.

3.5.1 Chronology

Date	Activity
July 7, 2006	Lang mobilized drilling equipment to the site. A 46-inch-diameter borehole was drilled to 22 feet, and 22 feet of 40-inch-diameter surface casing was installed.
July 8	The surface casing was cemented in place, and a 38-inch-diameter borehole was drilled from 22 to 85 feet
July 9	The 38-inch-diameter borehole was drilled from 85 to 102 feet, and 100 feet of 32-inch-diameter intermediate casing was installed and cemented in place.
July 10	The 32-inch-diameter intermediate casing was cemented in place. A 12¼-inch-diameter borehole was drilled to 105 feet, where the drilling method was switched from direct rotary to reverse rotary. The pilot hole was advanced to 145 feet.
July 11	The 12¼-inch-diameter pilot hole was advanced to a depth of 420 feet.
July 12	The pilot hole was advanced to 560 feet, geophysical logs were acquired, and the hole was reamed to 26-inch-diameter to a depth of 130 feet.
July 13	The borehole was reamed to a depth of 430 feet.
July 14	The borehole was reamed to a depth of 520 feet, and installation of 16-inch steel casing began. The gravel fill tube was installed.
July 15-16	The 16-inch casing installation was completed, the sounding tube installed, the filter pack was installed, and development began.
July 17-21	Development continued with a dual packer tool and the addition of "Aqua Clear" mud dispersant. The dispersant was swabbed in the screened intervals, then airlifted out with the dual packer tool.
July 21	Well development was completed by running the open ended drill string to the bottom of the casing and airlifting accumulated sand from the bottom.
July 27	The step test was performed.
July 28-31	The constant discharge test was performed

3.5.2 Lithology

An abbreviated geologic log is provided in Figure 7 and the complete field lithologic log is provided in Appendix B. The upper 100 feet of the borehole penetrated unconsolidated alluvial deposits comprising black volcanic gravel and sand, with minor silt and clay. The lower borehole penetrated fractured Tertiary basalt and or basaltic-andesite flows locally separated by a thin clay bed (Grose, 1984). Multiple flows of fractured, black, grey and red basalt or andesitic basalt, locally vesicular, extended from 100 to 560 feet.

Because Well B was completed in basaltic rock, drill samples were not submitted to a laboratory for sieve analyses.

3.5.3 Well B (#2) Construction Details

The well casing depth and the intervals completed with louver casing for Well B were determined based on a review of the formation samples and comparison with the borehole geophysical logs. The well was then completed with 16-inch outside diameter (O.D.) steel casing with 5/16 inch wall thickness to a depth of 510 feet. *Ful Flo* Louver Well Screens were placed from 120 feet to 510 feet bls. The annular space surrounding the perforated intervals was filled with a gravel filter pack. Well construction details are illustrated in Figure 7 and summarized in Table 6.

TABLE 6: WELL B (#2) CONSTRUCTION DETAILS.

Item	Depth	Description
Surface Casing	0-22 feet bls	40-inch O.D. x 0.50-inch wall thickness mild steel.
Intermediate Casing	0-100 feet bls	32-inch O.D. x 0.375-inch wall thickness mild steel.
Blank casing	+2 to 119.4 feet bls 219.4 to 229.4 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel. Blank at 219.4-229.4 to serve as pump chamber.
Perforated casing	119.4 to 219.4 feet bls 229.4 to 509.1 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers. A steel "bull nose" was welded to the bottom of the casing string.
External sounding tube	+2 to 221 feet	2-inch-diameter steel pipe attached to casing using four-ft long connector.
Gravel fill pipe	+2 to 110 feet bls	3-inch-diameter steel pipe
Filter pack	103 to 520 feet bls	SRI ⅜ filter pack from 103 to 260 feet, and Colorado Silica ⅛ x ¼ from 260 to 520 feet. The filter pack was placed using a tremie pipe and fluid was circulated through the tremie during installation.
Bentonite chip cutoff	100 to 103 feet bls	Bentonite chips placed using a tremie pipe. Fluid was circulated through the tremie during installation.
Sanitary Seal	Land surface to 100 feet bls	Neat cement grout from the land surface to 100 feet bls, placed by pumping via a tremie pipe. The annulus surrounding the surface and intermediate casing was also sealed with cement grout.

3.6 WELL A (#1) DRILLING

A 46-inch-diameter borehole was drilled to a depth of 22 feet bls using direct mud rotary methods, and 40-inch surface casing was installed to 22 feet bls and cemented in place. A 38-inch-diameter borehole was then drilled to a depth of 45 feet bls using direct mud rotary methods and 32-inch-intermediate casing was installed to a depth of 45 feet bls and cemented in place. After centering the borehole with a 14-inch centering stabilizer, a 12¼-inch pilot hole was advanced to a depth of 53 feet bls using direct mud rotary methods. The contractor then changed to the reverse rotary method to drill the borehole from 53 feet to the final depth of 450 feet. Borehole geophysical logs were acquired by *Dewey Data*. The geophysical logs are provided for comparison with the lithology and well construction details in Figure 8, while the data files are provided in EXCEL format in Appendix A.

3.6.1 Chronology

Date	Activity
July 2, 2006	Lang mobilized drilling equipment to the site, drilled a 46-inch-diameter borehole to 22 feet, and 22 feet of 40-inch-diameter surface casing was installed.
July 3	22 feet of 40-inch-diameter surface casing was cemented in place, and a 38-inch-diameter borehole was drilled from 22 to 45 feet.
July 4	45 feet of 32-inch-diameter intermediate casing was installed and cemented in place.
July 5	A 12¼-inch-diameter borehole was drilled with reverse rotary methods to 85 feet.
July 6	The 12¼-inch-diameter borehole was advanced to 450 feet and geophysical logs were acquired.
July 7	The drilling equipment was mobilized to the site of Well #2.
July 22	The drilling equipment was mobilized back on site.
July 23	The bore hole was reamed to a 29-inch-diameter from 45 to 110 feet.
July 24	The bore hole was reamed to a 26-inch-diameter from 110 to 440 feet.
July 25	The casing string, gravel fill tube and sounding tube were installed.
July 26	The filter pack was installed.
July 27	Well development was initiated by running the open-ended drill string inside the casing string and airlifting the drilling mud from the well.
July 28-August 1	Development continued with a dual packer tool and the addition of "Tackle" mud dispersant. The dispersant was swabbed in the screened intervals then airlifted out with the dual packer tool.
August 1	Well development was completed by running the open-ended drill string to the bottom of the casing and airlifting accumulated sand from the bottom.
August 13	The step test was performed.
August 14-17	The constant discharge test was performed.

3.6.2 Lithology

An abbreviated geologic log is provided in Figure 8 and the complete field lithologic log is provided in Appendix B. The upper 150 feet of borehole penetrated fine-grained, unconsolidated alluvial deposits mostly comprising clay, clayey sand, and silty sand. From 150 feet to 450 feet bls, beds of clean, coarse, well-sorted, well-rounded quartz sand dominated the lithology. Thin fingers of brown silty clay and small lenses of gravel separated the thicker sequences of sand. Samples were submitted to a laboratory for grain size distribution analysis from 205-210, 410-415, 420-425, and 435-440 feet bls. Results are provided in Appendix C.

ECO:LOGIC Engineering
10381 Double R Boulevard
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Project: Fish Springs Ranch
Well: Production Well A (#1)
Location: SE 1/4, NE 1/4 Section 25, T.26N., R.18E.
Coordinates (UTM): 252448.01E 4442414.16N
Borehole Depth: 450 feet
Diameter: 46" to 22 ft., 38" to 45 ft, 29" to 110 ft, 26" to 440 ft
Drilling Contractor: Lang Exploration and Well
Logged by: Bryan Kearney, Mark Hanneman
Completion Date: 7/31/06

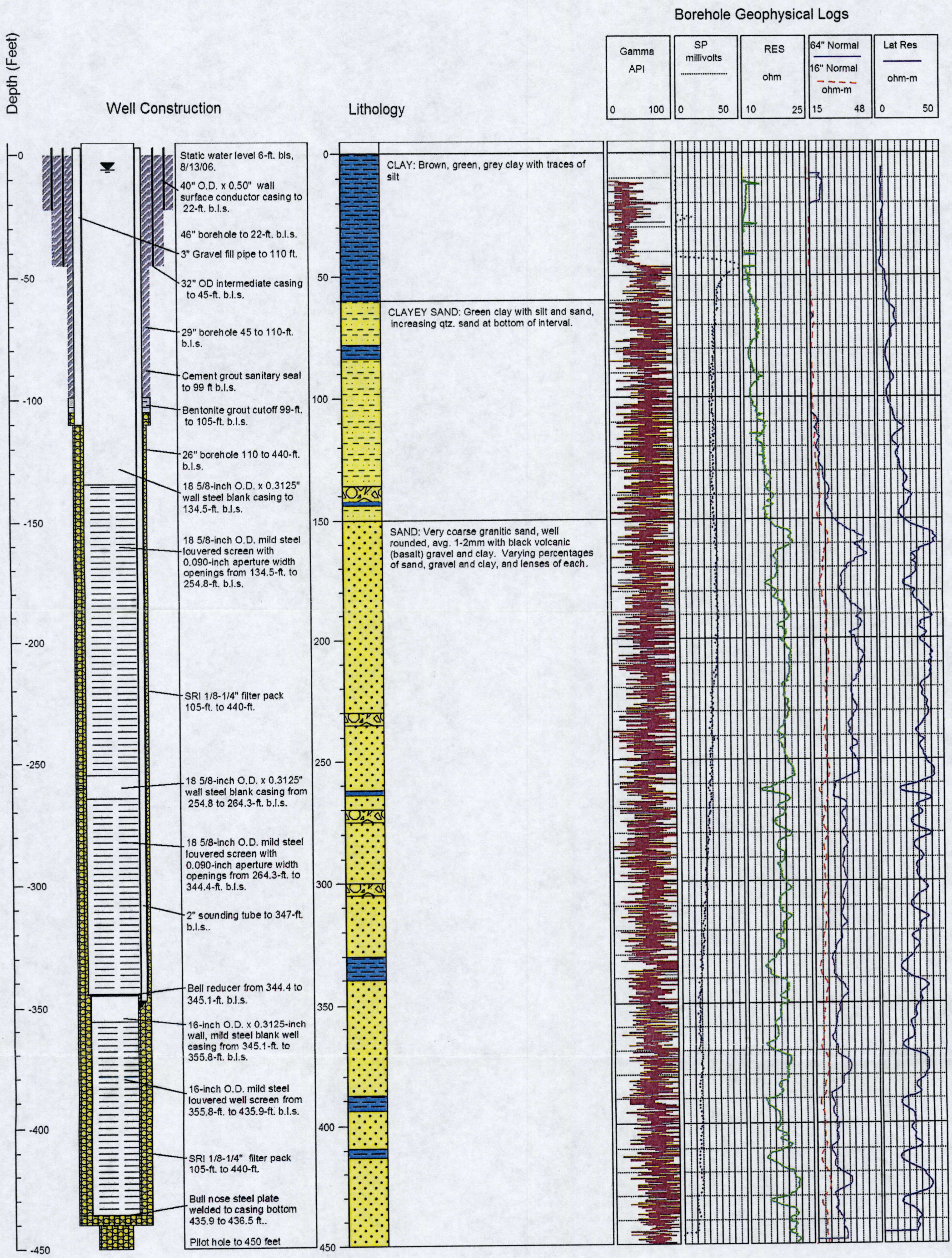


FIGURE 8: WELL A (#1) CONSTRUCTION DETAILS, LITHOLOGY, AND BOREHOLE GEOPHYSICAL LOGS

3.6.3 Well A (#1) Construction Details

The well casing depth and the intervals completed with louver casing for Well A were determined based on a review of the formation samples and comparison with the borehole geophysical logs. Because of the anticipated high transmissivity of the quartz sands, the well was then completed with a combination of 18 5/8-inch outside diameter (O.D.) steel casing (to 344 feet) and 16-inch O.D. casing (to 436 feet). Both had 5/16-inch wall thickness. *Ful Flo* Louver Well Screens were placed from a depth of 135 feet to 435 feet bls. The annular space surrounding the perforated intervals was filled with a gravel filter pack. Well construction details are illustrated in Figure 8 and summarized in Table 7.

TABLE 7: WELL A (#1) CONSTRUCTION DETAILS.

Material	Depth	Description
Surface Casing	0-22 feet bls	40-inch O.D. x 0.50-inch wall thickness mild steel.
Intermediate Casing	0-75 feet bls	32-inch O.D. x 0.375-inch wall thickness mild steel.
Blank casing	+2 to 134.5 feet bls 254.8 to 264.3 feet bls	18⅝-inch O.D. x 0.3125-inch wall thickness mild steel. Blank at 254.8-264.3 to serve as pump chamber.
Perforated casing	134.5 to 254.8 feet bls 264.3 to 344.4 feet bls	18 ⅝-inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers.
Bell reducer	344.4 to 345.1 feet bls	A bell reducer was welded on to the bottom of the 18⅝-inch O.D. string, reducing the casing diameter to 16-inch O.D. below 345 feet bls.
Blank casing	345.1 to 355.8 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel.
Perforated casing	355.8 to 435.9 feet bls	16-inch O.D. x 0.3125-inch wall thickness mild steel w/ 0.090-inch aperture-width louvers.
External sounding tube	+2 to 347 feet	2-inch-diameter steel pipe attached to casing using four-ft long connector.
Gravel fill pipe	+2 to 110 feet bls	3-inch-diameter steel pipe
Filter pack	105 to 440 feet bls	SRI ⅛ x ¼ filter pack. Placed using a tremie pipe and fluid was circulated through the tremie during installation.
Bentonite chip cutoff	99 to 105 feet bls	Bentonite chips placed using a tremie pipe. Fluid was circulated through the tremie during installation.
Sanitary Seal	Land surface to 99 feet bls	Neat cement grout from the land surface to 99 feet bls placed by pumping via a tremie pipe. The annulus surrounding the surface and intermediate casing was also sealed with cement grout.

4.0 WELL DEVELOPMENT

The primary reasons for development are to remove residual drilling fluid from the well bore and restore any damage to the formation that may have resulted from well construction. Formation damage includes plugging of the formation due to invasion of drilling fluid, or the buildup of an impermeable "wall cake" on the formation/borehole interface.

Well development was initiated prior to installation of the sanitary seal to allow for potential settling of the filter pack. Each well was initially developed by air-lift pumping using the drill-rig compressor to remove the drilling mud, followed by use of a dual-packer development tool. The development tool was constructed with two packers spaced 5 feet apart, which concentrates the effects of development to the interval between the packers. *Tackle*™ polymer drilling mud dispersant was then swabbed in to aid in mud removal, followed by additional dual-packer development until the discharge was clean to the unaided eye. At Well B, *Aqua Clear*™ polymer drilling mud dispersant was used. Finally, the end plug of the dual-packer assembly was removed and the assembly lowered to the well bottom to evacuate accumulated sand. The drilling fluid and initial water pumped from the well during development were disposed of on-site by land application.

A significant amount of rig time was spent at each well performing development, as follows:

- Well F (#6) - approximately 112 hours;
- Well D (#5), approximately 200 hours;
- Well E (#4), approximately 155 hours;
- Well C (#3), approximately 130 hours;
- Well B (#2), approximately 160 hours; and
- Well A (#1), approximately 132 hours.

5.0 WELL TESTING

The testing program for each well included a step test and a constant-discharge test. A recovery period followed each test. Step testing entailed pumping the well at progressively higher rates while monitoring the water levels in the pumped well. The purpose of the step test was to evaluate performance of the wells over a range of pumping rates, and to assess the efficacy of development and overall hydraulic efficiency of the wells. The constant-discharge test entailed pumping the well at a constant rate for approximately 72 hours while monitoring the water level in both the pumped well and in nearby observation wells. The purpose of the constant-discharge test was to evaluate the hydraulic characteristics of the aquifer. These properties influence the overall ability of the aquifer to transmit groundwater, how the aquifer responds to the stress of pumping, and the long-term performance of the well.

5.1 TESTING EQUIPMENT

Testing was accomplished using a line-shaft turbine test pump and diesel generator provided by *Carson Pump*. The discharge was conveyed a distance away from the well via aluminum piping, either into a drainage or onto the playa. The pumping rate was measured with a *Water Specialties* totalizing flow meter, and regulated by varying the engine speed and fine-tuning with a gate valve. The water level in the pumped well was monitored with an *In-Situ* MiniTROLL™ data logger equipped with a 100 p.s.i.g. pressure transducer. Water levels in nearby observation wells were generally monitored using MiniTROLLs equipped with 30 p.s.i.g. transducers. The data loggers were accessed through a laptop computer. During testing, data were periodically downloaded, and field data plots were updated, to ensure that the devices were operating properly.

Near the scheduled end of each 72-hour test, personnel from the Washoe County Department of Water Resources reviewed the data to ascertain whether the results were consistent with previous, County-conducted, extended duration tests of older Fish Springs Ranch wells. In each instance, the data were consistent with prior testing and the tests were terminated as scheduled.

5.2 ANALYTICAL METHODS

Analysis of the test data was accomplished in two phases. The first phase entailed classical graphical analysis of the data in the field as testing progressed. The field analysis allowed for comparison with results of previous testing by Washoe County. It also provided initial values of aquifer properties that were used as "seed values" of aquifer properties to facilitate the second phase of analysis using the computer program AQTESOLV for Windows (Version 4.02.004, HydroSolve, 2006). AQTESOLV compares the pumping test data to type curves generated for a large number of analytical solutions for unsteady flow in aquifers arising from pumping a well.

As described in detail in the following sections, a reasonable solution to the observed response of the aquifer to pumping in Wells F, E and D was obtained by invoking an analytical solution derived by Moench (1997). As previously described, these wells are all located in the northeastern well field and have similar geology. Moench derived an analytical solution for unsteady flow to a fully or partially penetrating, finite-diameter well with wellbore storage and wellbore skin in a homogeneous, anisotropic, unconfined aquifer with delayed gravity response.

The Moench solution also includes a correction for delayed observation well response. AQTESOLV uses the principle of superposition in time to simulate variable-rate tests, including recovery, with the Moench solution. This solution can be used to analyze both pumping and recovery data from constant- or variable-rate pumping tests. The radial flow and derivative-time plots can be used to detect the wellbore storage effect.

The early-time data from the test of Well F were also analyzed by the method of Butler (1988), who derived a solution for unsteady flow to a fully penetrating well in a heterogeneous, isotropic confined aquifer. The solution assumes the pumping well is located at the center of a disk of radius R embedded within an infinite matrix. Hydraulic properties of the disk and matrix are assumed uniform, but may differ between the two zones. The solution assumes a line source for the pumped well and therefore neglects wellbore storage.

Analysis of Well C, which contains both fluvial/alluvial gravels and basalt bedrock, used an analytical solution initially derived by Moench (1984). This solution was derived for unsteady flow to a fully penetrating, finite-diameter well with wellbore storage and wellbore skin in an isotropic fractured aquifer, assuming a double-porosity model with slab matrix blocks and fracture skin. Moench extended the method in 1988 to include partially penetrating wells and anisotropy based on the solution by Dougherty and Babu (1984). The solution also includes delayed response in an observation well based on the work of Moench (1997).

Analysis of Well B, which was completed almost entirely in fractured basalts, used the analytical solution developed by Barker (1988) for solution of a pumping test in a fractured bedrock aquifer. Barker derived a generalized radial flow model for unsteady, n-dimensional flow to a fully penetrating source in an isotropic, single- or double-porosity fractured aquifer. The source is an n-dimensional sphere (projected through three-dimensional space) of finite radius (r_w), storage capacity (ß) and skin factor (S_w).

At Wells B and C, the aquifer is comprised in part of volcanic lava flows. Flow behavior in fractured rock aquifers differs from that in uniformly porous aquifers such as sand and gravel deposits. Fractured rock aquifers possess, in addition to void spaces between mineral grains of rock, vesicular openings and flow boundaries, fissures (cracks, crevices, joints, etc.) which make the pattern of porosity and hydraulic conductivity complex (Streltsova, 1988, pp. 357-364):

> "In the double-porosity model, flow in a fractured rock aquifer is due almost entirely to the presence of fissures, while porosity and therefore storativity is mainly associated with the porous blocks. Fissures have an immediate elastic response to a sudden change in water levels, while porous blocks have an induced subsequent elastic response. Commonly, the actual irregular network of interconnected blocks and fissures is simulated by a regular network of interconnected horizontal block and fissure units. Due to vertical symmetry, the fractured rock aquifer may be further simplified to [a] two layered model. The block unit has a thickness equal to the average thickness of the individual blocks in the actual fractured rock aquifer and the fissure has a thickness equal to the average thickness of the fissures in the actual fractured rock aquifer. Both the block and fissure average thicknesses and hydraulic characteristics are assumed to be constant in space."
>
> "Three time-drawdown segments in fractured rock aquifers have been identified. The first segment, representing the response of fractures to pumping, exists only at very early times and is often masked by wellbore storage impacts. The effective storativity during the first segment is the storativity of the fissure. The

second segment represents the period during which the cone of depression slows in its rate of expansion (a quasi-steady state) as water stored in blocks reaches fractures. Block contribution is delayed because of low hydraulic conductivity. The third segment, approached asymptotically, represents the combined response of fractures and blocks to pumping as the cone of depression continues to expand. The effective storativity during the third segment is the fissure storativity plus the block storativity" (Walton, 1991).

For Well A, which was completed in well-rounded quartz sands, analysis of the test data utilized the method of Dougherty-Babu (1984) for a confined aquifer. Dougherty and Babu (1984) derived an analytical solution for unsteady flow to a fully or partially penetrating, finite-diameter well with wellbore storage and wellbore skin in a homogeneous, isotropic confined aquifer. Moench (1988) extended the method to include anisotropy. The Dougherty-Babu solution also includes delayed response in an observation well based on the work of Moench (1997). AQTESOLV uses the principle of superposition in time to simulate variable-rate tests including recovery with the Dougherty-Babu solution. This solution can be used to analyze both pumping and recovery data from constant- or variable-rate pumping tests.

5.2.1 Wellbore Skin

In the groundwater and petroleum industry literature, the concept of wellbore skin is used to account for the difference between measured and predicted response in a pumped well. The skin, which results from a zone of altered permeability near the wellbore, may be positive or negative.

In the case of positive skin, the interface between the aquifer and the wellbore is damaged. Lower permeability in a damaged skin zone may be a product of many factors including mud infiltration from drilling, bridging of screen openings by coarse particles, mineral precipitation, or improper screen slot size. According to Horne (1995), positive skin factors may attain any value, but in practice they rarely exceed 20.

A negative skin occurs in situations where the permeability immediately adjacent to the wellbore is enhanced. Enhanced permeability in the skin region as compared to the aquifer may be a result of factors such as acid stimulation; natural fracture or solution openings near the wellbore; hydraulic fracturing; or well development. The practical lower limit for negative skin factors is -5 (Horne 1995).

The "thin-skin" model assumes that flow in the skin zone is steady (i.e., the skin has no storage capacity). Head loss due to the skin is assumed to occur at the face of the wellbore; heads in the aquifer beyond the skin region are not affected by the presence of the skin (HydroSOLVE, 2006).

Based on this model, the dimensionless wellbore skin factor is given by (Moench 1997):

$$\text{Skin Factor, } S_w \text{ (dimensionless)} = K_r \times d_s / K_s \times r_w$$

where

K_r is the radial formation hydraulic conductivity

d_s is the thickness of the well bore skin

K_s is the hydraulic conductivity of the well bore skin

r_w is the well radius.

Like the thin-skin model, the "thick-skin" model also assumes that the skin has no storage capacity and flow is steady in the skin zone. Heads in the aquifer beyond the skin region are not affected by the presence of the skin. The wellbore skin factor for the thick-skin model is defined as (Raghavan 1993):

$$\text{Skin Factor, } S_w \text{ (dimensionless)} = [(K_r / K_s) - 1] \times [\ln (r_s / r_w)]$$

where

K_r is the radial formation hydraulic conductivity

K_s is the hydraulic conductivity of the well bore skin

r_s is the radius of the skin region

r_w is the well radius.

Additional descriptions of the results of the pumping tests and numerical modeling for each well are provided in the following sections.

5.3 WELL F (#6) TESTING

The test pump for Well F was installed at 200 feet bls. In addition to the pumped well, Well D (#5) and Well E (#4) were used as observation wells and equipped with data loggers during testing. The Hodges Well, an irrigation well located near Well E (#4), was pumped during a portion of the tests. The effect of changes in the pumping of the Hodges Well is most obvious in the data from Well E. A summary of the Well F water-level data is provided in Figure 9, while the entire pumping test data set is provided in Appendix D.

