ERROL L. MONTGOMERY & ASSOCIATES, INC.

December 19, 2000
FINAL REPORT

ANALYSIS OF RATE OF GROUNDWATER MOVEMENT BASED ON RESULTS OF TRACER AND HYDRAULIC TESTS CONDUCTED BETWEEN PITTMAN LATERAL AND SEEP AREA HENDERSON, NEVADA

Prepared for
KERR-McGEE CHEMICAL LLC

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EXECUTIVE SUMMARY

Rate of groundwater movement and aquifer parameters are necessary for determining mass transport in aquifers. Analysis of rate of groundwater movement given in this report for the Kerr-McGee Henderson facility have provided useful estimates of groundwater velocities at Sites A, B, and C between Pittman Lateral and the seep area. Rate of groundwater movement provides an estimate for rate of downgradient mass transport of perchlorate in groundwater between Pittman Lateral and the seep area. Perchlorate is considered a nonreactive ion; movement of the center of mass of perchlorate is coincident with average velocity of groundwater.

Analysis of testing results indicate that rates of groundwater movement are in the range of 20 to 30 feet per day (ft/d) at **Site A**, 30 to 45 ft/d at **Site B**, and 60 to 85 ft/d at **Site C**. Summary and conclusions for estimating rate of groundwater movement between Pittman Lateral and the seep area are as follows:

1. Groundwater tracer tests and hydraulic tests for the alluvial deposits aquifer were conducted at three sites between the area bounded geographically by Pittman Lateral and the seep on the south margin of Las Vegas wash. This area is located in the southeast part of the Las Vegas Valley, City of Henderson, Clark County, Nevada. Testing results were used to estimate rate of groundwater movement in the aquifer. Tracer testing consisted of natural gradient and drift and pumpback methods. Bromide and deionized water were used as tracers. Hydraulic tests consisted of aquifer tests and measurement of groundwater gradient.

2. The project area is shown on **Figure 1**. The sites investigated are: **Site A** south of the Pittman Lateral and south from the City of Henderson – Rapid Infiltration Basins (COH-RIB), **Site B** near monitor well MW-K5 within COH-RIB, and **Site C** north from COH-RIB and south from the seep. Wells and piezometers were constructed at the sites for introducing the tracer and for monitoring tracer breakthrough. Results for analysis of tracer tests, aquifer tests, and groundwater levels indicate that rates of groundwater movement are in the range of 20 to 30 ft/d at **Site A**, 30 to 45 ft/d at **Site B**, and 60 to 85 ft/d at **Site C**.

3. Groundwater level measurements in the area were obtained prior to and after the period of tracer testing to determine direction of groundwater movement and magnitude of hydraulic gradient. During the period September 18 to 20, 2000, depth to groundwater ranged from about 20 feet at **Site A** to about 1 foot at **Site C**. Groundwater level measurements and contours are shown on **Figure 2**. Direction of groundwater movement was north-northeast and toward the seep pumping station. Lateral hydraulic gradient, measured as change in head per unit of distance measured in the direction of the steepest change, ranged from about 0.008 feet per foot at **Site A** to about 0.01 at **Site C**.

Between **Sites A and C** average lateral hydraulic gradient was about 0.01. Measurements of depth to groundwater obtained at the piezometer nest at **Site C** indicate that vertical hydraulic gradient in the alluvial deposits aquifer was directed upward.

4. Prior to tracer testing, aquifer tests were conducted at the sites to measure hydraulic parameters. Transmissivity ranges from 50,000 gallons per day per foot at 1:1 hydraulic gradient (gpd/ft) for **Site A** to 160,000 gpd/ft at **Site C**. Based on thickness of coarse-grained parts of the aquifer penetrated by wells and piezometers at the sites, aquifer thickness ranges from 25 feet at **Site B** to 35 feet at **Site C**. Hydraulic conductivity ranges from about 1,700 gallons per day per square foot of aquifer at 1:1 hydraulic gradient (gpd/ft^2) at **Site A** to 4,600 gpd/ ft^2 at **Site C**. Aquifer parameters are summarized as follows:

	Transmissivity (gpd/ft)	Aquifer Saturated Thickness (feet)	Hydraulic Conductivity (gpd/ft^2)
SITE A	50,000	30	1,700
SITE B	55,000	25	2,200
SITE C	160,000	35	4,600

5. Rates of groundwater movement computed using Darcy's Law and from results of tracer test data are summarized as follows:

	.....Rate of Groundwater Movement.....			
	Natural Gradient Deionized Water Tracer Tests (ft/d)	Natural Gradient Bromide Tracer Test (ft/d)	Drift and Pumpback Bromide Tracer Test (ft/d)	Natural Gradient Darcy's Law (ft/d)
SITE A	25 – 30	30	---	20
SITE B	45	---	---	30
SITE C	85	---	60	60

6. Results of tracer testing using deionized water under natural gradient conditions indicated rate of groundwater movement to be approximately 25 to 30 ft/d at **Site A**, 45 ft/d at **Site B**, and 85 ft/d at **Site C**. Rates of groundwater movement at **Sites B and C** are for lower parts of the aquifer where breakthrough of tracer was more rapid. Because of large concentrations of inorganic ions liberated during the deionized water tracer test at **Sites A and C**, and transient effects of RIB water recharging the shallow groundwater system at **Sites B and C**, results of tracer testing using deionized water are approximate.

7. Results of tracer testing using bromide under natural gradient conditions at **Site A** indicated rate of groundwater movement to be approximately 30 ft/d at depths of 23, 32 feet, and 40 feet. Breakthrough in lower parts of the aquifer was faster than breakthrough in upper parts of the aquifer.

8. Results of tracer testing using bromide under drift and pumpback conditions at **Site C** indicated rate of groundwater movement to be approximately 60 ft/d and effective porosity to be approximately 10 percent.

9. Using Darcy's Law and parameters obtained from results of tracer and hydraulic testing, average rate of groundwater movement is indicated to be 20 ft/d at **Site A**, 30 ft/d at **Site B**, and 60 ft/d at **Site C**.

10. Results of analysis of rate of groundwater movement using different methods indicate close correlation. Larger rates of groundwater movement are estimated using natural gradient method due to observation of breakthrough occurring in lower parts of the aquifer faster than upper parts of the aquifer. Faster breakthrough in lower parts of the aquifer correlates to lithologic

descriptions that indicate lower parts of the aquifer comprise coarser grained sediments.

11. Using Darcy's Law and average values for aquifer parameters and groundwater gradient, average of rate of groundwater movement between **Site A and Site C** is about 35 ft/d. Distance between **Site A and Site C** is about 5,700 feet. Average residence time of groundwater between **Site A and Site C** is estimated to be 170 days or about 6 months.

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Prepared for
KERR-McGEE CHEMICAL LLC

INTRODUCTION

Groundwater tracer and hydraulic tests for the shallow alluvial deposits aquifer were implemented at three sites between the area bounded by Pittman Lateral and the seep south from Las Vegas wash, Henderson, Nevada. The work was conducted for KERR-McGEE CHEMICAL LLC (Kerr-McGee) by ERROL L. MONTGOMERY & ASSOCIATES, INC. (Montgomery & Associates) during the period May through September 2000. Tracer tests and hydraulic testing were conducted to estimate rate of groundwater movement in the shallow alluvial deposits aquifer. Analysis of rate of groundwater movement provided in this report can be used to provide preliminary estimates for rate of downgradient mass transport of perchlorate in groundwater.

Figure 1 is a location map showing the study area and **Sites A, B, and C** where testing was conducted. Tracer testing used both drift and pumpback and natural gradient methodologies. Distances between injection and monitoring

locations for natural gradient tracer tests were on the order of 50 feet. Tracers used were deionized water and bromide. Hydraulic tests consisted of conducting aquifer tests for estimating transmissivity and hydraulic conductivity, and measurements of water levels for determining groundwater gradient. Testing was authorized by the Nevada Division of Environmental Protection (NDEP, 2000). Correspondence providing authorization for testing from NDEP is provided in **Appendix A.** The following sections provide a summary of hydrogeologic conditions, methods and results of testing, and analysis of rate of groundwater movement.

WELLS AND PIEZOMETERS

Wells and piezometers were installed for tracer and hydraulic testing. Locations of the installations are: **Site A** at the Pittman Lateral south from the City of Henderson – Rapid Infiltration Basins (COH-RIB); **Site B** near monitor well MW-K5 within COH-RIB, and; **Site C** north from COH-RIB and south from the seep **(Figure 1)**. Identifiers for wells and piezometers and construction details are given in **Table 1**. Ed Krish, geologist for Kerr-McGee, directed drilling, construction, and sampling operations and prepared lithologic descriptions of drill cuttings samples.

Initial drilling was conducted by Compliance Drilling, Las Vegas, Nevada, using auger methods. Because very loose, coarse-sediments in the middle and lower parts of the aquifer were encountered during drilling, boreholes were unstable and construction of the wells and piezometers was difficult. Auger drilling methods may have also pulled silt and clay from lower parts of the borehole up into more permeable parts of the aquifer resulting in low hydraulic efficiency of the wells.

To obtain more hydraulically efficient wells and piezometers necessary for the tracer tests, an alternate drilling method was used to drill replacement wells and piezometers. Boreholes for replacement wells and piezometers were drilled using the dual-wall reverse-air-circulation percussion drilling method (AP-1000) by Layne Christensen Company, Chandler, Arizona (formerly Layne Environmental Services, Tempe, Arizona). Because the percussion drilling method provides drill cuttings from the depth being drilled without mixing with overlying sediments in the borehole and without use of a rotary bit and drilling fluids, cuttings accurately represent the sediments encountered at specific depths in the borehole, including degree of lithification. During drilling of the boreholes, drill cuttings were continuously observed and samples of drill cuttings were obtained to prepare an accurate and

continuous lithologic characterization of sediments encountered in the borehole. Schematic diagrams of well construction and lithologic logs are provided in **Appendix B** for replacement wells and piezometers installed at **Sites A, B, and C**.

HYDROGEOLOGIC CONDITIONS

The study area is located in the southeast part of the Las Vegas Valley, City of Henderson, Clark County, Nevada. The Las Vegas Valley occupies a topographic and structural basin within the Basin and Range Physiographic Province. The principal surface water drainage feature for the study area is Las Vegas wash, a shallow, narrow stream that drains to the southeast, across the valley floor to Lake Mead. The study area is bounded by the Pittman Lateral to the south and the seep area to the north **(Figure 1)**. The Henderson wastewater treatment facility lies within the study area. The following description of hydrogeologic conditions is based on data and reports provided by Kerr-McGee.

The late Tertiary Muddy Creek Formation underlies the study area. Wells penetrating the Muddy Creek Formation in the study area indicate lithologies comprising sandy and silty clay to clayey sand. Younger, Quaternary alluvial deposits overlie the Muddy Creek Formation. Alluvial deposits fill erosional paleochannels in the Muddy Creek Formation. Alluvial deposits are thickest within the paleochannels, and thin laterally over the interfluvial areas. Based on lithologic information from boreholes, thickness of the alluvial deposits in the study is on the order of 40 feet within erosional paleochannels. Lithology of the alluvial deposits ranges from silt, to fine to coarse-grained sand, to gravel, and cobbles. Results of previous studies indicate hydraulic conductivity of the overlying alluvial deposits to be substantially larger than the Muddy Creek Formation.

Lithologic descriptions of drill cuttings samples obtained from wells and piezometers completed at **Sites A, B, and C** indicate coarse grained sand, gravel, and cobbles dominate lower parts of the aquifer **(Appendix B)**. At **Sites B and C**, silt and clay predominate in the upper part of the aquifer. Silt and clay in upper parts

of the aquifer are believed to cause local, semi-perched groundwater conditions to exist during infiltration cycles from the COH-RIB facility.

OCCURRENCE AND MOVEMENT OF GROUNDWATER

Paleochannels generally trend southwest-northeast and control movement of groundwater in the alluvial deposits. Depth to groundwater in the alluvial deposits ranges from near land surface to 20 feet. Horizontal groundwater level gradients, measured as change in head per unit of distance measured in the direction of the steepest change, are in the range from 0.001 feet per foot (ft/ft) to 0.04 ft/ft. Direction of groundwater movement in the alluvial deposits is north-northeast.

Groundwater level measurements in the area were obtained prior to and after the period of tracer testing to determine direction of groundwater movement and groundwater gradient. Groundwater level contours and direction of groundwater movement for the area are shown on **Figure 2** for the period September 18 to 20, 2000. Depth to groundwater ranged from about 20 feet at **Site A** to about 1 foot at **Site C**. Direction of groundwater movement was to the north-northeast and toward the seep pumping station. Horizontal hydraulic gradient ranged from about 0.008 ft/ft at **Site A** to about 0.01 ft/ft at **Site C**. Average horizontal hydraulic gradient between **Site A and Site C** is estimated to be 0.01 ft/ft.

Analysis of water levels in wells in the vicinity of the study area indicates hydraulic head in the Muddy Creek Formation to be higher than hydraulic head in the alluvial deposits. Groundwater level elevation in the nested piezometer completed in the alluvial deposits aquifer at **Site C** indicates vertical hydraulic gradient is directed upward.

Figures 3 and 4 show groundwater level trends during the period of testing at **Sites B and C**. Infiltration cycles from COH-RIB facility dramatically impact groundwater levels.

AQUIFER PARAMETERS

Analysis of a 48-hour aquifer test conducted at well PC-70 in September 1998, **(Site A, Figure 1)** indicates an average transmissivity of 50,000 gallons per day per foot of aquifer at 1:1 hydraulic gradient for the alluvial deposits aquifer. Specific yield was estimated to be on the order of 0.06 (Kerr-McGee, 1998).

CHEMICAL QUALITY OF GROUNDWATER

Table 2 summarizes inorganic chemical quality of water in the study area. Sample sources are: seep sump near **Site C**, RIB pond near **Site B**, and well PC-70 near **Site A**. The RIB (Rapid Infiltration Basin) pond is part of the Henderson wastewater treatment facility. Results of sampling indicate total dissolved solids (TDS) ranging from 1,800 to 8,600 milligrams per liter (mg/L). Based on samples obtained in the study area, groundwater in the study area is a sodium chloride-sulfate type and is classified as slightly to moderately saline.

RESULTS OF HYDRAULIC TESTS

Aquifer test operations for **Sites B and C** began August 10, 2000, and were completed August 16, 2000. Following construction and development of the 4-inch diameter wells, constant-discharge pumping tests were conducted. The test pump was installed and operated by Compliance Drilling. The constant-discharge pumping tests were preceded by a short pretest and step-discharge test to verify equipment operation and to select an optimal pumping rate for testing. Aquifer tests were planned for 36 hours of pumping followed by 36 hours of water level recovery. Due to generator failure, duration of pumping was 29.9 hours for well PC-98R. A summary of hydrologic data is given in **Table 3**. Aquifer parameters determined from analysis of pumping test data are summarized in **Table 4**.

AQUIFER TEST PROCEDURES

The wells were tested using a submersible Grundfos pump and a 5 horsepower electric motor installed with 2-inch galvanized steel column pipe. Geokon vibrating-wire pressure transducers and an electric water level sounder were used to measure water levels. Pressure transducers were connected to a Campbell Scientific CR10 datalogger that recorded water level measurements at regular intervals throughout the testing period. A pressure transducer was also used to measure barometric pressure during the testing periods. Pressure transducers used for obtaining water levels measured absolute pressure changes and recorded data was processed to correct for changes in barometric pressure.

During the pumping period, measurements were obtained for: depth to groundwater level below measuring point; pumping rate; wellhead pressure; and sand content, temperature, specific conductance, and pH of pumped water. Sand content was measured using a 1-liter, calibrated Imhoff cone.

Pumping rate was measured using a totalizing inline flowmeter, and a 5-gallon bucket at the end of the discharge pipe. Pumping rate was regulated using a gate valve and pressure gauge. Pumped groundwater was discharged to land surface to a point 100 feet from the wellhead. During each pumping test, drawdown and recovery of water levels were also monitored at nearby piezometers.

ANALYSIS OF AQUIFER TEST RESULTS

Hydraulic parameters discussed below are derived from analysis of results of the pumping tests, and comprise values for transmissivity, hydraulic conductivity, and storativity. Transmissivity is defined as the rate of groundwater flow through a vertical section of the aquifer 1 foot wide and extending the full saturated height of the aquifer under a unit hydraulic gradient (Theis, 1935). Transmissivity has units of gallons per day per foot width of aquifer. Transmissivity is a measure of the ability of an aquifer to transmit groundwater, and is equal to the product of hydraulic conductivity and saturated thickness of the aquifer.

Hydraulic conductivity is the rate of groundwater flow through a unit area of aquifer under unit hydraulic gradient. Hydraulic conductivity has units of gallons per day per square foot of aquifer (gpd/ft^2). Average hydraulic conductivity of aquifer material encountered at **Sites A, B, and C** was computed by dividing the transmissivity computed from analysis of pumping test data by saturated thickness of the aquifer.

Storativity is the volume of water that a permeable unit will absorb or expel from storage per unit surface area per unit change in head. Storativity is dimensionless quantity and less than 1. In unconfined aquifers the storativity is generally considered equal to specific yield. Specific yield is the ratio of volume of water saturated sediments release due to gravity drainage to the total volume of sediments. Estimating storativity from aquifer tests requires water level data from one or more observation wells that are in hydraulic communication with the pumped well.

Water level drawdown data obtained during the constant-discharge pumping tests were analyzed for transmissivity using the Cooper-Jacob modified non-equilibrium equation semi-logarithmic graphical method (Cooper and Jacob, 1946). Water level recovery data were analyzed for transmissivity using the Theis recovery method (Theis, 1935). For the Theis recovery method, residual drawdown is plotted versus the ratio t/t', where "t" is time after pumping started and " t' " is time after pumping stopped. Residual drawdown is the drawdown remaining at any time after pumping stopped. Drawdown and recovery graphs for the pumping tests are shown of **Figures 5 through 10**. Because groundwater levels were rising during testing periods **(Figures 3 and 4)**, aquifer test data was corrected to subtract for the rising trends. Data obtained during the aquifer tests, corrected for barometric change and groundwater level trend, and results of analyses are given in **Appendix C**.

Drawdown and recovery measurements obtained at the pumped wells were sufficient for determination of aquifer parameters using the semi-logarithmic Cooper-Jacob method and the Theis recovery method. Semi-logarithmic analytical methods were considered valid for observation wells where "u" value (the argument of the well function) was less than 0.05. Driscoll (1986) indicates that only drawdown data for which the numerical value of "u" is less than 0.05 should be used to compute aquifer parameters using the semi-logarithmic graphical procedure. Values for "u" are inversely related to distance from the pumped well and duration of pumping.

Transmissivity and hydraulic conductivity values determined from analysis of pumping test data are summarized in **Table 4**. In most cases, recovery water level data are believed to be better for analysis because water level data obtained at the pumped well during pumping are subject to errors as a result of variations in pumping rate, by head loss inside the well casing associated with skin effects in the aquifer adjacent to the borehole, and by additional well development during the pumping period. Transmissivity calculated from water level recovery measurements at the pumped well is generally considered to be more representative of aquifer conditions than transmissivity calculated from water level drawdown measurements. Operative transmissivity is also given in **Table 4**, and is defined as the most probable correct value of transmissivity in the vicinity of the site based on analysis of recovery data. Hydraulic conductivity was computed as operative transmissivity divided by saturated thickness of aquifer. Saturated thickness of aquifer is based on lithologic logs and interpretation of thickness of saturated sediments contributing groundwater to the open part of the well. Thickness of sediments consisting of predominately silt and clay were excluded from estimates of aquifer thickness.

Aquifer Test, Site B

A pretest and step-discharge pumping test were conducted at well PC-98R on August 9, 2000, for well development and for determining pumping rates for the constant-discharge test.

The constant-discharge pumping test was conducted August 10, 2000. Average pumping rate for the 29.9-hour test was 52 gallons per minute (gpm). Maximum water level drawdown at the pumped well near the end of the pumping period was 1.73 feet. Specific capacity after pumping 29.9 hours was 30 gallons per minute per foot of drawdown (gpm/ft).

Range of temperature of the water pumped from well PC-98R was 23 to 24°C; at the end of the pumping period, temperature of the water was 23°C. Range of specific conductance measured in the field was 12,300 to 13,500 microSiemens per centimeter (µSm/cm); at the end of the pumping period, specific conductance was 13,050 µSm/cm. Specific conductance is defined as the electrical conductance of a cube of water, 1 centimeter on a side, at 25°C and has units of microSiemens per centimeter. Range of pH of the pumped water was 6.90 to 7.70; at the end of the pumping period, pH was 7.31 **(Table 3)**.

Well PC-98 and piezometer PC-100 were used as observation wells during the pumping test at well PC-98R **(Figure 1)**. Drawdown and recovery graphs for pumped well PC-100R and observation wells are shown on **Figures 5, 6, and 7**.

ANALYSIS FOR PUMPED WELL PC-98R: **Figure 5** is a semi-logarithmic drawdown and recovery graph for pumped well PC-98R. Analysis of the trend of drawdown data at the pumped well using the Cooper-Jacob method indicates transmissivity of about 90,000 gpd/ft. Analysis of the trend of water level recovery data indicates transmissivity of about 60,000 gpd/ft. The Cooper-Jacob and Theis recovery method match lines used to compute transmissivity are shown on **Figure 5**.

ANALYSIS FOR WELL PC-98 AND PIEZOMETER PC-100: During the pumping test at well PC-98R, depth to water was monitored at well PC-98 and piezometer PC-100, located 6 feet and 50 feet from the pumped well **(Table 3; Figures 6 and 7)**. Computation of aquifer parameters for well PC-98 and piezometer PC-100 indicates transmissivity of about 70,000 gpd/ft based on drawdown data and 60,000 gpd/ft based on recovery data. Storativity was computed to be 0.08.

SUMMARY OF PUMPING TEST RESULTS, SITE B: Analysis of pumping test results for **Site B** indicates that computed transmissivities range from 60,000 to

90,000 gpd/ft. Operative transmissivity is judged to be about 60,000 gpd/ft based on data obtained during the recovery period. Based on aquifer thickness of 25 feet, average hydraulic conductivity is estimated to be about 2,400 gpd/ft^2 **(Table 4)**. Computed storativity of 0.08 is considered to be the correct magnitude for specific yield of the aquifer.

Aquifer Test, Site C

A pretest and step-discharge pumping test were conducted at well PC-99R on August 12, 2000, for well development and for determining pumping rates for the constant-discharge test.

The constant-discharge pumping test was conducted August 13, 2000. Average pumping rate for the 36-hour test was 65 gpm. Maximum water level drawdown at the pumped well near the end of the pumping period was 0.94 feet. Specific capacity after pumping 36 hours was 70 gpm/ft.

Temperature of the water pumped from well PC-98R was 23°C during and at the end of the pumping period. Range of specific conductance measured in the field was 7,150 to 7,530 µSm/cm. Range of pH of the pumped water was 7.35 to 7.60; at the end of the pumping period, pH was 7.55 **(Table 3)**.

Well PC-99 and piezometer PC-88 were used as observation wells during the pumping test at well PC-99R **(Figure 1)**. Drawdown and recovery graphs for pumped well PC-100R, well PC-99, and piezometer PC-88 are shown on **Figures 8, 9, and 10**.

ANALYSIS FOR PUMPED WELL PC-99R: **Figure 8** is a semi-logarithmic drawdown and recovery graph for pumped well PC-99R. Analysis of the trend of drawdown data at the pumped well using the Cooper-Jacob method indicates transmissivity of about 130,000 gpd/ft. Analysis of the trend of water level recovery data indicates transmissivity of about 170,000 gpd/ft. The Cooper-Jacob and Theis recovery method match lines used to compute transmissivity are shown on **Figure 8.**

ANALYSIS FOR WELL PC-99 AND PIEZOMETER PC-88: During the pumping test at well PC-99R, depth to water was monitored at well PC-99 and piezometer PC-88, located 4 feet and 43 feet from the pumped well **(Table 3; Figures 9 and 10)**. Computation of aquifer parameters for well PC-99 indicates transmissivity of about 110,000 gpd/ft based on drawdown data and 150,000 gpd/ft based on recovery data **(Figure 9)**. Storativity was computed to be 0.002. Computation of aquifer parameters for well PC-99 indicates transmissivity of about 130,000 gpd/ft based on drawdown data and 160,000 gpd/ft based on recovery data **(Figure 10)**. Storativity could not be computed because of exceedance of "u" criterion.