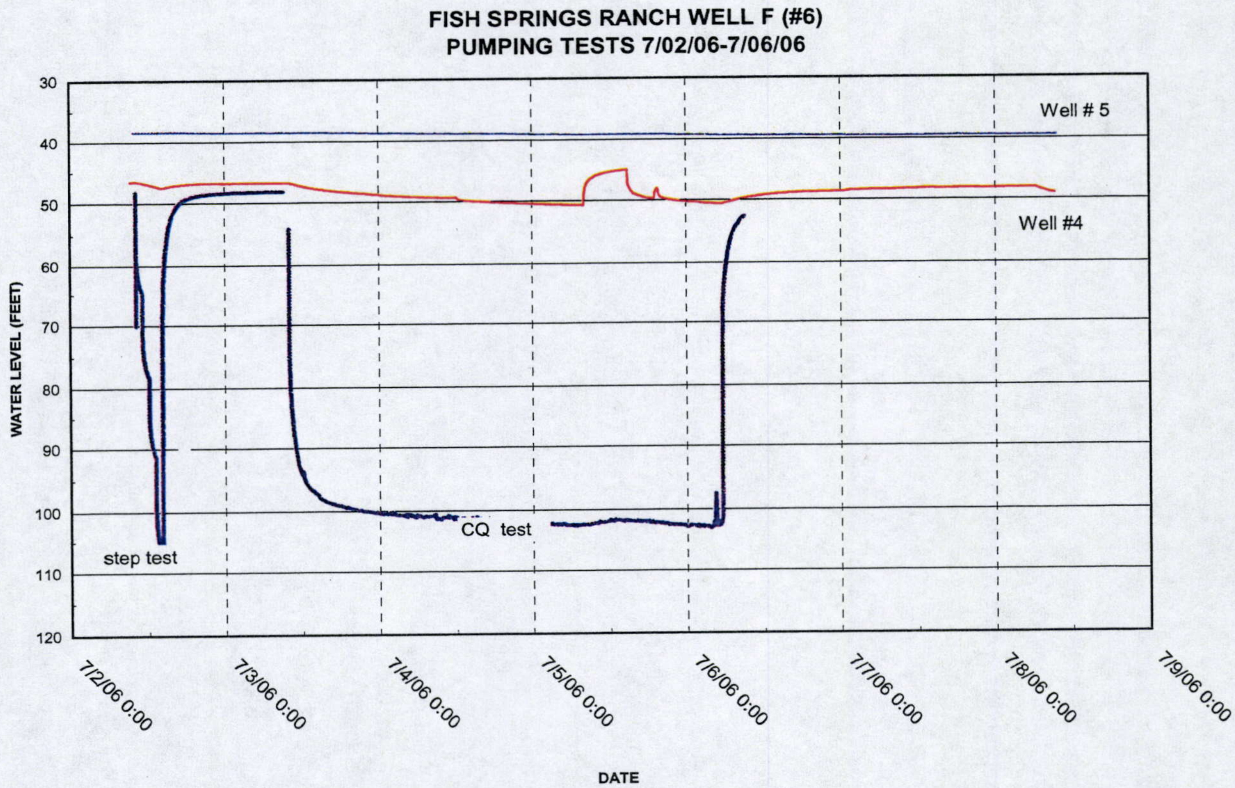


FIGURE 9: WELL F (#6) PUMPING TEST SUMMARY

5.3.1 Well F (#6) Step Test

Static water level: 48.00 feet below the top of the stilling well

Testing commenced: 10:00 hrs 7/2/06.

Test duration: 4 hours (240 minutes).

Testing terminated: 14:00 hrs 7/2/06.

The step-drawdown test comprised four steps of one-hour duration each, as illustrated in Figure 10 and summarized in Table 8. Plots of the specific capacity calculated for each pumping rate, and pumping rate versus drawdown are provided in Figure 11.

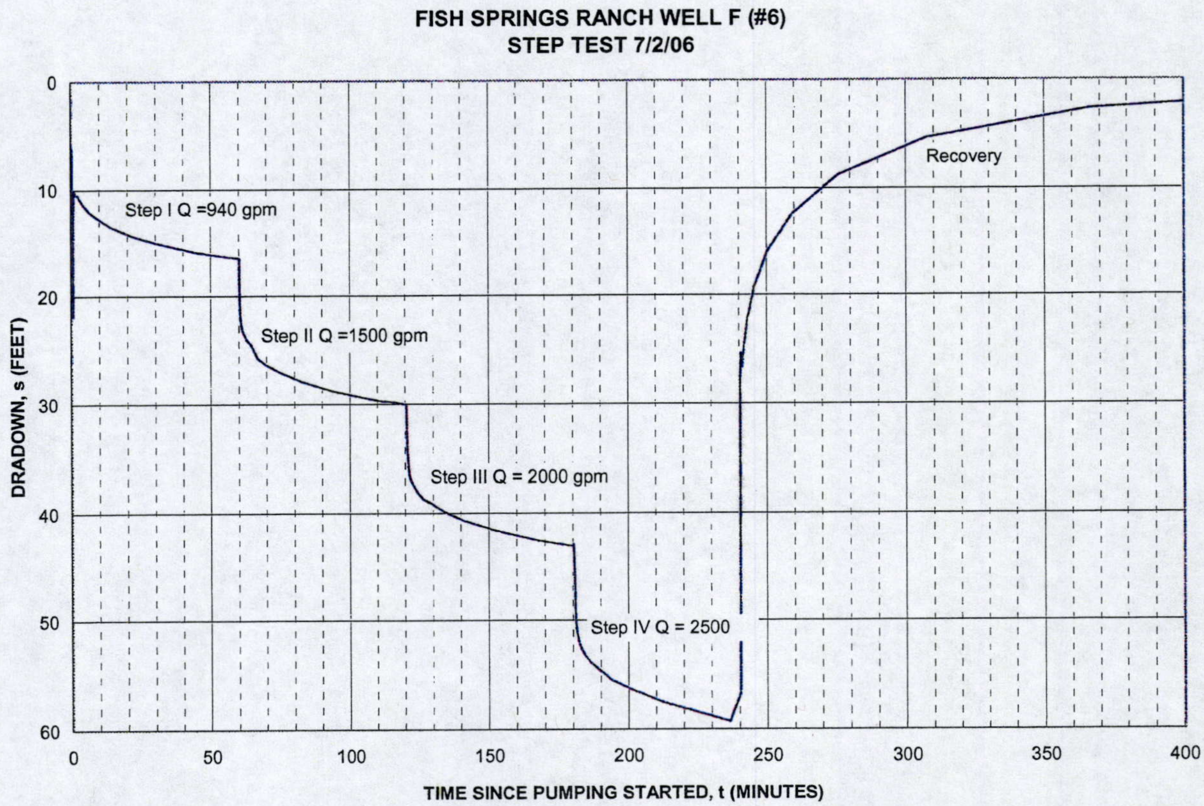


FIGURE 10: WELL F (#6) STEP TEST PLOT.

TABLE 8: WELL F (#6) STEP TEST SUMMARY.

Step	Duration t (minutes)	Pumping Rate Q (gpm)	Drawdown s (feet)	Specific Capacity C_s (gpm/ft)
I	60	940	16.45	57.13
II	60	1500	30.09	49.84
III	60	2000	43.12	46.38
IV	60	2500	59.28	42.16

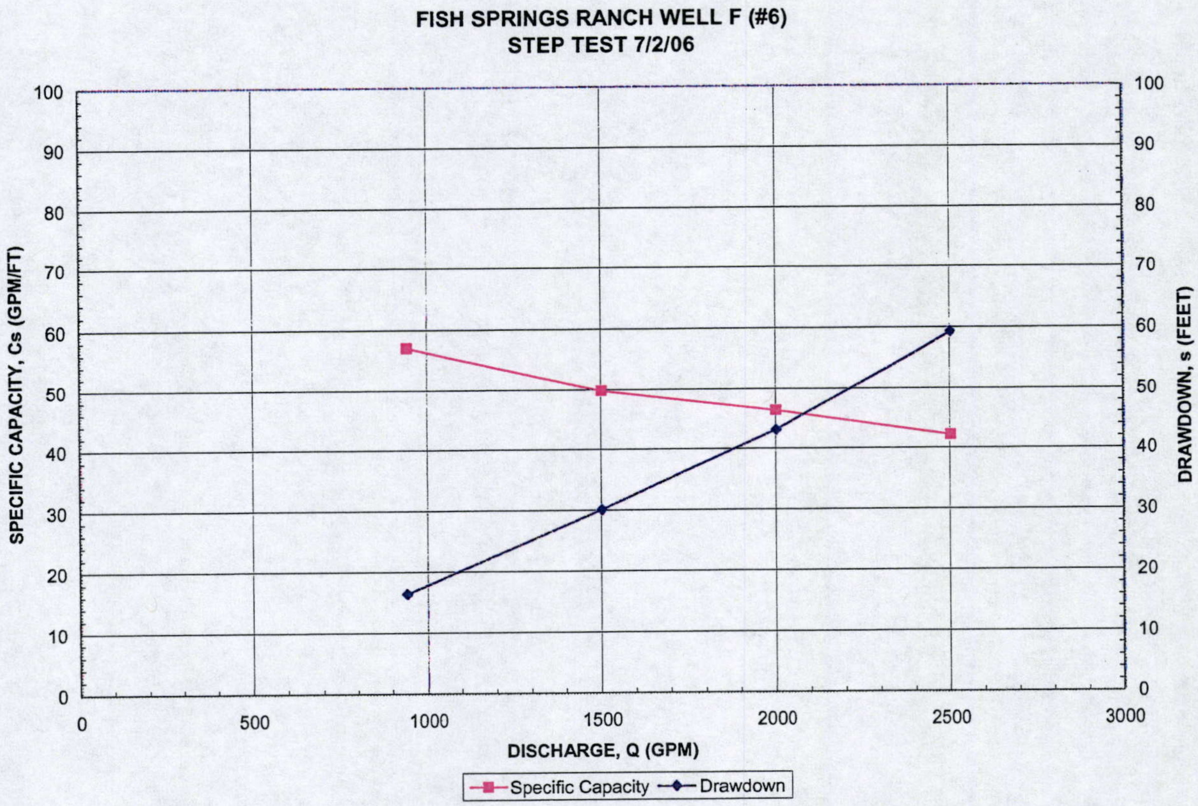


FIGURE 11: WELL F (#6) SPECIFIC CAPACITY PLOT

5.3.2 Well F (#6) Constant-Discharge Test

Constant-discharge testing ensued the day following the step test, after the water levels in the well recovered overnight. At the conclusion of the pumping test, water levels in the wells were monitored for a recovery period of approximately 3 hours. The test results are summarized below. Drawdown and recovery for the pumped well and the nearest observation well are plotted in Figure 12.

Static water level: 48.15 feet below the top of the stilling well

Pumping commenced: 09:50 hours 7/3/06

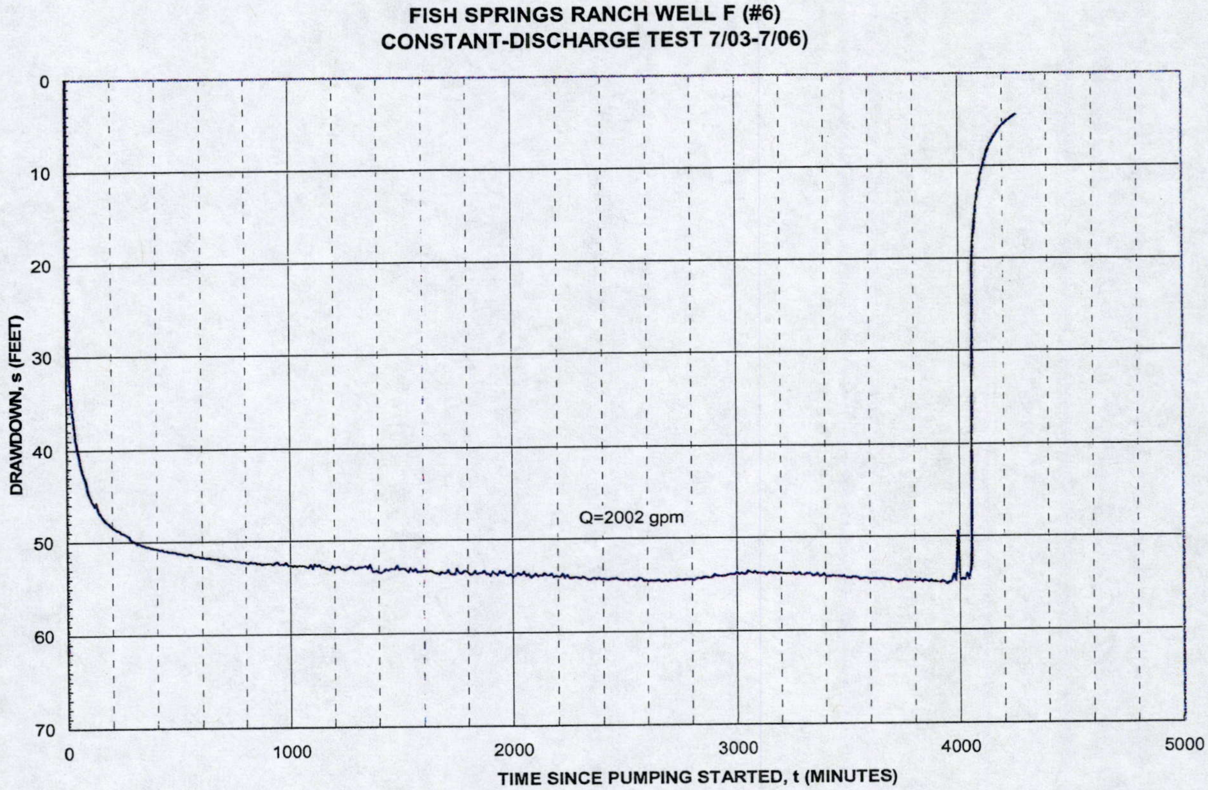
Discharge rate: approximately 2002 gpm (selected on the basis of the step test results).

Test duration: 66:50 hours.

Pumping terminated: approximately 05:00 hours 7/6/06 (due to plugged fuel filter on the generator).

Pumping level at the conclusion of the pumping test: 102.90 feet below the top of the stilling well.

Drawdown in the well at conclusion of test: 54.75 feet.



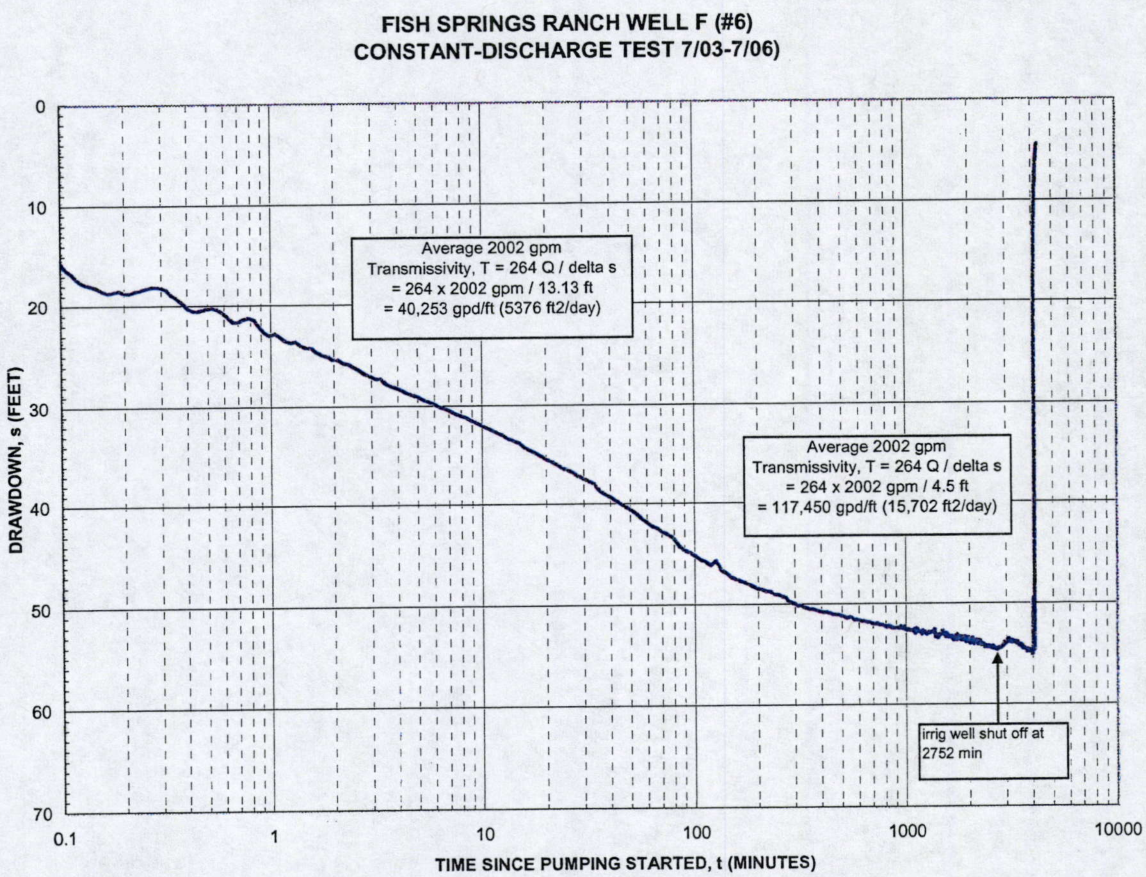


FIGURE 12: WELL F (#6) CONSTANT-DISCHARGE TEST PLOTS.

5.3.3 Well F (#6) Test Data Analysis

The aquifer tapped by the wells in the northeastern well field is comprised of unconsolidated gravel and sand beneath playa clays. As shown in Figure 12, there was a flattening of the drawdown data beginning approximately 200 minutes into the test. The small fluctuation in the late-time data at about 2,700 minutes was the result of the shut-off of the nearby Hodges irrigation well for a period of time. Using the Cooper Jacob approximation of the late-time field data (Cooper and Jacob, 1946), an initial estimate of the Transmissivity was calculated to be in the range of 15,702 ft^2/day. As shown in Figure 13, a reasonable fit of the constant discharge data using Wells D and E as observation wells, was obtained using the analytical method for an unconfined aquifer developed by Moench (1997); however, early time data for Well F do not fit the analytical model. This method also resulted in a Transmissivity of 15,140 ft^2/day and a storage coefficient of 1.7 x 10^{-3}, with a specific yield of 0.118. Well bore skin was estimated at 2.1.

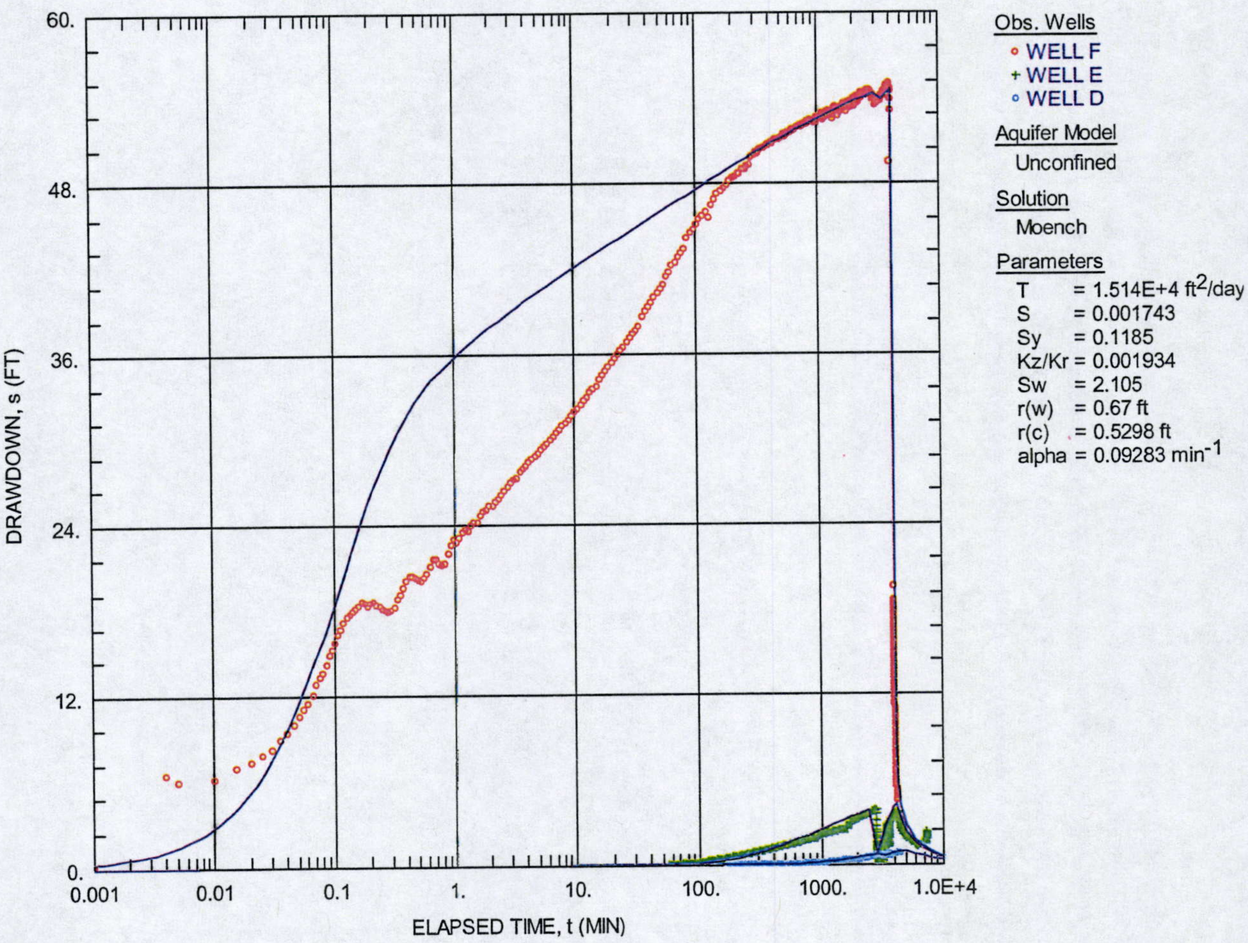


FIGURE 13: AQTESOLV SOLUTION OF WELL F (#6) CONSTANT DISCHARGE DATA

The apparent presence of well-bore skin, despite extensive development of the well, coupled with the poor fit of the early-time data suggests some factor or combination of factors affected the early-time data. One factor that can masquerade as skin is aquifer heterogeneity. For this reason, the data from Well F were also analyzed by the method of Butler (1988) which considers aquifer heterogeneity. The result is shown in Figure 14.

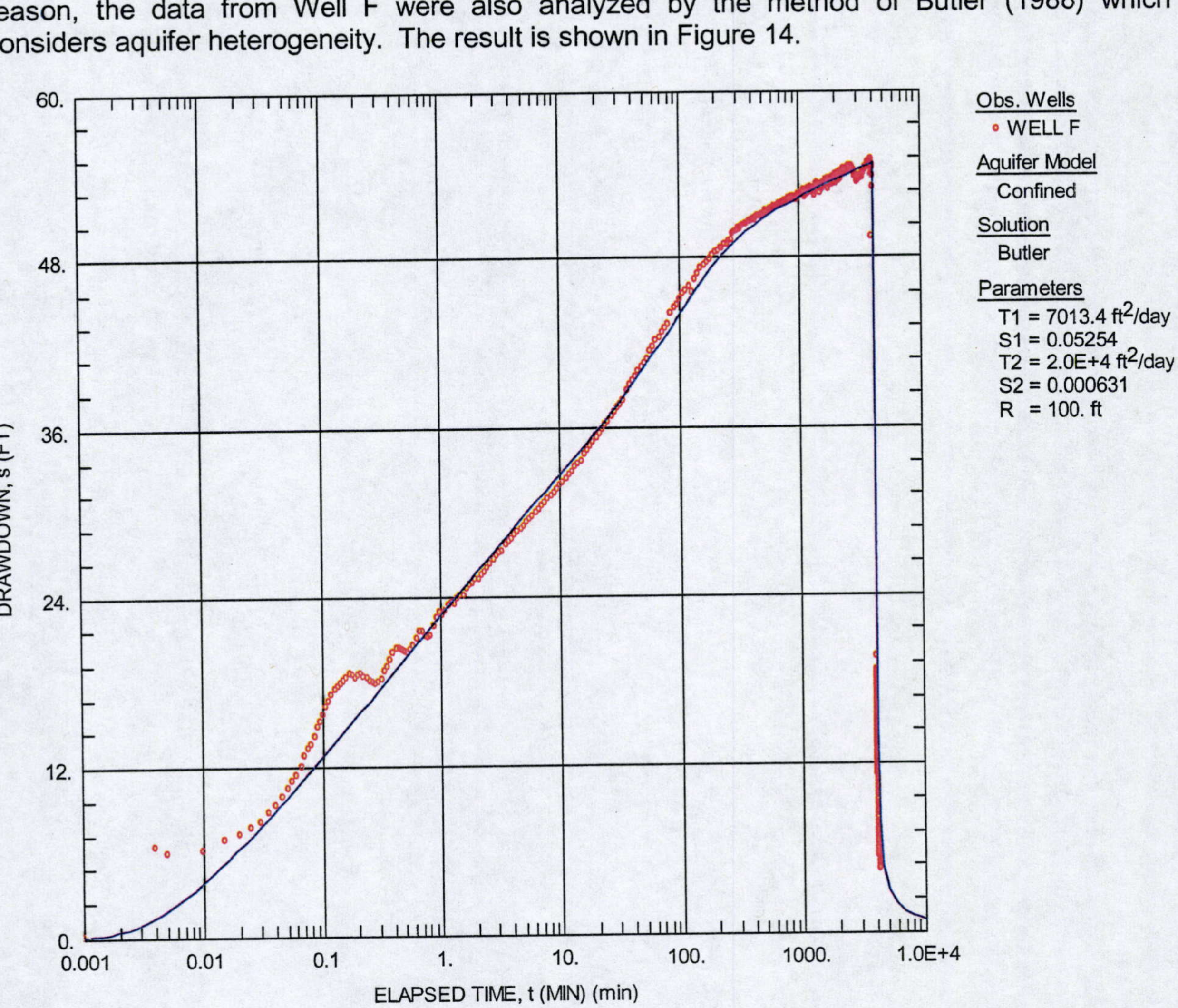


FIGURE 14: AQTESOLV SOLUTION OF WELL F (#6) CONSTANT DISCHARGE DATA

From the good correlation between the observed data and the type curve in Figure 14, it is apparent that the aquifer is heterogeneous near the Well F site and that the transmissivity increases a relatively short distance from the well, most likely in a westerly direction based on the aquifer transmissivity from the Well E observation well data.

5.4 WELL D (#5) TESTING

The test pump for the Well D tests was installed at 200 feet bls. In addition to the pumped well, the observation well network included Well E (#4) and Well F (#6). A summary of the Well D pumping data is provided in Figure 15, while the entire pumping test data set is provided in Appendix D.

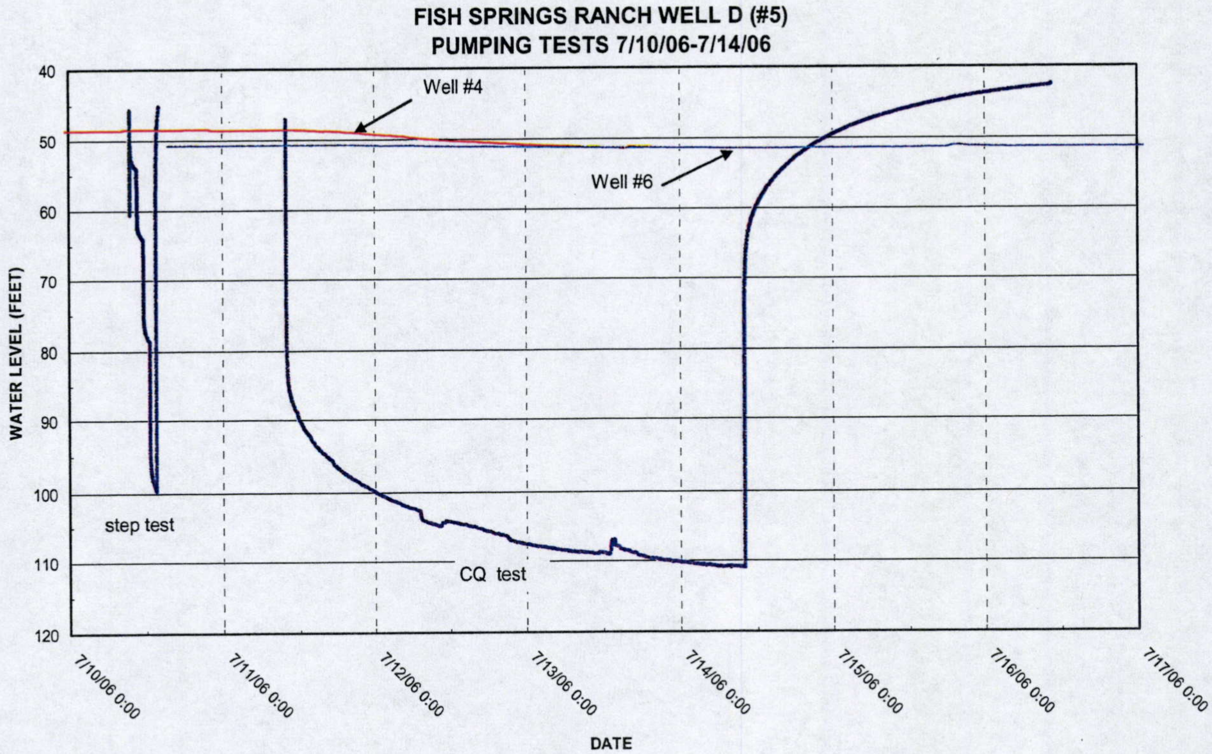


FIGURE 15: WELL D (#5) PUMPING TEST SUMMARY

5.4.1 Well D (#5) Step Test

Static water level: 38.98 feet below the top of the stilling well (top of stilling well was 0.25 feet above the land surface) or 38.73 feet bls.

Testing commenced: 9:25 hrs 7/10/06.

Test duration: 4 hours (240 minutes).

Testing terminated: 13:25 hrs 7/10/06.

The step-drawdown test comprised four steps of one-hour duration each. The data are illustrated in Figure 16 and summarized below in Table 9 and Figure 17.

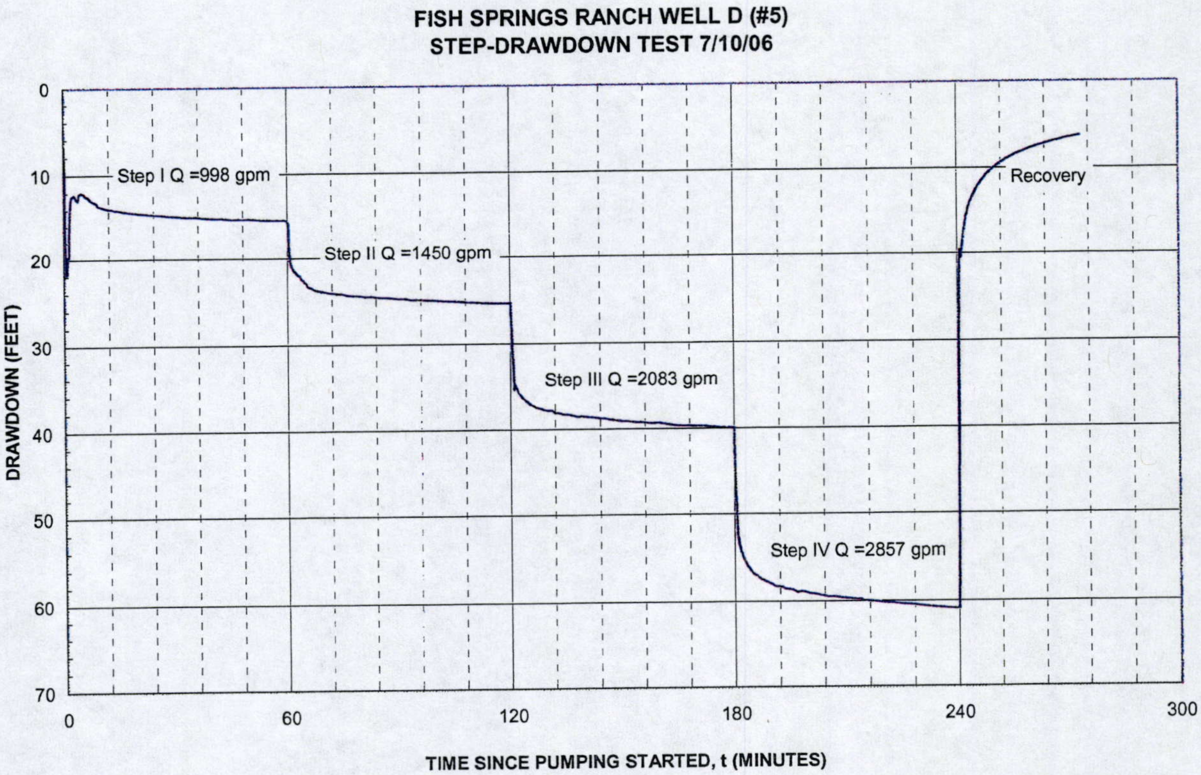


FIGURE 16: WELL D (#5) STEP TEST PLOT.

TABLE 9: WELL D (#5) STEP TEST SUMMARY.

Step	Duration t (minutes)	Pumping Rate Q (gpm)	Drawdown s (feet)	Specific Capacity C_s (gpm/ft)
I	60	998	15.31	65.19
II	60	1450	25.34	57.22
III	60	2083	39.90	52.20
IV	60	2857	60.89	46.92

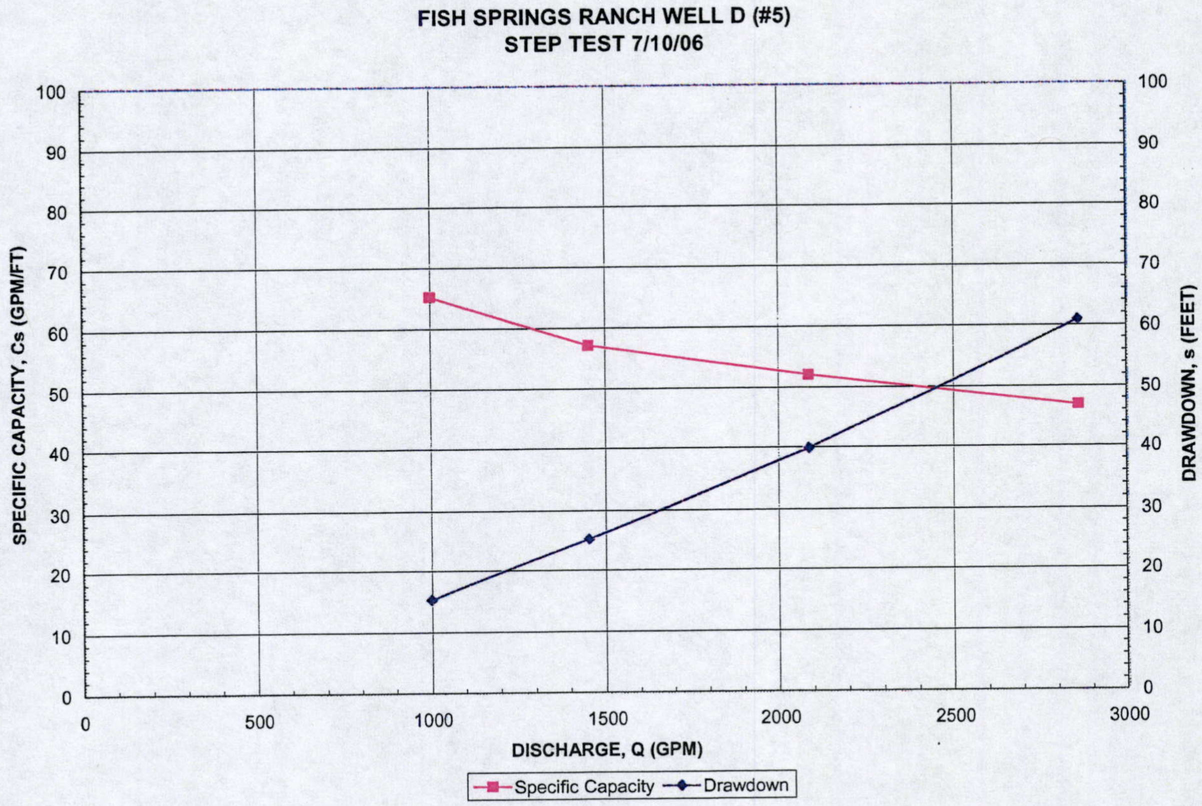


FIGURE 17: WELL D (#5) SPECIFIC CAPACITY PLOT.

5.4.2 Well D (#5) Constant-Discharge Test

Constant-discharge testing ensued the day following the step test, after the water levels in the well recovered overnight. At the conclusion of the pumping test, water levels in the wells were monitored for a recovery period of approximately 24 hours. The test results are summarized below. Drawdown and recovery for the pumped well are plotted in Figure 18.

Static water level: 39.40 feet below the top of the stilling well (top of stilling well was 0.25 feet above the land surface).

Pumping commenced: 09:45 hours 7/11/06.

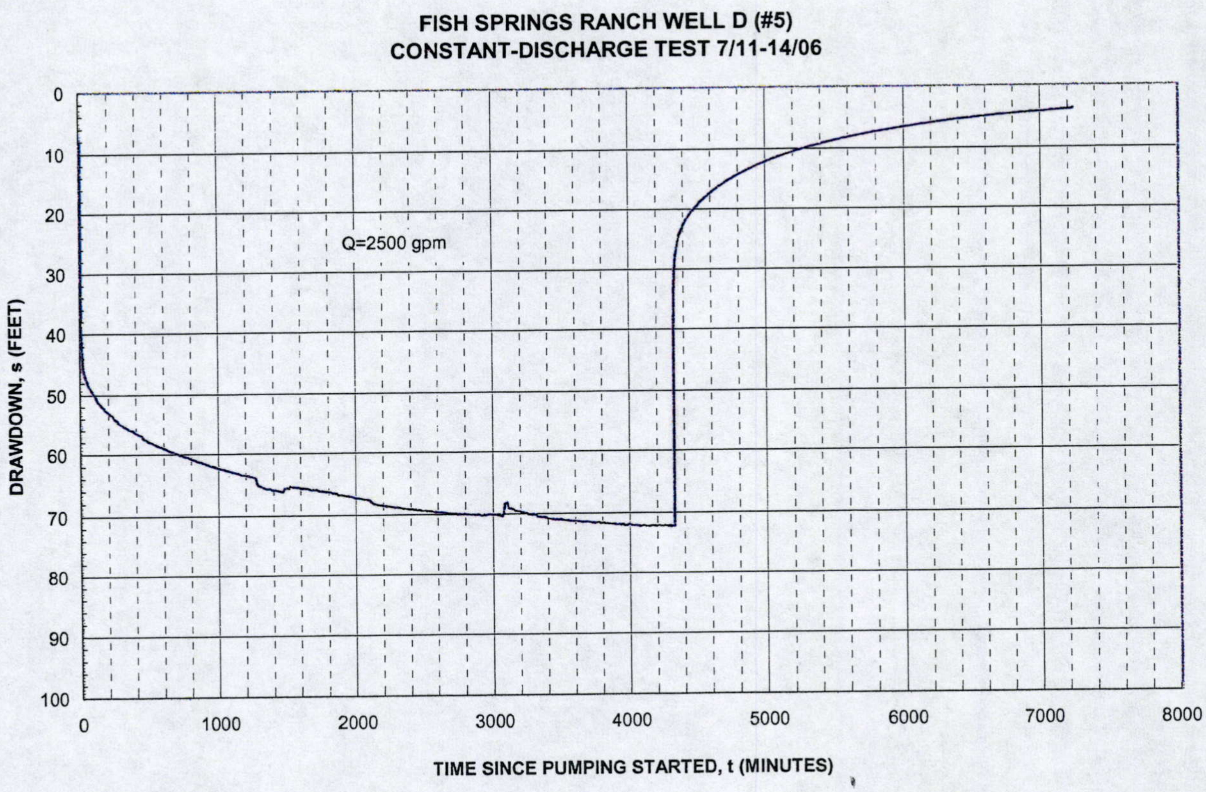
Discharge rate: approximately 2500 gpm (selected on the basis of the step test results).

Test duration: 72 hours.

Pumping terminated: 09:45 hours 7/14/06.

Pumping level at the conclusion of the pumping test: 110.84 feet below the top of the stilling well.

Drawdown in the well at conclusion of test: 72.11 feet.



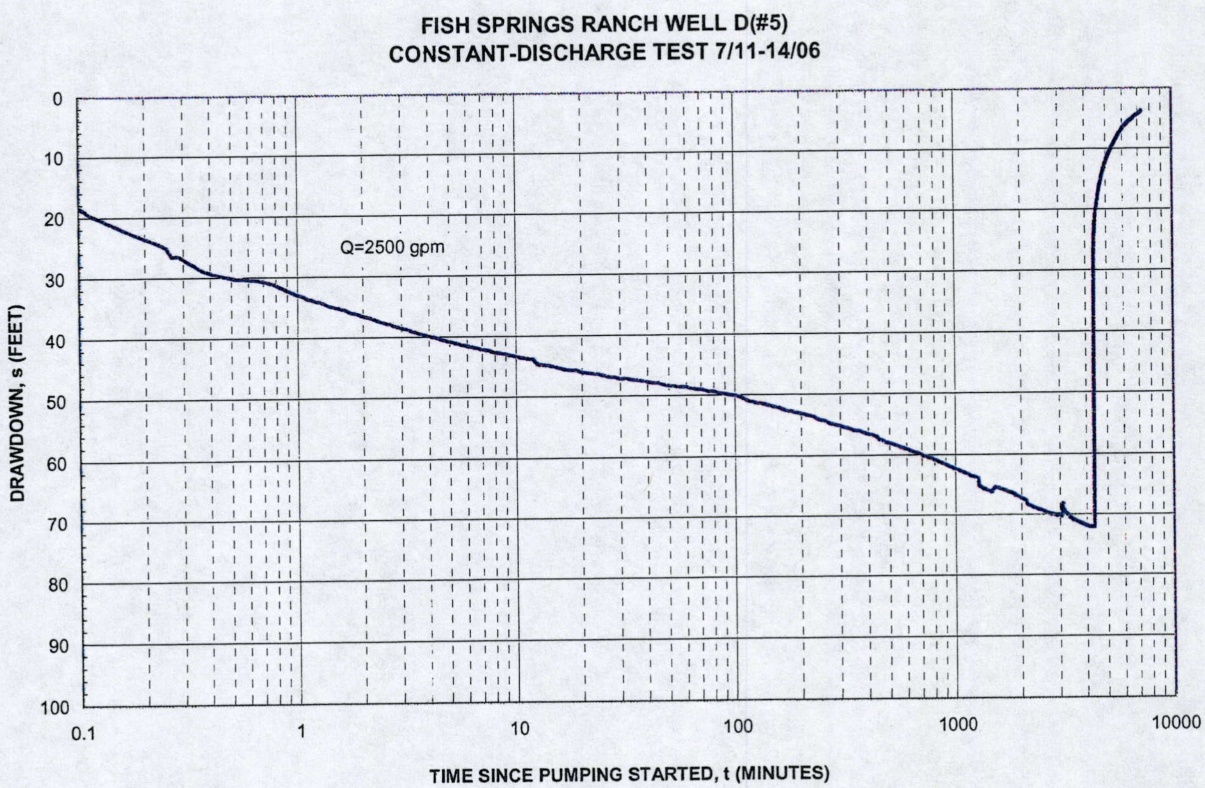


FIGURE 18: WELL D (#5) CONSTANT-DISCHARGE TEST PLOTS.

5.4.3 Well D (#5) Test Data Analysis

The aquifer tapped by the wells in the northeastern well field is comprised of unconsolidated gravel and sand beneath playa clays. As shown in Figure 18, the slope of the drawdown data plot steepened slightly beginning approximately 200 minutes into the test. As shown in Figure 19, a reasonable fit of the constant discharge data using Well E as an observation well, was obtained using the analytical method for an unconfined aquifer developed by Moench (1997). This method resulted in a Transmissivity of 13,380 ft^2/day and a storage coefficient of 2.7 x 10^{-3}. The specific yield of 0.3 is speculative, but is in the realm of possibilities for a coarse grained alluvial aquifer.

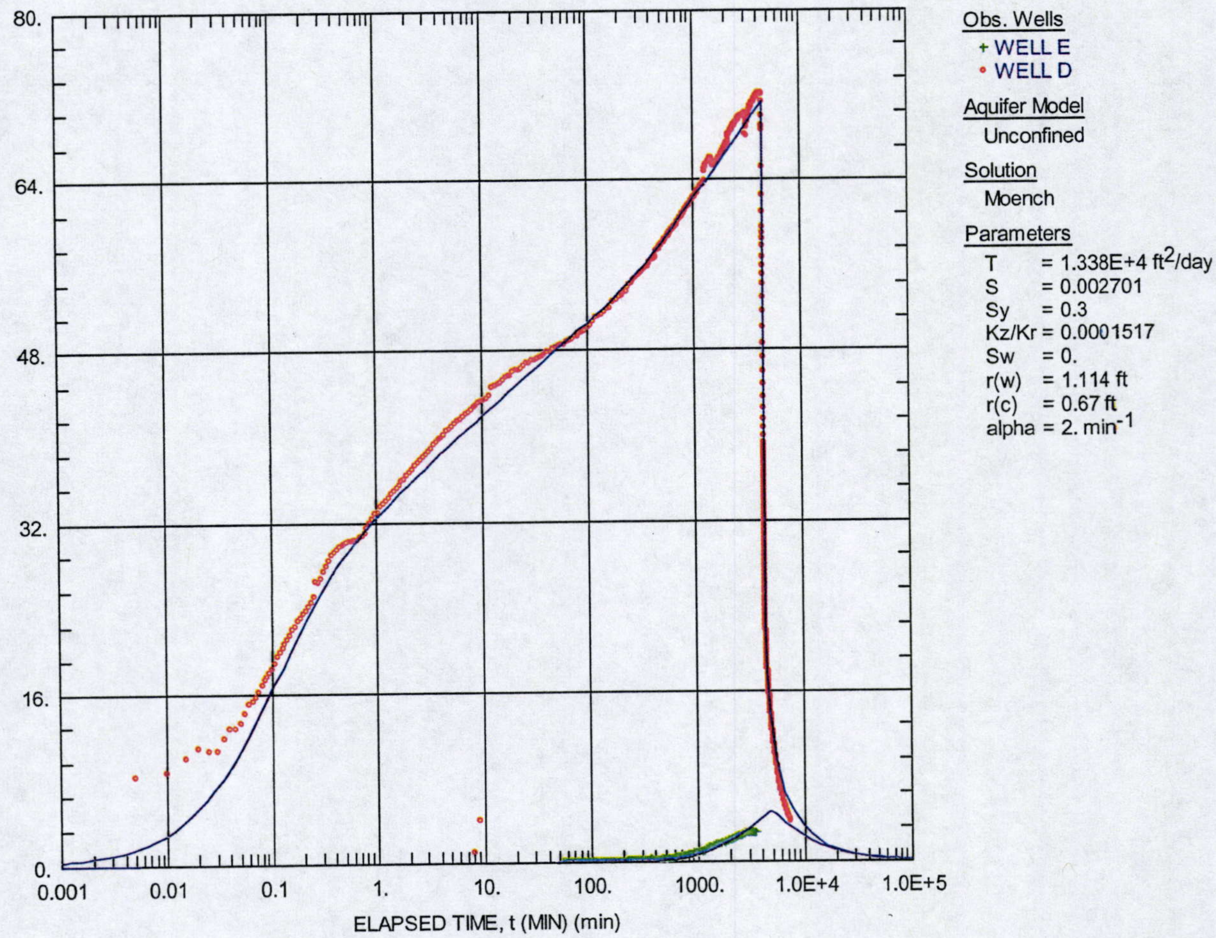


FIGURE 19: AQTESOLV SOLUTION OF WELL D (#5) CONSTANT-DISCHARGE DATA

5.5 WELL E (#4) TESTING

The test pump for the Well E (#4) tests was installed at 200 feet bls. In addition to the pumped well, the observation well network for the Well E test included Well D (#5) and Well F (#6). A summary of the Well F pumping data is provided in Figure 20, while the entire pumping test data set is provided in Appendix D.