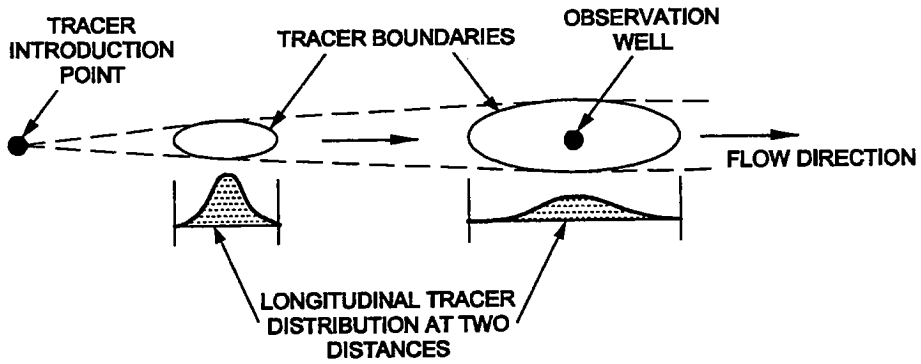
SUMMARY OF PUMPING TEST RESULTS, SITE C: Analysis of pumping test results for **Site C** indicates that computed transmissivities range from 110,000 to 170,000 gpd/ft. Operative transmissivity is judged to be about 160,000 gpd/ft based on data obtained during the recovery period. Based on aquifer thickness of 32 feet, average hydraulic conductivity is estimated to be about 4,600 gpd/ft^2 **(Table 4)**. Due to the short duration of the pumping test and large transmissivity, computed storativity of 0.002 is considered to be smaller than the actual value.

RESULTS OF TRACER TESTS

Rate of groundwater movement was measured at **Sites A, B, and C** using natural gradient and drift and pumpback groundwater tracer test methodologies. Bromide and deionized water were used as tracers. Results are given in **Table 5** and **Figures 11 through 17.**

TRACER TEST METHODS AND RESULTS

Using the dual-well natural gradient method, the direction and gradient of groundwater flow was measured to determine placement of downgradient piezometers. The observation point was located directly downgradient from the well where tracer was introduced. The illustration below shows the estimate of average groundwater velocity is determined as the center of mass of the tracer passes by the observation well. Bedient and others (1999) describe the natural groundwater gradient tracer test in detail.



The single-well drift and pumpback tracer test used to determine groundwater velocity in the vicinity of a well is described by Leap and Kaplan, 1988, and Hall and others, 1991. The test is conducted by introducing tracer solution in a test well. The tracer is allowed to drift under the influence of the natural groundwater gradient and, after sufficient time has passed, the test well is pumped to recover the tracer. Groundwater velocity is computed using Darcy's Law and effective porosity:

$$V = KI/n \qquad (1)$$

where V is average linear groundwater velocity (seepage velocity), K is the horizontal hydraulic conductivity; I is the horizontal hydraulic gradient; and n is effective porosity. For the drift and pumpback test, equation (1) can be rewritten as:

$$V = (Qt/\Pi nb)^{1/2}/d \qquad (2)$$

where Q is pumping rate during tracer recovery, t is time elapsed from the start of pumping until the center of mass of the tracer is recovered, b is aquifer thickness, and d is time elapsed from start of injection of tracer until the center of mass of the tracer is recovered by pumping. Parameter d is equivalent to drift time plus t. Hall and others (1991) rearrange equations (1) and (2) to yield algebraic expressions for two equations and two unknowns, velocity and effective porosity, that can be obtained from test data:

$$V = Qt/\Pi bd^2KI \qquad (3)$$

and

$$n=\Pi bK^2I^2d^2/Qt \qquad (4)$$

Leap and Kaplan (1988) describe equation (2) for confined aquifers, however Hall and others (1991) describe field application with satisfactory results for an unconfined aquifer.

Natural Gradient, Deionized Water Tracer Tests (Sites A, B, and C)

Natural gradient, deionized water tracer tests were conducted at **Sites A, B, and C** during the period September 13 through 15, 2000. Deionized water was delivered to the injection wells via stainless steel tanker truck. Deionized water was supplied from the Kerr-McGee Apex facility. Volume of deionized water injected in the wells ranged from 1,800 gallons at **Site A** to 2,630 gallons at **Site C**. Specific conductance of injected deionized water was on the order of 5 µSm/cm. Vertical profiles of specific conductance were measured at the injection and downgradient piezometers using Campbell Scientific CS547 specific conductance and temperature probe. Data was recorded using Campbell Scientific CR10 dataloggers. Specific conductance prior to and during tracer tests are given in **Table 5** and shown on **Figures 11 through 15**. Data are tabulated in **Appendix D**.

ANALYSIS FOR SITE A: **Figure 11** is a hydrograph of specific conductance of groundwater at piezometer PC-101R during the deionized tracer test at **Site A**. Piezometer PC-101R is 30 feet down horizontal hydraulic gradient from well PC-70. Before introduction of tracer at well PC-70 (time = 0), specific conductance of groundwater ranged from about 10,000 µSm/cm in the lower part of the aquifer to about 10,500 µSm/cm in the upper part of the aquifer.

After tracer was introduced, specific conductance initially increased at all sampled depth intervals; largest increases in specific conductance occurred in the upper part of the aquifer. The increase in specific conductance is believed to result

from mobilization of ions from sediments ahead of the deionized water tracer front. After about 0.25 days, specific conductance decreased at most depth intervals except in the uppermost part of the aquifer. Specific conductance returned to near pretest values after about 1 day in lower parts of the aquifer; in the middle and upper parts of the aquifer decrease in specific conductance occurred after about 1 to 1.2 days. Assuming a symmetrical breakthrough and the lower values of specific conductance representing the center of mass tracer, rate of movement of groundwater is about 30 ft/d in the lower part of the aquifer and about 25 ft/d in the upper part of the aquifer **(Figure 11)**. Because the anomalous mobilization of ions ahead of the deionized water tracer front, results of the tracer test are approximate.

ANALYSIS FOR SITE B: **Figures 12 and 13** are hydrographs of specific conductance of groundwater at piezometer PC-100R during the deionized tracer test at **Site B**. **Figure 12** is a graph of specific conductance versus time from midpoint of injection. **Figure 13** is graph of specific conductance versus depth. Piezometer PC-100R is 50 feet downgradient from well PC-98R. Before introduction of tracer at well PC-98R (time = 0), specific conductance of groundwater ranged from about 13,000 µSm/cm in the lower part of the aquifer to about 13,400 µSm/cm in the upper part of the aquifer.

After tracer was introduced, specific conductance substantially decreased in the middle to lower part of the aquifer, at depths from 25 to 35 feet, after about 0.3 to 0.4 days. Specific conductance in the lower part of the aquifer, at depths below 35 feet, decreased after about 0.6 to 0.8 days. Trends in specific conductance in the upper part of the aquifer, at depths above 25 feet could not be determined. Assuming a symmetrical breakthrough and the lower values of specific conductance representing the center of mass tracer at about 1.1 days, rate of movement of groundwater is about 45 ft/d **(Figures 12 and 13)**. Because COH-RIB facility was filling a nearby RIB during

the tracer test and impacted local groundwater levels **(Figure 3)**, results of the tracer test are judged to be approximate.

ANALYSIS FOR SITE C: **Figures 14 and 15** are hydrographs of specific conductance of groundwater at piezometer PC-102 during the deionized tracer test at **Site C**. **Figure 14** is a graph of specific conductance versus time from midpoint of injection. **Figure 15** is graph of specific conductance versus depth. Piezometer PC-102 is 43 feet downgradient from well PC-99R. Before introduction of tracer at well PC-99R (time = 0), specific conductance of groundwater ranged from about 9,300 µSm/cm in the lower part of the aquifer to about 8,000 µSm/cm in the upper part of the aquifer.

After tracer was introduced, specific conductance decreased in the lower part of the aquifer, at depths below 35 feet, after about 0.2 days. Trends in specific conductance in the middle and upper part of the aquifer, at depths above 35 feet generally increased in conductance. Because of the increase in specific conductance above 35 feet, results above 35 feet are difficult to interpret. At depths below 35 feet, assuming a symmetrical breakthrough and the lower values of specific conductance representing the center of mass tracer at about 0.5 days, rate of movement of groundwater is about 85 ft/d **(Figures 14 and 15)**.

Natural Gradient, Bromide Tracer Test (Site A)

Natural gradient, bromide tracer test was conducted at **Site A** during the period September 16 through 17, 2000. Well PC-70 was used as the injection well and piezometer PC-101R was used as the downgradient observation point. Bromide solution was mixed in a tanker truck using a ratio of 55 pounds of calcium bromide to approximately 2,000 gallons of water. Water used for the bromide

solution was groundwater processed through the reverse osmosis plant at the Kerr-McGee facility. Average bromide injection concentration was 3,600 mg/L. Background concentration of bromide at **Site A** was less than 1 mg/L **(Table 2)**.

Bromide solution was injected into Well PC-70 through a flexible hose inserted into the well. The hose was moved up and down to distribute the bromide solution throughout the well. Average injection flow rate was about 70 gpm. Immediately following the bromide injection, a conductivity probe was inserted in the well and a vertical profile of specific conductance was obtained. The specific conductance profile indicated a relatively uniform distribution of the tracer solution in the well casing.

Sampling of groundwater at PC-101R at depths from 23, 32, and 40 feet were conducted using a peristaltic pump and a micro-purge sampling method. The method minimized disturbance of the natural groundwater gradient that might otherwise occur from purging 3 casing volumes. Bromide samples were analyzed by NEL Laboratories, Las Vegas, Nevada. Tabulation of results of bromide concentration in samples obtained at depths from 23, 32, and 40 feet at piezometer PC-101R and laboratory reports are given in **Appendix D**.

Figure 16 is a hydrograph of bromide concentration breakthrough at the three depth intervals sampled. Assuming symmetrical breakthrough and peak concentration representing the center of mass of the bromide slug, travel time ranges from about 0.9 days for the 40-foot depth interval to about 1.05 days for the 23-foot and 32-foot depth intervals. Rate of groundwater movement is estimated to be about 30 ft/d **(Table 5)**.

Drift and Pumpback, Bromide Tracer Tests (Site C)

A drift and pumpback bromide tracer test was conducted at **Site C**, well PC-99R on September 18, 2000. Bromide solution was mixed in a tanker truck using a ratio of 55 pounds of calcium bromide to approximately 2,000 gallons of water. Water used for the bromide injection slurry was groundwater processed through the reverse osmosis plant at the Kerr-McGee facility. Average bromide injection concentration was 4,200 mg/L. Set-up of pumps and discharge lines for pumpback at well PC-70 was similar to procedures described earlier in the report for aquifer testing.

Bromide solution was injected into Well PC-99R through a flexible hose inserted into the well. The hose was moved up and down to distribute the bromide solution throughout the well. Average injection flow rate was about 120 gpm. Immediately following the bromide injection, a conductivity probe was inserted in the well and a vertical profile of specific conductance was obtained. The specific conductance profile indicated a relatively uniform distribution of the tracer solution in the well casing. Bromide samples were collected from the pump discharge. Sampling frequency ranged from 5 minutes per sample during the first part of the test to 15 minutes per sample during the final part of test. Bromide samples were analyzed by NEL Laboratories, Las Vegas, Nevada. Tabulation of results of bromide concentration in samples obtained during the pumpback are given **Appendix D**.

Figure 17 is a hydrograph of bromide concentration breakthrough during the pumpback. Integrating under the curve, center of mass of the bromide pulse is recovered after about 30 minutes of pumping. Using equation 3 (Page 20) and aquifer parameters derived from hydraulic tests, rate of groundwater movement is estimated to be about 60 ft/d **(Table 5)**. Using equation 4 (Page 20), effective porosity is estimated to be about 10 percent.

ANALYSIS OF RATE OF GROUNDWATER MOVEMENT

Reliable estimates of groundwater velocity and aquifer parameters are critical for determining mass transport in aquifers. For the present work, velocity calculations provide preliminary rates of downgradient mass transport of perchlorate in groundwater. Perchlorate is generally considered a nonreactive ion. Movement of perchlorate is therefore coincident with the average velocity of groundwater.

In addition to rate of groundwater movement estimated from results of tracer tests, Darcy's Law (equation 1, Page 20) provides an estimate for average rate of groundwater movement at **Sites A, B, and C** as well as for the area between **Sites A and C.**

Based on lithologic data obtained from installation of wells in the study area **(Appendix B)**, aquifer test results **(Table 4)**, and the groundwater level contour map **(Figure 2)**, analysis of groundwater velocity was conducted using the following parameters:

	Site A	**Site B**	**Site C**
Transmissivity (gpd/ft)	50,000	60,000	160,000
Aquifer thickness (feet)	30	25	32
Hydraulic Conductivity (gpd/ft^2)	1,700	2,400	5,000
Effective porosity (percent)	10	10	10
Groundwater gradient (ft/ft)	0.0008	0.01	0.01
Groundwater velocity (ft/d)	**20**	**30**	**65**

Using the geometric mean of hydraulic conductivity from **Sites A, B, and C** and average groundwater gradient between **Sites A and C** analysis of groundwater velocity was conducted using the following parameters:

	Sites A, B, and C
Hydraulic Conductivity (gpd/ft^2)	2,700
Effective porosity (percent)	10
Groundwater gradient (ft/ft)	0.01
Groundwater velocity (ft/d)	**35**

Groundwater velocity estimates using Darcy's Law are included in **Table 5.** Results of analysis of rate of groundwater movement using different methods indicate close correlation. Larger rates of groundwater movement are estimated using natural gradient tracer test data due to observation of breakthrough occurring in lower parts of the aquifer faster than upper parts of the aquifer. Faster break-through in lower parts of the aquifer correlates to lithologic descriptions that indicate lower parts of the aquifer comprise coarser grained sediments through which groundwater would flow faster.

Using Darcy's Law to compute average rate of groundwater movement may provide a lower limit for groundwater velocity between Pittman Lateral and the seep south from Las Vegas wash. Using Darcy's Law and average values for aquifer parameters and groundwater gradient, minimum rate of groundwater of movement between **Site A and Site C** is estimated to be 35 ft/d. Based on distance between **Site A and Site C** of about 5,700 feet, average residence time of groundwater between **Site A and Site C** is estimated to be about 170 days or about 6 months.

REFERENCES

Bedient, P.B., Rife, H.S., and Newell, C.J., 1999, **Ground Water Contamination Transport and Remediation:** Second Edition, Prentice Hall PTR, Upper Saddle River, NJ, 604 p.

Cooper, H.H., Jr., and Jacob, C.E., 1946, **A generalized graphical method for evaluating formation constants and summarizing well-field history:** American Geophysical Union Transactions, vol. 27, no. IV, pp. 526-534.

Driscoll, F.G., 1986, **Groundwater and wells (2nd edition),** Johnson Division, St. Paul, Minnesota, 1,089 p.

Hall, S.H., Luttrell, S.P., Cronin, W.E., 1991, **A method for estimating effective porosity and ground-water velocity:** Ground Water, vol. 29, no. 2, March-April 1991.

Kerr-McGee, 1998, **Preliminary Report on a Hydrogeologic Investigation of Channel-Fill Alluvium at the Pittman Lateral, Henderson Nevada:** prepared by Steven R. Lower, Hydrology Services Group, October 19, 1998.

Leap, D.I., Kaplan, P.G., 1988, **A single-well tracing method for estimating regional advective velocity in a confined aquifer: theory and preliminary laboratory verification:** Water Resources Research, vol. 23, no. 7, pp. 993-998

Nevada Department of Environmental Protection, 2000, **Authorization to conduct tracer test(s) at the Kerr-McGee Facility, Henderson, Nevada, UIC Permit UNEV94218:** letter from Russ Land, NDEP, to Susan Crowley, Kerr-McGee Chemical LLC, July 21, 2000.

Theis, C.V., 1935, **The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage:** American Geophysical Union Transaction, vol. 16, pp. 519-524.

TABLE 1. SUMMARY OF CONSTRUCTION DETAILS FOR WELLS AND PIEZOMETERS COMPLETED FOR TRACER AND HYDRAULIC TESTING CONDUCTED BETWEEN PITTMAN LATERAL AND SEEP AREA, HENDERSON, NEVADA

WELL IDENTIFIER	PIEZOMETER IDENTIFIER	DATE COMPLETED	ALTITUDE OF TOP OF CASING (feet, msl)[a]	.....BOREHOLE..... BOREHOLE DIAMETER (inches)	BOREHOLE DEPTH (feet)	.....CASING..... CASING DIAMETER (inches)	CASING DEPTH (feet)	PERFORATED INTERVAL (feet)
SITE A								
PC-70		12Sep1998	1,617.90	12	50.5	6	50.5	18.5 – 48.5
	PC-101	18May2000	1,618.09	8	52	2	50	14.5 – 49.5
	PC-101R	16Aug2000	1,618.09	10	51.5	2	50.5	20 – 50
SITE B								
PC-98		17May2000	1,593.41	10.5	45	4	33.5	13 – 33
PC-98R		08Aug2000	1,593.41	10	41.5	4	40.5	20 – 35
	PC-100	18May2000	1,592.83	8	40	2	39	8.5 – 38.5
	PC-100R	16Aug2000	1,592.83	10	41.5	2	40.5	15 – 40
SITE C								
PC-99		17May2000	1,551.97	10.5	51	4	47.5	1.5 – 47
PC-99R		08Aug2000	1,551.97	10	54	4	53	8.5 – 48.5
	PC-88	11May2000	1,551.01	8	62	2	50.5	40 – 50
	PC-89	12May2000	1,551.10	8	39	2	35	24.5 – 34.5
	PC-90	12May2000	1,550.46	8	17	2	15	4.5 – 14.5
	PC-102	17Aug2000	1,551.01	10	50	2	48.5	8 – 48

[a] feet, msl = feet above mean sea level; replacement well or piezometer altitudes assumed to be equivalent to original well or piezometer

TABLE 2. SUMMARY OF LABORATORY CHEMICAL RESULTS FOR COMMON CONSTITUENTS AND ROUTINE PARAMETERS FOR WATER SAMPLES OBTAINED BETWEEN PITTMAN LATERAL AND SEEP AREA KERR–McGEE CHEMICAL LLC, HENDERSON, NEVADA

SAMPLE SOURCE	SAMPLE IDENTIFIER		DATE SAMPLED	COMMON CONSTITUENTS[a] (milligrams per liter)												ROUTINE PARAMETERS				
	FIELD	LAB		Ca	Mg	Na	K	HCO_3	Cl	SO_4	NO_3	F	Br	B	Alk	TDS	TEMP[b]	ELECTRICAL CONDUCTANCE (µmho/cm)[c] FIELD	ELECTRICAL CONDUCTANCE (µmho/cm)[c] LAB	pH FIELD	pH LAB
SEEP SUMP	SEEP SUMP	0004161-01A	11Apr2000	390	170	1,300	54	244	2,700	2,000	5.5	1.6	<1.0	2.8	200	5,900	22.8	7,835	7,300	6.87	7.3
RIB POND	RIB POND	0004161-03A	11Apr2000	120	64	410	54	171	510	600	<20.0	0.37	<1.0	0.92	140	1,800	24.1	2,765	2,800	6.84	9.6
PC-70	PC-70	0004161-02A	11Apr2000	670	310	1,600	50	171	1,700	1,600	22	1.3	1.7	5.3	140	8,600	25.0	11,020	9,600	6.85	7.1

NOTE: All samples were analyzed by Turner Laboratories, Incorporated, Tucson, Arizona. Bromide analyses were conducted by NEL Laboratories, Las Vegas, Neveda.

[a] Ca = Calcium
Mg = Magnesium
Na = Sodium
K = Potassium
HCO_3 = Bicarbonate (as HCO_3)
Cl = Chloride
SO_4 = Sulfate
NO_3 = Nitrate (as N)
F = Fluoride
Br = Bromide
B = Boron
Alk = Alkalinity (as $CaCO_3$)

TDS = Total dissolved solids

[b] Temp = Temperature (degrees Celsius)

[c] µmho/cm = Micromhos per centimeter

TABLE 3. SUMMARY OF HYDROLOGIC DATA FROM CONSTANT-DISCHARGE PUMPING TESTS CONDUCTED AT SITES B AND C, PITTMAN LATERAL AND SEEP AREA HENDERSON, NEVADA

PUMPED WELL IDENTIFIER	OBSERVATION WELL / PIEZOMETER IDENTIFIER	DISTANCE FROM PUMPED WELL (feet)	DATE PUMPING TEST STARTED	DURATION OF PUMPING PERIOD (hours)	AVERAGE PUMPING RATE (gpm)[a]	PRE-PUMPING WATER LEVEL (feet, bmp)[b]	PRE-PUMPING WATER LEVEL (feet, msl)[c]	.....FIELD PARAMETERS..... TEMPERATURE OF PUMPED WATER (°C)[d]	SPECIFIC ELECTRICAL CONDUCTANCE (µSm/cm)[e]	pH OF PUMPED WATER
SITE B										
PC-98R			10Aug2000	29.9	52	15.45	1,577.96	23	13,050	7.31
	PC-98	6				19.95	1,573.46			
	PC-100	30				15.61	1,577.22			
SITE C										
PC-99R			13Aug2000	36	65	2.19	1,549.78	23	7,530	7.55
	PC-99	4				1.73	1,550.24			
	PC-88	43				1.09	1,549.92			
	PC-89	50				1.03	1,550.07			
	PC-90	60				1.88	1,548.58			

[a] gpm = gallons per minute

[b] feet, bmp = feet above mean sea level

[c] feet, msl = feet below measuring point

[d] °C = degrees Celsius

[e] µSm/cm = microSiemens per centimeter

TABLE 4. SUMMARY OF AQUIFER COEFFICIENTS FROM CONSTANT-DISCHARGE PUMPING TESTS CONDUCTED AT SITES B AND C, PITTMAN LATERAL AND SEEP AREA HENDERSON, NEVADA

PUMPED WELL IDENTIFIER	OBSERVATION WELL IDENTIFIER	COOPER-JACOB SEMI-LOGARITHMIC GRAPHICAL METHOD TRANSMISSIVITY (gpd/ft)[a]	COOPER-JACOB SEMI-LOGARITHMIC GRAPHICAL METHOD STORAGE COEFFICIENT[b]	THEIS SEMI-LOGARITHMIC RECOVERY GRAPHICAL METHOD TRANSMISSIVITY (gpd/ft)	OPERATIVE TRANSMISSIVITY (gpd/ft)	AVERAGE HYDRAULIC CONDUCTIVITY[c] (gpd/ft^2)[d]
SITE B						
PC-98R		90,000	---	55,000	55,000	2,200
	C-98	70,000	0.08	55,000		
	C-101	70,000	0.08	55,000		
SITE C						
PC-98R		130,000	---	170,000	160,000	4,600
	C-98	110,000	0.002	150,000		
	C-101	130,000	---	160,000		

[a] gpd/ft = gallons per day per foot width of aquifer at 1:1 hydraulic gradient

[b] Dimensionless: volume of water released from storage per unit surface area of aquifer, per unit decrease in head.

[c] Computed as the operative transmissivity divided by the effective saturated thickness.