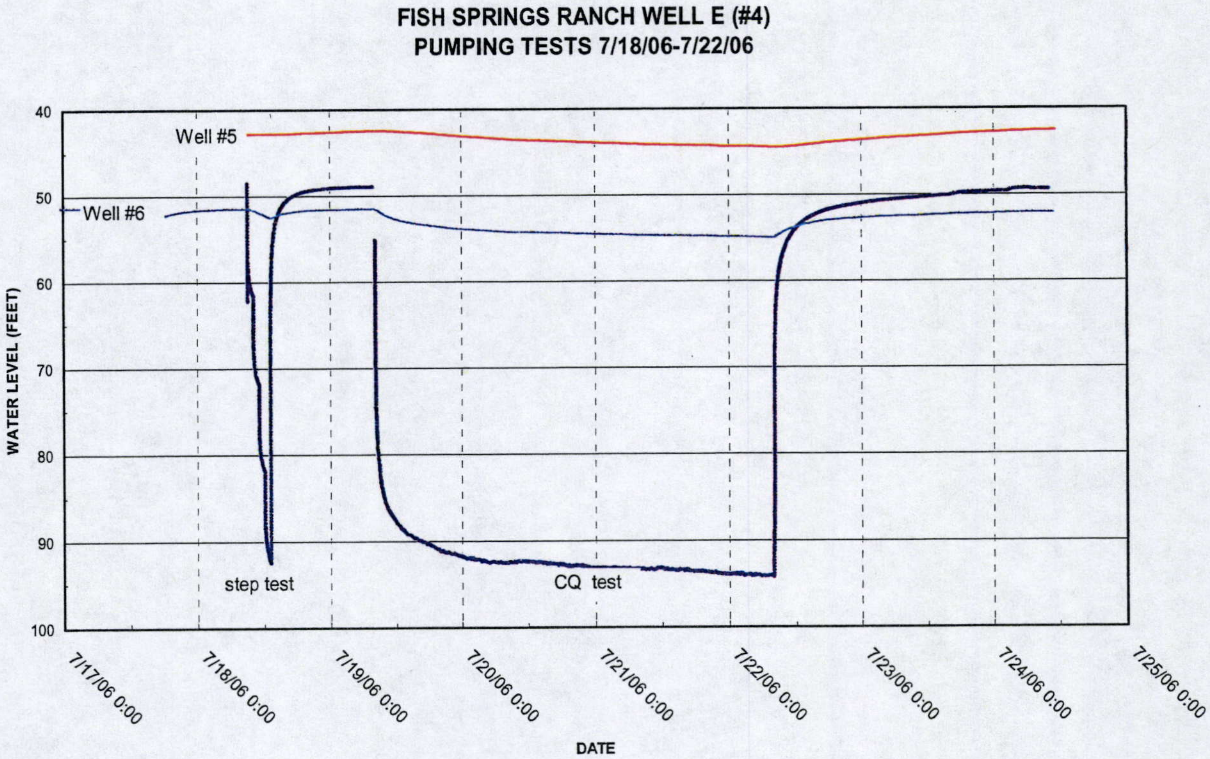


FIGURE 20: WELL E (#4) PUMPING TEST SUMMARY

5.5.1 Well E (#4) Step Test

Static water level: 48.6 feet below the top of the stilling well

Testing commenced: 9:00 hrs 7/18/06.

Test duration: 4 hours (240 minutes).

Testing terminated: 13:00 hrs 7/18/06.

The step-drawdown test comprised four steps of one hour duration each. The data are illustrated in Figure 21, and summarized below in Table 10 and Figure 22.

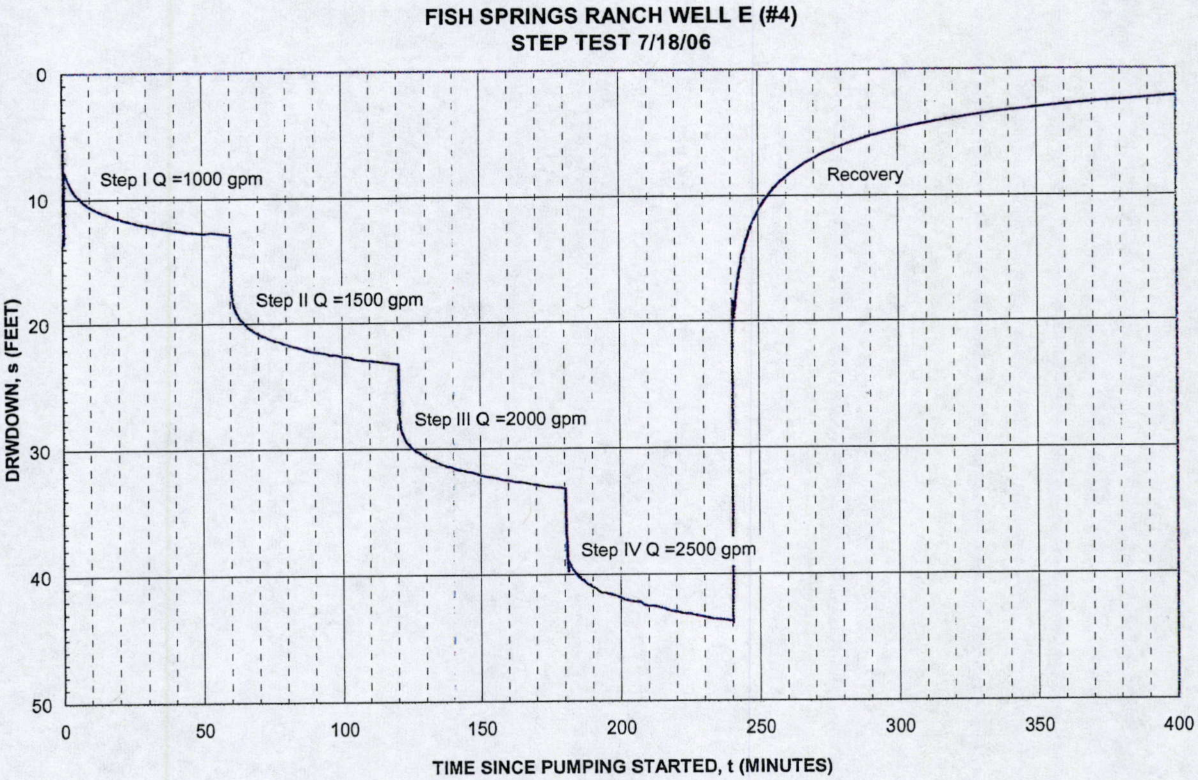


FIGURE 21: WELL E (#4) STEP TEST PLOT.

TABLE 10: WELL E (#4) STEP TEST SUMMARY.

Step	Duration t (minutes)	Pumping Rate Q (gpm)	Drawdown s (feet)	Specific Capacity C_s (gpm/ft)
I	60	1000	12.78	78.25
II	60	1500	23.09	64.96
III	60	2000	33.06	60.50
IV	60	2500	43.57	57.38

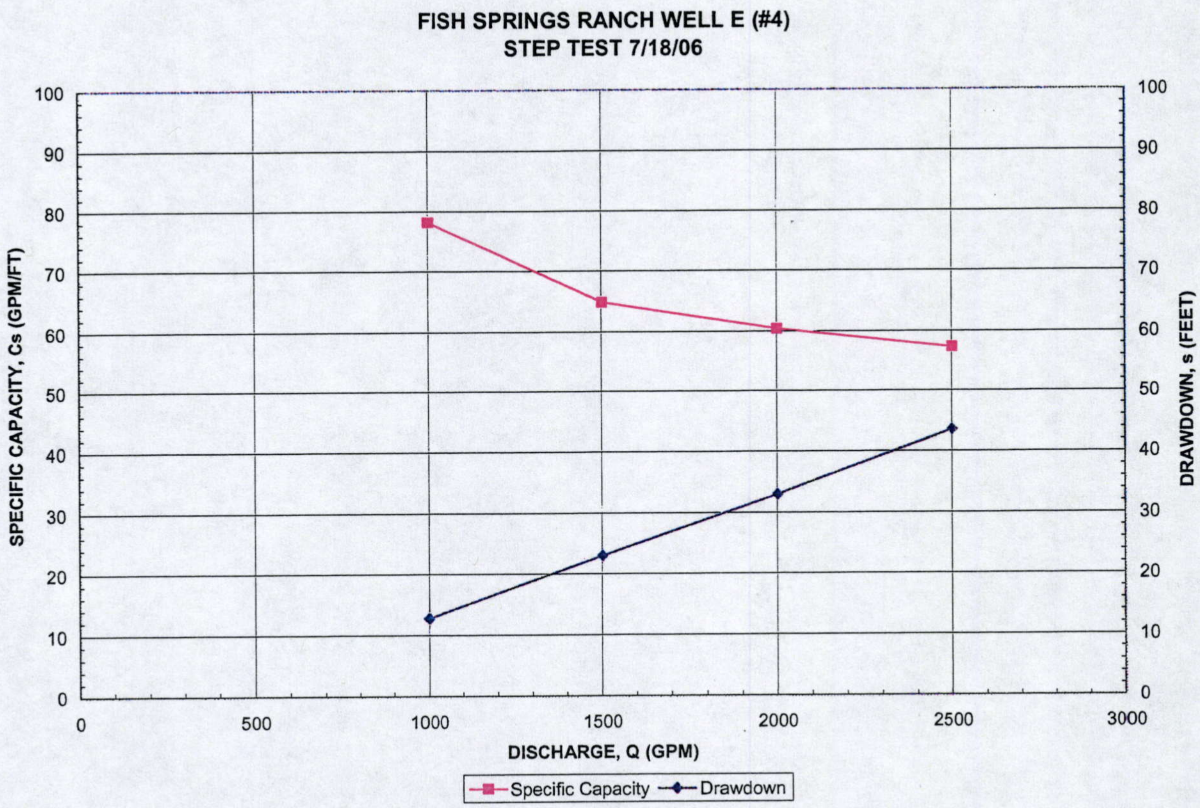


FIGURE 22: WELL E (#4) SPECIFIC CAPACITY PLOT.

5.5.2 Well E (#4) Constant-Discharge Test

Constant-discharge testing ensued the day following the step test, after the water levels in the well recovered overnight. At the conclusion of the pumping test, water levels in the wells were monitored for a recovery period of approximately 49 hours. The test results are summarized below. Drawdown and recovery for the pumped well are plotted in Figure 23.

Static water level: 48.6 feet below the top of the stilling well

Pumping commenced: 08:00 hours 7/19/06.

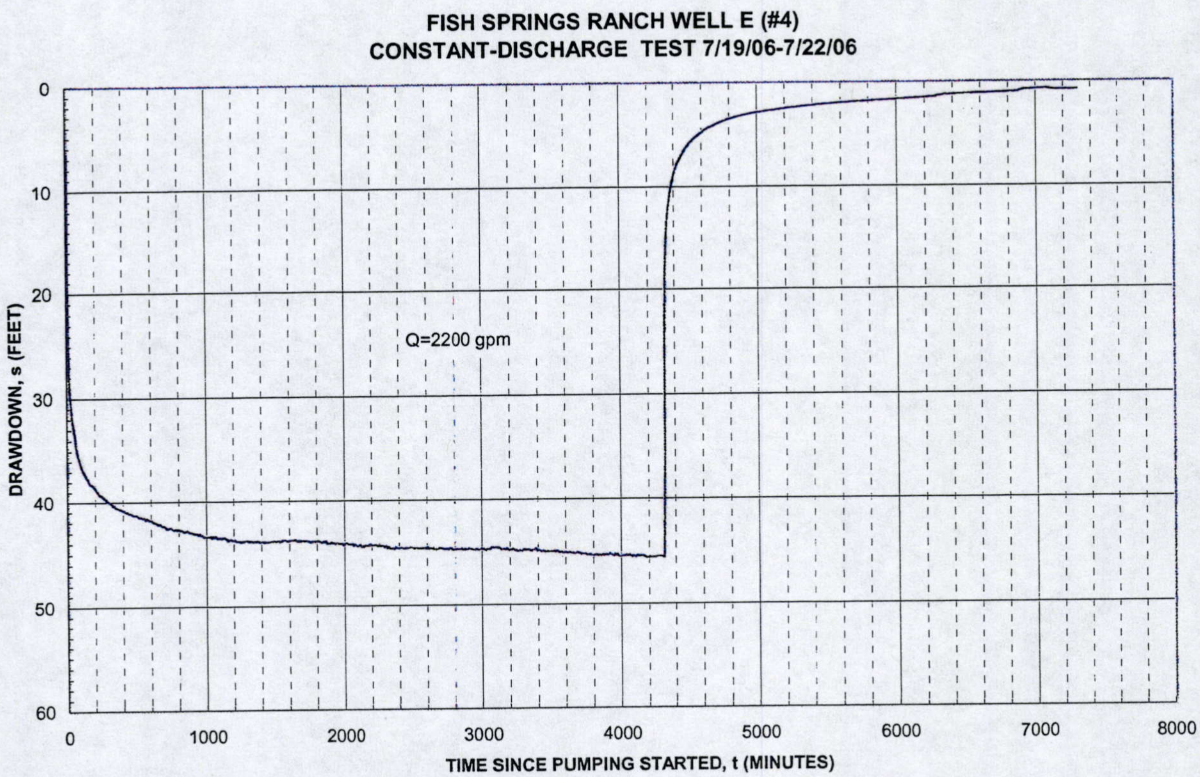
Discharge rate: approximately 2200 gpm (selected on the basis of the step test results).

Test duration: 72 hours.

Pumping terminated: 08:00 hours 7/22/06.

Pumping level at the conclusion of the pumping test: 94.20 feet below the top of the stilling well.

Drawdown in the well at conclusion of test: 45.60 feet.



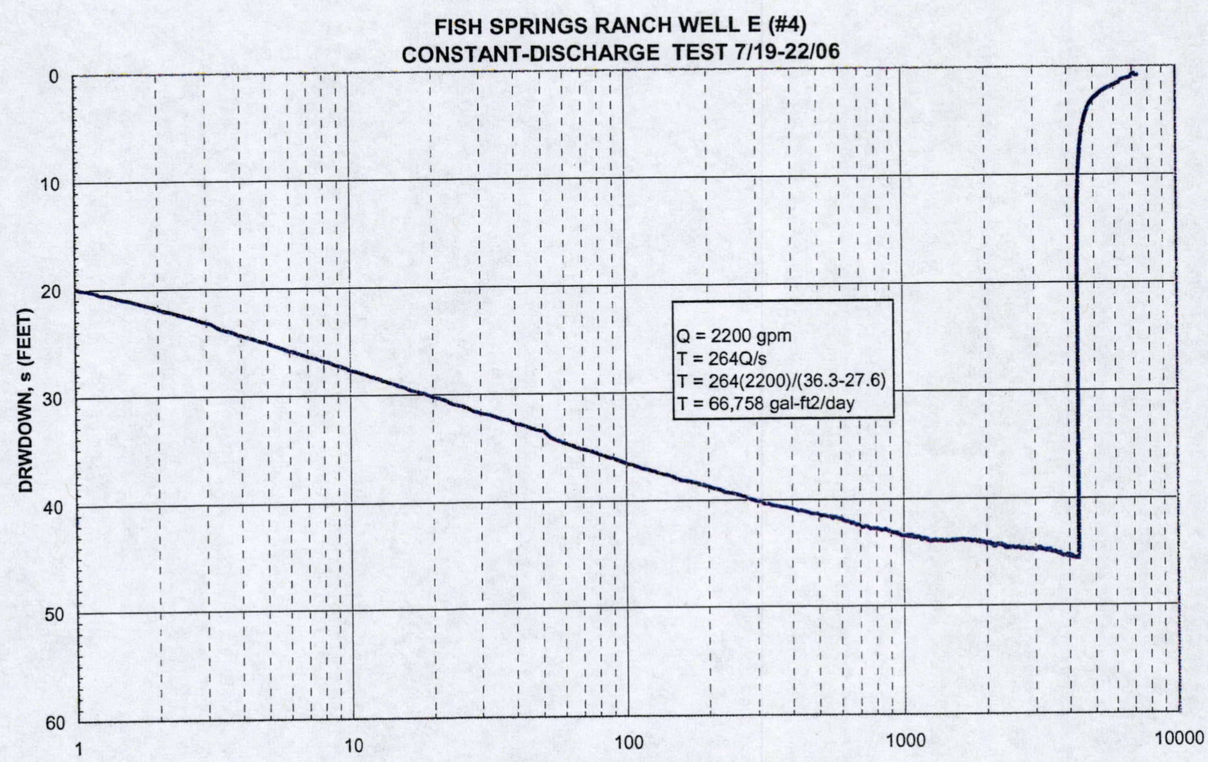


FIGURE 23: WELL E (#4) CONSTANT-DISCHARGE TEST PLOTS.

5.5.3 Well E (#4) Test Data Analysis

The aquifer tapped by the wells in the northeastern well field is comprised of unconsolidated gravel and sand beneath playa clays. As shown in Figure 23, the drawdown data flattened slightly beginning approximately 1,200 minutes into the test. This is similar to the results of Well F, which had a flattening of the drawdown curve at about 200 minutes, but dissimilar to Well D, which had an opposite response at about 100 minutes. As shown in Figure 24, a reasonable fit of the constant discharge data using Well F as an observation well, was obtained using the analytical method for an unconfined aquifer developed by Moench (1997). This method resulted in a Transmissivity of 11,060 ft^2/day and a storage coefficient of 2.7 x 10^{-3}. The flattening of the curve is likely related to delayed yield due to gravity drainage of the pore spaces in the aquifer, which may be accounted for by the specific yield of 0.20.

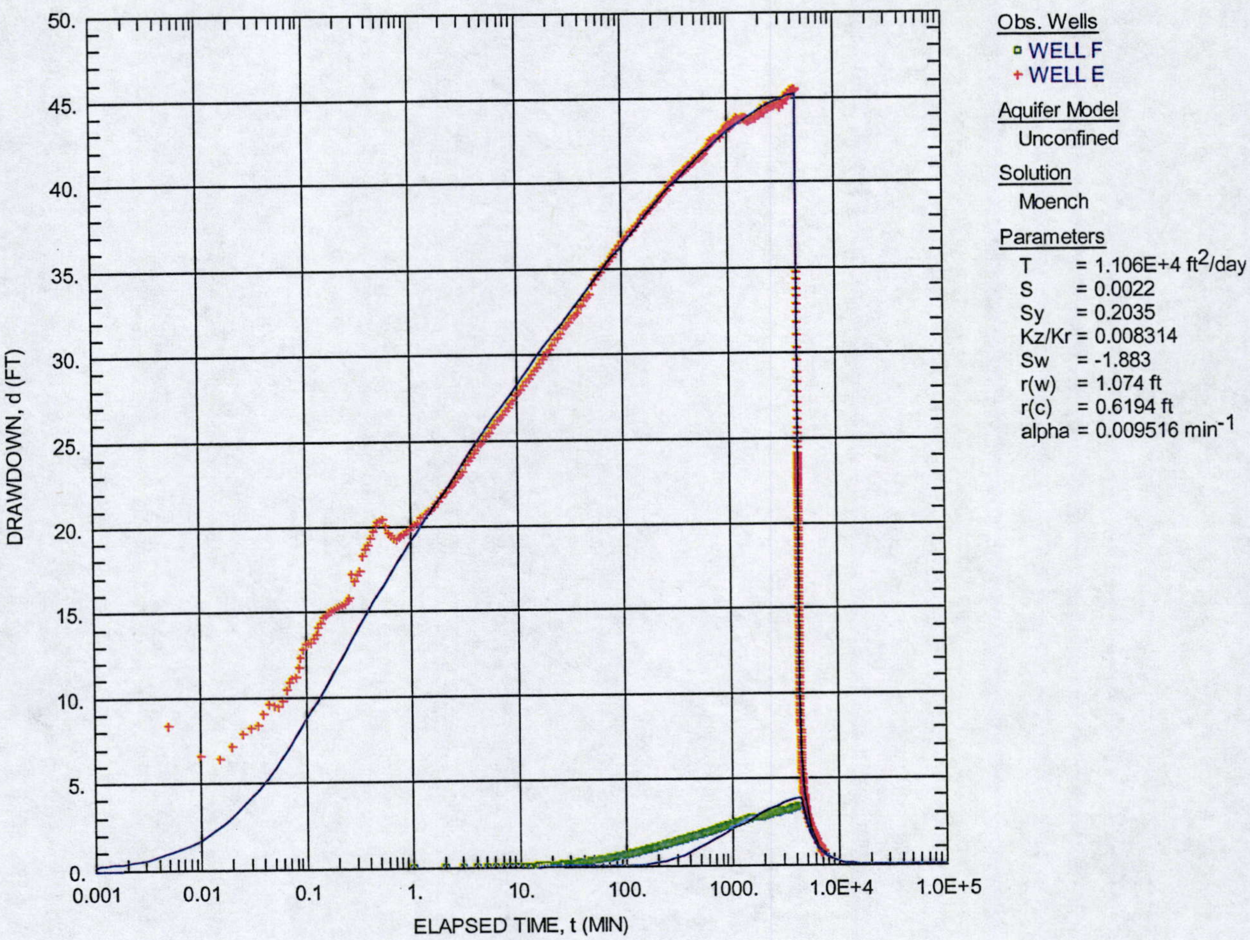


FIGURE 24: AQTESOLV SOLUTION OF WELL E (#4) CONSTANT DISCHARGE DATA

5.6 WELL C (#3) TESTING

The test pump for the Well C (#3) tests was installed at 200 feet bls. In addition to the pumped well, the observation well network for the test included the Jarboe MW1 and the Headquarters MW2. A summary of the Well C pumping data is provided in Figure 25, while the entire pumping test data set is provided in Appendix D.

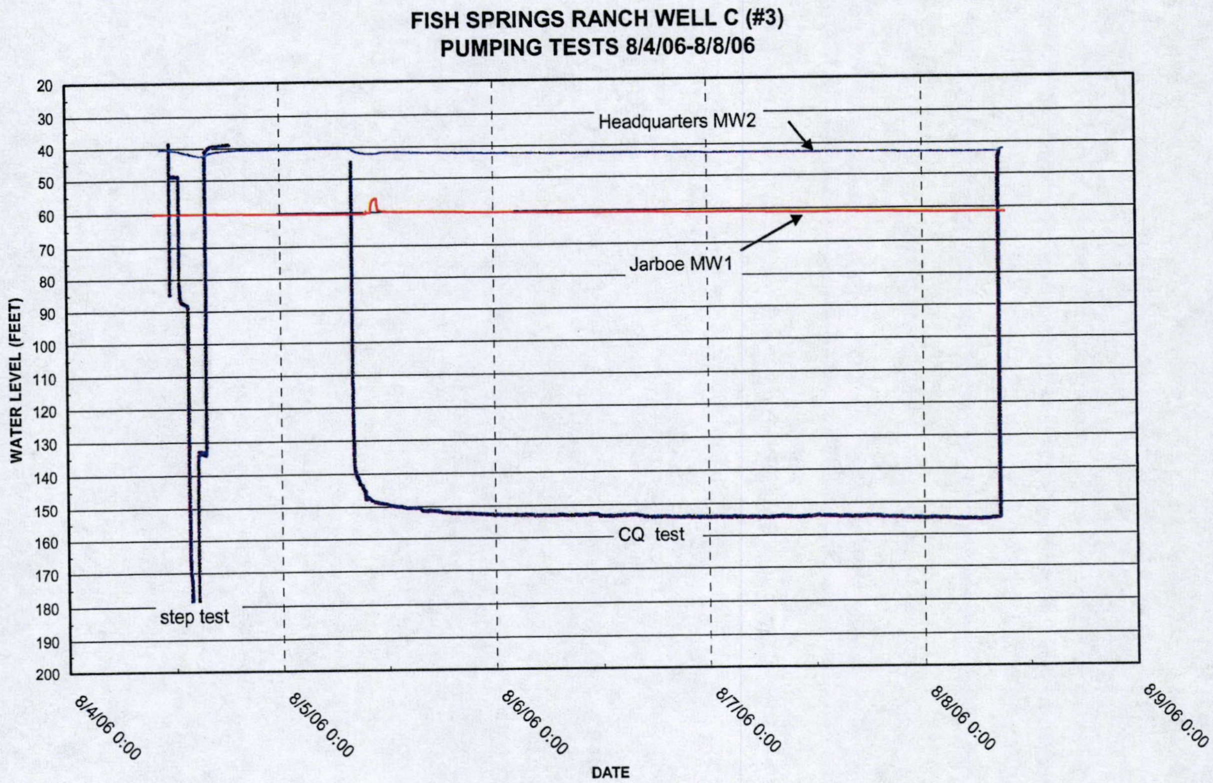


FIGURE 25: WELL C (#3) PUMPING TEST SUMMARY

5.6.1 Well C (#3) Step Test

Static water level: 38.51 feet below the top of the stilling well

Testing commenced: 11:30 hrs 8/4/06.

Test duration: 4 hours (240 minutes).

Testing terminated: 15:30 hrs 8/4/06.

The step-drawdown test comprised four steps of one hour duration each. The data are illustrated in Figure 26 and summarized below in Table 11 and Figure 27.

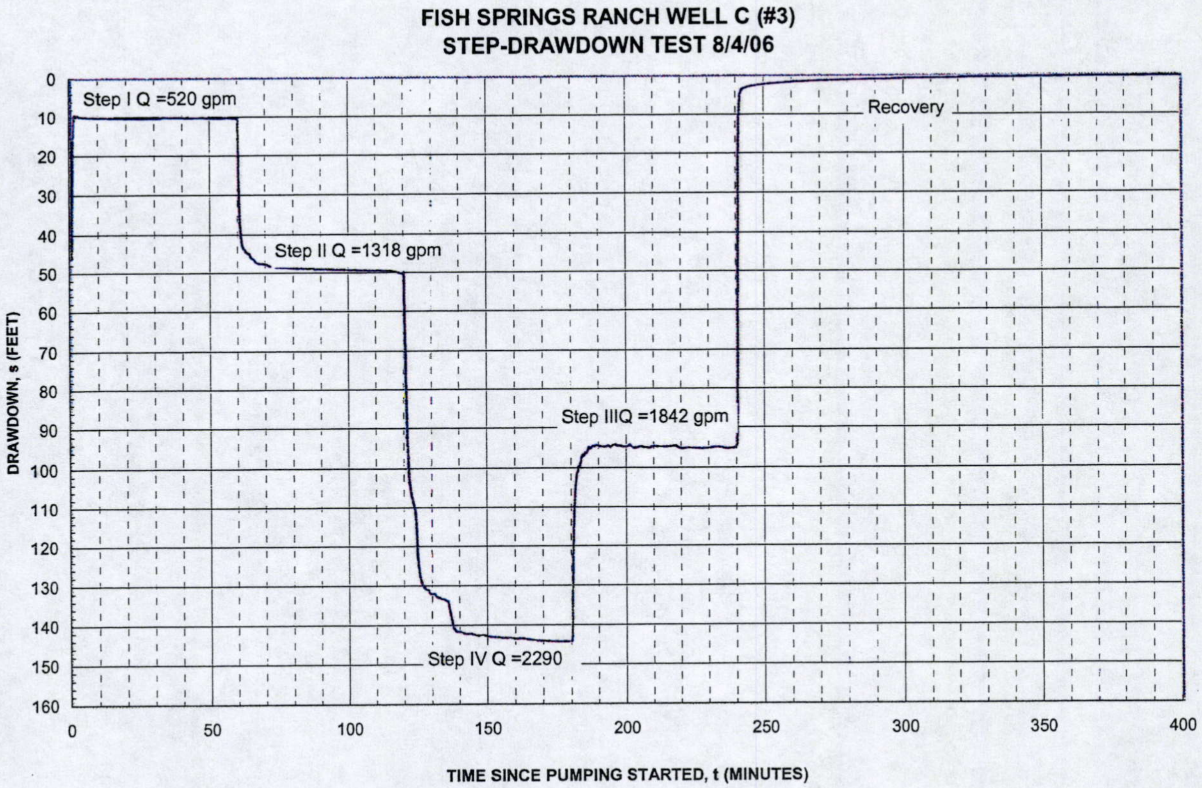


FIGURE 26: WELL C (#3) STEP TEST PLOT

TABLE 11: WELL C (#3) STEP TEST SUMMARY.

Step	Duration t (minutes)	Pumping Rate Q (gpm)	Drawdown s (feet)	Specific Capacity C_s (gpm/ft)
I	60	520	10.19	51.03
II	60	1318	49.55	26.60
III	60	1842	94.97	19.40
IV	60	2290	144.21	15.88

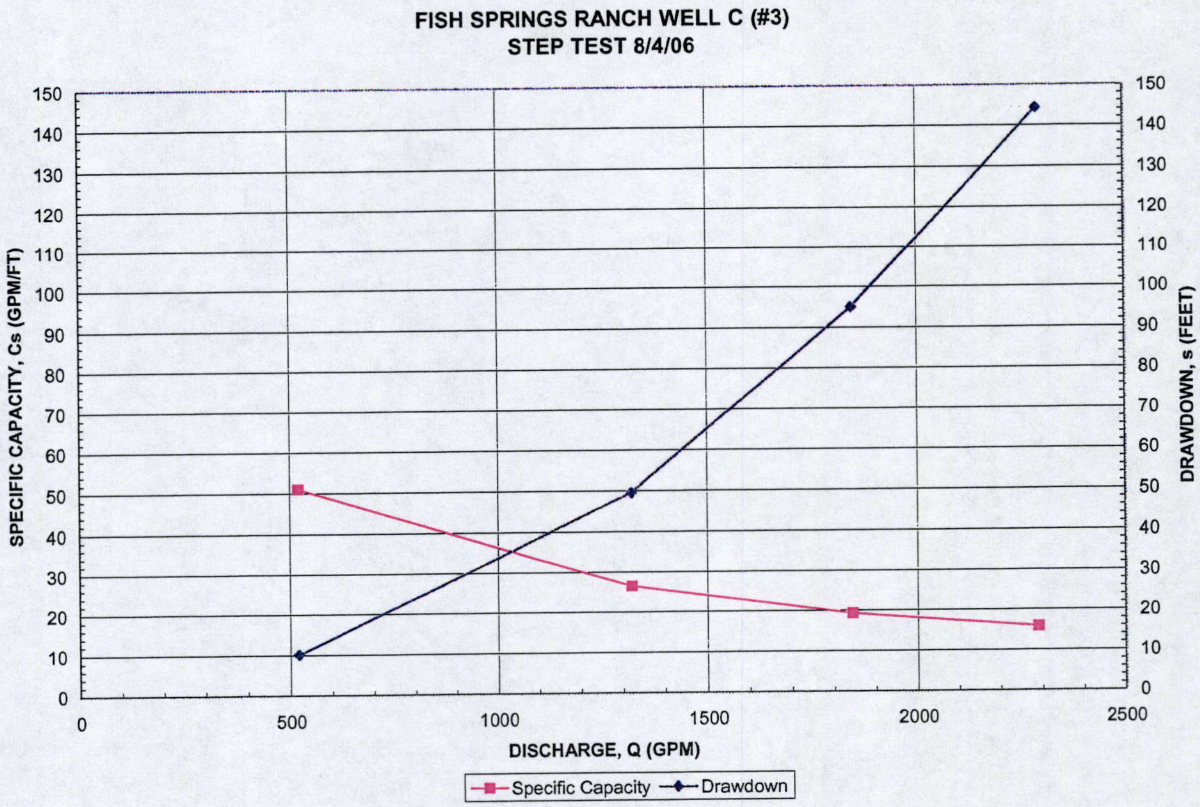


FIGURE 27: WELL C (#3) SPECIFIC CAPACITY PLOT

5.6.2 Well C (#3) Constant-Discharge Test

Constant-discharge testing ensued the day following the step test, after the water levels in the well recovered overnight. At the conclusion of the pumping test, water levels in the wells recovered rapidly. The test results are summarized below. Drawdown and recovery for the pumped well and the nearest observation well are plotted in Figure 28.

Static water level: 38.58 feet below the top of the stilling well

Pumping commenced: 8:00 hours 8/5/06.

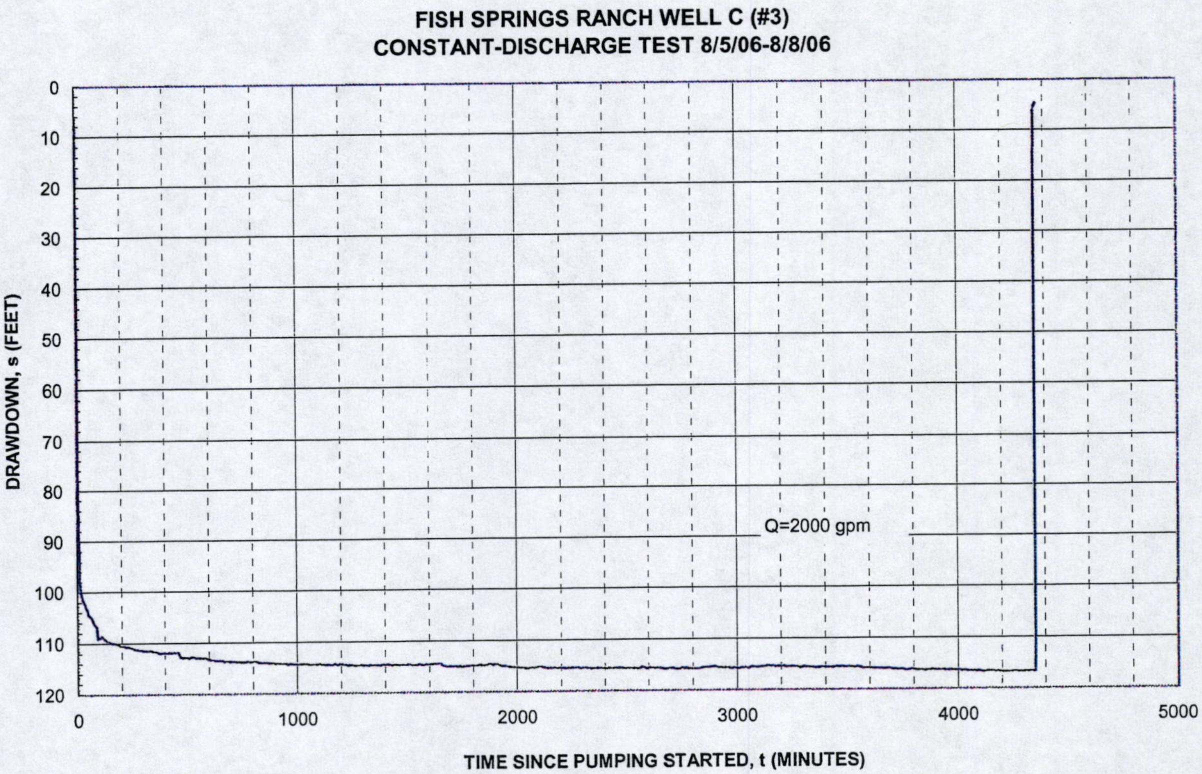
Discharge rate: approximately 2000 gpm (selected on the basis of the step test results).

Test duration: 72:30 hours.

Pumping terminated: 8:30 hours 8/8/06.

Pumping level at the conclusion of the pumping test: 155.57 feet below the top of the stilling well.

Drawdown in the well at conclusion of test: 116.99 feet.



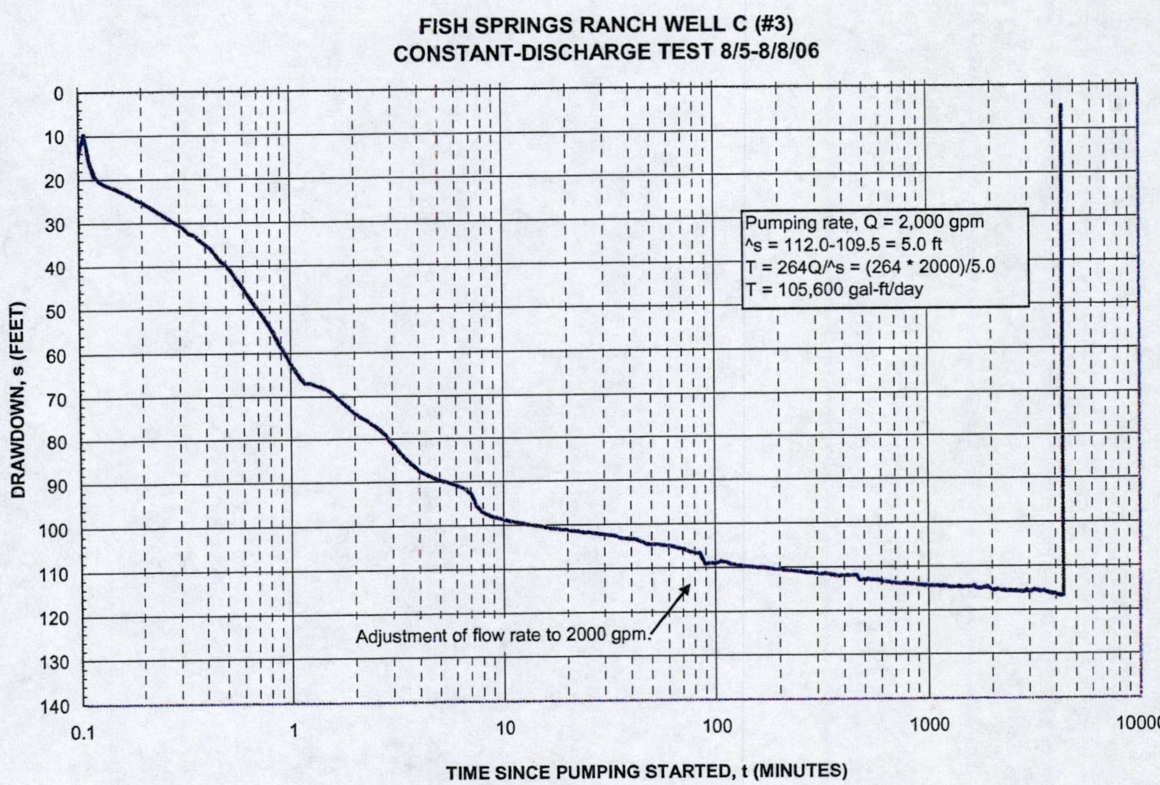


FIGURE 28: WELL C (#3) CONSTANT-DISCHARGE TEST PLOTS.

5.6.3 Well C (#3) Test Data Analysis

The aquifer at Well C differs from the northeastern well field and contains zones of sand, clay and gravel to 270 feet, a thick clay zone to 335 feet, underlain by basalt to the hole bottom. Despite extensive development, the step test indicated low well efficiency. As shown in Figure 29, a reasonable fit of the constant discharge data, using Headquarters Monitoring Well 2 as an observation well, was obtained using the analytical method for a fractured rock aquifer developed by Moench. This method resulted in a Hydraulic Conductivity of 55.84 feet/day. With an aquifer thickness of 366 feet, the Transmissivity would be 20,437 ft^2/day. For the solution shown in Figure 29, the Storage Coefficient would be equal to Ss x b plus Ss' x b. For a 366 foot thick aquifer, this amounts to 5.3^{-5}, indicating that the aquifer is confined.

Although a close fit is obtained for the observation well data, a very large skin effect is required to fit the late-time data for Well C. The skin effect may have resulted from invasion of drill mud into a relatively small thickness of highly permeable gravel and fractured basalt. Unlike the other wells, bit plugging occurred while drilling a stiff clay zone at 130 feet. Consequently, the driller switched from reverse circulation back to conventional mud-rotary methods for both the clay zone and underlying sand and gravel, to a depth of 272 feet. Also, the driller reported significant fluid circulation loss at a depth of 370 feet, which was within a high resistivity, and probably highly permeable, zone in the lower basalt. Both of these factors may have resulted in increased mud invasion. Alternatively, an apparent skin effect could exist due to aquifer heterogeneity, if the well intersected a less fractured, and therefore less permeable area in a fractured rock aquifer that in general contains greater fracture porosity.

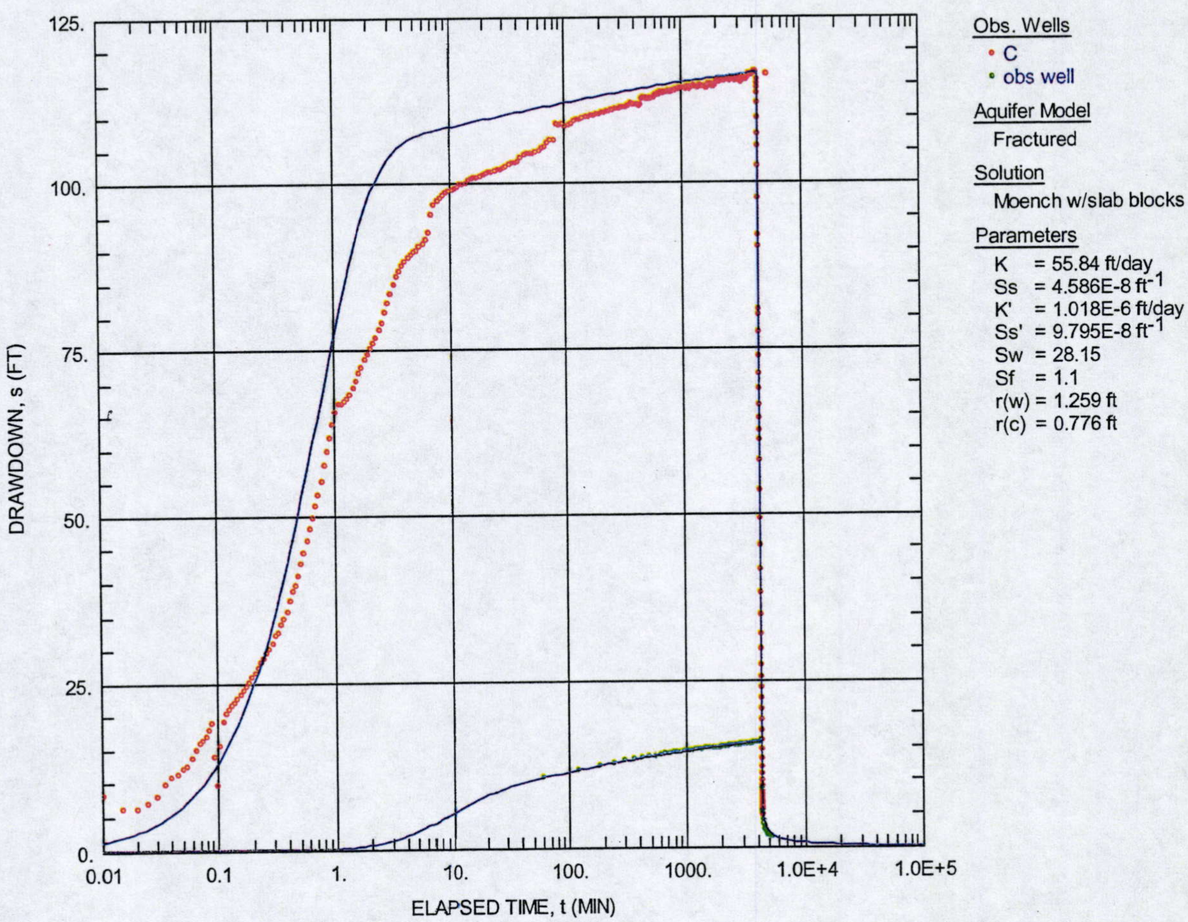


FIGURE 29: AQTESOLV SOLUTION OF WELL C (#3) CONSTANT DISCHARGE DATA

5.7 WELL B (#2) TESTING

The test pump for the Well B (#2) tests was installed at 210 feet bls. In addition to the pumped well, the observation well network included Jarboe MW1 and Headquarters MW2. A summary of the Well B pumping data is provided in Figure 30, while the entire pumping test data set is provided in Appendix D.

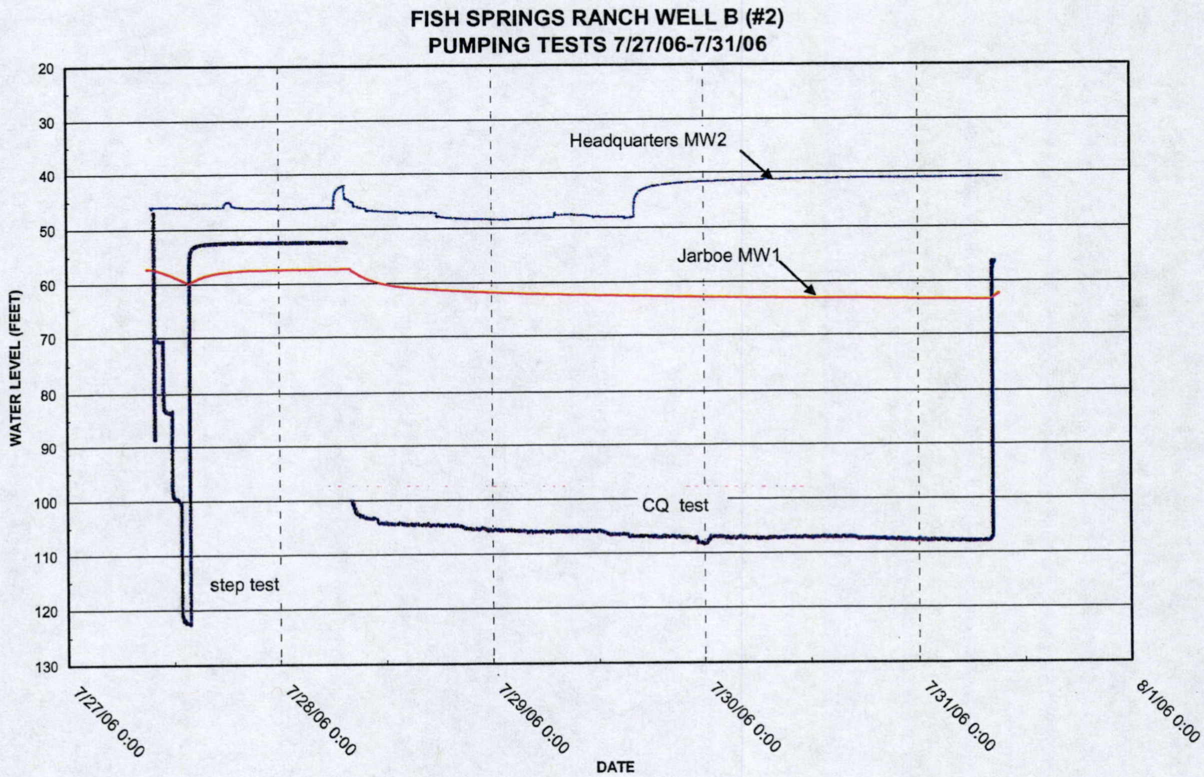


FIGURE 30: WELL B (#2) PUMPING TEST SUMMARY

5.7.1 Well B (#2) Step Test

Static water level: 52.27 feet below the top of the stilling well

Testing commenced: 9:48 hrs 7/27/06.

Test duration: 4 hours (240 minutes).

Testing terminated: 13:48 hrs 7/27/06.

The step-drawdown test comprised four steps of one-hour duration each. The data are illustrated in Figure 31 and summarized below in Table 12 and Figure 32.

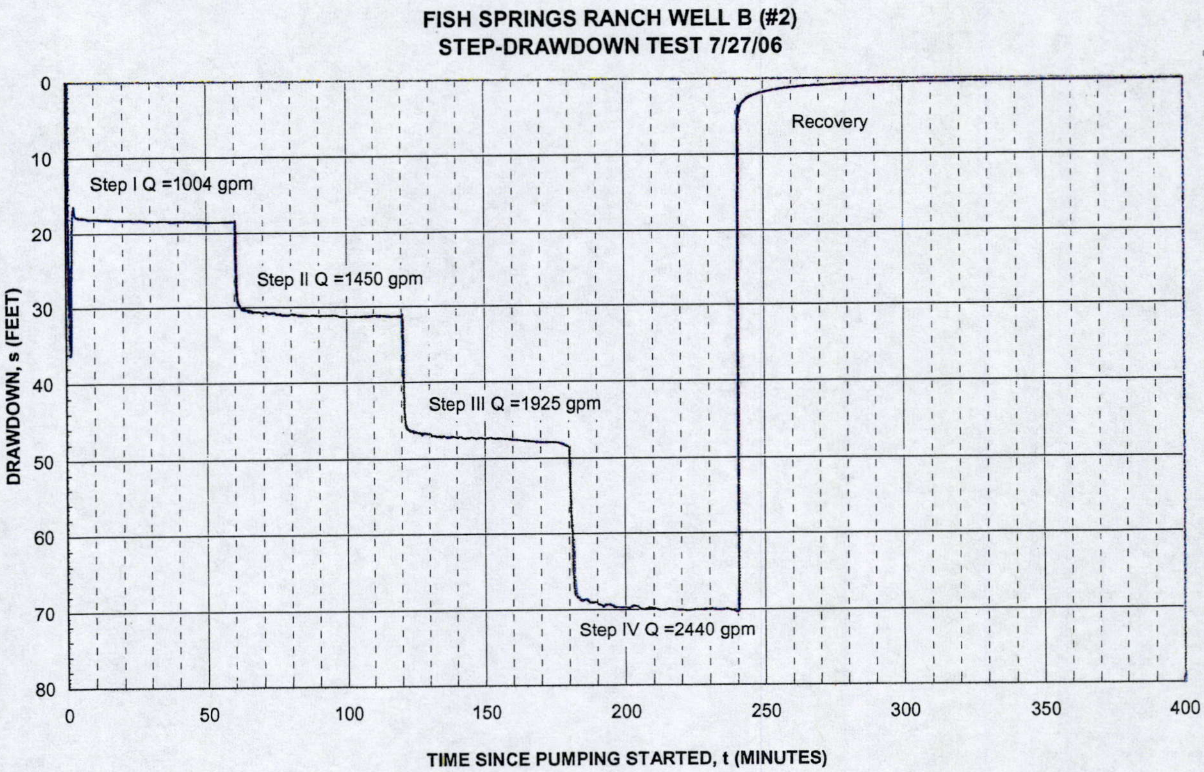


FIGURE 31: WELL B (#2) STEP TEST PLOT

TABLE 12: WELL B (#2) STEP TEST SUMMARY.