[d] gpd/ft^2= gallons per day per square foot of aquifer at 1:1 hydraulic gradient

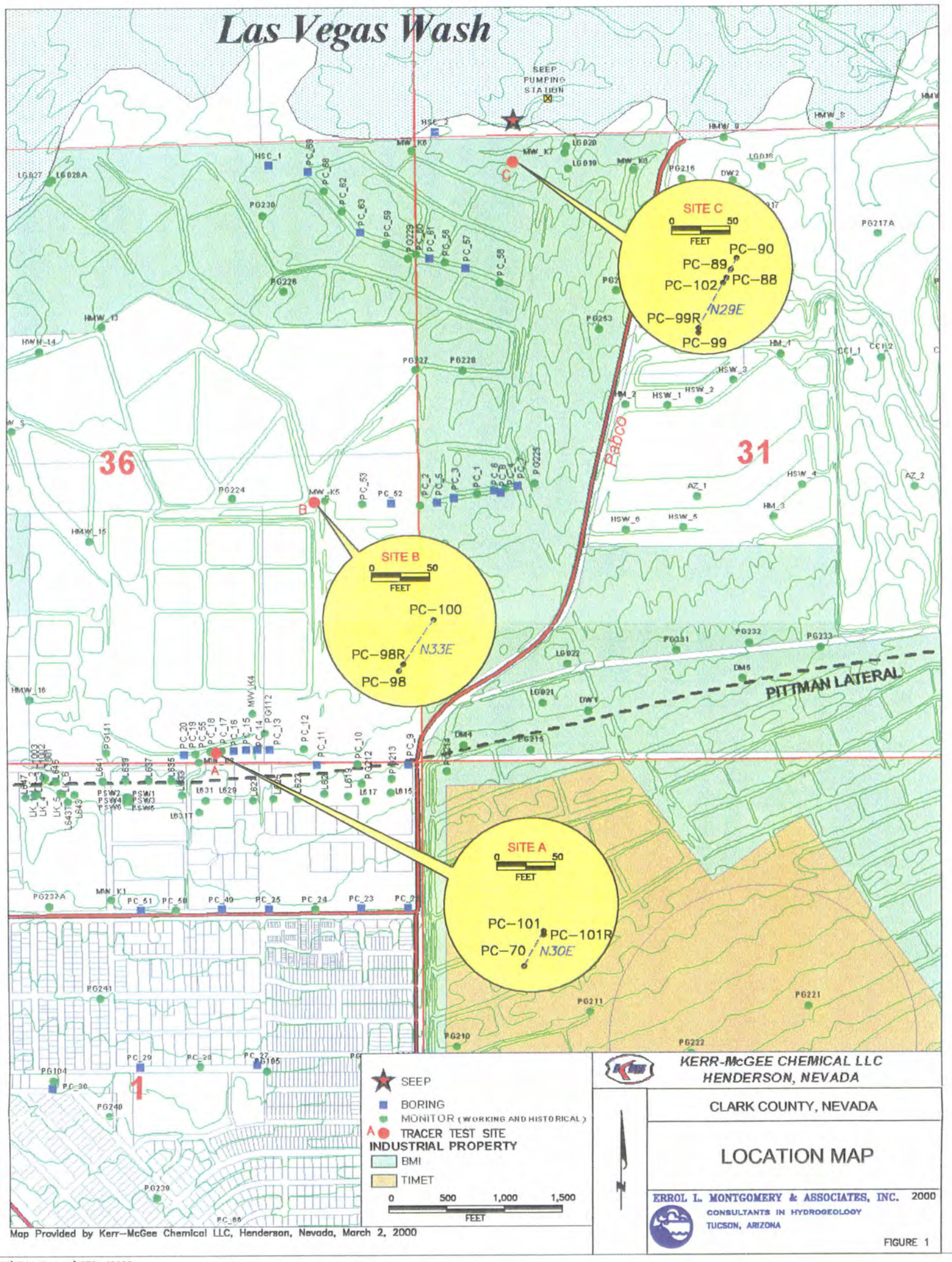
--- = Reliable value could not be determined

TABLE 5. SUMMARY OF ANALYSIS OF RATE OF GROUNDWATER MOVEMENT BASED ON RESULTS OF HYDRAULIC AND TRACER TESTS CONDUCTED AT SITES A, B, AND C PITTMAN LATERAL AND SEEP AREA HENDERSON, NEVADA

	NATURAL GRADIENT DEIONIZED WATER TRACER TESTS (ft/d)[a]	NATURAL GRADIENT BROMIDE TRACER TEST (ft/d)	DRIFT AND PUMPBACK BROMIDE TRACER TEST (ft/d)	NATURAL GRADIENT DARCY'S LAW (ft/d)
SITE A	25 – 30	30	---	20
SITE B	45	---	---	30
SITE C	85	---	60	60

[a] ft/d = feet per day

--- = Test not conducted



Map Provided by Kerr–McGee Chemical LLC, Henderson, Nevada, March 2, 2000

448.01\FIG1–locmap\27Sept2000

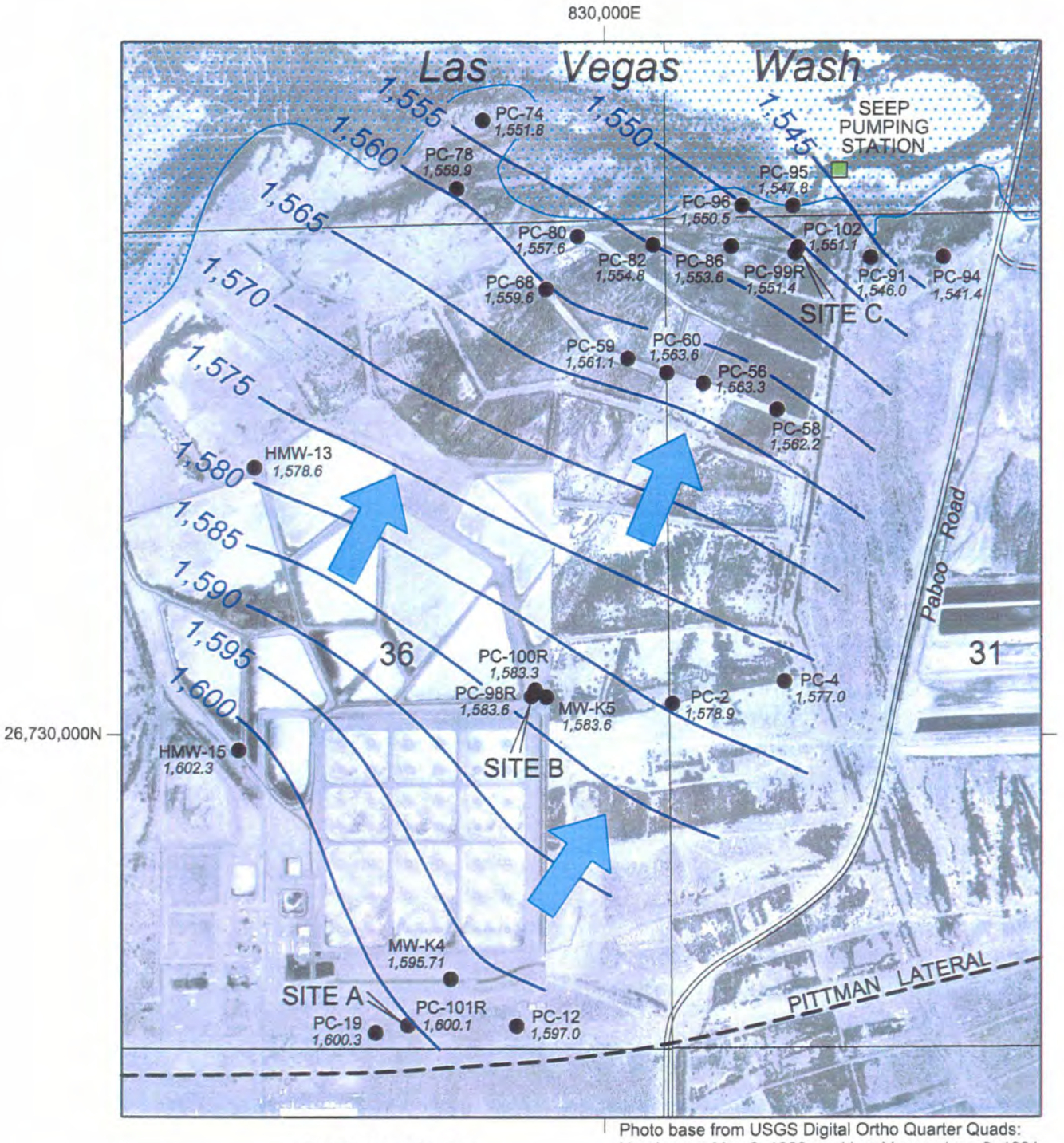


Photo base from USGS Digital Ortho Quarter Quads: Henderson, May 2, 1990, and Las Vegas, June 3, 1994.

EXPLANATION

PC-2 1,578.9 — MONITOR WELL OR PIEZOMETER LOCATION
WATER LEVEL, altitude in feet above land surface

— 1,575 — WATER LEVEL ALTITUDE CONTOUR FOR ALLUVIAL DEPOSITS AQUIFER, in feet above mean sea level, September 18-20, 2000

DIRECTION OF GROUNDWATER MOVEMENT

0 500 1,000 1,500
FEET

FIGURE 2. WATER LEVEL CONTOURS FOR PITTMAN LATERAL AND SEEP AREA, HENDERSON, NEVADA

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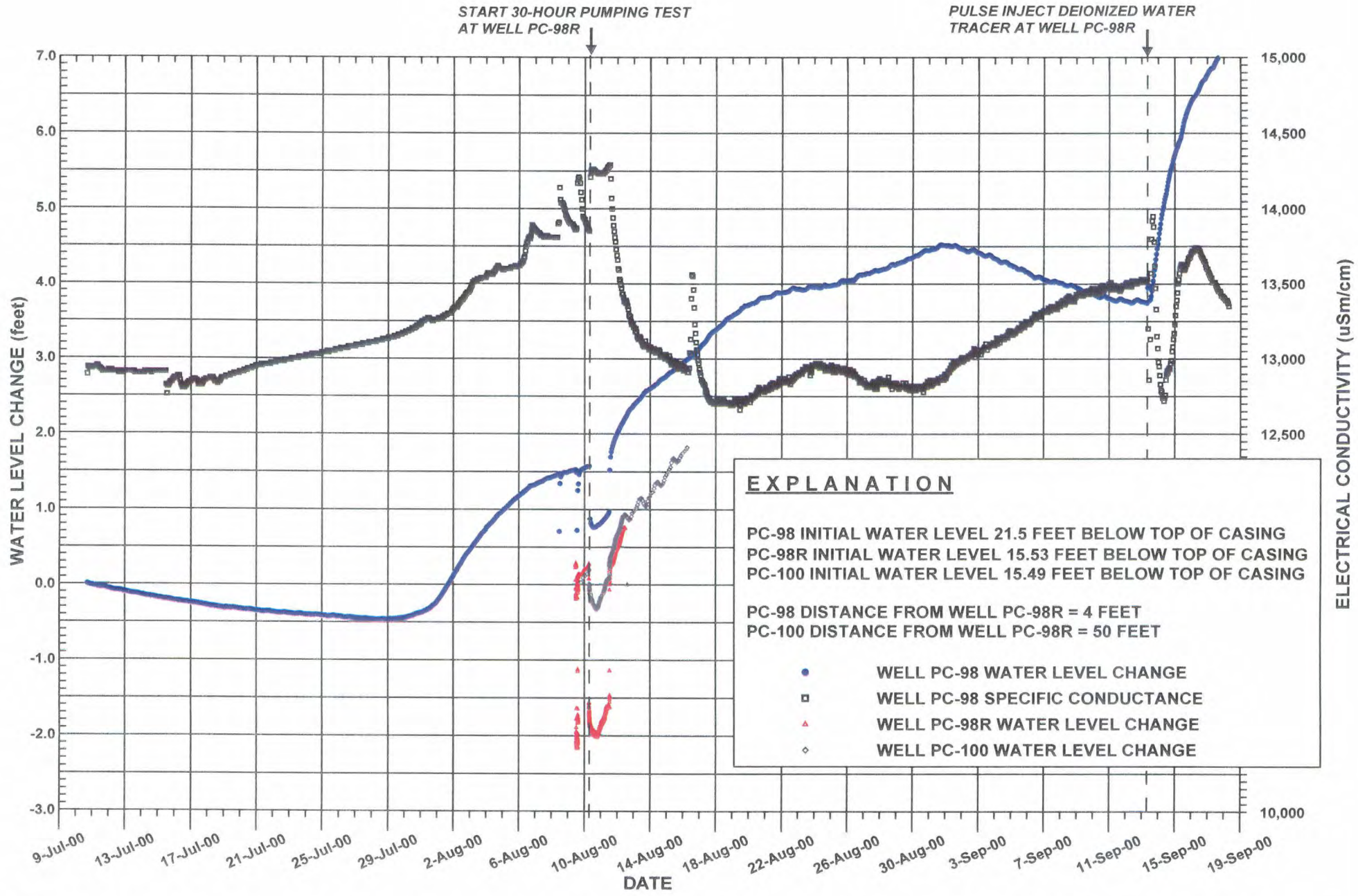

FIGURE 3. BASELINE HYDROGRAPH OF WATER LEVEL AND SPECIFIC CONDUCTANCE HYDROGRAPH FOR WELL PC-98, WATER LEVEL FOR WELL PC-98R, AND WATER LEVEL FOR PIEZOMETER PC-100, SITE B

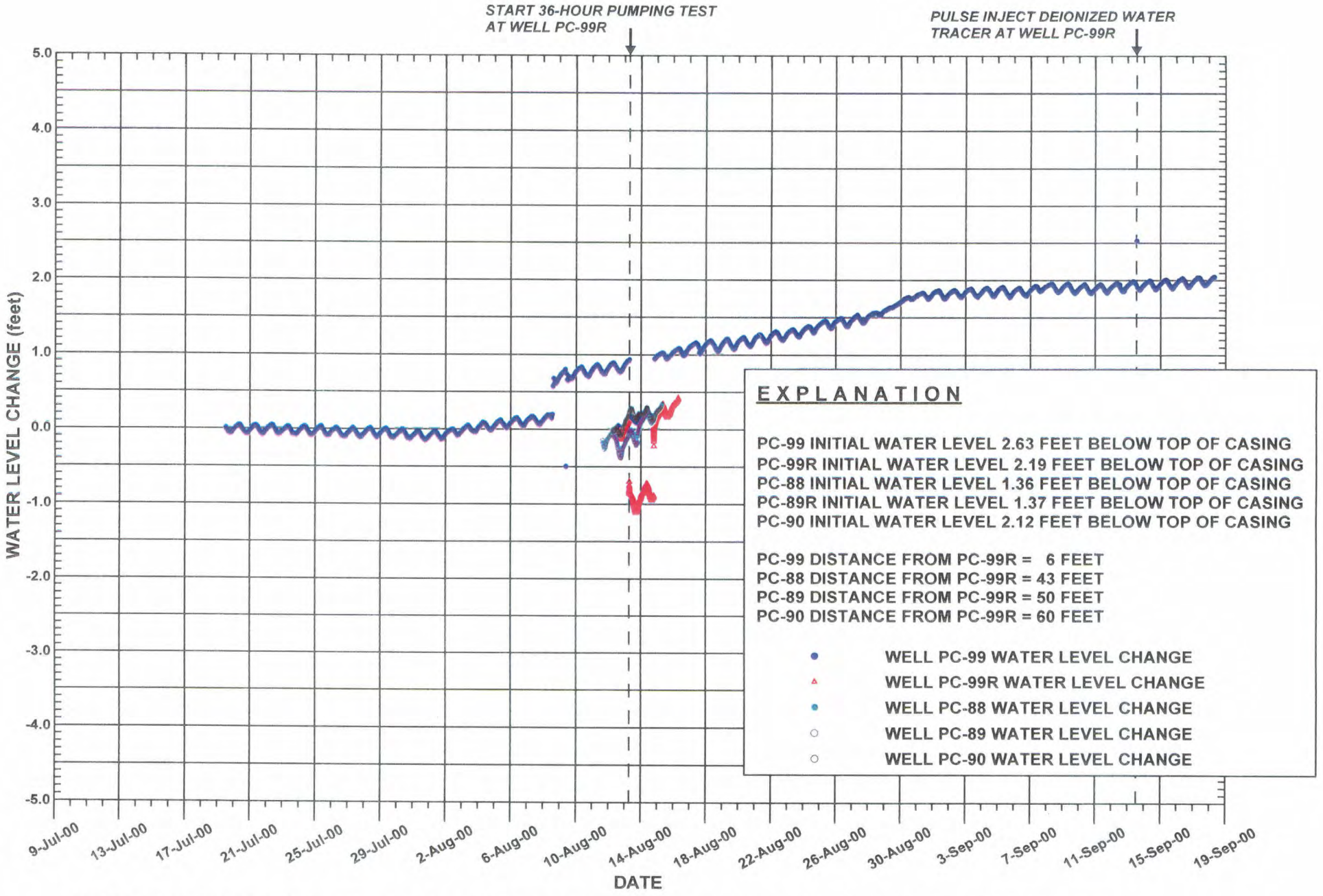

FIGURE 4. BASELINE HYDROGRAPH OF WATER LEVEL FOR WELLS PC-99 AND PC-99R, AND PIEZOMETERS PC-88, PC-89, AND PC-90, SITE C

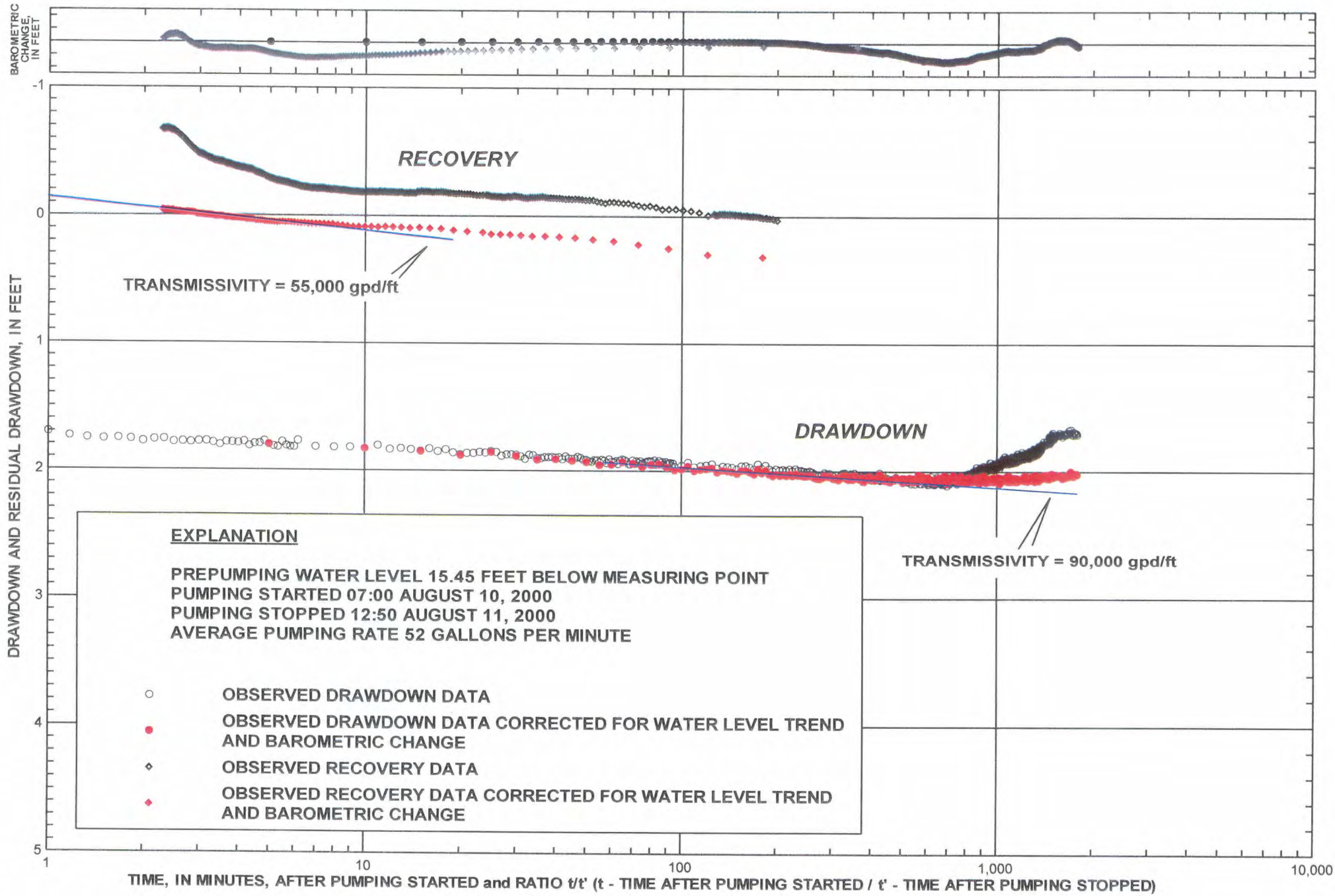

FIGURE 5. DRAWDOWN AND RECOVERY GRAPH FOR PUMPED WELL PC-98R DURING CONSTANT-DISCHARGE PUMPING TEST (SITE B)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

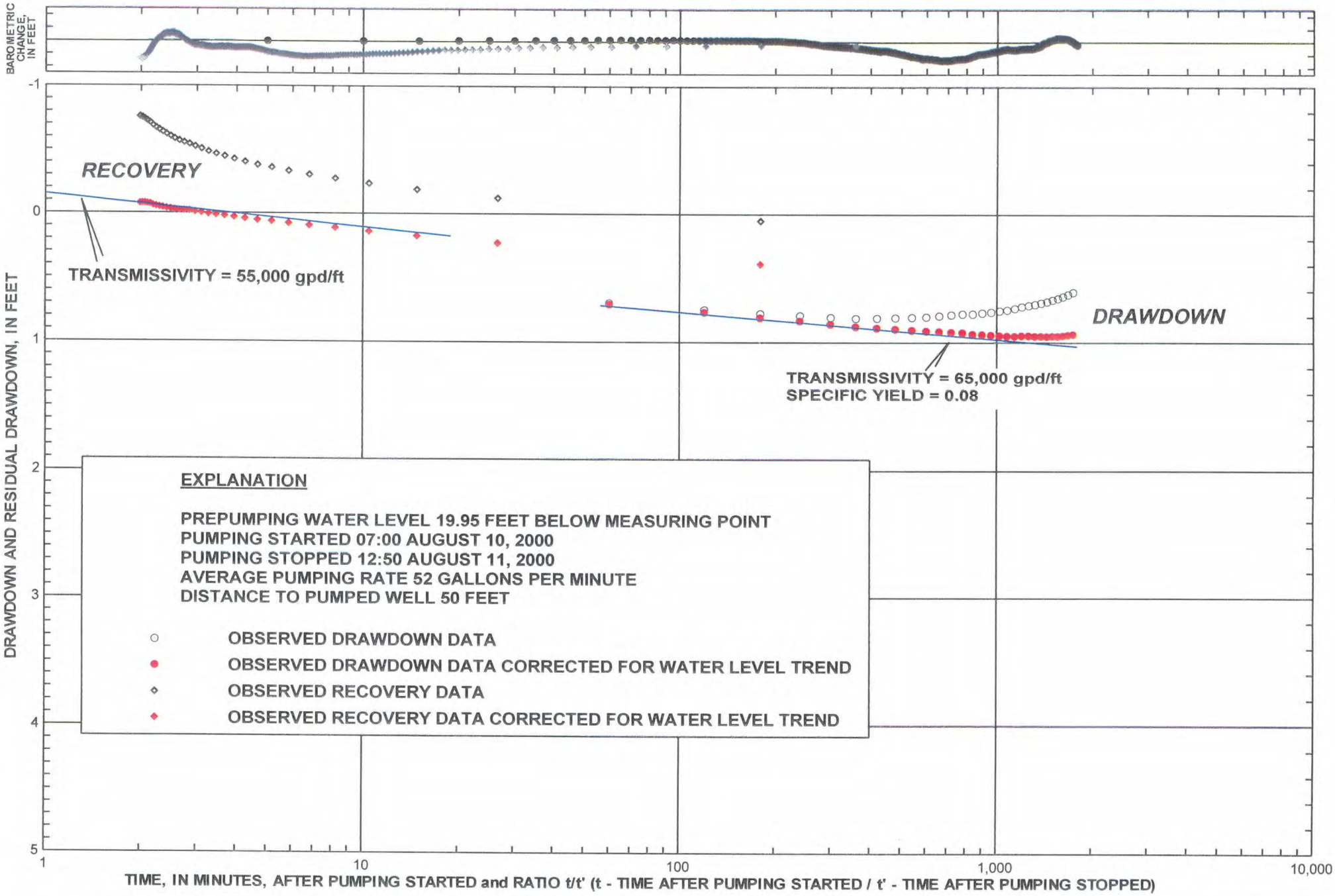

FIGURE 6. DRAWDOWN AND RECOVERY GRAPH FOR OBSERVATION WELL PC-98 DURING CONSTANT-DISCHARGE PUMPING TEST AT WELL PC-98R (SITE B)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

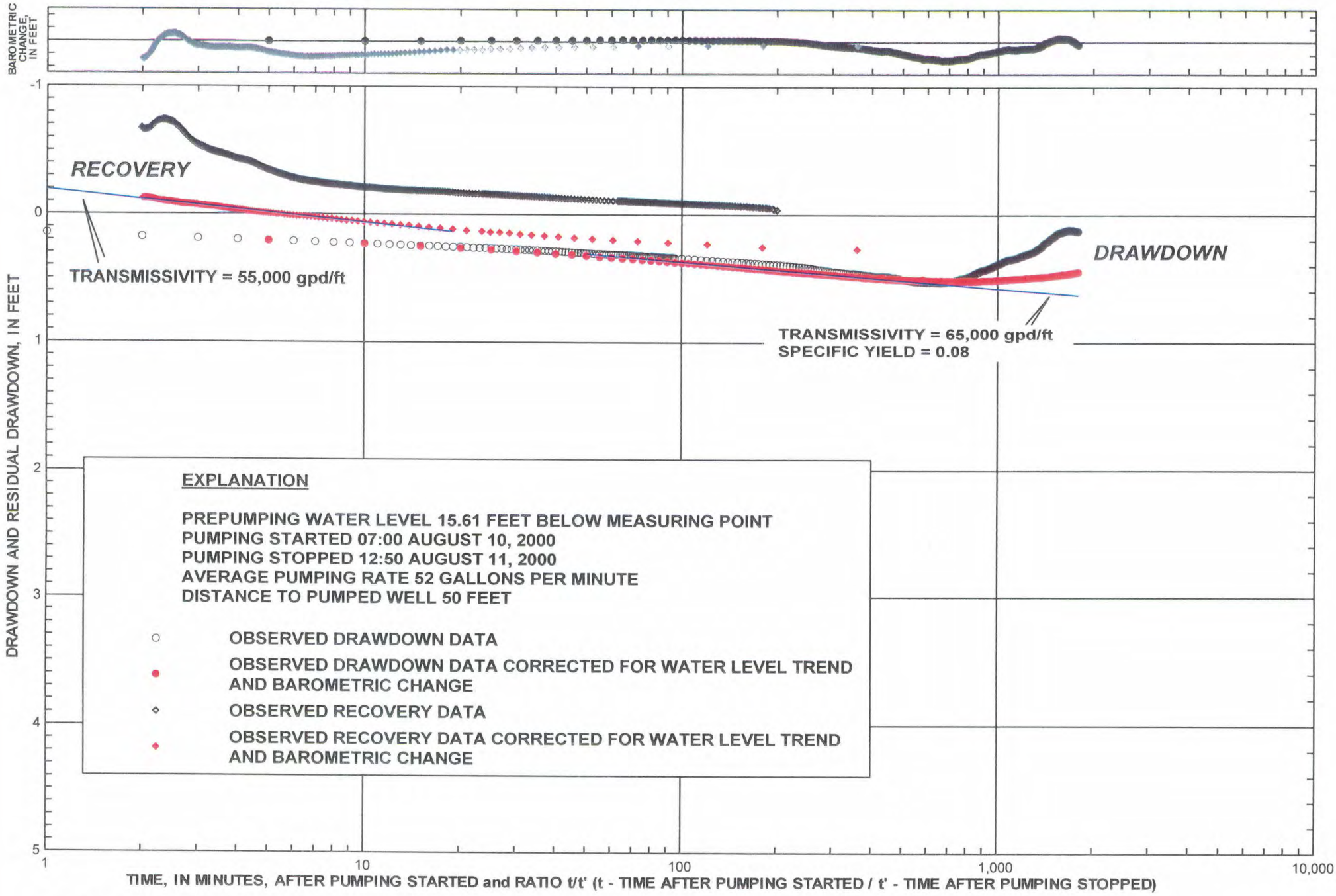

FIGURE 7. DRAWDOWN AND RECOVERY GRAPH FOR PIEZOMETER PC-100 DURING CONSTANT-RATE PUMPING TEST AT WELL PC-98R (SITE B)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