Step	Duration t (minutes)	Pumping Rate Q (gpm)	Drawdown s (feet)	Specific Capacity C_s (gpm/ft)
I	60	1004	18.23	55.07
II	60	1450	31.37	46.22
III	60	1925	48.48	39.71
IV	60	2440	70.27	34.72

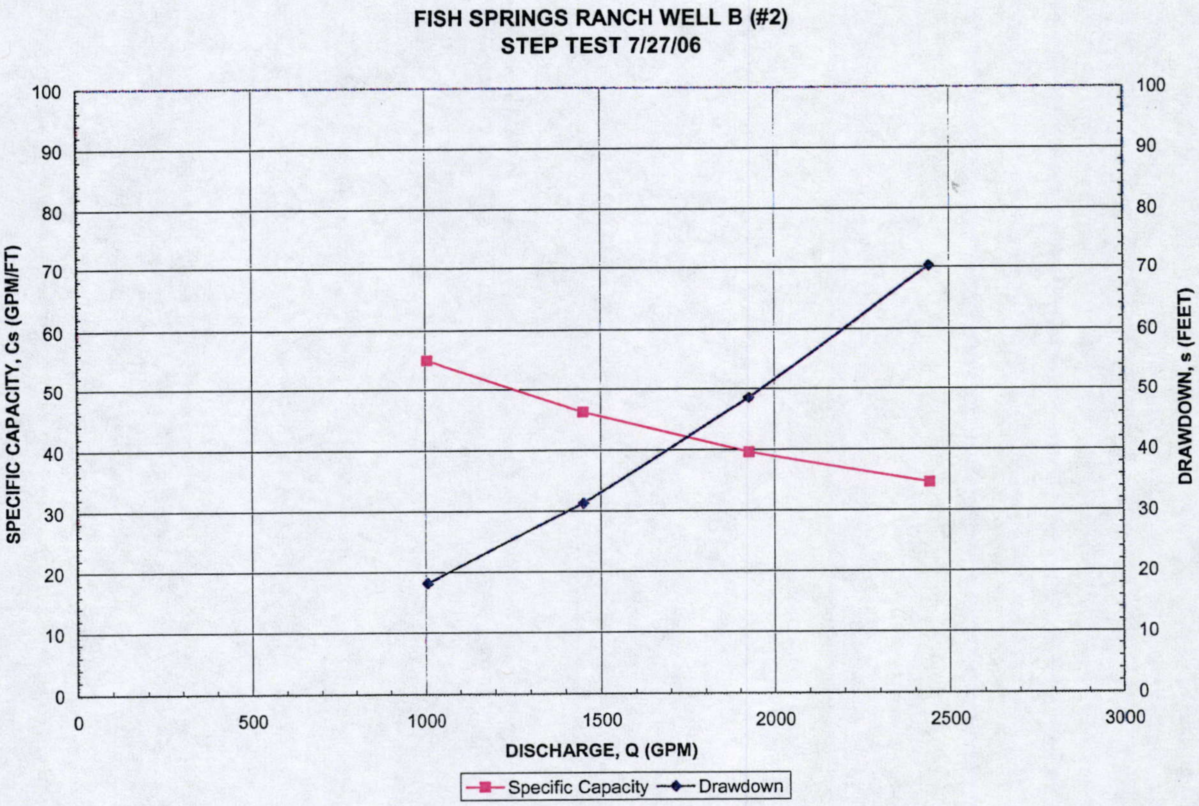


FIGURE 32: WELL B (#2) SPECIFIC CAPACITY PLOT

5.7.2 Well B (#2) Constant-Discharge Test

Constant-discharge testing ensued the day following the step test, after the water levels in the well recovered overnight. At the conclusion of the pumping test, water levels in the wells recovered rapidly. The test results are summarized below. Drawdown and recovery for the pumped well and the nearest observation well are plotted in Figure 33. Note that the data logger failed to start logging at the beginning of the test and the early time data were lost.

Static water level: 52.27 feet below the top of the stilling well

Pumping commenced: 8:00 hours 7/28/06.

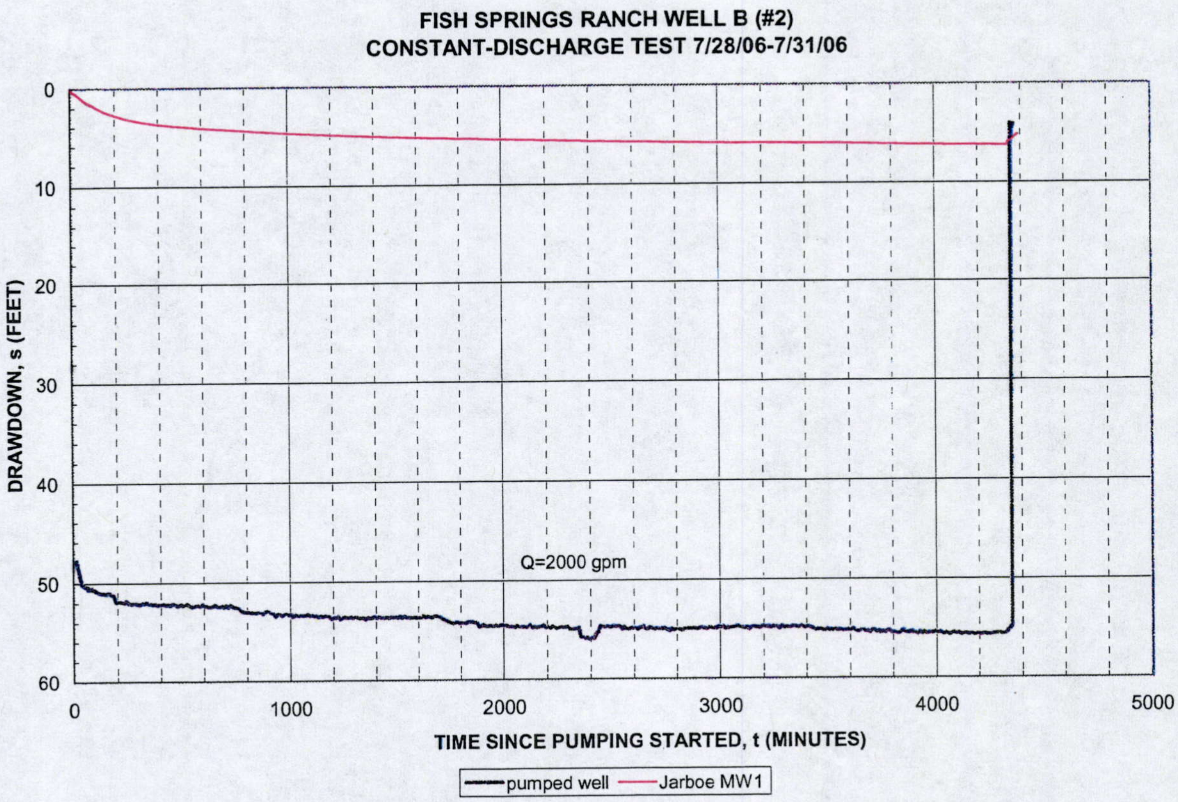
Discharge rate: approximately 2,000 gpm (selected on the basis of the step test results).

Test duration: 72 hours.

Pumping terminated: 8:15 hours 7/31/06.

Pumping level at the conclusion of the pumping test: 107.36 feet below the top of the stilling well.

Drawdown in the well at conclusion of test: 55.09 feet.



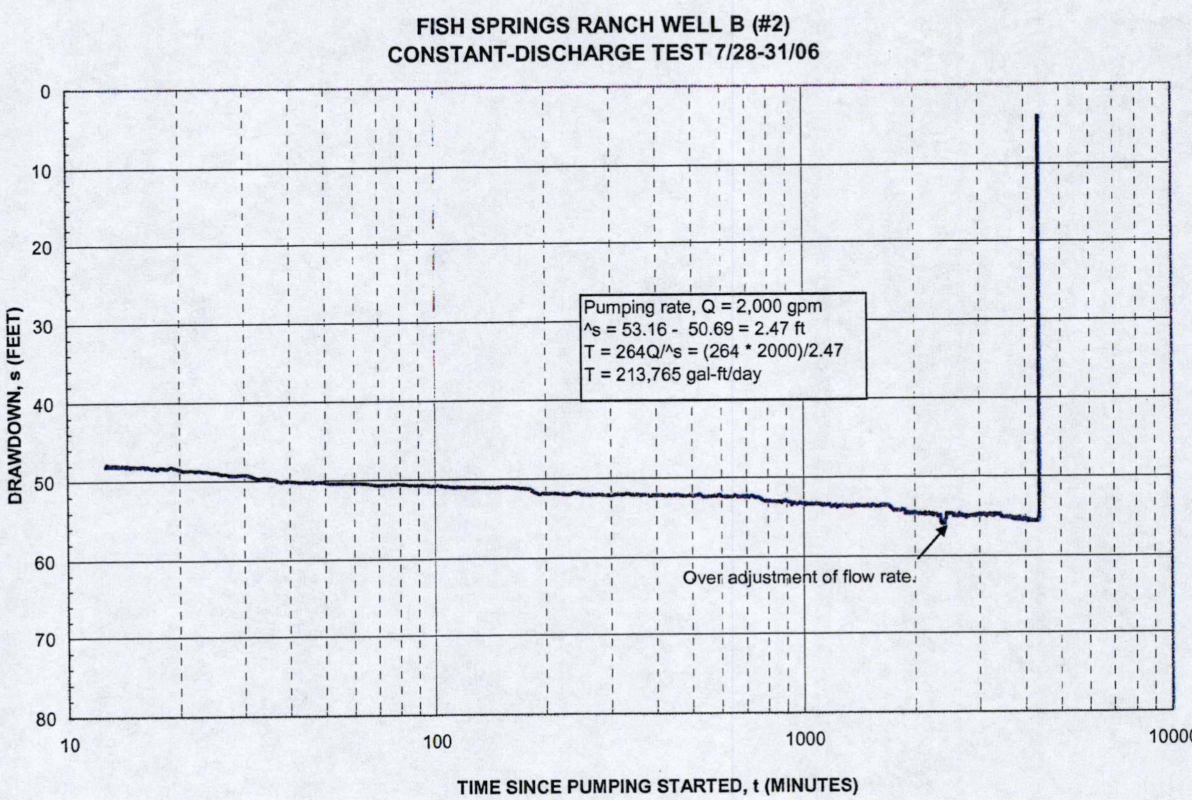


FIGURE 33: WELL B (#2) CONSTANT-DISCHARGE TEST PLOTS.

5.7.3 Well B (#2) Test Data Analysis

The aquifer tapped by Well B is comprised entirely of variably-fractured, brittle basalt flows that are locally highly vesicular. The step test indicated that the well is moderately efficient. As shown in Figure 34, a reasonable fit of the constant discharge data, using Jarboe Monitoring Well 2 as an observation well, was obtained using the analytical method for a fractured rock aquifer developed by Barker (1988). This method resulted in a Hydraulic Conductivity of 45 feet/day. With an aquifer thickness of 457 feet, the Transmissivity would be 20,565 ft^2/day. A very close fit is obtained for the observation well data, but a large skin effect is required to fit the Well B data to the modeled curve. The large skin effect may have resulted from invasion of drill mud into areas of highly permeable fractured basalt, although no zones of lost circulation were noted during drilling. Alternatively, the skin effect may be the result of the well intersecting an area of relatively lower fracture porosity, in a fractured rock aquifer that in general contains greater fracture porosity. The Storage Coefficient (equal to Ss x b plus Ss' x b) for a 457 foot thick aquifer, is 0.02, indicating that the aquifer is unconfined to semi-confined.

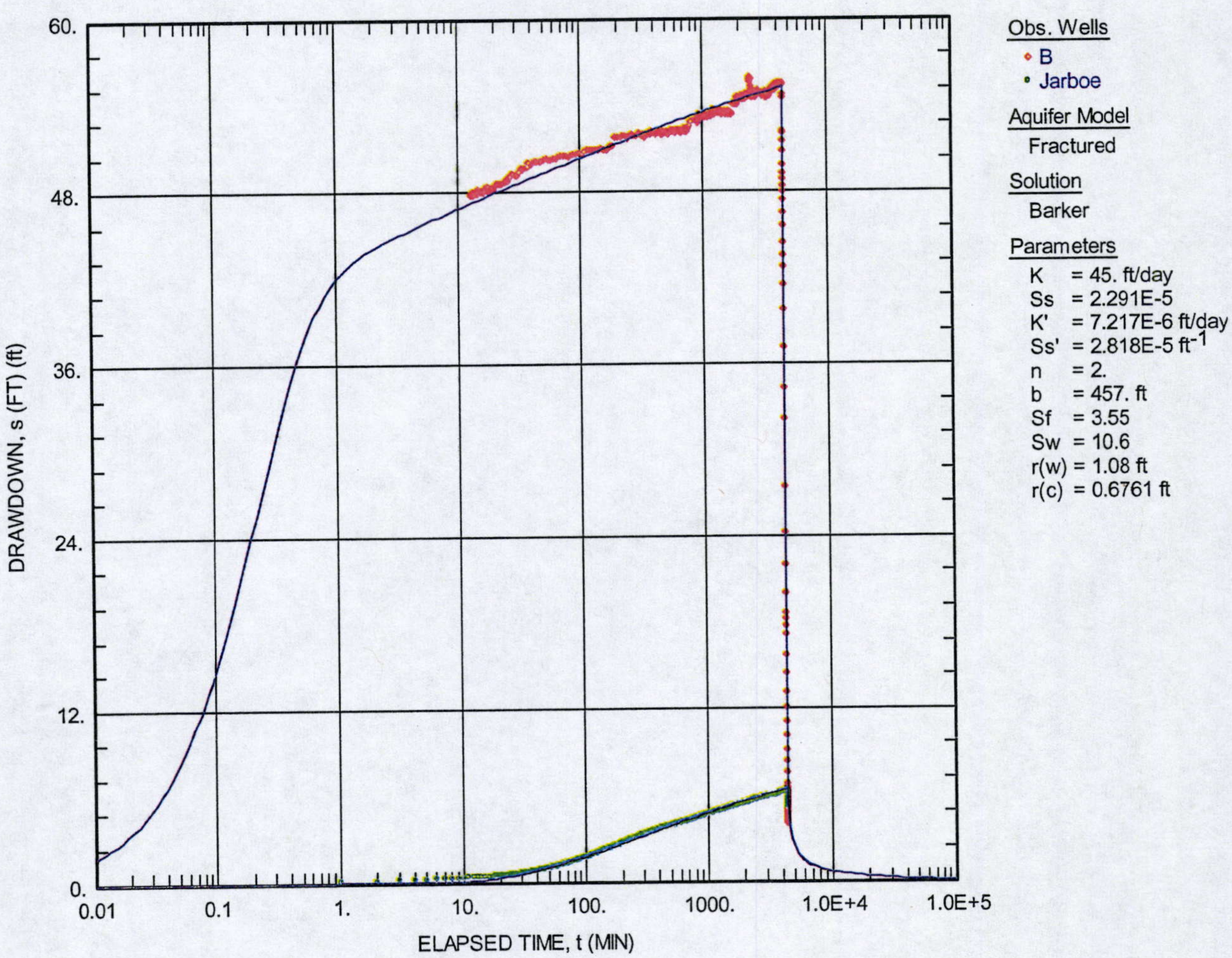


FIGURE 34: AQTESOLV SOLUTION OF WELL B (#2) CONSTANT DISCHARGE DATA

5.8 WELL A (#1) TESTING

The test pump was installed in Well A at a depth of 200 feet bls. In addition to the pumped well, the observation well network for the Well A test included the Ferrel monitoring well MW-1. A summary of the Well A pumping data is provided in Figure 35, while the entire pumping test data set is provided in Appendix D.

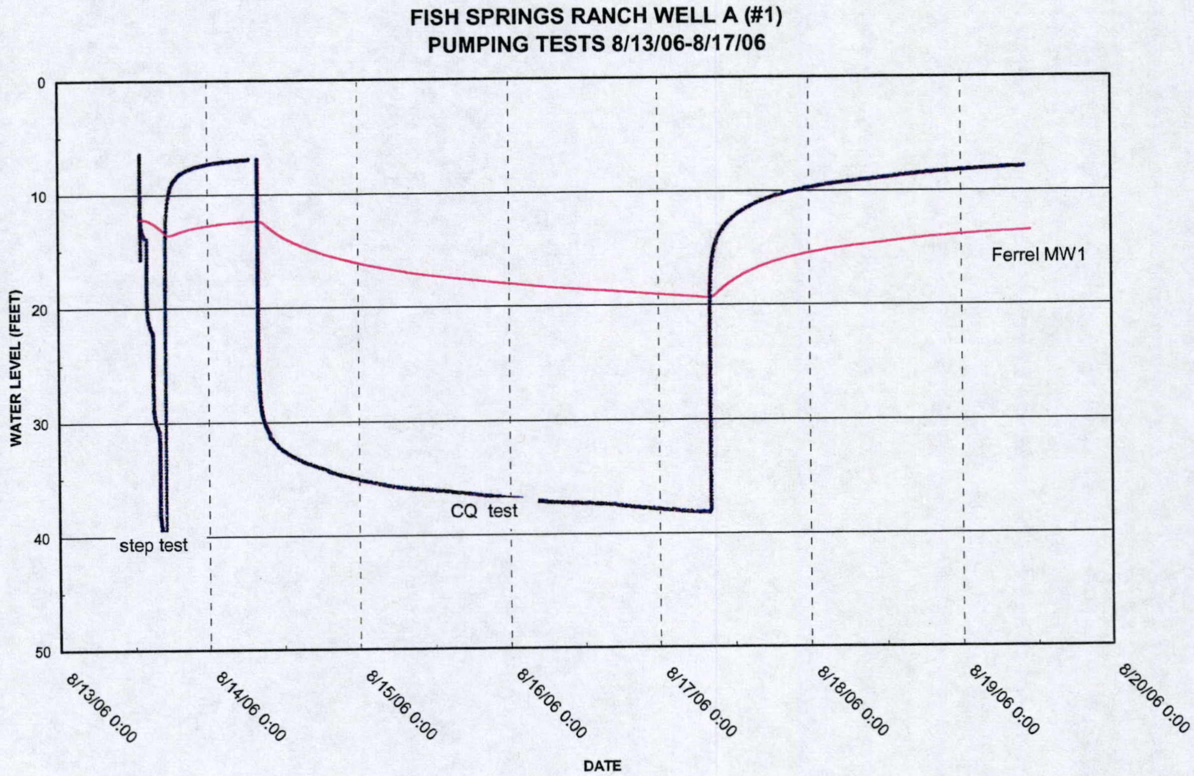


FIGURE 35: WELL A (#1) PUMPING TEST SUMMARY

5.8.1 Well A (#1) Step Test

Static water level: 6.60 feet below the top of the stilling well

Testing commenced: 13:00 hrs 8/13/06.

Test duration: 4 hours (240 minutes).

Testing terminated: 17:00 hrs 8/13/06.

The step-drawdown test comprised four steps of one-hour duration each. The data are illustrated in Figure 36 and summarized below in Table 13 and Figure 37.

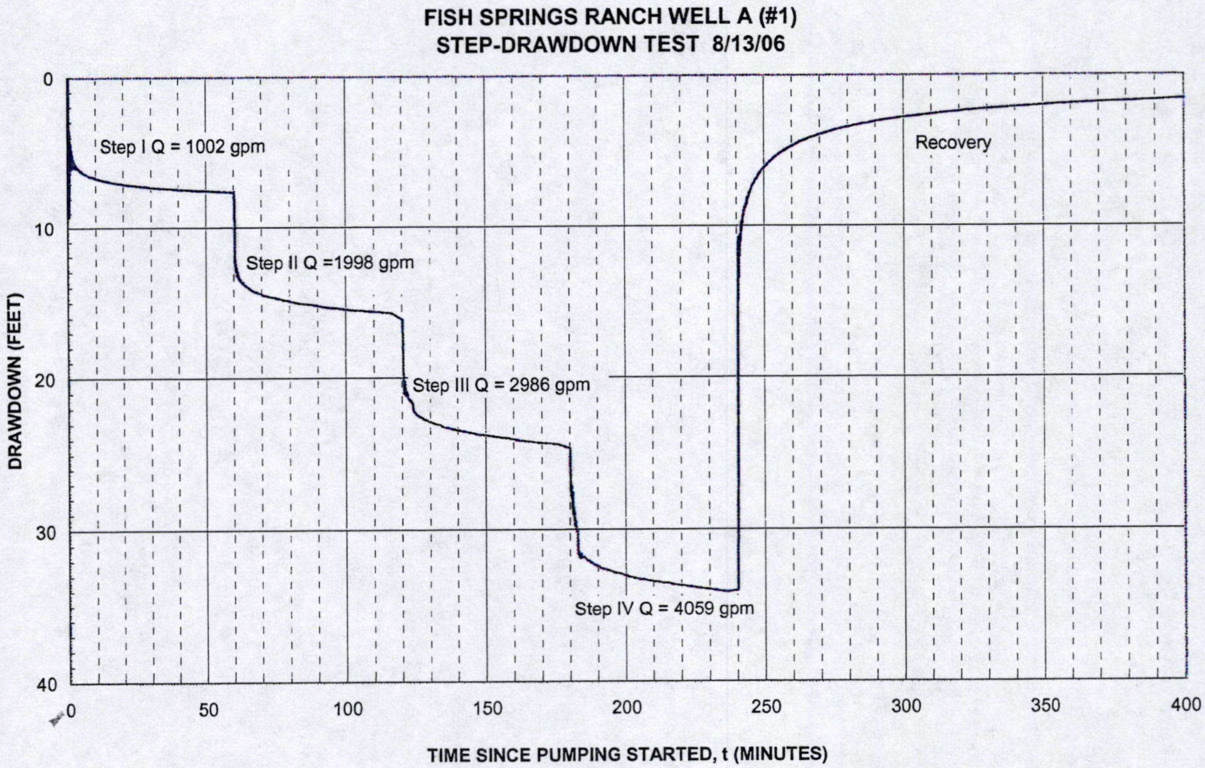


FIGURE 36: WELL A (#1) STEP TEST PLOT

TABLE 13: WELL A (#1) STEP TEST SUMMARY.