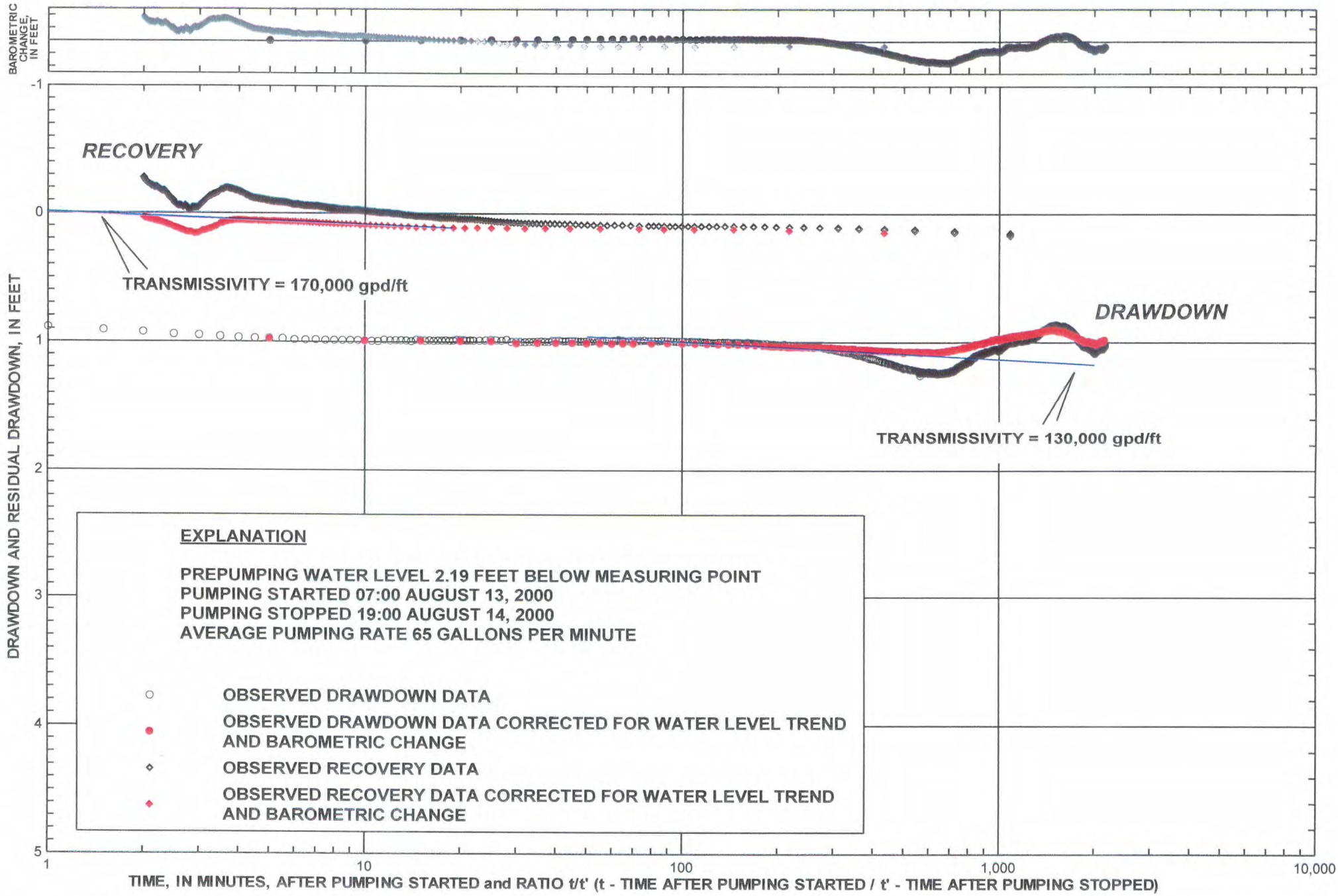

FIGURE 8. DRAWDOWN AND RECOVERY GRAPH FOR PUMPED WELL PC-99R DURING CONSTANT-DISCHARGE PUMPING TEST (SITE C)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

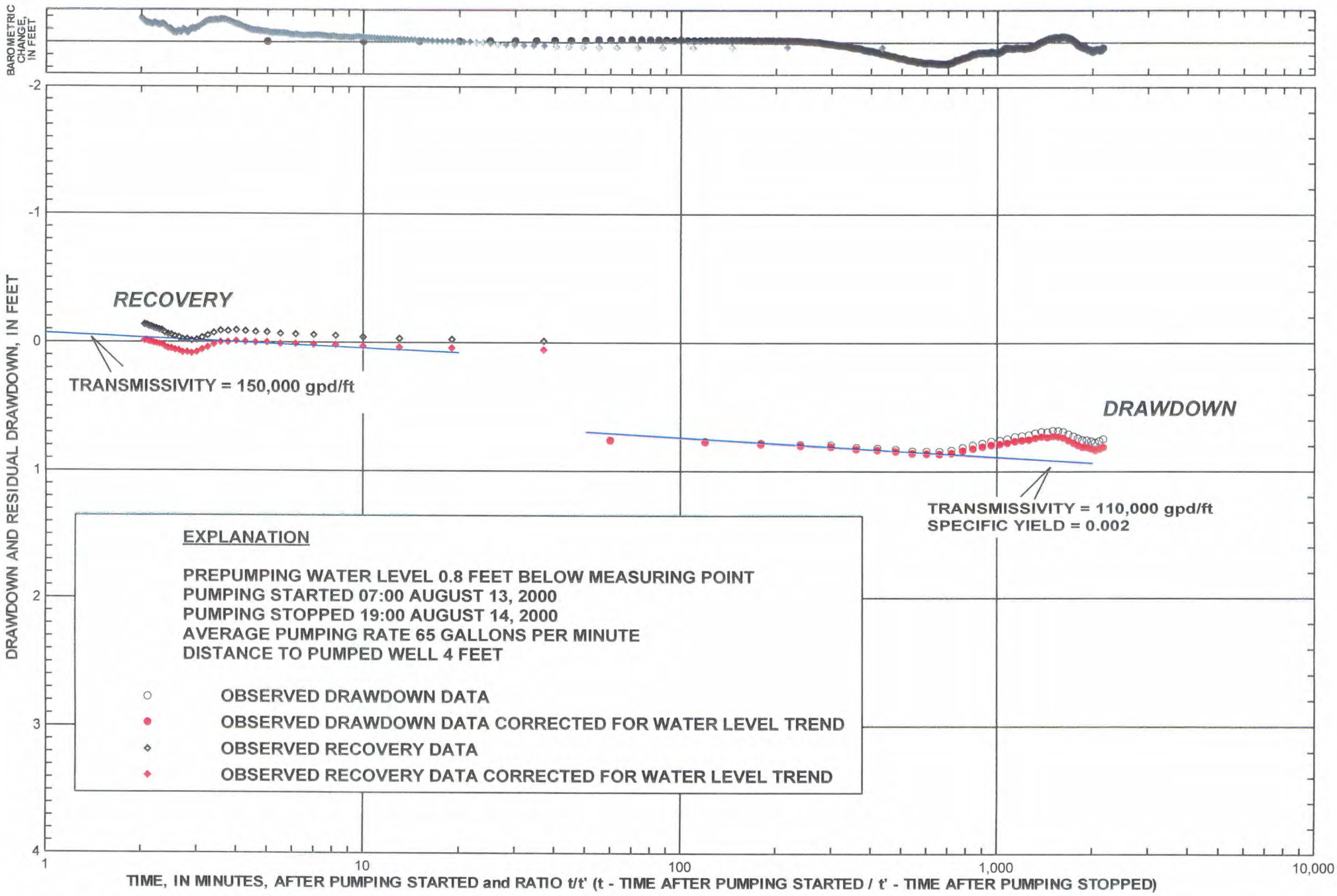

FIGURE 9. DRAWDOWN AND RECOVERY GRAPH FOR OBSERVATION WELL PC-99 DURING CONSTANT-DISCHARGE PUMPING TEST AT WELL PC-99R (SITE C)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

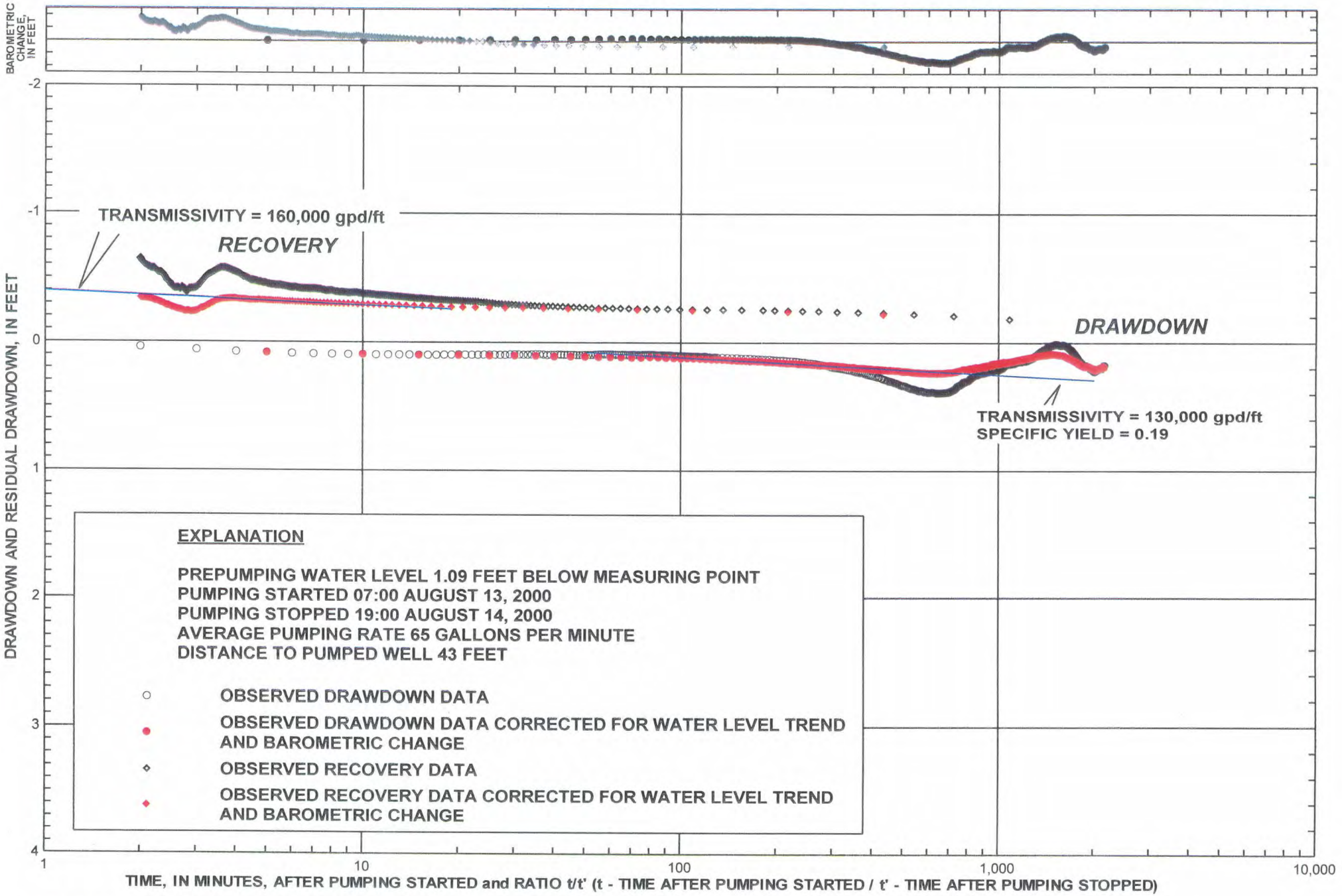

FIGURE 10. DRAWDOWN AND RECOVERY GRAPH FOR PIEZOMETER PC-88 DURING CONSTANT-DISCHARGE PUMPING TEST AT WELL PC-99R (SITE C)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

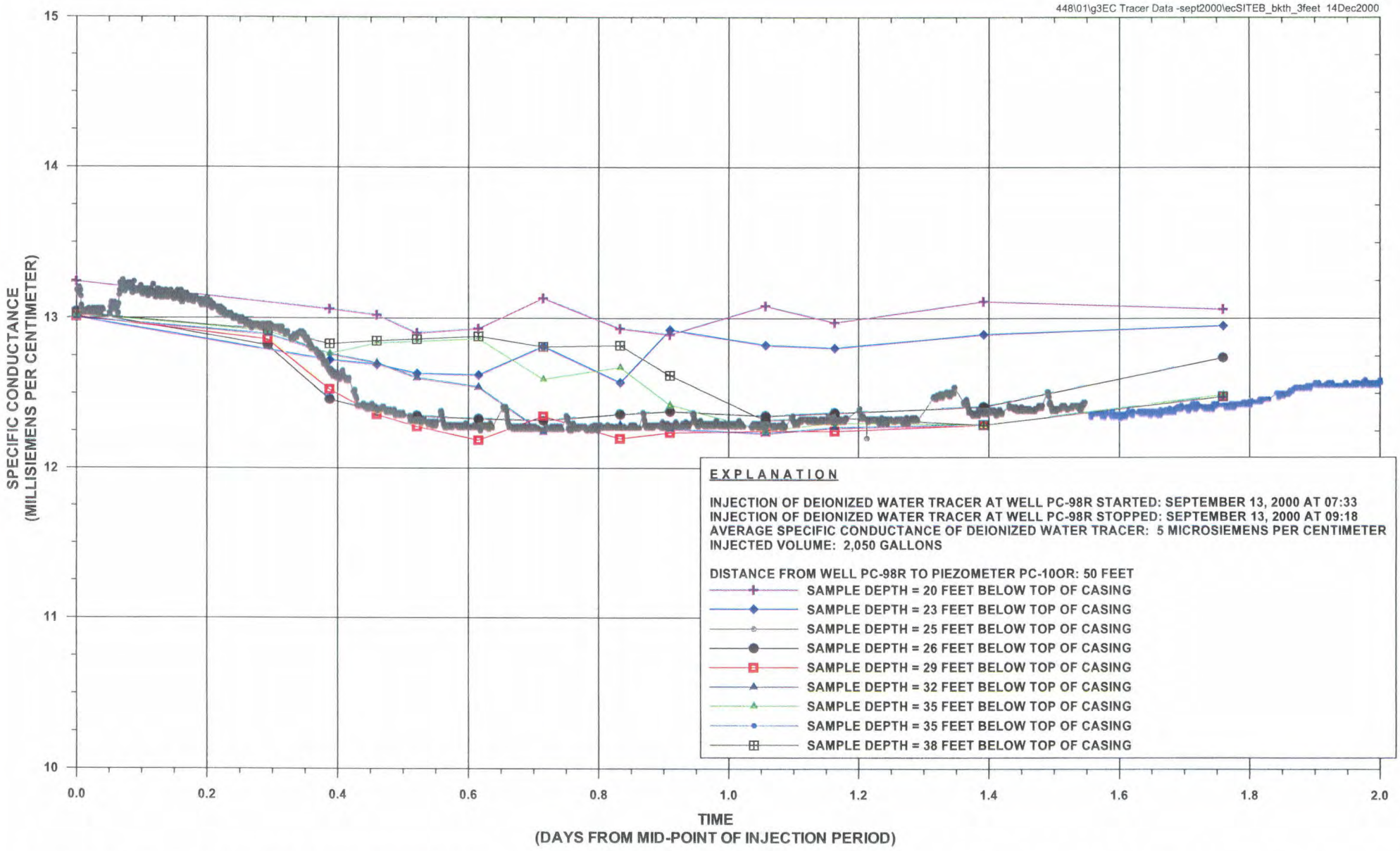

FIGURE 12. HYDROGRAPH OF SPECIFIC CONDUCTANCE OF GROUNDWATER AT PIEZOMETER PC-100R, SITE B DURING DEIONIZED WATER TRACER TEST

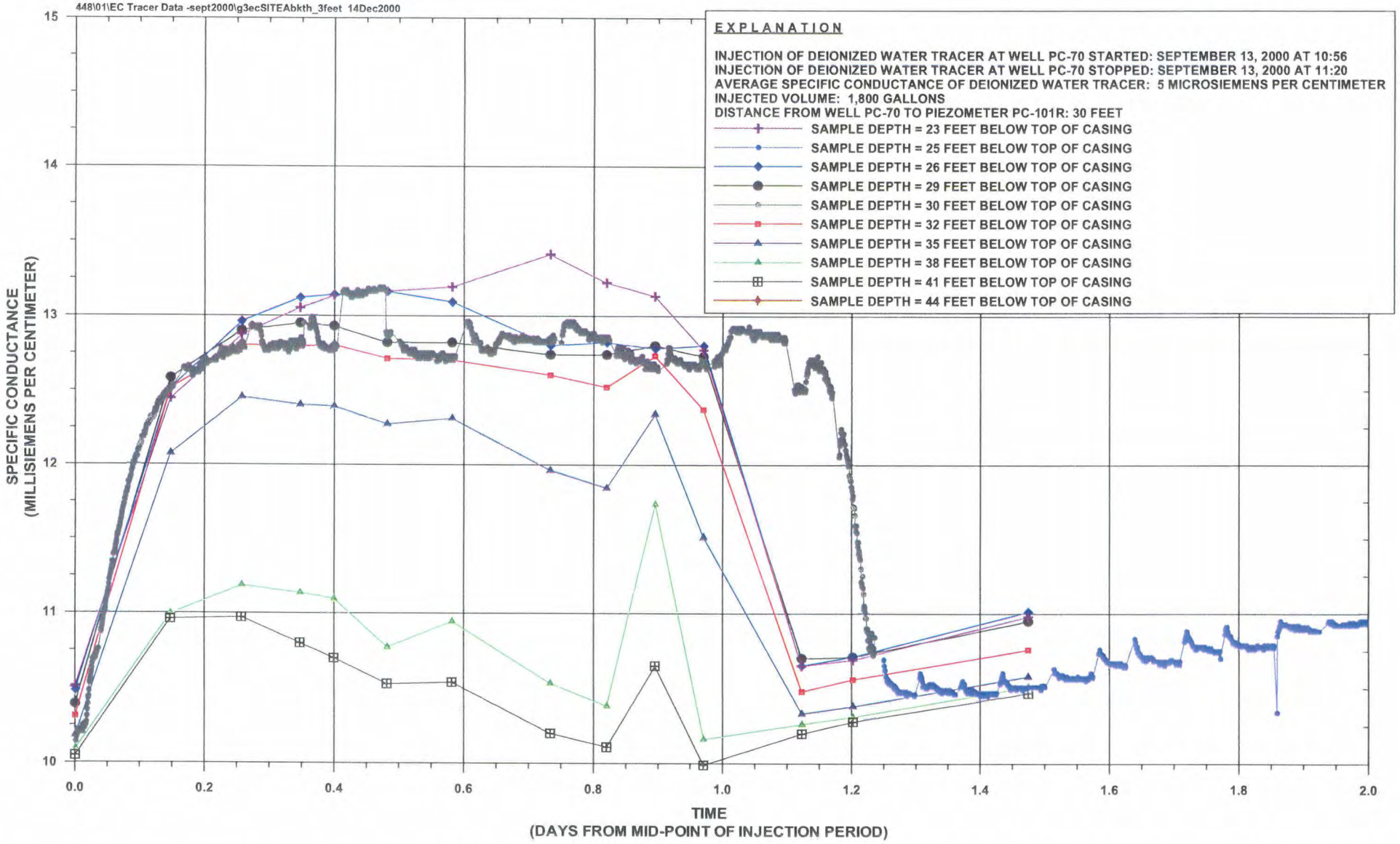

FIGURE 11. HYDROGRAPH OF SPECIFIC CONDUCTANCE OF GROUNDWATER AT PIEZOMETER PC-101R, SITE A DURING DEIONIZED WATER TRACER TEST

ERROL L. MONTGOMERY & ASSOCIATES, INC.

EXPLANATION

INJECTION OF DEIONIZED WATER TRACER AT WELL PC-98R STARTED: SEPTEMBER 13, 2000 AT 07:33
INJECTION OF DEIONIZED WATER TRACER AT WELL PC-98R STOPPED: SEPTEMBER 13, 2000 AT 09:18
AVERAGE SPECIFIC CONDUCTANCE OF DEIONIZED WATER TRACER: 5 MICROSIEMENS PER CENTIMETER
INJECTED VOLUME: 2,050 GALLONS
DISTANCE FROM WELL PC-98R TO PIEZOMETER PC-100R: 50 FEET

- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.29
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.39
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.52
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.62
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.71
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.91
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 1.1
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 1.4
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 1.76

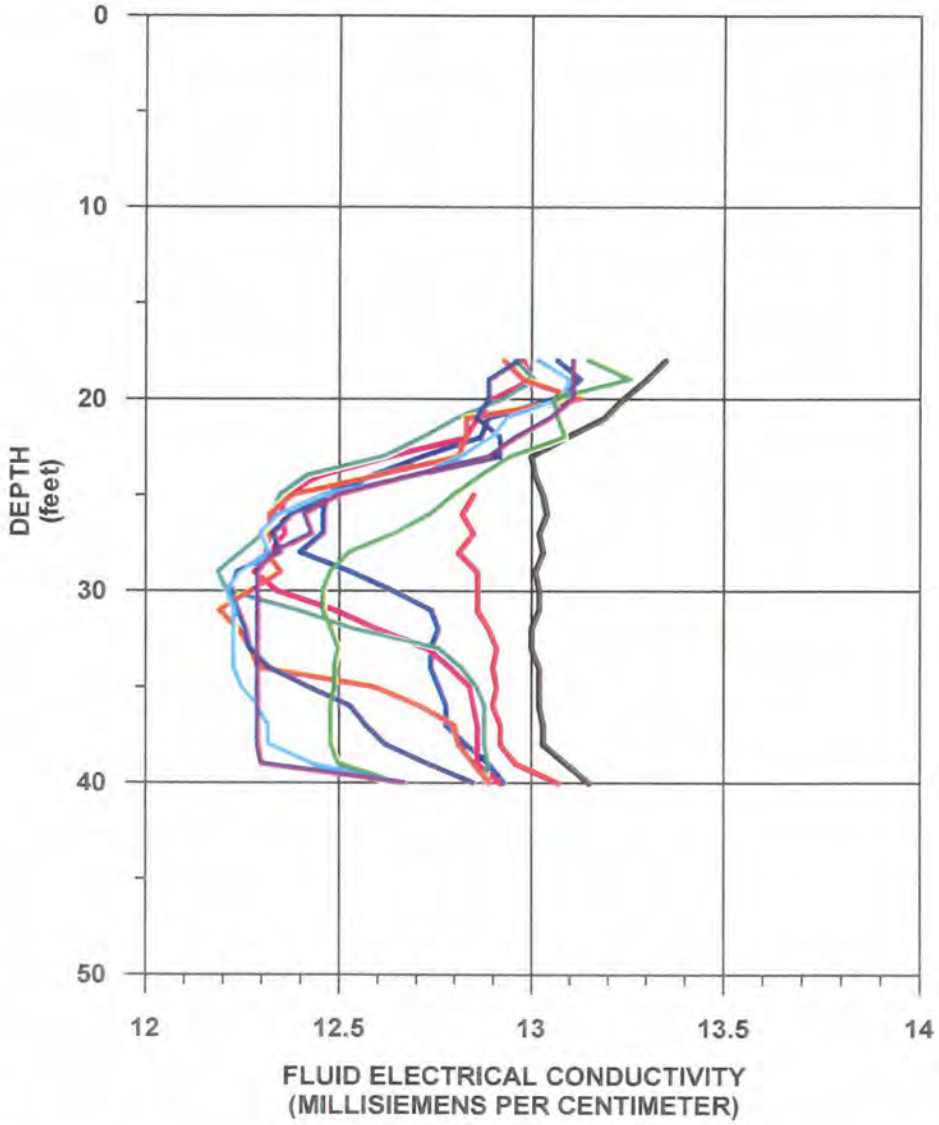

FIGURE 13. SPECIFIC CONDUCTANCE OF GROUNDWATER VERSUS DEPTH AT PIEZOMETER PC-100R, SITE B DURING DEIONIZED WATER TRACER TEST

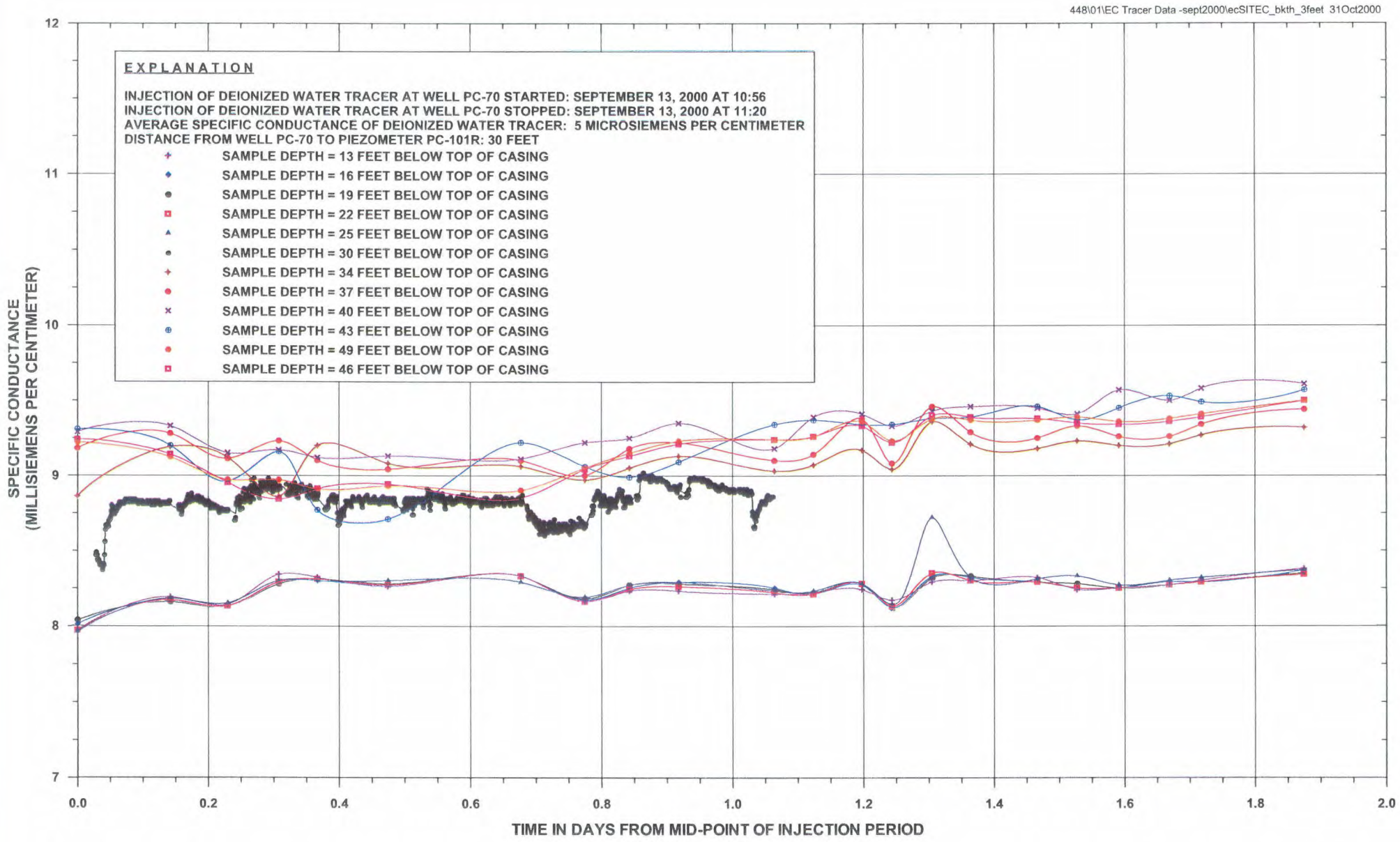

FIGURE 14. HYDROGRAPH OF SPECIFIC CONDUCTANCE OF GROUNDWATER AT PIEZOMETER PC-102, SITE C DURING DEIONIZED WATER TRACER TEST

EXPLANATION

INJECTION OF DEIONIZED WATER TRACER AT WELL PC-99R STARTED: SEPTEMBER 13, 2000 AT 12:45
INJECTION OF DEIONIZED WATER TRACER AT WELL PC-99R STOPPED: SEPTEMBER 13, 2000 AT 13:27
AVERAGE SPECIFIC CONDUCTANCE OF DEIONIZED WATER TRACER: 5 MICROSIEMENS PER CENTIMETER
INJECTED VOLUME: 2,630 GALLONS
DISTANCE FROM WELL PC-99R TO PIEZOMETER PC-102: 43 FEET

- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.14
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.23
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.31
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.48
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.68
- DAYS AFTER MIDPOINT OF INJECTION SLUG = 0.92

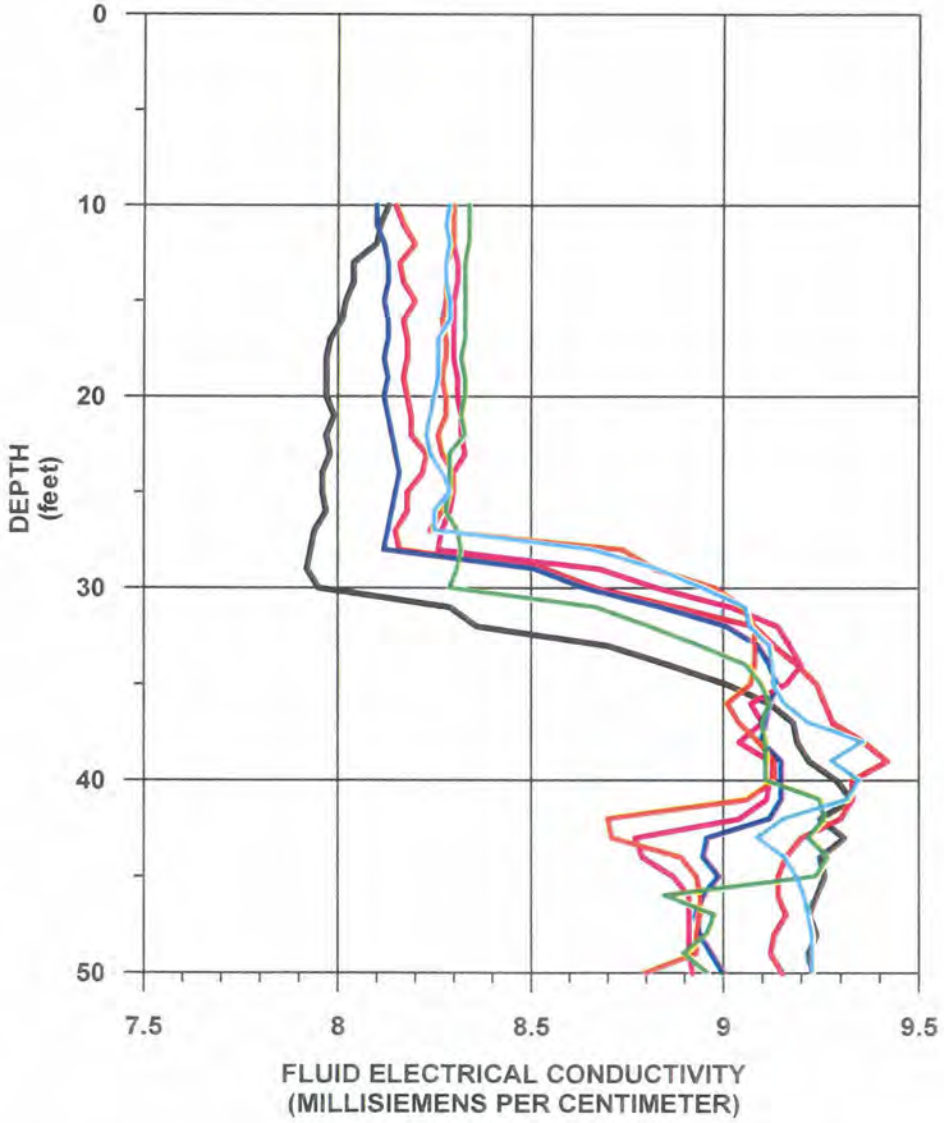

FIGURE 15. SPECIFIC CONDUCTANCE OF GROUNDWATER VERSUS DEPTH AT PIEZOMETER PC-102, SITE C DURING DEIONIZED WATER TRACER TEST

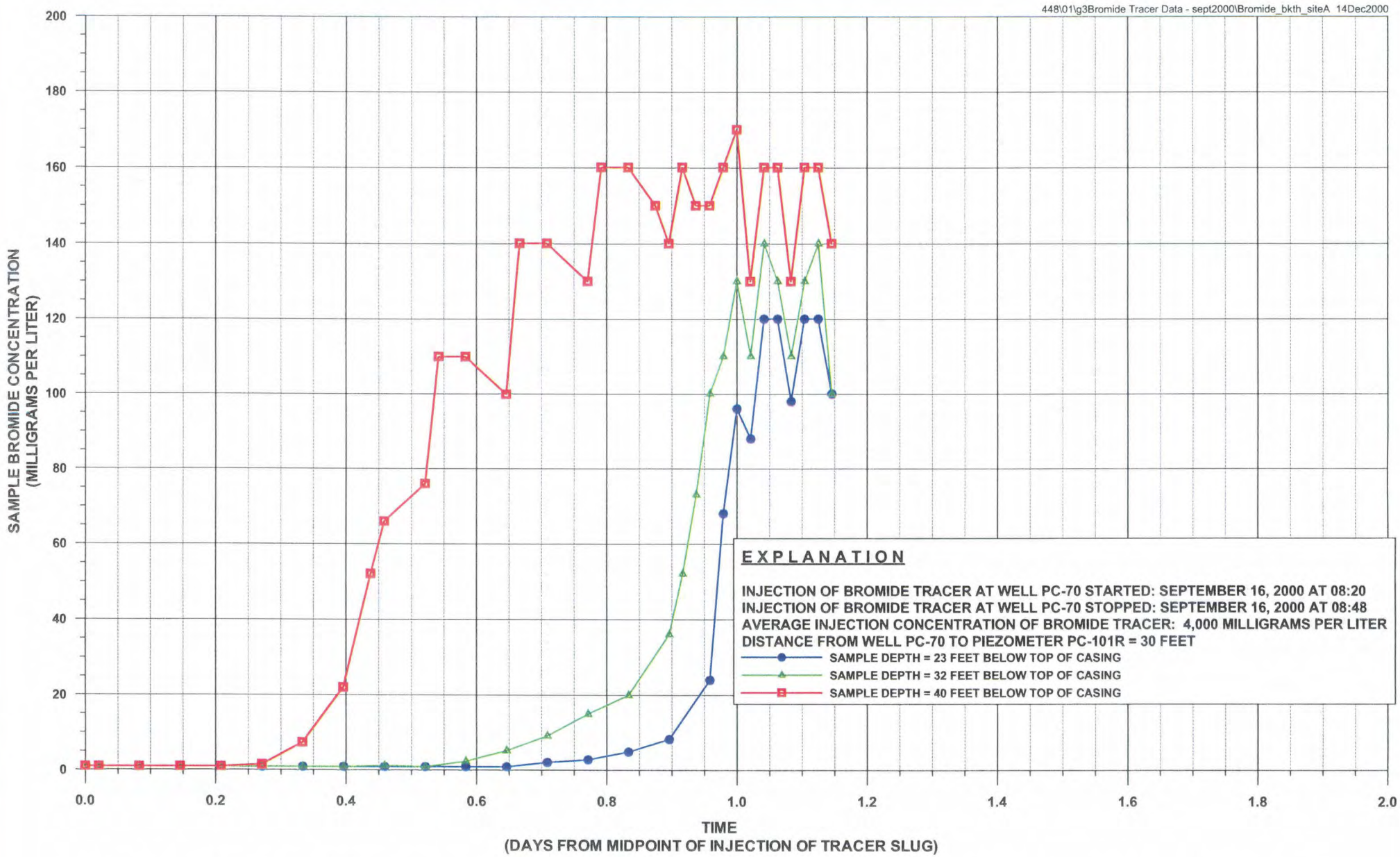

FIGURE 16. HYDROGRAPH OF BROMIDE BREAKTHROUGH DURING NATURAL GRADIENT TRACER TEST AT PIEZOMETER PC-101R, SITE A

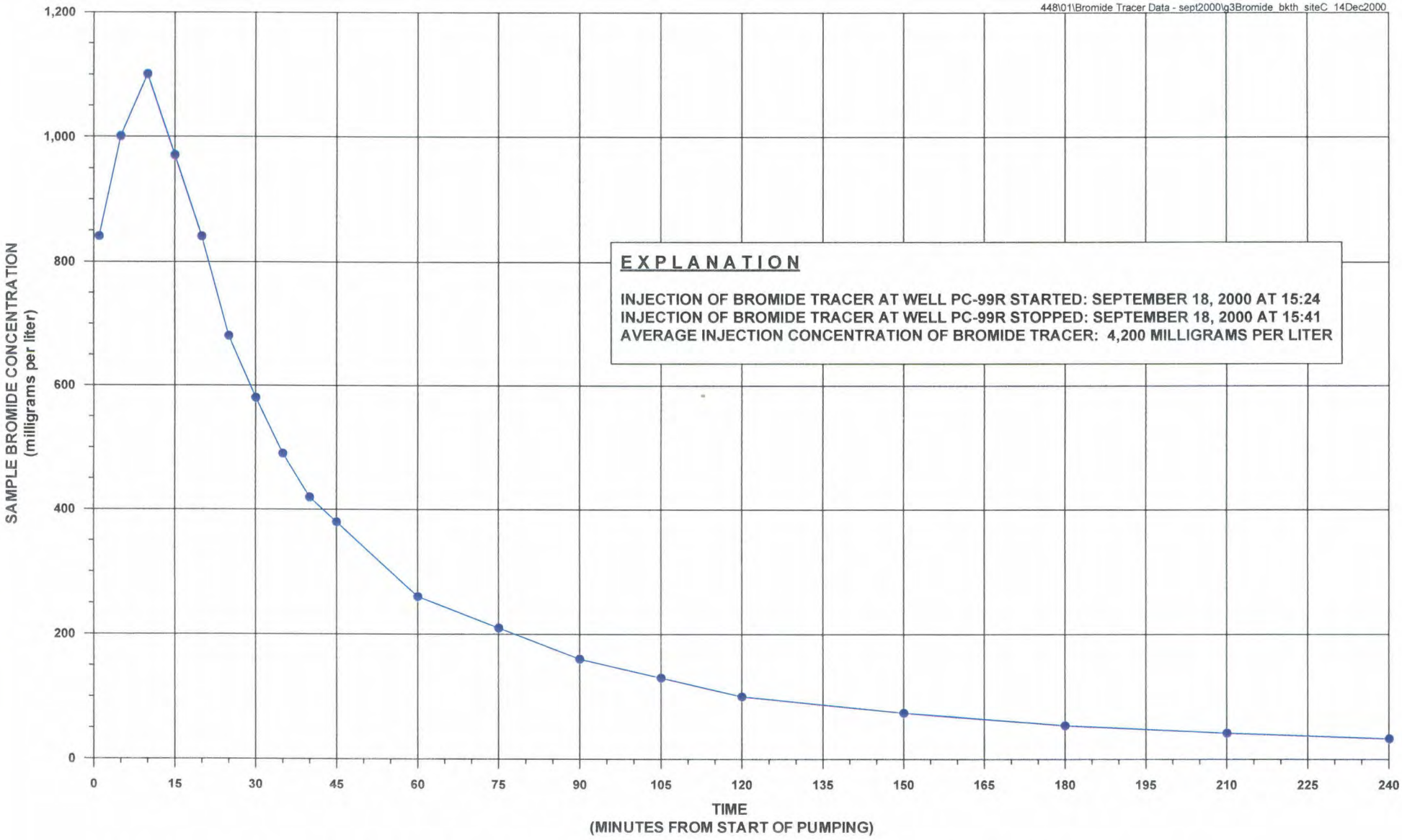

FIGURE 17. HYDROGRAPH OF BROMIDE BREAKTHROUGH DURING DRIFT AND PUMPBACK TRACER TEST AT WELL PC-99R, SITE C

APPENDIX A

NEVADA DEPARTMENT OF ENVIRONMENTAL PROTECTION: AUTHORIZATION FOR TESTING

PETER G. MORROS, Director
ALLEN BIAGGI, *Administrator*
(775) 687-4670
) 687-4678
...inistration
Water Pollution Control
Facsimile 687-5856
Mining Regulation and Reclamation
Facsimile 684-5259

STATE OF NEVADA
KENNY C. GUINN
Governor

Waste Management
Corrective Actions
Federal Facilities
Air Quality
Water Quality Planning
Facsimile 687-6396

COPY

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
333 W. Nye Lane, Room 138
Carson City, Nevada 89706-0851

RECEIVED
JUL 3 1 2000
MONTGOMERY & ASSOC., INC.

July 21, 2000

Ms. Susan Crowley
Kerr McGee Chemical LLC
P.O. Box 55
Henderson, NV 89009

Re: Authorization to Conduct Tracer Test(s) at the Kerr-McGee Facility, Henderson, Nevada. UIC Permit UNEV94218.

Dear Ms. Crowley:

The Nevada Division of Environmental Protection has reviewed your request dated June 15, 2000 to conduct tracer testing between Pittman Lateral and the Seep Area near Las Vegas Wash in Clark County, Nevada.

Based on the information provided, authorization is hereby granted to inject **deionized water and calcium bromide** into wells located near Sites A, B and C as identified in the submittal referenced above. The Division is not requiring limits on deionized water, however a **total mass of 65 pounds of calcium bromide is maximum limit** established by this approval. If additional calcium bromide is required, please contact me for approval. **The water used for solution preparation is required to be dechlorinated.** All future tracer tests must have prior written Division approval.

If bromide tracer is used, the 50' downgradient monitoring well associated with injection at that particular site shall be sampled for bromide concentration. At the completion of the tracer testing, please submit details of the tracer test(s) with the next quarterly report for UIC permit UNEV94218. Report shall include site locations and the volumes/concentrations injected, and all monitoring results collected.

Please feel free to call with any questions you may have regarding this approval at 775-687-4670 ext. 3150.

Sincerely,

Russ Land
UIC Program
Bureau of Water Pollution Control

cc: Cathe Pool, NDEP Water Permits Supervisor
Val King, NDEP UIC Program
Pat Corbett, Kerr McGee Plant Manager, Kerr McGee Chemical LLC, P.O. Box 55 Henderson, NV 89009
Daniel S. Weber, Errol L. Montgomery & Associates, Inc., 1550 E Prince Rd, Tucson AZ, 85719
Nadir Sous, NDEP LV

ERROL L. MONTGOMERY & ASSOCIATES, INC.
CONSULTANTS IN HYDROGEOLOGY

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JAMES S. DAVIS, P.G.
MICHAEL J. ROSKO, P.G.
CHARLES F. BARTER (1937-1999)
DANIEL S. WEBER, P.G.
LESLIE T. KATZ, P.G.

June 15, 2000

Mr. Russ Land
NEVADA DEPARTMENT OF ENVIRONMENTAL PROTECTION
UIC Program
333 W. Nye Lane
Carson City, NV 89706

SUBJECT: REQUEST FOR AUTHORIZATION TO CONDUCT TRACER TESTS BETWEEN PITTMAN LATERAL AND SEEP AREA, KERR-McGEE CHEMICAL LLC, HENDERSON, NEVADA

Dear Mr. Land:

Pursuant to our telephone conversation on May 11, 2000, we are requesting authorization to conduct tracer tests between Pittman Lateral and seep area (study area), south from Las Vegas wash, Henderson, Nevada. The work will be conducted for KERR-McGEE CHEMICAL LLC (Kerr-McGee) by ERROL L. MONTGOMERY & ASSOCIATES, INC. (Montgomery & Associates). Tracer tests will be conducted to estimate residence time of groundwater in the shallow alluvial deposits aquifer and rate of mass transport of perchlorate between Pittman Lateral and seep area south from Las Vegas wash.

For your reference, I have attached a workplan recently prepared for Kerr-McGee that describes the planned approach and field activities. **Figure 1** of the workplan is a location map showing the study area and the three areas **(Sites A, B, and C)** for the planned tracer tests. Tracer tests will use both drift and pumpback and natural gradient methodologies. Natural gradient tracer tests will be small-scale; monitoring distance from point of tracer introduction will be on the order of 50 feet. Tracers will be deionized water and bromide. The following sections of this letter are provided to summarize hydrogeologic conditions and the methods for planned tracer tests. Analytical modeling for the planned tracer testing indicates small tracer breakthrough concentrations at observation wells and at the seep area, the nearest potential receptor of tracer.

HYDROGEOLOGIC CONDITIONS

The study area is located in the southeast part of the Las Vegas Valley and within the limits of City of Henderson, Clark County, Nevada. The Las Vegas Valley occupies a topographic and structural basin within the Basin and Range Physiographic Province. The principal surface water drainage feature for the study area is Las Vegas wash, a shallow, narrow stream that drains to the southeast, across the valley floor to Lake Mead. The study area is bounded by the Pittman Lateral to the south and the seep area to the north **(Figure 1)**. The Henderson wastewater treatment facility lies within the study area.

The late Tertiary Muddy Creek Formation underlies the study area. Wells penetrating the Muddy Creek Formation in the study area indicate lithologies comprising sandy and silty clay to clayey sand. Younger, Quaternary alluvial deposits overlie the Muddy Creek Formation. Alluvial deposits fill erosional paleochannels in the Muddy Creek Formation. Alluvial deposits are thickest within the paleochannels, and thin laterally over the interfluvial areas. Based on lithologic information for wells penetrating the alluvial deposits, thickness of the alluvial deposits in the study is on the order of 40 feet within erosional paleochannels. Lithology of the alluvial deposits ranges from silt, fine to coarse grained sand, gravel, and cobbles.

Paleochannels generally trend southwest-northeast and control movement of groundwater in the alluvial deposits. Depth to groundwater in the alluvial deposits is on the order of 20 feet. Horizontal groundwater level gradients, measured as change in head per unit of distance measured in the direction of the steepest change, range from 0.01 feet per foot (ft/ft) to 0.04 ft/ft. Direction of groundwater movement in the alluvial deposits is north-northeast.

Analysis of a 48-hour aquifer test conducted in the vicinity of **Site A (Figure 1)** indicates an average transmissivity of 50,000 gallons per day per foot of aquifer at 1:1 hydraulic gradient (gpd/ft) for the saturated alluvial deposits. Specific yield was determined to be on the order of 0.06.

Based on analysis of an aquifer test in the alluvial deposits and lithology of saturated sediments in the study area, hydraulic conductivity of the overlying alluvial deposits is judged to be substantially larger than the Muddy Creek Formation. Analysis of water levels in wells completed in the Muddy Creek Formation in the vicinity of the study area indicates hydraulic head to be higher than hydraulic head in the alluvial deposits. Because of larger hydraulic conductivity of the alluvial deposits and direction of groundwater movement being generally upward from the Muddy Creek to the alluvial deposits, we anticipate movement of tracer to be restricted to the alluvial deposits.

Table 1 summarizes chemical quality of water in the study area. Sample sources are: seep sump near **Site C**, RIB pond near **Site B**, and well PC-70 near **Site A**. The RIB (Rapid Infiltration Basin) pond is part of the Henderson wastewater treatment facility. Results of sampling indicate total dissolved solids (TDS) ranging from 1,800 to 8,600 milligrams per liter (mg/L). Based on samples obtained in the study area, groundwater in the study area is a sodium chloride-sulfate type and is classified as slightly to moderately saline.

TRACER TESTS

Tracer tests will be conducted to estimate residence time of groundwater and rate of mass transport of perchlorate in the shallow alluvial groundwater system between Pittman Lateral and seep area south from Las Vegas wash. Groundwater will be monitored for breakthrough of tracer at an observation well or a series of observation wells directly down groundwater hydraulic gradient from the tracer introduction well. The tracer introduction well will fully penetrate the alluvial deposits. Distance from tracer introduction to observation

wells will be on the order of 50 feet. North from the City of Henderson (COH) RIB at **Site C**, observation wells will be completed in upper, middle, and lower parts of the alluvial deposits for determination of differences in transit time down hydraulic gradient from COH-RIB. In the vicinity of COH-RIB at **Site B** and up hydraulic gradient from COH-RIB at **Site A**, one fully-penetrating observation well will be completed directly down hydraulic gradient from the tracer introduction well.