Step	Duration t (minutes)	Pumping Rate Q (gpm)	Drawdown s (feet)	Specific Capacity C_s (gpm/ft)
I	60	1002	7.40	135.41
II	60	1998	15.68	127.42
III	60	2986	24.33	122.73
IV	60	4059	34.00	119.38

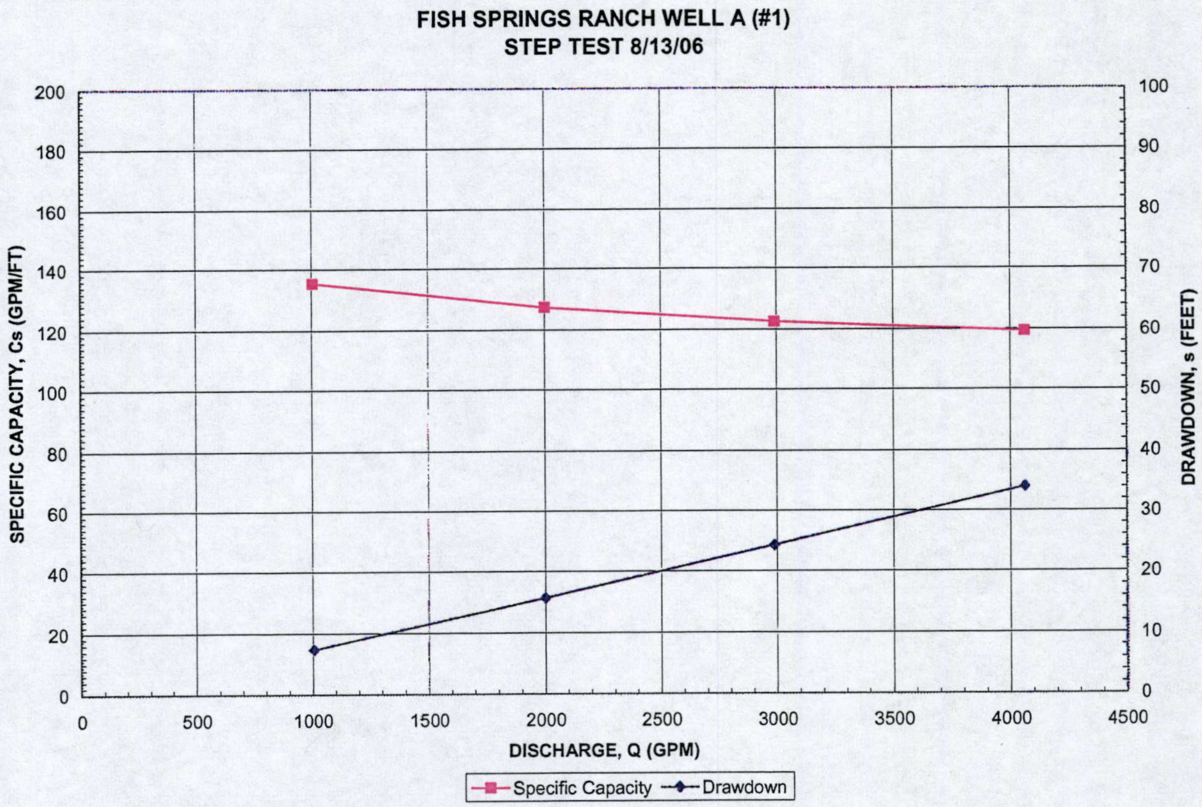


FIGURE 37: WELL A (#1) SPECIFIC CAPACITY PLOT

5.8.2 Well A (#1) Constant-Discharge Test

Constant-discharge testing ensued the day following the step test, after the water levels in the well recovered overnight. At the conclusion of the pumping test, water levels in the wells were monitored for a recovery period of approximately 50 hours. The test results are summarized below. Drawdown and recovery for the pumped well and the nearest observation well are plotted in Figure 8.

Static water level: 6.60 feet below the top of the stilling well

Pumping commenced: 08:00 hours 8/14/06.

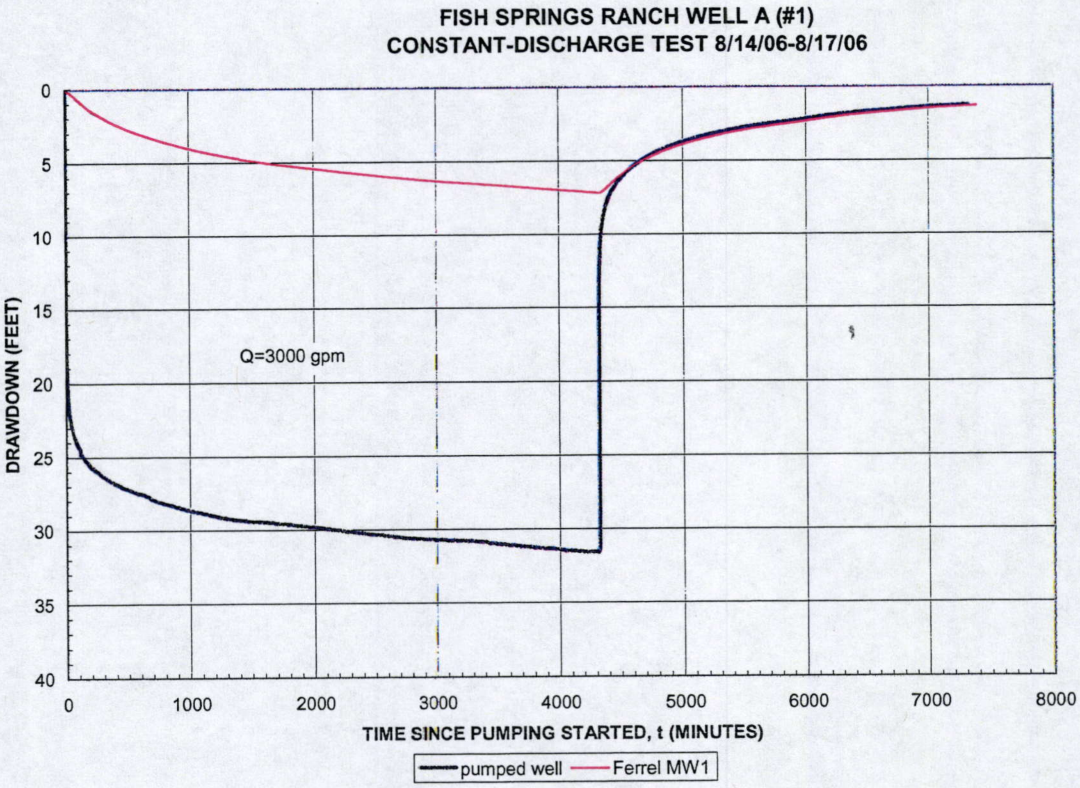
Discharge rate: approximately 3,000 gpm (selected on the basis of the step test results).

Test duration: 72 hours.

Pumping terminated: 08:00 hours 8/17/06.

Pumping level at the conclusion of the pumping test: 38.35 feet below the top of the stilling well.

Drawdown in the well at conclusion of test: 31.75 feet.



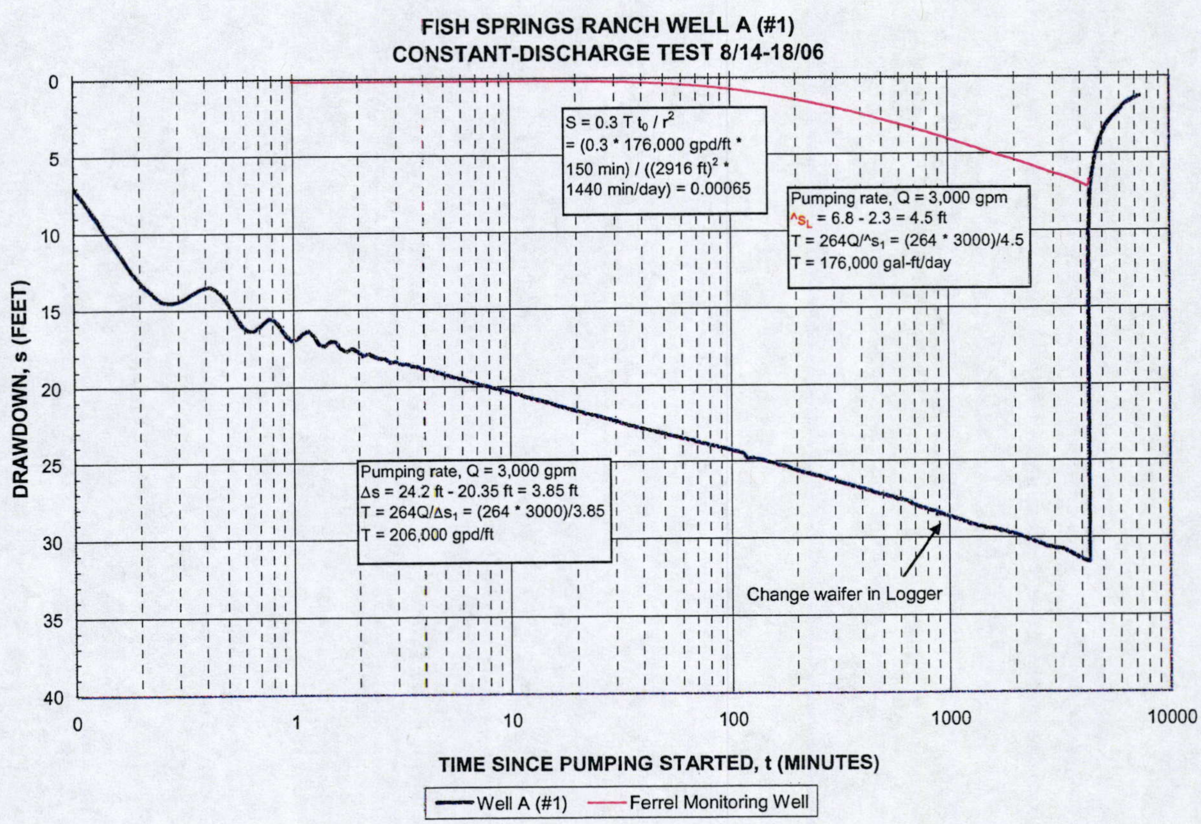


FIGURE 38: WELL A (#1) CONSTANT-DISCHARGE TEST PLOTS.

5.8.3 Well A (#1) Test Data Analysis

The aquifer tapped by Well A is comprised mostly of coarse, well-sorted, well-rounded quartz sand. The step test indicated that the well has very high efficiency. As shown in Figure 39, a reasonable fit of the constant discharge data using Ferrel Playa Monitoring Well as an observation well, was obtained using the analytical method for a confined aquifer developed by Dougherty-Babu (1984). This method resulted in a Transmissivity of 23,890 ft^2/day and a Storage coefficient of 3E-4. A reasonable fit is obtained for the observation well data, while a small negative skin effect is required for Well A. The drawdown data show a small increase in slope after about 1,000 minutes, indicating an area of lower Transmissivity is present at some distance from the well.

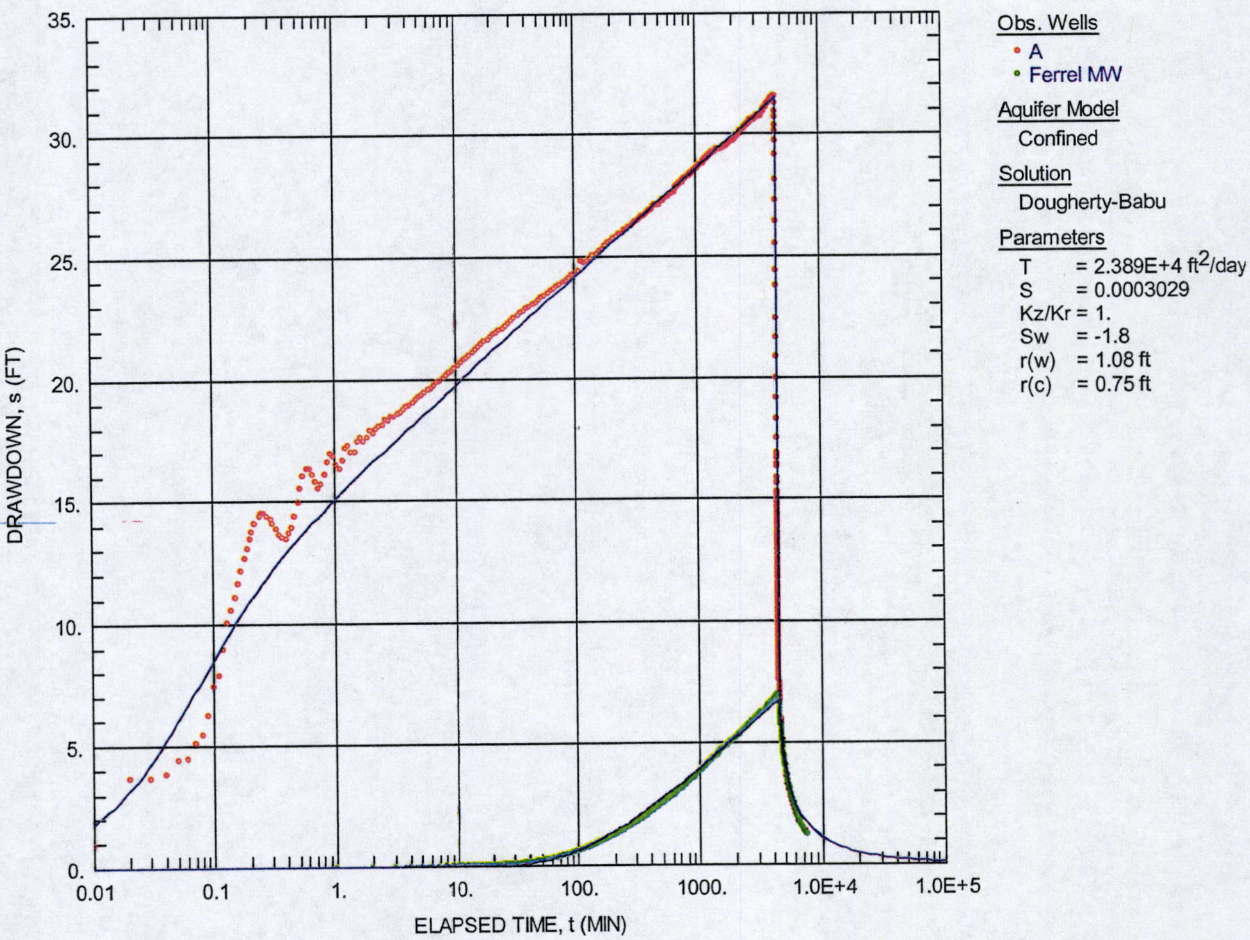


FIGURE 39: AQTESOLV SOLUTION OF WELL A (#1) CONSTANT DISCHARGE DATA

6.0 ANTICIPATED YIELD OF PRODUCTION WELLS

The likely future performance of each Fish Springs Ranch production well was evaluated utilizing the aquifer properties determined from the pumping tests. The "forward modeling" capabilities of the computer program AQTESOLV, the same program used to analyze the pumping test data, were used to calculate future drawdown in each production well. The yield ratings of the wells were constrained by the depth to the top of the well screens. That is, the predicted future pumping level was held at or above the top of the screens to minimize the potential for air to become entrained in the discharge. If a pumping rate resulted in drawing the pumping level down to the top of the screen, a series of trial-and-error calculations were performed until a pumping rate was found that maintained the pumping level above the top of the screens. The actual drawdown in the production wells is expected to be less than the predicted amount for two reasons. First, the analytical models assume no recharge occurs, whereas the work to date clearly shows that significant recharge to the aquifer occurs. Second, the initial stage of the project restricts total wellfield pumping to 8,000 acre-feet per year, which is equivalent to five wells each pumping, on average, 1,000 gpm each.

6.1 WELL F (#6)

Assumptions for the analysis include:

Borehole diameter: 26 inches

Casing diameter: 16 inches

Transmissivity: 15,140 feet^2/day (113,000 gpd/ft)

Coefficient of storage: 0.0017

Specific yield: 0.3

Depth to top of well screen: 116 feet

Static water level: 40 feet (11/05)

Skin factor: 2.1 (to account for aquifer heterogeneity)

Pumping rate: 2,000 gpm, plus 2,250 gpm interference from adjacent well E (#4)

No flow boundary 10,000 feet east of the well

The likely performance of Well F was simulated utilizing the analytical model of Moench (1997) and the forward modeling feature of AQTESOLV, assuming delayed yield and 2,250 gpm interference from adjacent Well E. A no-flow boundary was invoked at a distance of 10,000 feet east of the well site based on previous, long-term Washoe County pumping tests of the irrigation wells. Results of the calculations are show in Figure 40.

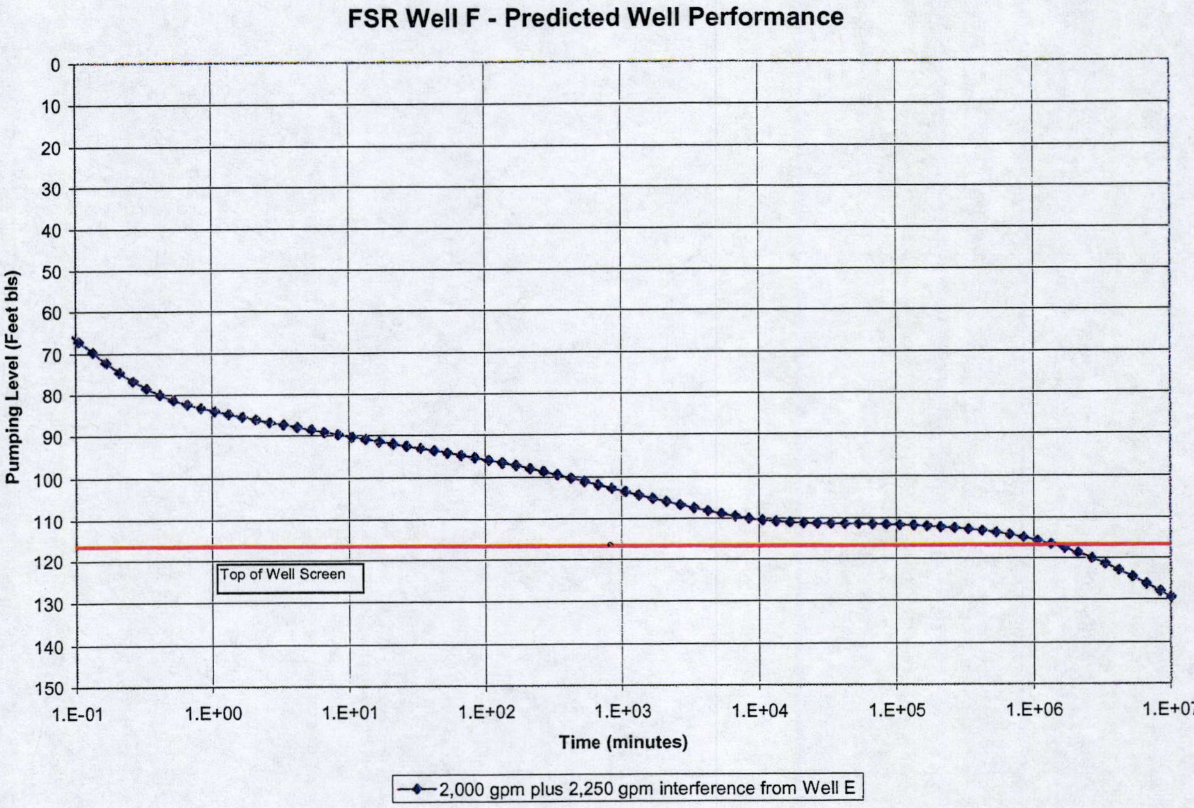


FIGURE 40: PREDICTED PERFORMANCE OF PRODUCTION WELL F (#6)

From Figure 40, it might be concluded that Well F can safely yield as much as 2,000 gallons per minute on a sustained basis, even with interference from pumping Well E at 2,250 gpm. However, the predicted drawdowns are unlikely to occur for two reasons. First, the solution assumes continuous pumping for 1E6 minutes (almost two years) before the water level drops to the top of the well screen, which is unlikely because the project only allows pumping 8,000 acre-feet per year, which equates to an average pumping rate of 1,000 gpm from each of the five wells that will be equipped in the initial stage of the project. Secondly, the solution assumes that no recharge occurs, when in fact significant recharge occurs from the Cottonwood Creek drainage in the form of direct infiltration of precipitation and infiltration of streamflow from Cottonwood Creek.

6.2 WELL E (#4)

Assumptions for the analysis include:

Borehole diameter: 26 inches

Casing diameter: 16 inches

Transmissivity: 11,060 feet^2/day (82,729 gpd/ft)

Specific yield: 0.20

Coefficient of storage: 0.0022

Depth to top of well screen: 119 feet bls

Static water level: 40 feet

Skin factor: -1.883

Effective thickness of the aquifer: 470 feet

Pumping rate: 2,250 gpm, plus 1,500 gpm interfernce from adjacent Well D

No flow boundary at 10,000 ft distance from well

The likely performance of Well E was simulated utilizing the analytical model of Moench (1997) and the forward modeling feature of AQTESOLV, assuming delayed yield and 1,500 gpm interference from adjacent Well D. A no-flow boundary was invoked at a distance of 10,000 feet based on previous, long-term Washoe County pumping tests of the irrigation wells. The results of the simulation are illustrated in Figure 41, which indicates that Well E should be capable of sustained operation at 2,250 gpm on a long-term basis without drawing the water level below the top of the well screen. Because the initial phase of the project allows pumping of only 8,000 acre-feet per year, which equates to an average pumping rate of 1,000 gpm from each of the five wells that will be equipped in the initial stage of the project, the well will not be pumped continuously at this rate and drawdown in the well will likely be less than predicted.

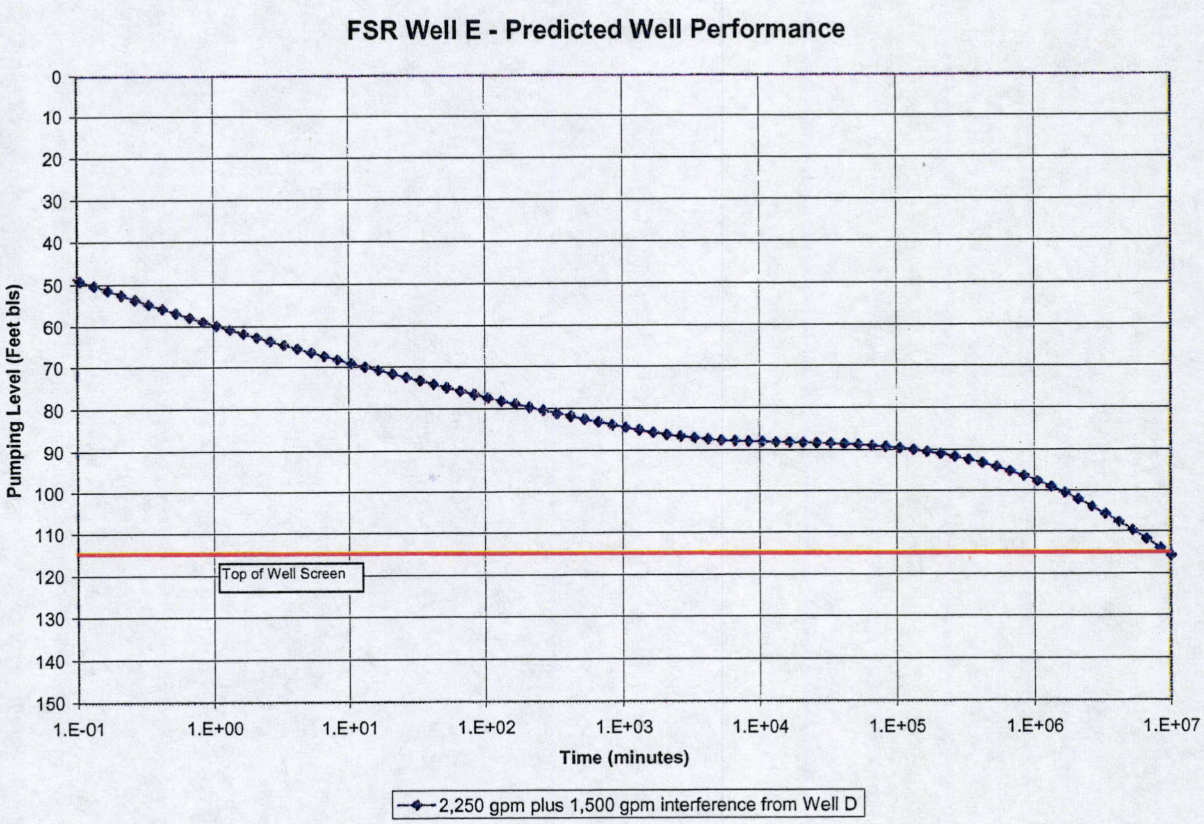


FIGURE 41: PREDICTED PERFORMANCE OF PRODUCTION WELL E (#4)

6.3 WELL D (#5)

Assumptions for the analysis include:

Borehole diameter: 26 inches

Casing diameter: 16 inches

Transmissivity: 13,380 feet^2/day (100,080 gpd/ft)

Coefficient of storage: 0.0027

Specific yield: 0.3

Depth to top of well screen: 116 feet

Static water level: 40

Skin factor: 0

Pumping rate: 1,500 gpm, plus 2,000 gpm interfernce from adjacent Well E

No flow boundary at 10,000 ft distance from well

The likely performance of Well D was simulated utilizing the analytical model of Moench (1997) and the forward modeling feature of AQTESOLV, assuming delayed yield and 2,000-gpm interference from adjacent Well E. A no-flow boundary was invoked at a distance of 10,000 feet based on previous, long-term Washoe County pumping tests of the irrigation wells. The results of the simulation are illustrated in Figure 42, which indicates that Well D should be capable of sustained operation at 1,500 gpm on a long-term basis without drawing the water level below the top of the well screen.

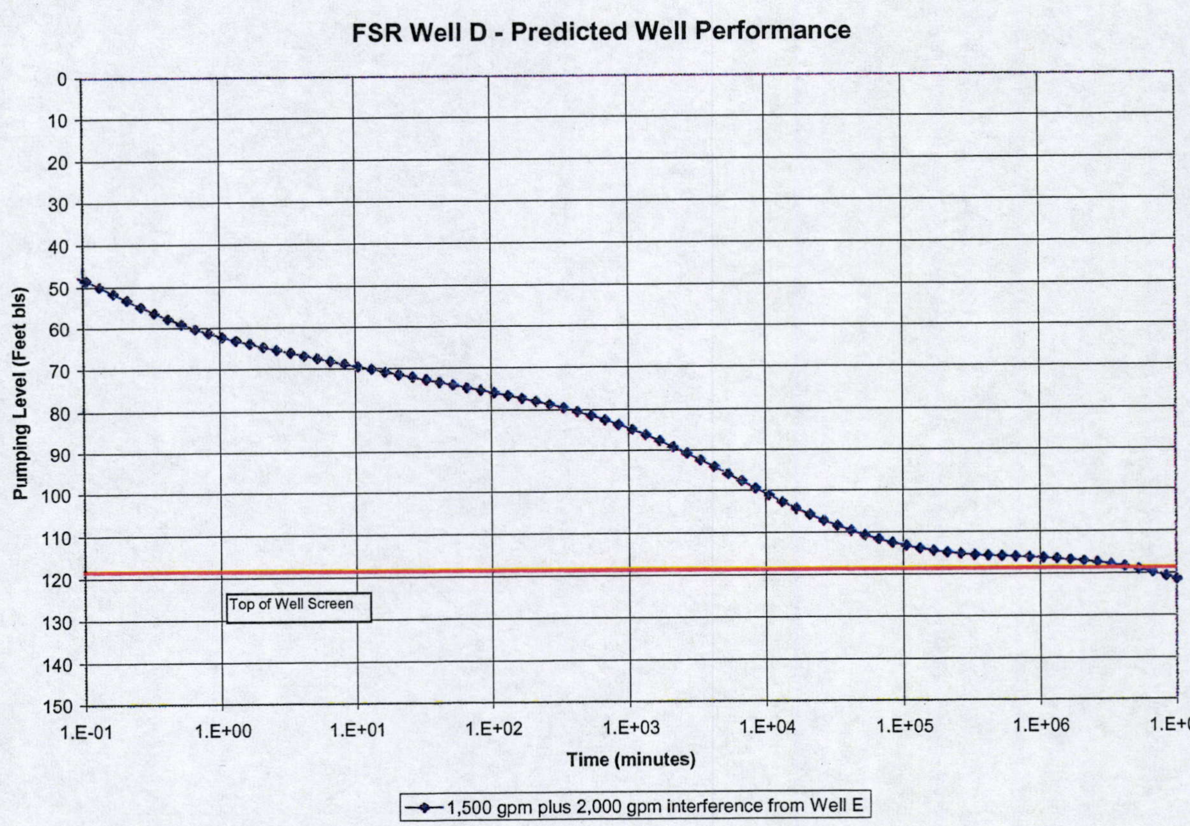


FIGURE 42: PREDICTED PERFORMANCE OF PRODUCTION WELL D (#5)

6.4 WELL C (#3)

Assumptions for the analysis include:

Borehole diameter: 26 inches

Casing diameter: 18 inches

Transmissivity: 20,437 feet^2/day (153,000 gpd/ft)

Specific Storage: 4.59E-8 ft^{-1}

Depth to top of well screen: 105 feet

Static water level: 38 ft

Skin factor: 28.15

Pumping rate: 1,500 gpm, plus 2,000 gpm interference from Well B

The likely performance of Well C was simulated utilizing the analytical model of Moench (1997) for a fractured rock aquifer with slab blocks and the forward modeling feature of AQTESOLV, and assuming 2,000-gpm interference from Well B.

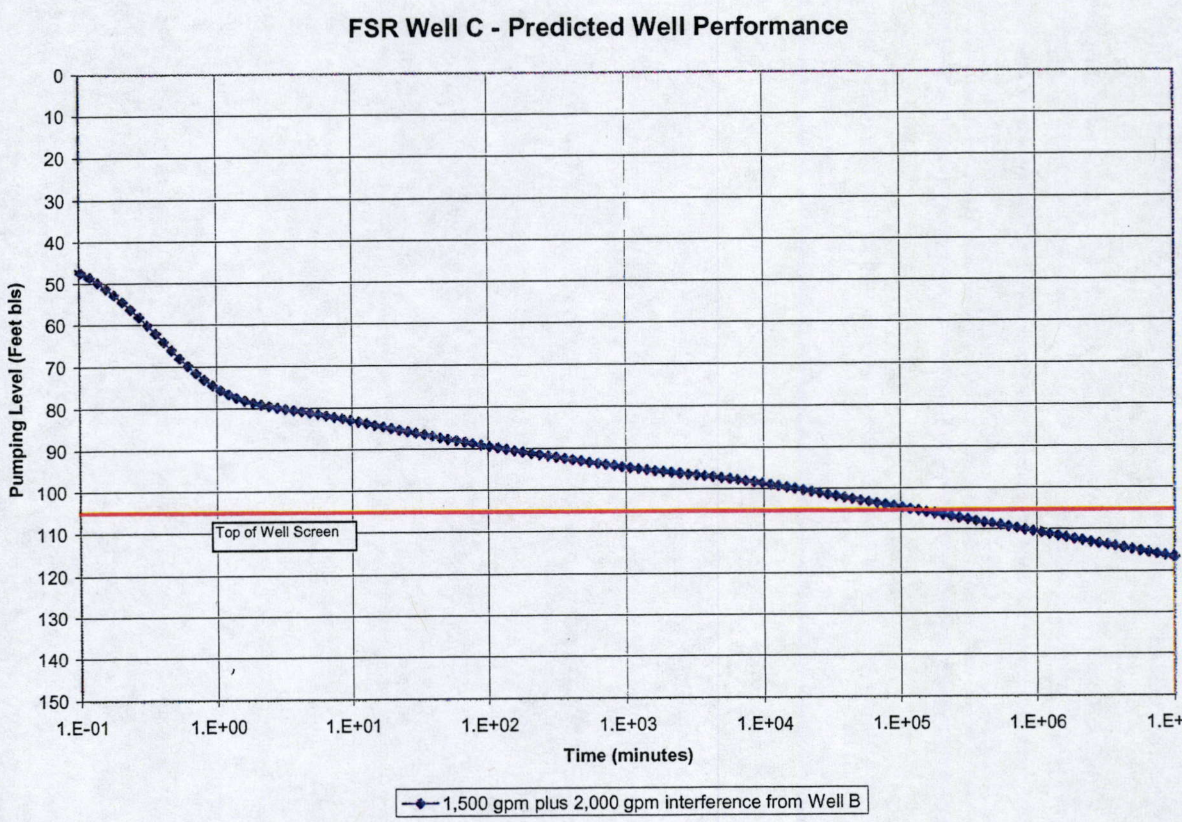


FIGURE 43: PREDICTED PERFORMANCE OF PRODUCTION WELL C (#3)

The results of the simulation are illustrated in Figure 43, which indicates that Well C is only capable of sustained operation at 1,500 gpm for up to 100,000 minutes (about 70 days) without drawing the water level below the top of the well screen. However, because the transmissivity is large, and most drawdown is the result of apparent wellbore skin, drawdown increases very slowly with increasing pumping time, and only about 10 feet of screen exposure would be expected by the end of the model period (19 years). The predicted drawdown is likely conservative for two reasons. First, the solution assumes continuous pumping at 1,500 gpm. The initial phase of the project allows pumping of only 8,000 acre-feet per year, which equates to an average pumping rate of 1,000 gpm from each of the five wells that will be equipped in the initial stage of the project. The well will thus not be pumped continuously at 1,500 gpm and drawdown in the well will likely be less than predicted. Second, the analysis assumes no recharge, whereas significant recharge to the aquifer is known to occur.

6.5 WELL B (#2)

Assumptions for the analysis include:

Borehole diameter: 26 inches

Casing diameter: 16 inches

Transmissivity: 20,500 feet^2/day (153,000 gpd/ft)

Specific Storage: 2.29E-5

Depth to top of well screen: 119 feet

Static water level: 52 feet

Skin factor: 10

Pumping rate: 2,000 gpm, plus 1,500 gallon interference from Well C

The likely performance of Well B was simulated utilizing the analytical model of Barker (1988) for a fractured rock aquifer, and the forward modeling feature of AQTESOLV, assuming 1,500 gpm interference from Well B. A no-flow boundary was not invoked. The results are illustrated in Figure 44.

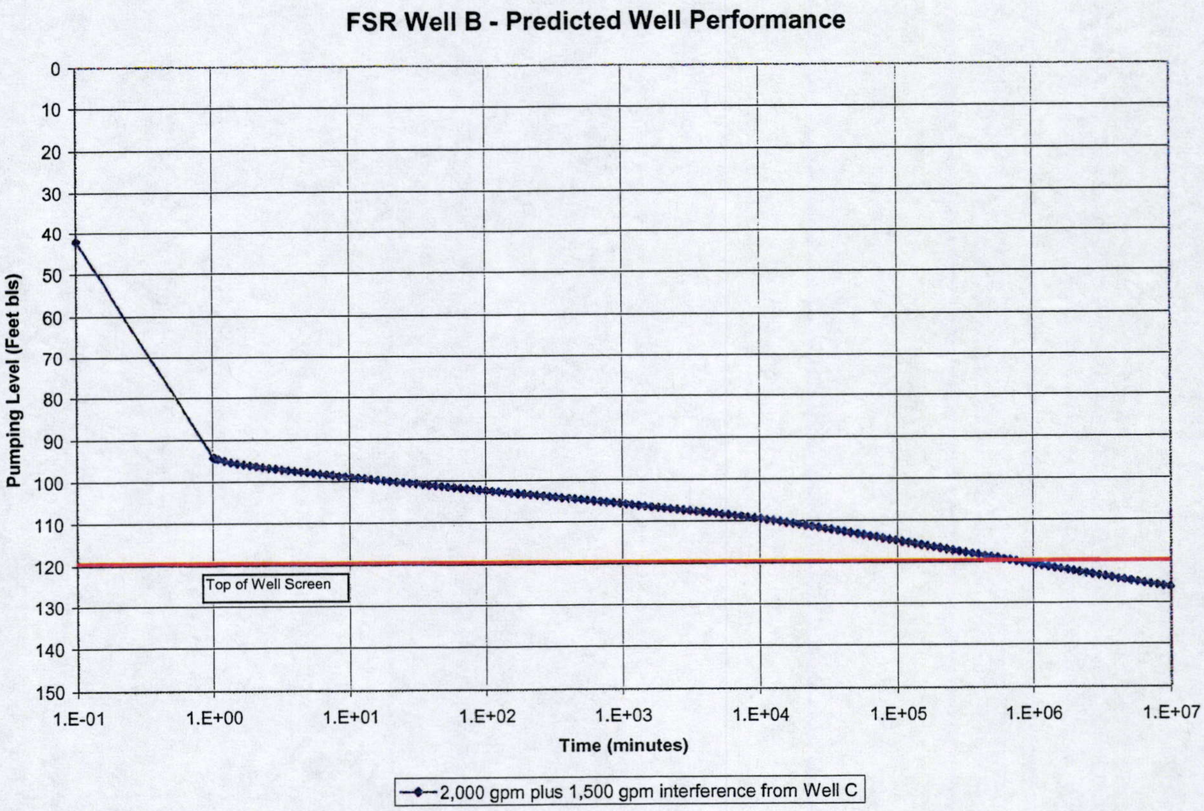


FIGURE 44: PREDICTED PERFORMANCE OF PRODUCTION WELL B (#2)

The results of the simulation indicate that Well B is capable of sustained operation at 2,000 gpm for almost 2.0 years without drawing the water level below the top of the well screen. Because the transmissivity is large, and most drawdown is the result of well inefficiency, drawdown increases very slowly with increasing pumping time, and only about 5 feet of screen exposure would be expected by the end of the model period (19 years). The predicted drawdown is likely conservative for two reasons. Because the initial phase of the project allows pumping of only 8,000 acre-feet per year, which equates to an average pumping rate of 1,000 gpm from each of the five wells that will be equipped in the initial stage of the project, the well will not be pumped continuously at this rate and drawdown in the well will likely be less than predicted. Secondly, the solution assumes that no recharge occurs and significant recharge to the aquifer is known to occur.

6.6 WELL A (#1)

Assumptions for the analysis include:

Borehole diameter: 26 inches

Casing diameter: 18-inch to 255 feet, and 16-inch to 435 feet

Transmissivity: 23,900 feet^2/day (180,000 gpd/ft)

Coefficient of storage: 0.0003

Depth to top of well screen: 135 feet

Static water level: 6 feet

Skin factor: -1.8

Pumping rate: 3,000 gpm

The likely performance of Well A was simulated utilizing the analytical model of Dougherty-Babu (1984) for a confined aquifer, and the forward modeling feature of AQTESOLV. The results are illustrated in Figure 45.

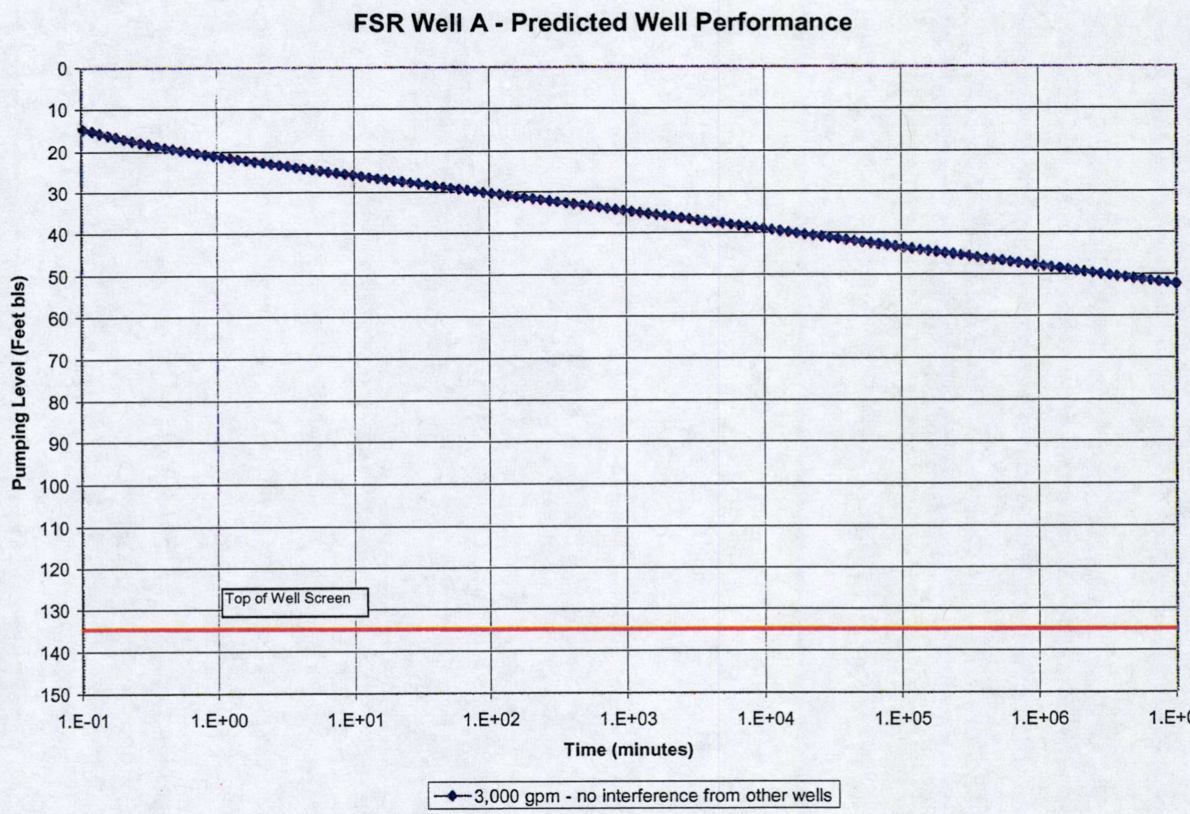


FIGURE 45: PREDICTED PERFORMANCE OF PRODUCTION WELL A (#1)

From Figure 45 it is apparent that Well A has the potential to yield at least 3,000 gpm on a continuous basis for an indefinite period without drawing the water level in the well below the top of the screened interval.

7.0 PLUMBNESS AND ALIGNMENT

Following construction and testing of the wells, deviation surveys were completed to determine each well's plumbness and alignment. Results of the surveys are provided in Appendix E. As shown, all wells are less than one foot out of vertical at the hole bottom and all meet the plumbness and alignment criteria required in the technical specifications.

8.0 SAND CONTENT

The sand content of the discharge from the wells was measured with a Rossum™ sand tester. For each well, the sand content was less than the specified five (5) parts per million (ppm) within five minutes of starting the pump. After five minutes, the sand content was essentially zero, and the wells can be classified as "sand free".

9.0 WATER QUALITY

Water samples were collected from the discharge of each production well at the conclusion of each constant discharge test. The water samples submitted under chain-of-custody documentation to Sierra Environmental Monitoring, a State of Nevada certified environmental laboratory. Results of the analyses are summarized in Table 14 and provided in their entirety in Appendix F. As shown in the table, the water quality in each well meets the drinking water standard for all analyzed parameters.

The water in general is moderately alkaline with a pH ranging from 7.96 to 8.45, and is a sodium bicarbonate type. Total dissolved solids (TDS) range from a low of 170 mg/L at Well B, to 240 mg/L in three of the wells. Arsenic, iron, manganese and nitrate are all present in concentrations well below their respective drinking water standards.

TABLE 14: FISH SPRINGS RANCH WELLFIELD WATER CHEMISTRY DATA SUMMARY.

Parameter	Well A (#1)	Well B (#2)	Well C (#3)	Well E (#4)	Well D (#5)	Well F (#6)
Date Collected:	8/17/06	7/31/06	8/8/06	7/21/06	7/14/06	7/08/06
Time Collected:	7:00	7:00	7:00	13:10	6:30	9:00
Collected By:	C.Wessel	P.Sinclair	C. Wessel	D.Bugenig	Z. Rosta	D.Bugenig
Date/Time Received :	8/17/06 11:00	7/31/06 11:43	8/8/06 14:50	7/21/06 16:25	7/14/06 8:35	7/10/06 7:55
Date Analysis Started:	8/17/06	8/17/06	8/9/06	7/21/06	7/15/06	7/11/06
Date Analysis Completed:	9/22/06	9/18/06	10/4/06	8/28/06	8/21/06	8/1/06

Parameter	Units	Well A (#1)	Well B (#2)	Well C (#3)	Well E (#4)	Well D (#5)	Well F (#6)	Standard
Color Apparent	Color Units	< 5	< 5	< 5	< 5	<5	< 5	15
pH (Laboratory)	Standard Units	8.45	8.33	8.44	7.96	8.01	8.36	6.5-8.5 (2)
TDS (ROE at 180°)	mg/L	240	170	190	240	240	210	500/1000 (2)
Turbidity (Laboratory)	NTU	0.4	2.0	4.0	0.3	0.3	1.3	5 (2)
Major Cations								
Calcium (Ca)	mg/L	6.9	14	3.1	12	4.8	1.3	
Magnesium (Mg)	mg/L	1.3	5.0	1.7	4.7	1.7	< 0.5	125/150 (2)
Potassium (K)	mg/L	4.7	6.3	7.0	6.6	5.6	1.9	
Sodium (Na)	mg/L	66	24	45	51	61	54	

Parameter	Units	Well A (#1)	Well B (#2)	Well C (#3)	Well E (#4)	Well D (#5)	Well F (#6)	Standard
Major Anions								
Alkalinity/Bicarbonate ($CaCO_3$)	mg/L	123	94	100	130	130	114	
Alkalinity/Carbonate ($CaCO_3$)	mg/L	7	3	6	< 2	<2	4	
Alkalinity/Hydroxide ($CaCO_3$)	mg/L	< 2	< 2	< 2	< 2	<2	< 2	
Alkalinity/Total ($CaCO_3$)	mg/L	130	97	106	130	130	118	
Chloride (Cl)	mg/L	24	6.4	6.7	21	13	4.7	250/500 (2)
Fluoride (F)	mg/L	0.4	0.2	0.2	< 0.1	0.2	0.36	2 (2)
Nitrate-N	mg/L	1.1	1.2	1.1	0.58	0.66	0.54	10 (1)
Sulfate (SO_4)	mg/L	18	8	8.9	17	16	4.7	250/500 (2)
Metals								
Arsenic (As)	mg/L	0.006	< 0.003	0.005	< 0.004	0.004	0.007	0.01 (1)
Barium (Ba)	mg/L	0.007	0.006	0.014	0.045	0.015	0.006	2 (1)
Copper (Cu)	mg/L	0.003	< 0.005	0.002	0.003	0.002	0.004	1
Iron (Fe)	mg/L	< 0.0 5	< 0.0 5	0.08	< 0.05	<0.05	0.07	0.3/0.6 (2)
Lead (Pb)	mg/L	0.002	< 0.001	< 0.001	<0.001	<0.001	0.002	0.015 (3)
Manganese (Mn)	mg/L	0.002	0.004	0.007	<0.003	<0.01	0.004	0.05/0.1 (2)
Zinc (Zn)	mg/L	0.03	< 0.04	< 0.04	0.04	<0.03	0.02	5 (2)
Uranium (U)	mg/L	0.001	0.001	< 0.001	<0.001	<0.001	< 0.001	0.03 (1)
Radionuclides								
Gross α	pCi/L	0.576 ± 0.914	0.684 ± 0.580	0.510 ± 0.807	0.0706 ± 1.19	0.008 ± 1.25	-0.409 ± 0.665	15 pCi/L
Gross β	pCi/L	2.92 ± 0.744	5.92 ± 1.08	8.11 ± 1.76	9.30 ± 1.35	4.68 ± 1.97	1.74 ± 1.35	50 pCi/L
Radium 226	pCi/L	0.168 ± 0.233	0.127 ± 0.321	0.129 ± 0.438	0.170 ± 0.294	0.086± 0.239	0.061 ± 0.190	5 pCi/L
Radium 228	pCi/L	-0.325 ± 0.195	-0.0322 ± 0.231	1.91 ± 0.549	-0.0568 ± 0.196	-0.0125 ± 0.202	-0.109 ± 0.191	5 pCi/L
Organic Compounds (see lab report for complete listing and detection limits								
525 Semivolatiles by GC/MS	See report	ND	ND	ND	ND	ND	ND	See report
Aldicarbs by 531.2	See report	ND	ND	ND	ND	ND	ND	See report
Diquat and Paraquat	See report	ND	ND	ND	ND	ND	ND	See report

Parameter	Units	Well A (#1)	Well B (#2)	Well C (#3)	Well E (#4)	Well D (#5)	Well F (#6)	Standard
EDB-DBCP by GC-ECD	See report	ND	ND	ND	ND	ND	ND	See report
Glyphosate	See report	ND	ND	ND	ND	ND	ND	See report
Endothall	See report	ND	ND	ND	ND	ND	ND	See report
Herbicides by 515.4	See report	ND	ND	ND	ND	ND	ND	See report
Pesticides by EPA 505	See report	ND	ND	ND	ND	ND	ND	See report
Regulated VOCs plus Lists 1&3	See report	ND	ND	ND	ND	ND	ND	See report
MBAS Surfactants	See report	ND	ND	ND	ND	ND	ND	See report

Table Notes: ND signifies not detected.

(1) Primary Drinking Water Standard (2) Secondary Drinking Water Standard (recommended/maximum concentration).

(3) Action level

All results in mg/l unless otherwise indicated.

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