Tracers proposed for use are deionized water and bromide. Because of large concentration of TDS in groundwater, deionized water will be used in the first set of single-well drift and pumpback tracer tests. Electrical conductivity of deionized water is estimated to be less than 5 micromhos per centimeter. Electrical conductivity of groundwater is estimated to be on the order of 1,000 times larger than deionized water **(Table 1)**. Drift and pumpback and natural gradient tracer testing will initially be conducted with 1,000 to 1,500 gallons of deionized water. Using 1,000 gallons of deionized water, the tracer solution would occupy approximately 900 cubic feet of sediments, based on an assumed effective porosity of 15 percent. Based on saturated thickness of the alluvial deposits of about 32 feet at **Site A**, the resulting tracer would have a plan view diameter of about 6 feet assuming a cylindrical volume. Monitoring of tracer introduction and pumpback will be conducted using electrical conductivity sensors placed in the borehole and in a flow cell at land surface.

To assess impact of tracer breakthrough due to density contrasts between the deionized water tracer and groundwater, bromide tracer tests will be conducted. A bromide tracer test, using calcium bromide, is planned for at least two sites for confirmation of deionized water tracer results. Laboratory analysis of background bromide indicates background concentrations ranging from 1.7 mg/L at **Site A** to less than 1.0 mg/L at **Sites B and C** (**Table 1**). Tracer slug concentration of bromide is planned to be on the order of 5,000 mg/L in a 1,000 gallon water solution. About 31 pounds of calcium bromide will be required for the tracer slug. Tracer tests conducted using bromide will be monitored by sampling groundwater at observation wells using a peristaltic pump. Groundwater sampling at observation wells will be conducted using micro-purge sampling methods to minimize disturbance of the natural groundwater gradient that might otherwise occur from purging 3 casing volumes. Bromide samples will be analyzed by NEL Laboratories, Las Vegas, Nevada.

PROJECTED CONCENTRATION OF TRACER IN GROUNDWATER

To investigate the projected concentration of bromide downgradient from the introduction well, Montgomery & Associates conducted analytical groundwater modeling using the method described by Hunt, 1983, and provided in a computer program described by Walton, 1989. The method provides a two-dimensional equation governing migration of a conservative solute in uniform one-directional flow from a slug point source without adsorption.

Based on lithologic data obtained from installation of wells in the study area, aquifer test data, a groundwater level contour map, and literature values for dispersivity (Bedient, 1999) modeling was conducted using the following parameters:

Aquifer thickness:	30 feet
Total porosity:	25 percent
Effective porosity:	15 percent
Longitudinal dispersivity:	10 feet for an observation distance of 50 feet; 30 feet for an observation distance of 500 feet
Transverse dispersivity:	1 foot for an observation distance of 50 feet; 3 feet for an observation distance of 500 feet
Seepage velocity:	15 feet per day
Slug concentration load:	31 pounds
Observation points:	50 feet and 500 feet

The observation point at 50 feet represents the well installed directly downgradient from the tracer introduction well that will be used to monitor tracer breakthrough. The monitoring point at a distance of 500 feet represents the seep area; the nearest potential intercept of tracer from **Site C**. Largest concentration of bromide is projected to be on the order of 70 mg/L at a distance of 50 feet from tracer introduction. Largest concentration of bromide at a distance of 500 feet is projected to be on the order of 2 mg/L. Analytical modeling for planned tracer testing indicates small tracer breakthrough concentrations at observation wells and at the seep area. Actual concentrations of bromide downgradient from tracer testing activities at **Sites A and B** are projected to be smaller due to contribution of COH-RIB water to the groundwater system.

Thank you for your review and consideration for this request for tracer test authorization. If you have questions or require more information, please contact me.

Very truly yours,

ERROL L. MONTGOMERY & ASSOCIATES, INC.

Daniel S. Weber, P.G.
Project Hydrogeologist

Martin L. Barackman
Hydrologist

Enclosure

cc: Susan Crowley, w/o encl.
Rick Stater, w/o encl.
Ed Krish, w/o encl.
Bill Ganus, w/o encl.
Tom Reed, w/o encl.
Steve Lower, w/o encl.
Pat Corbett, w/o encl.
Keith Bailey, w/o encl.

SENT VIA FEDERAL EXPRESS

...ONSTITUENTS AND ROUTINE PARAMETERS FOR WATER SAMPLES
OBTAINED BETWEEN PITTM... ...TERAL AND SEEP AREA
KERR-McGEE CHEMICAL LLC, HENDERSON, NEVADA

SAMPLE SOURCE	SAMPLE IDENTIFIER FIELD	SAMPLE IDENTIFIER LAB	DATE SAMPLED	COMMON CONSTITUENTS[a] (milligrams per liter) Ca	Mg	Na	K	HCO_3	Cl	SO_4	NO_3	F	Br	B	Alk	TDS	ROUTINE PARAMETERS: ELECTRICAL CONDUCTANCE (µmho/cm)[c] TEMP[b]	FIELD	LAB	pH FIELD	LAB
EEP UMP	SEEP SUMP	0004161-01A	11Apr2000	390	170	1,300	54	244	2,700	2,000	24.4	1.6	<1.0	2.8	200	5,900	22.8	7,835	7,300	6.87	7.3
B POND	RIB POND	0004161-03A	11Apr2000	120	64	410	54	171	510	600	<20.0	0.37	<1.0	0.92	140	1,800	24.1	2,765	2,800	6.84	9.6
C-70	PC-70	0004161-02A	11Apr2000	670	310	1,600	50	171	1,700	1,600	97.46	1.3	1.7	5.3	140	8,600	25.0	11,020	9,600	6.85	7.1

NOTE: All samples were analyzed by Turner Laboratories, Incorporated, Tucson, Arizona. Bromide analyses were conducted by NEL Laboratories, Las Vegas, Neveda.

Ca = Calcium
Mg = Magnesium
Na = Sodium
K = Potassium
HCO_3 = Bicarbonate (as HCO_3)
Cl = Chloride
SO_4 = Sulfate
NO_3 = Nitrate (as N)
F = Fluoride
Br = Bromide
B = Boron
Alk = Alkalinity (as $CaCO_3$)
TDS = Total dissolved solids

[b] Temp = Temperature (degrees Celsius)

[c] µmho/cm = Micromhos per centimeter

ERROL L. MONTGOMERY & ASSOCIATES, INC.
CONSULTANTS IN HYDROGEOLOGY

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RONALD H. DEWITT, P.G.
MARK M. CROSS, P.G.
DENNIS G. HALL, P.G.
TODD KEAY, P.G.
JAMES S. DAVIS, P.G.
MICHAEL J. ROSKO, P.G.
CHARLES F. BARTER (1937-1999)
DANIEL S. WEBER, P.G.
LESLIE T. KATZ, P.G.

September 7, 2000

Mr. Russ Land
NEVADA DEPARTMENT OF ENVIRONMENTAL PROTECTION
UIC Program
333 W. Nye Lane
Carson City, NV 89706

SUBJECT: AUTHORIZATION TO INCREASE TOTAL MASS OF CALCIUM BROMIDE DURING CONDUCT OF TRACER TEST(S) AT KERR-MCGEE FACILITY, HENDERSON, NEVADA UIC PERMIT UNEV94218

Dear Mr. Land:

In accordance with our telephone conversation today referring to your authorization letter dated July 21, 2000, for conducting tracer test at Kerr-McGee's Henderson, Nevada facility, we are requesting to increase total mass of calcium bromide from 65 pounds to 110 pounds. Previous estimate of calcium bromide needed for tracer testing stated in our request for authorization letter dated June 15, 2000, was incorrect due to an incorrect value for molecular weight of calcium bromide.

For a 1,000 gallon slurry of 5,000 milligrams per liter (mg/L), calculation of calcium bromide is as follows:

- Molecular weight of calcium bromide ($CaBr_2$) = 40.08 + 2 (79.9) = 199.88 grams per mole (g/mol)
- 1 gallon (gal) = 3.78 liters (L)
- 1 pound (lb) = 454 g

Using ratio to calculate mass of $CaBr_2$ needed:

$$\frac{2(Br^-)}{CaBr_2} = \frac{5\ g/L\ of\ Br^-}{x\ lbs\ of\ CaBr_2}$$

rearranging

$$x\ lbs\ of\ CaBr_2 =$$

$$[(5\ g/L)(199.88\ g/mol)/(2\ x\ 79.9\ g/mol)]x[(1{,}000\ gal\ x\ 3.78\ L/gal)]/(454\ g/lb) = 52.1\ lbs$$

Calcium bromide is delivered in 55-pound bags; we intend to use 1 bag per 1,000 gallons of water which will provide a slug of bromide on the order of 5,000 mg/L. The bromide slug will be sampled and analyzed using laboratory analytical methods for final estimate of slug concentration of bromide. Current plans are to conduct a maximum of two bromide trace tests which would require use of a total of 110 pounds of calcium bromide.

Thank you for your review of our request and consideration for authorization. If you have questions or need more information, please contact me.

Very truly yours,

ERROL L. MONTGOMERY & ASSOCIATES, INC.

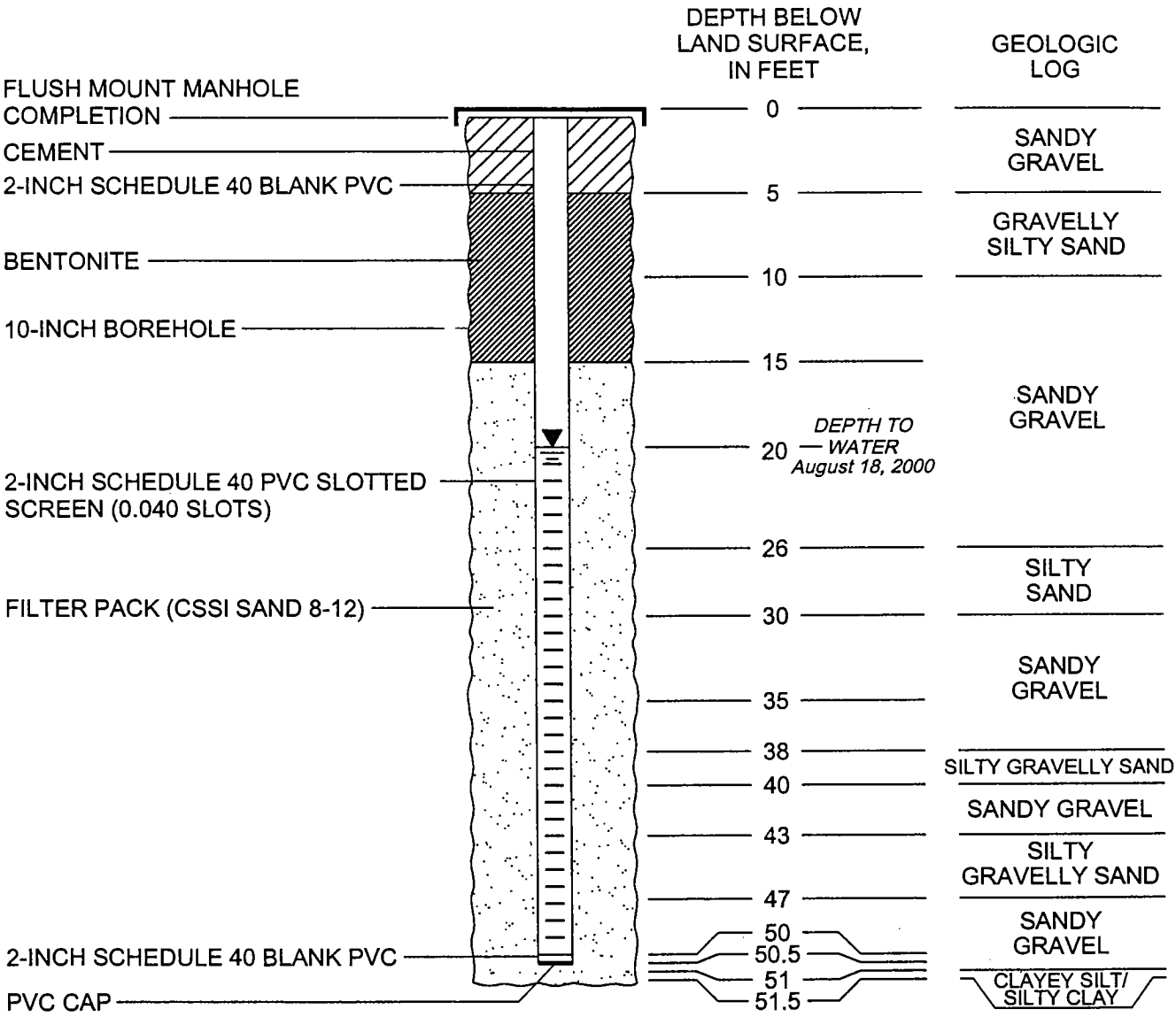
Daniel S. Weber, P.G.
Project Hydrogeologist

cc: Susan Crowley
Ed Krish
Bill Ganus

SENT VIA FACSIMILE

APPENDIX B

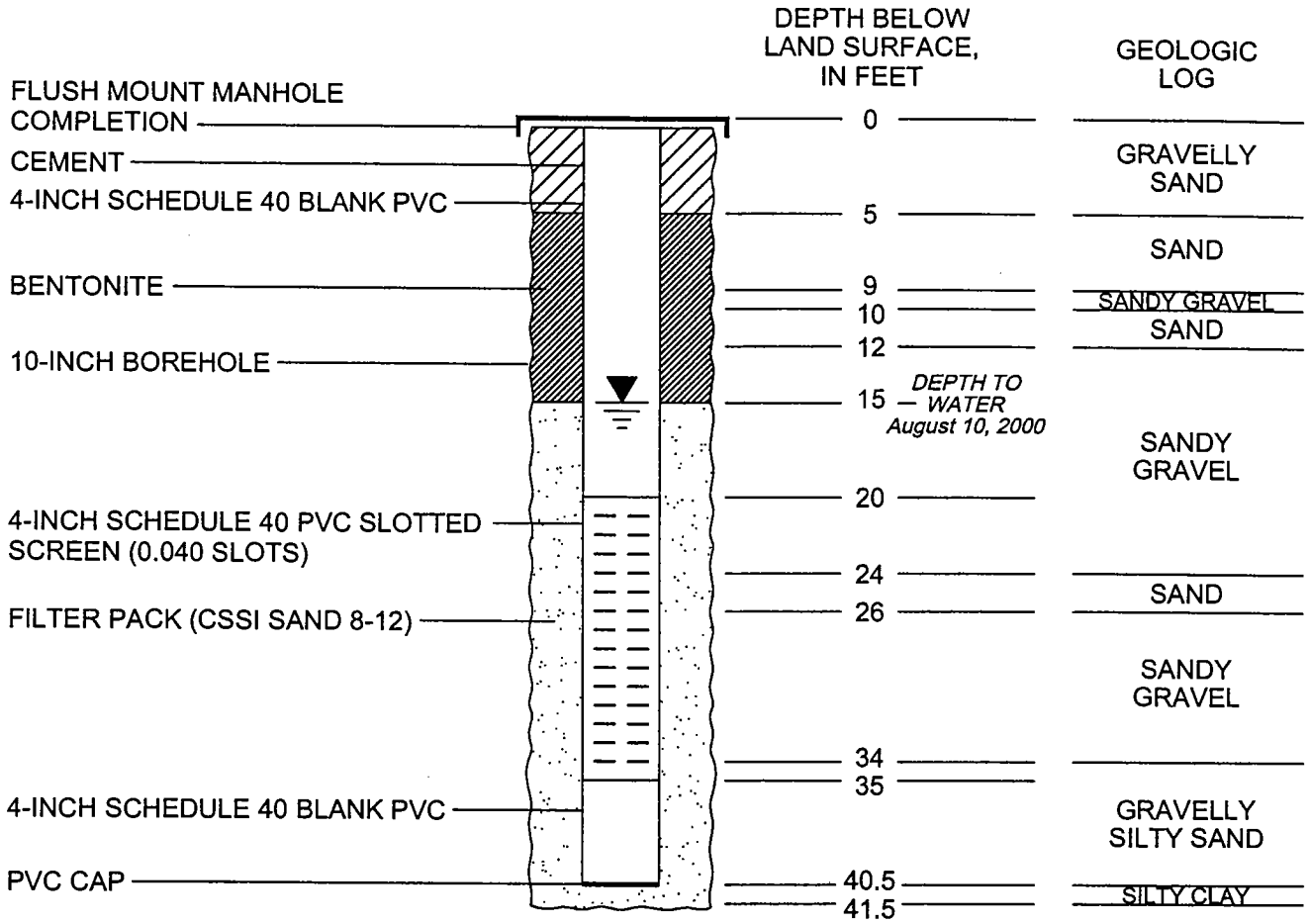
SCHEMATIC DIAGRAMS OF WELL CONSTRUCTION AND GEOLOGIC LOGS FOR WELLS AND PIEZOMETERS



Data provided by Kerr-McGee

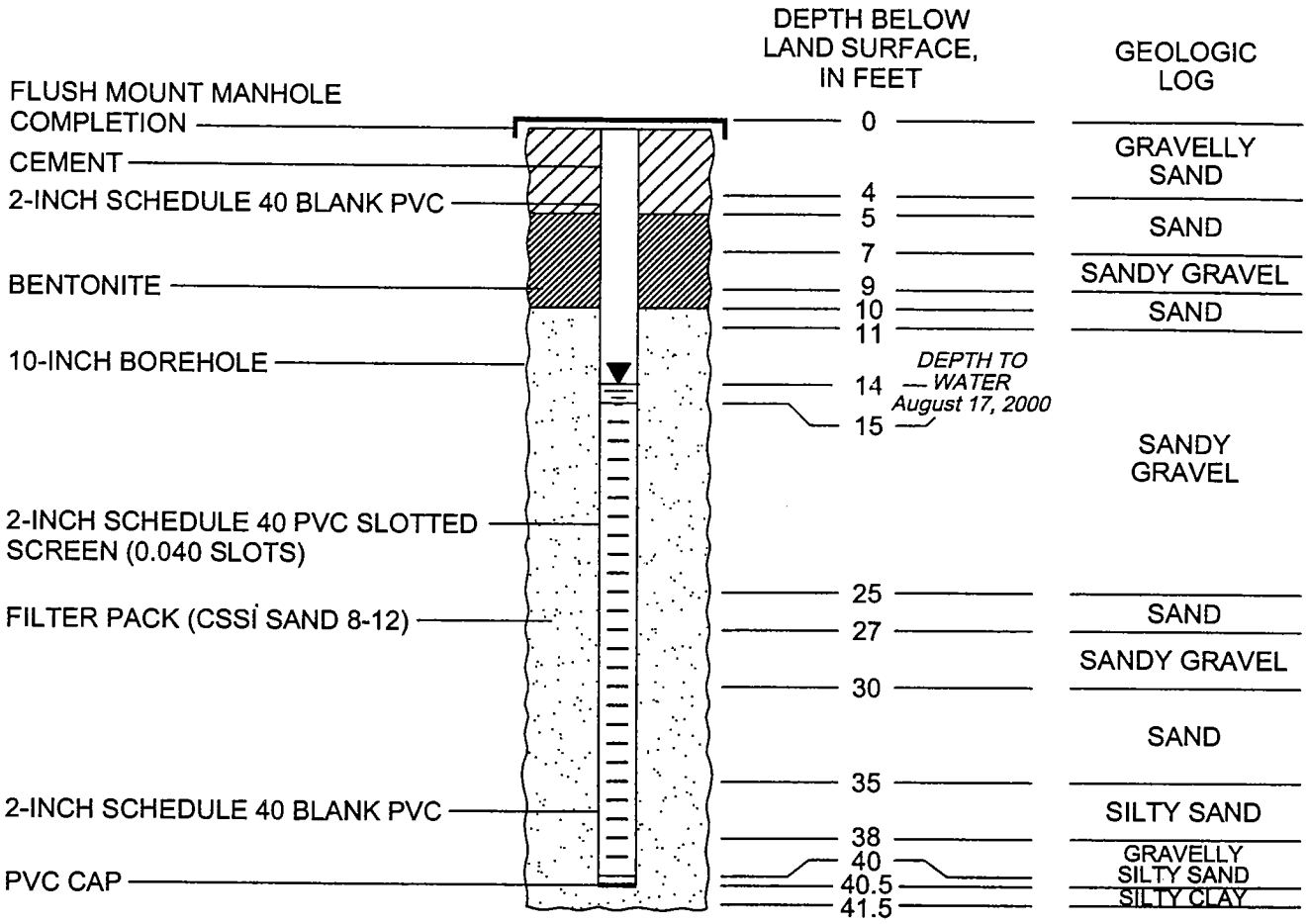
FIGURE B-1. SCHEMATIC DIAGRAM OF CONSTRUCTION AND GEOLOGIC LOG FOR PIEZOMETER PC-101R, SITE A

448.01/PC101R-SITEA-WS/14DEC2000



Data provided by Kerr-McGee

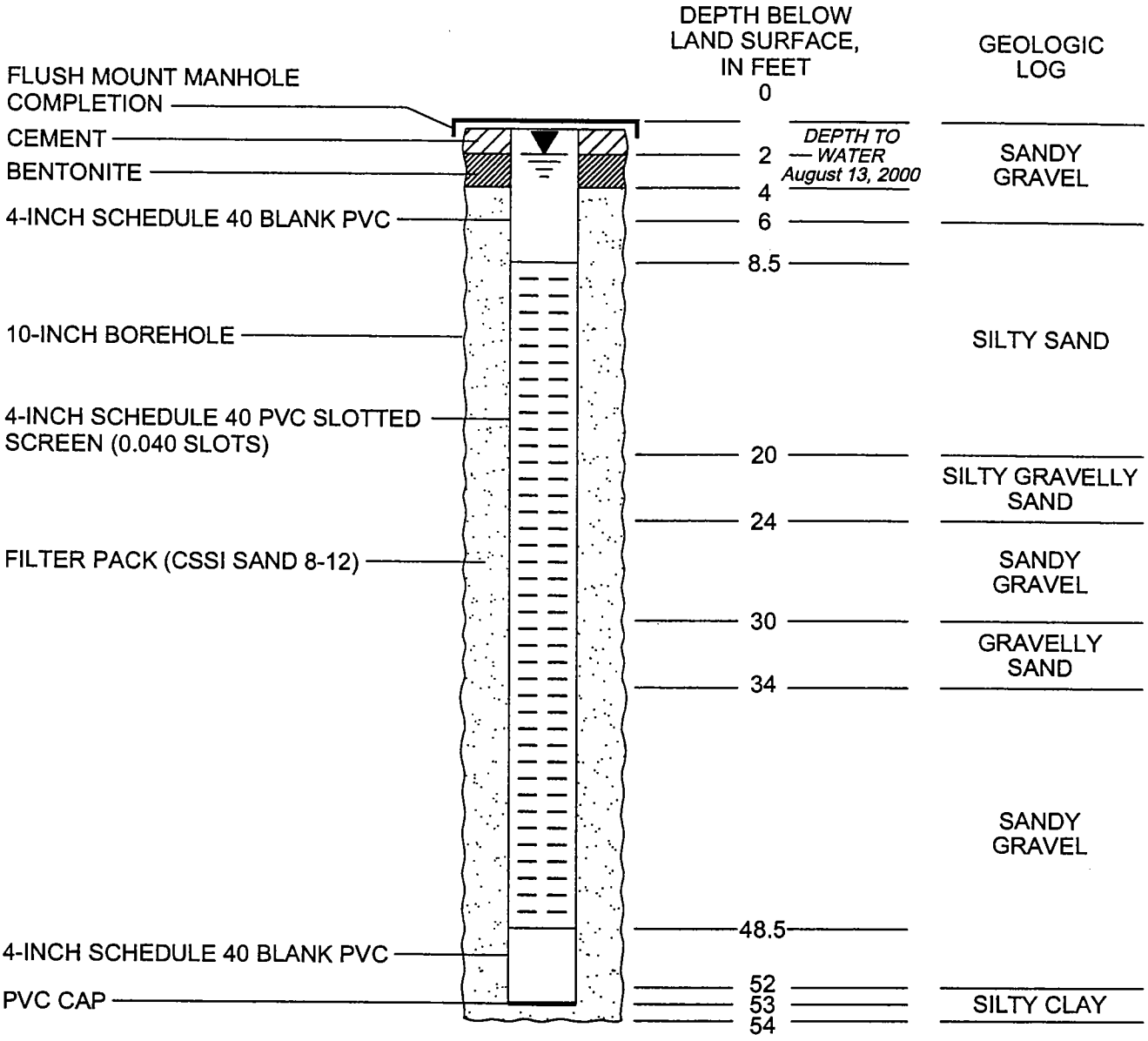
FIGURE B-2. SCHEMATIC DIAGRAM OF CONSTRUCTION AND GEOLOGIC LOG FOR MONITOR WELL PC-98R, SITE B



Data provided by Kerr-McGee

FIGURE B-3. SCHEMATIC DIAGRAM OF CONSTRUCTION AND GEOLOGIC LOG FOR PIEZOMETER PC-100R, SITE B

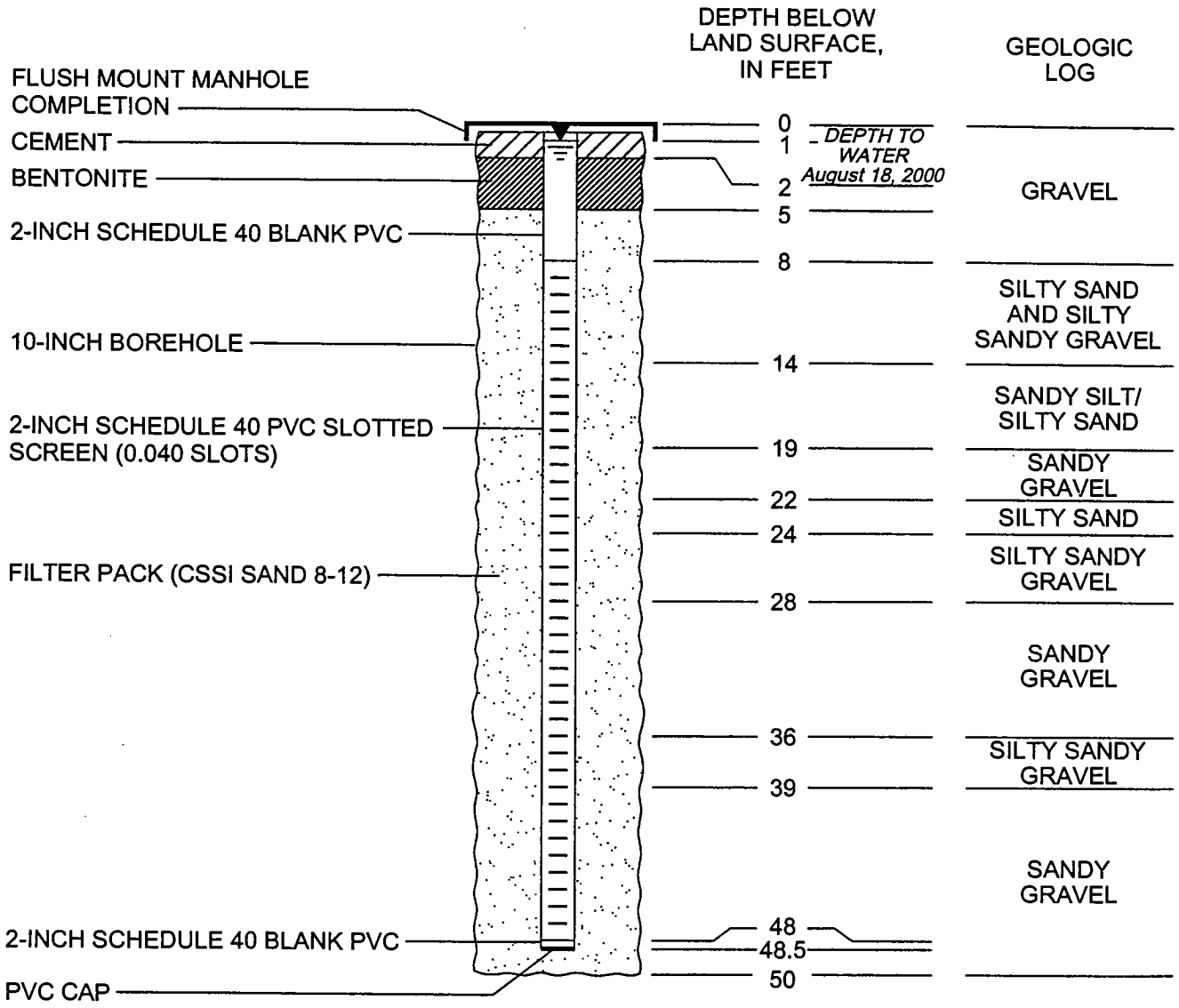
448.01/PC100R-SITEB-WS/14DEC2000



Data provided by Kerr-McGee

FIGURE B-4. SCHEMATIC DIAGRAM OF CONSTRUCTION AND GEOLOGIC LOG FOR MONITOR WELL PC-99R, SITE C

448.01/PC99R-SITEC-WS/14DEC2000



Data provided by Kerr-McGee

FIGURE B-5. SCHEMATIC DIAGRAM OF CONSTRUCTION AND GEOLOGIC LOG FOR PIEZOMETER PC-102, SITE C

448.01/PC102-SITEC-WS/14DEC2000

APPENDIX C

AQUIFER TEST DATA

Data Set: S:\Projects\448\01\PC98R pumping test - Site B\pc98Rpc98R-JC-corrected for baro&trend.aqt

ROJECT INFORMATION

Company: ELM&A
Client: K-M
Project: 448.01
Location: K-M Henderson
Test Date: Aug 10, 2000
Test Well: PC-98R

PUMPING WELL DATA

Number of pumping wells: 1

Pumping Well No. 1: PC-98R

X Location: 0. ft
Y Location: 0. ft

No. of pumping periods: 2

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	52.	1790.	0.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: PC98R

X Location: 0. ft
Y Location: 1. ft

o. of observations: 471

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.	1.798	480.	2.046	955.	2.056	1465.	2.045	2300.	0.0406
10.	1.829	485.	2.06	960.	2.06	1470.	2.02	2310.	0.0349
15.	1.85	490.	2.063	965.	2.048	1475.	2.033	2320.	0.0334
20.	1.88	495.	2.055	970.	2.077	1480.	2.042	2330.	0.0326
25.	1.857	500.	2.052	975.	2.075	1485.	2.015	2340.	0.0327
30.	1.886	505.	2.082	980.	2.079	1490.	2.037	2350.	0.0311
35.	1.915	510.	2.052	985.	2.048	1495.	2.035	2360.	0.0265
40.	1.91	515.	2.055	990.	2.051	1500.	2.031	2370.	0.0258
45.	1.921	520.	2.069	995.	2.073	1505.	2.046	2380.	0.0247
50.	1.931	525.	2.071	1000.	2.071	1510.	2.019	2390.	0.0231
55.	1.954	530.	2.048	1005.	2.05	1520.	2.033	2400.	0.0235
60.	1.95	535.	2.078	1010.	2.043	1530.	2.035	2410.	0.0217
65.	1.932	540.	2.054	1015.	2.069	1540.	2.03	2420.	0.0225
70.	1.942	545.	2.053	1020.	2.093	1550.	2.036	2430.	0.0211
75.	1.966	550.	2.079	1025.	2.08	1560.	2.031	2440.	0.0185
80.	1.95	555.	2.061	1030.	2.049	1570.	2.037	2450.	0.0161
85.	1.946	560.	2.059	1035.	2.076	1580.	2.024	2460.	0.0161
90.	1.972	565.	2.023	1040.	2.072	1590.	2.035	2470.	0.0164
95.	1.994	570.	2.075	1045.	2.053	1600.	2.04	2480.	0.015
100.	1.986	575.	2.046	1050.	2.066	1610.	2.054	2490.	0.0095
105.	1.961	580.	2.069	1055.	2.069	1620.	2.035	2500.	0.0091
110.	1.998	585.	2.039	1060.	2.064	1630.	2.041	2510.	0.0083
115.	1.988	590.	2.067	1065.	2.045	1640.	2.047	2520.	0.0089
120.	1.984	595.	2.059	1070.	2.066	1650.	2.037	2530.	0.0069
125.	1.975	600.	2.062	1075.	2.039	1660.	2.033	2540.	0.0063
130.	2.009	605.	2.044	1080.	2.076	1670.	2.041	2550.	0.0061
135.	1.994	610.	2.077	1085.	2.058	1680.	2.031	2560.	0.0051
140.	1.998	615.	2.064	1090.	2.063	1690.	2.012	2570.	0.0039
145.	2.005	620.	2.067	1095.	2.055	1700.	2.027	2580.	-0.0001
150.	2.018	625.	2.076	1100.	2.038	1710.	1.999	2590.	0.0019
155.	1.995	630.	2.06	1105.	2.078	1720.	2.034	2600.	-0.0022
160.	1.994	635.	2.083	1110.	2.065	1730.	2.034	2610.	-0.0002

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
165.	2.007	640.	2.073	1115.	2.062	1740.	2.036	2620.	-0.0028
170.	2.023	645.	2.06	1120.	2.046	1750.	2.014	2630.	-0.0017
175.	1.982	650.	2.056	1125.	2.052	1760.	2.018	2640.	-0.0009
180.	2.015	655.	2.049	1130.	2.07	1770.	2.019	2650.	-0.0064
185.	1.993	660.	2.051	1135.	2.076	1780.	2.015	2660.	-0.0068
190.	2.023	665.	2.056	1140.	2.06	1790.	2.023	2670.	-0.005
195.	2.037	670.	2.067	1145.	2.048	1800.	0.3198	2680.	-0.006
200.	2.024	675.	2.042	1150.	2.079	1805.	0.301	2690.	-0.0055
205.	2.033	680.	2.035	1155.	2.054	1810.	0.254	2700.	-0.0092
210.	2.028	685.	2.035	1160.	2.076	1815.	0.2245	2710.	-0.0089
215.	2.035	690.	2.047	1165.	2.052	1820.	0.1957	2720.	-0.0096
220.	2.022	695.	2.094	1170.	2.068	1825.	0.1827	2730.	-0.0159
225.	2.035	700.	2.067	1175.	2.061	1830.	0.1703	2740.	-0.0176
230.	2.021	705.	2.061	1180.	2.061	1835.	0.1636	2750.	-0.0172
235.	2.031	710.	2.056	1185.	2.055	1840.	0.1591	2760.	-0.0211
240.	2.032	715.	2.065	1190.	2.062	1845.	0.1583	2770.	-0.021
245.	2.038	720.	2.044	1195.	2.055	1850.	0.1525	2780.	-0.019
250.	2.038	725.	2.059	1200.	2.063	1855.	0.1472	2790.	-0.021
255.	2.031	730.	2.028	1205.	2.068	1860.	0.1454	2800.	-0.0232
260.	2.038	735.	2.062	1210.	2.047	1865.	0.1429	2810.	-0.0216
265.	2.05	740.	2.064	1215.	2.039	1870.	0.1304	2820.	-0.0245
270.	2.057	745.	2.06	1220.	2.049	1880.	0.1219	2830.	-0.0224
275.	2.058	750.	2.075	1225.	2.07	1890.	0.1131	2840.	-0.0217
280.	2.05	755.	2.082	1230.	2.034	1900.	0.1024	2850.	-0.0218
285.	2.034	760.	2.082	1235.	2.045	1910.	0.0989	2860.	-0.0218
290.	2.042	765.	2.065	1240.	2.047	1920.	0.0936	2870.	-0.0224
295.	2.037	770.	2.037	1245.	2.052	1930.	0.0965	2880.	-0.0216
300.	2.049	775.	2.073	1250.	2.075	1940.	0.0915	2890.	-0.0224
305.	2.059	780.	2.053	1255.	2.064	1950.	0.0887	2900.	-0.0255
310.	2.046	785.	2.06	1260.	2.067	1960.	0.087	2910.	-0.0252
315.	2.066	790.	2.06	1265.	2.065	1970.	0.0899	2920.	-0.0278
320.	2.054	795.	2.081	1270.	2.042	1980.	0.0874	2930.	-0.0266
325.	2.033	800.	2.082	1275.	2.04	1990.	0.0874	2940.	-0.0265
330.	2.031	805.	2.063	1280.	2.041	2000.	0.087	2950.	-0.0277
335.	2.058	810.	2.057	1285.	2.066	2010.	0.0869	2960.	-0.0308
340.	2.063	815.	2.047	1290.	2.064	2020.	0.081	2970.	-0.0276
345.	2.036	820.	2.078	1295.	2.04	2030.	0.0766	2980.	-0.0302
350.	2.063	825.	2.062	1300.	2.062	2040.	0.0731	2990.	-0.0318
355.	2.033	830.	2.065	1305.	2.052	2050.	0.0671	3000.	-0.0346
360.	2.051	835.	2.064	1310.	2.028	2060.	0.0688	3010.	-0.0382
365.	2.059	840.	2.077	1315.	2.077	2070.	0.0646	3020.	-0.0368
370.	2.063	845.	2.055	1320.	2.041	2080.	0.0651	3030.	-0.0353
375.	2.047	850.	2.055	1325.	2.029	2090.	0.0654	3040.	-0.0344
380.	2.078	855.	2.064	1330.	2.044	2100.	0.0645	3050.	-0.0348
385.	2.052	860.	2.047	1335.	2.066	2110.	0.0639	3060.	-0.0349
390.	2.057	865.	2.067	1340.	2.05	2120.	0.0577	3070.	-0.0363
395.	2.038	870.	2.08	1345.	2.055	2130.	0.0605	3080.	-0.0382
400.	2.062	875.	2.061	1350.	2.05	2140.	0.0576	3090.	-0.0381
405.	2.056	880.	2.068	1355.	2.072	2150.	0.0551	3100.	-0.0383
410.	2.069	885.	2.085	1360.	2.066	2160.	0.0536	3110.	-0.0369
415.	2.052	890.	2.041	1365.	2.038	2170.	0.0524	3120.	-0.0366
420.	2.048	895.	2.076	1370.	2.058	2180.	0.0526	3130.	-0.0371
425.	2.021	900.	2.061	1375.	2.057	2190.	0.0504	3140.	-0.0365
430.	2.047	905.	2.073	1380.	2.055	2200.	0.0514	3150.	-0.0382
435.	2.04	910.	2.035	1385.	2.055	2210.	0.0547	3155.	-0.03705
440.	2.068	915.	2.06	1390.	2.038	2220.	0.0522	3160.	-0.0387
445.	2.07	920.	2.046	1400.	2.05	2230.	0.0503	3165.	-0.04055
450.	2.064	925.	2.083	1410.	2.024	2240.	0.0495	3170.	-0.0407
455.	2.076	930.	2.067	1420.	2.047	2250.	0.0484	3175.	-0.04315
460.	2.08	935.	2.053	1430.	2.053	2260.	0.0466		
465.	2.07	940.	2.057	1440.	2.026	2270.	0.0422		
470.	2.063	945.	2.069	1450.	2.034	2280.	0.0407		
475.	2.066	950.	2.077	1460.	2.057	2290.	0.0411		

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	8.799E+04	gal/day/ft
S	4.065E-10	

Data Set: S:\Projects\448\01\PC98R pumping test - Site B\pc98Rpc98R-rec-corrected for baro&trend.aqt

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	5.337E+04	gal/day/ft
S'	3.262	

Data Set: S:\Projects\448\01\PC98R pumping test - Site B\pc98Rpc98-JC-corrected for baro&trend.aqt

PROJECT INFORMATION

Company: ELM&A
Client: K-M
Project: 448.01
Location: K-M Henderson
Test Date: June 12-15, 2000
Test Well: PC-98

PUMPING WELL DATA

Number of pumping wells: 1

Pumping Well No. 1: PC-98R

X Location: 0. ft
Y Location: 0. ft

No. of pumping periods: 2

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	52.	1790.	0.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: PC98

X Location: 0. ft
Y Location: 6. ft

No. of observations: 60

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
60.	0.7104	780.	0.9252	1500.	0.952	2220.	0.0638	2940.	-0.0254
120.	0.7698	840.	0.9366	1560.	0.9514	2280.	0.0552	3000.	-0.032
180.	0.8112	900.	0.939	1620.	0.9488	2340.	0.0436	3060.	-0.0366
240.	0.8366	960.	0.9434	1680.	0.9442	2400.	0.032	3120.	-0.0442
300.	0.862	1020.	0.9458	1740.	0.9376	2460.	0.0224	3180.	-0.0488
360.	0.8804	1080.	0.9502	1800.	0.393	2520.	0.0148	3240.	-0.0534
420.	0.8898	1140.	0.9506	1860.	0.2314	2580.	0.0082	3300.	-0.06
480.	0.8982	1200.	0.948	1920.	0.1758	2640.	-0.0014	3360.	-0.0696
540.	0.9056	1260.	0.9494	1980.	0.1412	2700.	-0.008	3420.	-0.0742
600.	0.914	1320.	0.9518	2040.	0.1136	2760.	-0.0156	3480.	-0.0768
660.	0.9164	1380.	0.9522	2100.	0.095	2820	-0.0182	3540.	-0.0774
720.	0.9208	1440.	0.9536	2160.	0.0784	2880.	-0.0198	3600.	-0.075

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	6.516E+04	gal/day/ft
S	0.008451	

Data Set: S:\Projects\448\01\PC98R pumping test - Site B\pc98Rpc98-rec-corrected for baro&trend.aqt

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	5.359E+04	gal/day/ft
S'	3.848	

Data Set: S:\Projects\448\01\PC98R pumping test - Site B\pc98Rpc100-JC-corrected for baro&trend.aqt

PROJECT INFORMATION

Company: ELM&A
Client: K-M
Project: 448.01
Location: K-M Henderson
Test Date: Aug 10, 2000
Test Well: PC-98R

PUMPING WELL DATA

Number of pumping wells: 1

Pumping Well No. 1: PC-98R

X Location: 0. ft
Y Location: 0. ft

No. of pumping periods: 2

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	52.	1793.	0.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: PC100

X Location: 0. ft
Y Location: 50. ft

No. of observations: 516

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.	0.2087	525.	0.506	1045.	0.5052	1565.	0.4668	2300.	-0.0144
10.	0.2334	530.	0.5057	1050.	0.5054	1570.	0.4669	2310.	-0.0171
15.	0.252	535.	0.5061	1055.	0.5037	1575.	0.4698	2320.	-0.0176
20.	0.267	540.	0.5086	1060.	0.5049	1580.	0.4656	2330.	-0.0204
25.	0.2793	545.	0.5087	1065.	0.5054	1585.	0.4679	2340.	-0.0223
30.	0.2897	550.	0.5078	1070.	0.5049	1590.	0.4639	2350.	-0.0249
35.	0.2988	555.	0.5094	1075.	0.5039	1595.	0.4683	2360.	-0.0275
40.	0.3082	560.	0.508	1080.	0.5023	1600.	0.4648	2370.	-0.0292
45.	0.3155	565.	0.5089	1085.	0.5017	1605.	0.4673	2380.	-0.0303
50.	0.3229	570.	0.5095	1090.	0.5006	1610.	0.465	2390.	-0.0319
55.	0.3322	575.	0.5089	1095.	0.5012	1615	0.4662	2400.	-0.0335
60.	0.3369	580.	0.502	1100.	0.5009	1620.	0.4646	2410.	-0.0343
65.	0.3428	585.	0.5087	1105.	0.4999	1625.	0.4662	2420.	-0.0355
70.	0.3486	590.	0.5093	1110.	0.5003	1630.	0.4628	2430.	-0.0369
75.	0.3535	595.	0.5115	1115.	0.5006	1635.	0.4652	2440.	-0.0385
80.	0.3587	600.	0.5112	1120.	0.4997	1640.	0.4608	2450.	-0.0419
85.	0.3629	605.	0.5109	1125.	0.4989	1645.	0.4616	2460.	-0.0429
90.	0.3684	610.	0.511	1130.	0.4985	1650.	0.4612	2470.	-0.0436
95.	0.3729	615.	0.511	1135.	0.4995	1655.	0.4622	2480.	-0.044
100.	0.3758	620.	0.5127	1140.	0.499	1660.	0.4593	2490.	-0.0485
105.	0.3791	625.	0.5125	1145.	0.498	1665.	0.459	2500.	-0.0489
110.	0.3831	630.	0.5111	1150.	0.4973	1670.	0.4599	2510.	-0.0497
115.	0.3865	635.	0.5142	1155.	0.4979	1675.	0.4613	2520.	-0.0511
120.	0.3907	640.	0.5117	1160.	0.4989	1680.	0.4572	2530.	-0.0531
125.	0.3938	645.	0.5132	1165.	0.4985	1685.	0.4588	2540.	-0.0547
130.	0.3978	650.	0.5128	1170.	0.4984	1690.	0.4572	2550.	-0.0559
135.	0.4016	655.	0.5117	1175.	0.4974	1695.	0.4592	2560.	-0.0559
140.	0.4042	660.	0.512	1180.	0.4973	1700.	0.4565	2570.	-0.0561
145.	0.4077	665.	0.5119	1185.	0.4963	1705.	0.4573	2580.	-0.0591
150.	0.4101	670.	0.5128	1190.	0.496	1710.	0.4547	2590.	-0.0571
155.	0.4121	675.	0.515	1195.	0.4956	1715.	0.4575	2600.	-0.0602
160.	0.4163	680.	0.5133	1200.	0.4972	1720.	0.4535	2610.	-0.0592

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
165.	0.4189	685.	0.5145	1205.	0.4964	1725.	0.4547	2620.	-0.0628
170.	0.4219	690.	0.5132	1210.	0.4955	1730.	0.4544	2630.	-0.0617
175.	0.4229	695.	0.5132	1215.	0.4935	1735.	0.454	2640.	-0.0609
180.	0.4255	700.	0.5139	1220.	0.4925	1740.	0.4502	2650.	-0.0654
185.	0.4291	705.	0.5131	1225.	0.4945	1745.	0.4507	2660.	-0.0648
190.	0.4306	710.	0.5161	1230.	0.4943	1750.	0.4516	2670.	-0.065
195.	0.4334	715.	0.5141	1235.	0.4928	1755.	0.4517	2680.	-0.066
200.	0.4357	720.	0.5168	1240.	0.4932	1760.	0.4495	2690.	-0.0685
205.	0.439	725.	0.5178	1245.	0.4933	1765.	0.4512	2700.	-0.0712
210.	0.4406	730.	0.5178	1250.	0.4922	1770.	0.4475	2710.	-0.0699
215.	0.442	735.	0.5189	1255.	0.4919	1775.	0.4496	2720.	-0.0686
220.	0.4424	740.	0.5176	1260.	0.4916	1780.	0.446	2730.	-0.0709
225.	0.4462	745.	0.5172	1265.	0.4905	1785.	0.4469	2740.	-0.0746
230.	0.4485	750.	0.5178	1270.	0.4899	1790.	0.4462	2750.	-0.0712
235.	0.4496	755.	0.5168	1275.	0.4899	1795.	0.272	2760.	-0.0731
240.	0.452	760.	0.5165	1280.	0.4888	1800.	0.2548	2770.	-0.074
245.	0.4532	765.	0.517	1285.	0.4894	1805.	0.2321	2780.	-0.074
250.	0.4535	770.	0.5159	1290.	0.4888	1810.	0.22	2790.	-0.076
255.	0.4537	775.	0.5162	1295.	0.4895	1815.	0.2085	2800.	-0.0772
260.	0.4566	780.	0.5156	1300.	0.4884	1820.	0.1997	2810.	-0.0756
265.	0.4603	785.	0.5152	1305.	0.4884	1825.	0.1916	2820.	-0.0765
270.	0.4599	790.	0.5168	1310.	0.4877	1830.	0.1833	2830.	-0.0764
275.	0.4623	795.	0.5163	1315.	0.4886	1835.	0.1747	2840.	-0.0757
280.	0.4628	800.	0.5171	1320.	0.4874	1840.	0.1691	2850.	-0.0758
285.	0.4651	805.	0.5161	1325.	0.4865	1845.	0.1623	2860.	-0.0788
290.	0.4662	810.	0.5169	1330.	0.4869	1850.	0.1565	2870.	-0.0794
295.	0.4668	815.	0.5167	1335.	0.4864	1855.	0.1472	2880.	-0.0776
300.	0.4701	820.	0.5182	1340.	0.4853	1860.	0.1424	2890.	-0.0804
305.	0.4688	825.	0.5182	1345.	0.4848	1865.	0.1399	2900.	-0.0825
310.	0.472	830.	0.5178	1350.	0.4857	1870.	0.1344	2910.	-0.0832
315.	0.4738	835.	0.5169	1355.	0.4849	1880.	0.1279	2920.	-0.0848
320.	0.4752	840.	0.5169	1360.	0.4844	1890.	0.1171	2930.	-0.0856
325.	0.4759	845.	0.517	1365.	0.4849	1900.	0.1104	2940.	-0.0835
330.	0.4789	850.	0.5165	1370.	0.4844	1910.	0.1029	2950.	-0.0837
335.	0.4795	855.	0.5165	1375.	0.4865	1920.	0.0966	2960.	-0.0888
340.	0.4822	860.	0.516	1380.	0.4866	1930.	0.0895	2970.	-0.0876
345.	0.4818	865.	0.5159	1385.	0.487	1940.	0.0855	2980.	-0.0902
350.	0.4843	870.	0.5159	1390.	0.4858	1950.	0.0787	2990.	-0.0888
355.	0.4832	875.	0.5157	1395.	0.4839	1960.	0.075	3000.	-0.0906
360.	0.4837	880.	0.5146	1400.	0.4841	1970.	0.0709	3010.	-0.0932
365.	0.4854	885.	0.5137	1405.	0.4844	1980.	0.0664	3020.	-0.0928
370.	0.4874	890.	0.5138	1410.	0.4832	1990.	0.0614	3030.	-0.0913
375.	0.4895	895.	0.5114	1415.	0.4819	2000.	0.058	3040.	-0.0904
380.	0.4883	900.	0.5122	1420.	0.4821	2010.	0.0539	3050.	-0.0928
385.	0.4908	905.	0.5121	1425.	0.481	2020.	0.052	3060.	-0.0929
390.	0.4888	910.	0.5134	1430.	0.4809	2030.	0.0456	3070.	-0.0943
395.	0.4915	915.	0.5127	1435.	0.4809	2040.	0.0421	3080.	-0.0942
400.	0.4913	920.	0.5124	1440.	0.4811	2050.	0.0371	3090.	-0.0951
405.	0.4928	925.	0.5121	1445.	0.4805	2060.	0.0368	3100.	-0.0963
410.	0.4946	930.	0.5124	1450.	0.4809	2070.	0.0316	3110.	-0.0959
415.	0.496	935.	0.5113	1455.	0.4814	2080.	0.0301	3120.	-0.0986
420.	0.4948	940.	0.5124	1460.	0.4803	2090.	0.0264	3130.	-0.0991
425.	0.4953	945.	0.5113	1465.	0.4779	2100.	0.0235	3140.	-0.0995
430.	0.4923	950.	0.5113	1470.	0.478	2110.	0.0219	3150.	-0.0982
435.	0.4993	955.	0.5127	1475.	0.4774	2120.	0.0177	3180.	-0.1017
440.	0.4991	960.	0.5122	1480.	0.4767	2130.	0.0175	3210.	-0.1034
445.	0.5013	965.	0.51	1485.	0.4764	2140.	0.0156	3240.	-0.1052
450.	0.5	970.	0.51	1490.	0.4759	2150.	0.0131	3270.	-0.1097
455.	0.5002	975.	0.5084	1495.	0.4757	2160.	0.0116	3300.	-0.1136
460.	0.5016	980.	0.5087	1500.	0.4741	2170.	0.0104	3330.	-0.1167
465.	0.5007	985.	0.5105	1505.	0.4743	2180.	0.0076	3360.	-0.1187
470.	0.5023	990.	0.5075	1510.	0.4736	2190.	0.0044	3390.	-0.1186
475.	0.503	995.	0.5085	1515.	0.4738	2200.	0.0044	3420.	-0.1205
480.	0.5009	1000.	0.508	1520.	0.4724	2210.	0.0027	3450.	-0.1207
485.	0.5041	1005.	0.5078	1525.	0.4717	2220.	-0.0008	3480.	-0.124
490.	0.504	1010.	0.5069	1530.	0.4724	2230.	-0.0027	3510.	-0.1215
495.	0.5041	1015.	0.5071	1535.	0.4722	2240.	-0.0045	3540.	-0.1232
500.	0.5039	1020.	0.5062	1540.	0.4697	2250.	-0.0056	3570.	-0.122
505.	0.5065	1025.	0.5064	1545.	0.4719	2260.	-0.0064		
510.	0.5043	1030.	0.5069	1550.	0.4681	2270.	-0.0088		

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
515.	0.5062	1035.	0.5078	1555.	0.4678	2280.	-0.0113		
520.	0.5064	1040.	0.506	1560.	0.4678	2290.	-0.0119		

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	6.742E+04	gal/day/ft
S	0.008075	

Data Set: S:\Projects\448\01\PC98R pumping test - Site B\pc98Rpc100-rec-corrected for baro&trend.aqt

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	5.332E+04	gal/day/ft
S'	5.435	

Data Set: S:\Projects\448\01\PC99R pumping test - Site C\pc99Rpc99R-JC-corrected for baro and trend.aqt
Date: 10/30/00
Time: 13:12:22

PUMPING WELL DATA

Number of pumping wells: 1

Pumping Well No. 1: PC99R

X Location: 0. ft
Y Location: 0. ft

No. of pumping periods: 2

Pumping Period Data			
Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	64.	2160.	0.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: PC99R

X Location: 0. ft
Y Location: 1. ft

No. of observations: 624

Observation Data									
Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.	0.9796	685.	1.087	1310.	0.9671	2005.	1.068	3080.	0.1058
10.	0.9936	690.	1.086	1315.	0.9627	2010.	1.069	3090.	0.1112
15.	0.994	695.	1.091	1320.	0.9643	2015.	1.074	3100.	0.1129
20.	0.9954	700.	1.086	1325.	0.9637	2020.	1.073	3110.	0.1213
25.	0.9977	705.	1.085	1330.	0.963	2025.	1.073	3120.	0.1194
30.	1.014	710.	1.083	1335.	0.961	2030.	1.076	3130.	0.1225
35.	1.01	715.	1.081	1340.	0.9632	2035.	1.072	3140.	0.1263
40.	1.009	720.	1.086	1345.	0.9617	2040.	1.068	3150.	0.1279
45.	1.009	725.	1.08	1350.	0.96	2045.	1.071	3160.	0.1294
50.	1.011	730.	1.08	1355.	0.9618	2050.	1.065	3170.	0.1331
55.	1.013	735.	1.08	1360.	0.9578	2055.	1.065	3180.	0.1348
60.	1.014	740.	1.077	1365.	0.9613	2060.	1.065	3190.	0.1365
65.	1.013	745.	1.076	1370.	0.9592	2065.	1.066	3200.	0.137
70.	1.014	750.	1.074	1375.	0.9599	2070.	1.062	3210.	0.1374
80.	1.012	755.	1.076	1380.	0.9564	2075.	1.062	3220.	0.1449
90.	1.011	760.	1.072	1385.	0.9586	2080.	1.055	3230.	0.1464
100.	1.015	765.	1.072	1390.	0.9588	2085.	1.062	3240.	0.1518
110.	1.018	770.	1.071	1395.	0.9544	2090.	1.06	3250.	0.1563
120.	1.017	775.	1.063	1400.	0.957	2095	1.063	3260.	0.1572
130.	1.019	780.	1.072	1410.	0.9522	2100.	1.057	3270.	0.1554
140.	1.022	785.	1.069	1420.	0.9526	2105.	1.056	3280.	0.1578
150.	1.024	790.	1.064	1430.	0.954	2110.	1.058	3290.	0.1595
160.	1.026	795.	1.062	1440.	0.9534	2115.	1.053	3300.	0.16
170.	1.029	800.	1.064	1450.	0.9511	2120.	1.054	3310.	0.1569
180.	1.032	805.	1.064	1455.	0.9506	2125.	1.056	3320.	0.1541
185.	1.034	810.	1.054	1460.	0.952	2130.	1.056	3330.	0.1504
190.	1.038	815.	1.054	1465.	0.9496	2135.	1.05	3340.	0.1504
195.	1.039	820.	1.051	1470.	0.9511	2140.	1.052	3350.	0.1492
200.	1.039	825.	1.053	1475.	0.9494	2145.	1.048	3360.	0.1471
205.	1.043	830.	1.051	1480.	0.9505	2150.	1.049	3370.	0.1491
210.	1.037	835.	1.056	1485.	0.9504	2155.	1.047	3380.	0.1501
215.	1.047	840.	1.041	1490.	0.9531	2165.	0.1477	3390.	0.1469
220.	1.044	845.	1.046	1495.	0.9486	2170.	0.1306	3400.	0.1428
225.	1.046	850.	1.041	1500.	0.9485	2175.	0.122	3410.	0.1473
230.	1.043	855.	1.042	1505.	0.9506	2180.	0.1211	3420.	0.1418
235.	1.046	860.	1.039	1510.	0.9519	2185.	0.1214	3430.	0.1389
240.	1.048	865.	1.039	1515.	0.9512	2190.	0.1195	3440.	0.1393
245.	1.044	870.	1.04	1520.	0.9579	2200.	0.1166	3450.	0.134
250.	1.048	875.	1.037	1525.	0.9576	2210.	0.1162	3460.	0.1327

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
255.	1.047	880.	1.037	1530.	0.9585	2220.	0.1154	3470.	0.1307
260.	1.051	885.	1.033	1535.	0.9596	2230.	0.1159	3480.	0.1293
265.	1.047	890.	1.038	1540.	0.9628	2240.	0.1135	3490.	0.1277
270.	1.046	895.	1.03	1545.	0.9597	2250.	0.114	3500.	0.1249
275.	1.049	900.	1.031	1550.	0.9633	2260.	0.1124	3510.	0.1234
280.	1.05	905.	1.027	1560.	0.9615	2270.	0.1132	3520.	0.1225
285.	1.05	910.	1.031	1570.	0.9648	2280.	0.1111	3530.	0.1184
290.	1.053	915.	1.026	1580.	0.9673	2290.	0.1109	3540.	0.1187
295.	1.051	920.	1.023	1590.	0.9676	2300.	0.1101	3550.	0.1168
300.	1.054	925.	1.023	1600.	0.9663	2310.	0.1074	3560.	0.1122
305.	1.056	930.	1.019	1610.	0.9676	2320.	0.1087	3570.	0.111
310.	1.057	935.	1.021	1620.	0.9748	2330.	0.1034	3580.	0.1113
315.	1.056	940.	1.021	1630.	0.977	2340.	0.1032	3590.	0.1105
320.	1.063	945.	1.015	1640.	0.9813	2350.	0.1	3600.	0.1082
325.	1.058	950.	1.01	1645.	0.9819	2360.	0.0963	3610.	0.1094
330.	1.062	955.	1.012	1650.	0.9813	2370.	0.0953	3620.	0.1047
335.	1.062	960.	1.017	1655.	0.9846	2380.	0.0949	3630.	0.1021
340.	1.062	965.	1.011	1660.	0.984	2390.	0.0921	3640.	0.1004
345.	1.06	970.	1.01	1665.	0.9876	2400	0.0919	3650.	0.0991
350.	1.063	975.	1.006	1670.	0.9857	2410.	0.0912	3660.	0.0969
355.	1.069	980.	1.005	1675.	0.9908	2420.	0.0845	3670.	0.0955
360.	1.072	985.	1.007	1680.	0.9914	2430.	0.0847	3680.	0.0925
365.	1.068	990.	1.006	1685.	0.9888	2440.	0.0841	3690.	0.0927
370.	1.07	995.	1.014	1690.	0.9946	2450.	0.0835	3700.	0.0931
375.	1.071	1000.	1.002	1695.	0.9947	2460.	0.0814	3710.	0.0905
380.	1.07	1005.	1.006	1700.	1.	2470.	0.0806	3720.	0.0905
385.	1.069	1010.	1.005	1705.	0.9993	2480.	0.0789	3730.	0.0835
390.	1.075	1015.	1.008	1710.	1.001	2490.	0.0775	3740.	0.0868
395.	1.072	1020.	1.002	1715.	1.001	2500.	0.0772	3750.	0.0848
400.	1.076	1025.	1.001	1720.	1.002	2510.	0.076	3760.	0.0827
405.	1.075	1030.	1.004	1725.	1.003	2520.	0.0722	3770.	0.0815
410.	1.075	1035.	1.	1730.	1.005	2530.	0.0718	3780.	0.0792
415.	1.078	1040.	1.004	1735.	1.005	2540.	0.0709	3790.	0.0782
420.	1.078	1045.	0.9962	1740.	1.01	2550.	0.069	3800.	0.0776
425.	1.079	1050.	1.	1745.	1.007	2560.	0.0698	3810.	0.075
430.	1.079	1055.	1.001	1750.	1.011	2570.	0.0669	3820.	0.0746
435.	1.082	1060.	1.	1755.	1.007	2580.	0.0697	3830.	0.0737
440.	1.081	1065.	0.9968	1760.	1.012	2590.	0.0653	3840.	0.0711
445.	1.081	1070.	0.9968	1765.	1.017	2600.	0.0647	3850.	0.0707
450.	1.084	1075.	0.9911	1770.	1.017	2610.	0.0662	3860.	0.0689
455.	1.08	1080.	0.9956	1775.	1.014	2620.	0.0635	3870.	0.0684
460.	1.083	1085.	0.9892	1780.	1.021	2630.	0.0646	3880.	0.0671
465.	1.085	1090.	0.9928	1785.	1.02	2640.	0.0628	3890.	0.0672
470.	1.088	1095.	0.9941	1790.	1.024	2650.	0.0625	3900.	0.0664
475.	1.085	1100.	0.9915	1795.	1.025	2660.	0.0625	3910.	0.0657
480.	1.089	1105.	0.9899	1800.	1.033	2670.	0.0615	3920.	0.0643
485.	1.087	1110.	0.9844	1805.	1.03	2680.	0.06	3930.	0.0647
490.	1.087	1115.	0.9873	1810.	1.032	2690.	0.0604	3940.	0.0636
495.	1.092	1120.	0.9901	1815.	1.033	2700.	0.0627	3950.	0.0618
500.	1.096	1125.	0.9851	1820.	1.034	2710.	0.0615	3960.	0.0611
505.	1.094	1130.	0.9856	1825.	1.038	2720.	0.0608	3970.	0.0608
510.	1.088	1135.	0.9859	1830.	1.037	2730.	0.0599	3980.	0.0603
515.	1.089	1140.	0.9824	1835.	1.034	2740.	0.0587	3990.	0.0579
520.	1.09	1145.	0.9823	1840.	1.04	2750.	0.0577	4000.	0.0569
525.	1.091	1150.	0.9849	1845.	1.044	2760.	0.0618	4010.	0.0568
530.	1.089	1155.	0.9835	1850.	1.043	2770.	0.0571	4020.	0.0558
535.	1.091	1160.	0.9815	1855.	1.051	2780.	0.0561	4030.	0.0554
540.	1.092	1165.	0.981	1860.	1.049	2790.	0.0585	4040.	0.0533
545.	1.091	1170.	0.9831	1865.	1.05	2800.	0.059	4050.	0.0537
550.	1.094	1175.	0.9825	1870.	1.054	2810.	0.0588	4060.	0.0514
555.	1.091	1180.	0.9807	1875.	1.053	2820.	0.0564	4070.	0.0502
560.	1.093	1185.	0.9839	1880.	1.056	2830.	0.0548	4080.	0.0496
565.	1.098	1190.	0.9762	1885.	1.048	2840.	0.0561	4090.	0.0504
570.	1.093	1195.	0.9785	1890.	1.05	2850.	0.0553	4100.	0.0495
575.	1.093	1200.	0.9803	1895.	1.052	2860.	0.0539	4110.	0.0479
580.	1.095	1205.	0.9761	1900.	1.055	2870.	0.0552	4120.	0.0474
585.	1.095	1210.	0.9791	1905.	1.05	2880.	0.0526	4130.	0.0465
590.	1.092	1215.	0.9752	1910.	1.05	2890.	0.0541	4140.	0.0449
595.	1.097	1220.	0.9728	1915.	1.047	2900.	0.055	4150.	0.0464
600.	1.095	1225.	0.9782	1920.	1.049	2910.	0.0554	4160.	0.0431

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
605.	1.094	1230.	0.9736	1925.	1.051	2920.	0.0564	4170.	0.0436
610.	1.095	1235.	0.9748	1930.	1.053	2930.	0.0597	4180.	0.0436
615.	1.097	1240.	0.9736	1935.	1.053	2940.	0.0596	4190.	0.0429
620.	1.1	1245.	0.9711	1940.	1.055	2950.	0.0605	4200.	0.0419
625.	1.098	1250.	0.9732	1945.	1.054	2960.	0.0668	4210.	0.0414
630.	1.098	1255.	0.9728	1950.	1.057	2970.	0.0628	4220.	0.0392
635.	1.096	1260.	0.9719	1955.	1.059	2980.	0.0671	4230.	0.039
640.	1.096	1265.	0.9686	1960.	1.062	2990.	0.0702	4240.	0.0391
645.	1.1	1270.	0.9704	1965.	1.064	3000.	0.0802	4250.	0.0373
650.	1.096	1275.	0.9689	1970.	1.063	3010.	0.0793	4260.	0.037
655.	1.094	1280.	0.9724	1975.	1.064	3020.	0.0802	4270.	0.0365
660.	1.094	1285.	0.9683	1980.	1.063	3030.	0.0826	4280.	0.037
665.	1.093	1290.	0.968	1985.	1.06	3040.	0.0887	4290.	0.0354
670.	1.093	1295.	0.9661	1990.	1.06	3050.	0.0987	4300.	0.0335
675.	1.092	1300.	0.9673	1995.	1.063	3060.	0.1027	4310.	0.0326
680.	1.091	1305.	0.9655	2000.	1.069	3070.	0.1034		

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.249E+05	gal/day/ft
S	0.0001041	

Data Set: S:\Projects\448\01\PC99R pumping test - Site C\pc99Rpc99R-REC-corrected for baro and trend.aqt
Date: 10/30/00
Time: 13:13:42

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.738E+05	gal/day/ft
S'	1.21	

Data Set: S:\Projects\448\01\PC99R pumping test - Site C\pc99Rpc99-JC-corrected for WL baro and trend.aqt
Date: 10/30/00
Time: 13:15:48

PUMPING WELL DATA

Number of pumping wells: 1

Pumping Well No. 1: PC99R

X Location: 0. ft
Y Location: 0. ft

No. of pumping periods: 2

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	64.	2160.	0.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: PC99

X Location: 0. ft
Y Location: 4. ft

No. of observations: 70

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
60.	0.7578	900.	0.807	1740.	0.7752	2580.	0.0134	3420.	0.0816
120.	0.7696	960.	0.7928	1800.	0.793	2640.	0.0132	3480.	0.0674
180.	0.7864	1020.	0.7866	1860.	0.8078	2700.	0.002	3540.	0.0622
240.	0.8002	1080.	0.7774	1920.	0.8116	2760.	0.0028	3600.	0.052
300.	0.806	1140.	0.7632	1980.	0.8214	2820.	-0.0024	3660.	0.0478
360.	0.8248	1200.	0.757	2040.	0.8332	2880.	-0.0066	3720.	0.0376
420.	0.8306	1260.	0.7508	2100.	0.823	2940.	0.0012	3780.	0.0224
480.	0.8444	1320.	0.7376	2160.	0.8098	3000.	0.001	3840.	0.0182
540.	0.8562	1380.	0.7294	2220.	0.0556	3060.	0.0198	3900.	0.012
600.	0.86	1440.	0.7332	2280.	0.0434	3120.	0.0416	3960.	0.0088
660.	0.8638	1500.	0.725	2340.	0.0392	3180.	0.0604	4020.	0.0006
720.	0.8556	1560.	0.7288	2400.	0.031	3240.	0.0802	4080.	-0.0016
780.	0.8364	1620.	0.7366	2460.	0.0198	3300.	0.088	4140.	-0.0098
840.	0.8222	1680.	0.7564	2520.	0.0176	3360.	0.0798	4200.	-0.01

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.126E+05	gal/day/ft
S	0.001677	

Data Set: S:\Projects\448\01\PC99R pumping test - Site C\pc99Rpc99-REC-corrected for baro and WL trend.aqt
Date: 10/30/00
Time: 13:16:54

AQUIFER DATA

Saturated Thickness: 1. ft
Anisotropy Ratio (Kz/Kr): 1.

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.483E+05	gal/day/ft
S'	3.997	

Data Set: S:\Projects\448\01\PC99R pumping test - Site C\pc99Rpc88-JC-corrected for baro and trend.aqt
Date: 10/30/00
Time: 14:30:01

PUMPING WELL DATA

Number of pumping wells: 1

Pumping Well No. 1: PC99R

X Location: 0. ft
Y Location: 0. ft

No. of pumping periods: 2

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	64.	2160.	0.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: PC88

X Location: 0. ft
Y Location: 43. ft

No. of observations: 647

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
5.	0.08715	655.	0.2392	1305.	0.1084	1955.	0.1946	3050.	-0.3012
10.	0.0993	660.	0.2383	1310.	0.1081	1960.	0.1976	3060.	-0.2981
15.	0.1032	665.	0.2382	1315.	0.1055	1965.	0.1968	3070.	-0.2937
20.	0.105	670.	0.2373	1320.	0.1059	1970.	0.1981	3080.	-0.2925
25.	0.1082	675.	0.2369	1325.	0.1038	1975.	0.1964	3090.	-0.2849
30.	0.1071	680.	0.2359	1330.	0.1045	1980.	0.1993	3100.	-0.2821
35.	0.1095	685.	0.2349	1335.	0.1044	1985.	0.1989	3110.	-0.2783
40.	0.1111	690.	0.2354	1340.	0.1042	1990.	0.2035	3120.	-0.2749
45.	0.1118	695.	0.2352	1345.	0.1039	1995.	0.2027	3130.	-0.2704
50.	0.1141	700.	0.2344	1350.	0.1024	2000.	0.2074	3140.	-0.2645
55.	0.1158	705.	0.2326	1355.	0.102	2005.	0.2076	3150.	-0.2602
60.	0.1162	710.	0.2319	1360.	0.101	2010.	0.2098	3160.	-0.2578
65.	0.1166	715.	0.2311	1365.	0.1007	2015.	0.2105	3170.	-0.2539
70.	0.1199	720.	0.2299	1370.	0.1001	2020.	0.2117	3180.	-0.2548
75.	0.1198	725.	0.2284	1375.	0.09915	2025.	0.211	3190.	-0.2509
80.	0.1175	730.	0.2269	1380.	0.0989	2030.	0.209	3200.	-0.2466
85.	0.1194	735.	0.2261	1385.	0.09995	2035.	0.2082	3210.	-0.2451
90.	0.1213	740.	0.225	1390.	0.0976	2040.	0.2041	3220.	-0.2361
95.	0.123	745.	0.2221	1395.	0.09595	2045.	0.2091	3230.	-0.2353
100.	0.1256	750.	0.2185	1400.	0.0964	2050.	0.2031	3240.	-0.2321
105.	0.1253	755.	0.2183	1405.	0.09545	2055.	0.2054	3250.	-0.2317
110.	0.127	760.	0.2169	1410.	0.0956	2060.	0.203	3260.	-0.2287
115.	0.1285	765.	0.215	1415.	0.09595	2065.	0.2028	3270.	-0.23
120.	0.1301	770.	0.2139	1420.	0.0941	2070.	0.2009	3280.	-0.2272
125.	0.1334	775.	0.2089	1425.	0.09355	2075.	0.2001	3290.	-0.2258
130.	0.1341	780.	0.2132	1430.	0.0931	2080.	0.1956	3300.	-0.2242
135.	0.1353	785.	0.2091	1435.	0.09455	2085.	0.1994	3310.	-0.2263
140.	0.1374	790.	0.2093	1440.	0.0932	2090.	0.1949	3320.	-0.2261
145.	0.1399	795.	0.2091	1445.	0.09275	2095.	0.1984	3330.	-0.2295
150.	0.1407	800.	0.209	1450.	0.0944	2100.	0.196	3340.	-0.2305
155.	0.1427	805.	0.2052	1455.	0.09285	2105.	0.1951	3350.	-0.2321
160.	0.1435	810.	0.2017	1460.	0.0918	2110.	0.1947	3360.	-0.2309
165.	0.1457	815.	0.2021	1465.	0.09175	2115.	0.1918	3370.	-0.2289
170.	0.1448	820.	0.2	1470.	0.0904	2120.	0.1921	3380.	-0.2284
175.	0.149	825.	0.2013	1475.	0.08935	2125.	0.1918	3390.	-0.2303
180.	0.1473	830.	0.1984	1480.	0.0895	2130.	0.1924	3400.	-0.2341
185.	0.1508	835.	0.2029	1485.	0.08965	2135.	0.1853	3410.	-0.2317
190.	0.1514	840.	0.1952	1490.	0.0903	2140.	0.1926	3420.	-0.2361
195.	0.1543	845.	0.1969	1495.	0.08955	2145.	0.1918	3430.	-0.242

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
200.	0.1535	850.	0.1923	1500.	0.0902	2150.	0.1899	3440.	-0.2394
205.	0.1583	855.	0.1938	1505.	0.09015	2155.	0.1906	3450.	-0.243
210.	0.1577	860.	0.1948	1510.	0.0911	2165.	-0.217	3460.	-0.2428
215.	0.1606	865.	0.1918	1515.	0.09115	2170.	-0.2361	3470.	-0.2442
220.	0.1613	870.	0.1927	1520.	0.0915	2180.	-0.2464	3480.	-0.2445
225.	0.1621	875.	0.1936	1525.	0.09195	2190.	-0.2511	3490.	-0.2467
230.	0.1644	880.	0.1904	1530.	0.0926	2200.	-0.2547	3500.	-0.2494
235.	0.1676	885.	0.1868	1535.	0.09325	2210.	-0.2582	3510.	-0.2499
240.	0.167	890.	0.1889	1540.	0.0946	2220.	-0.2605	3520.	-0.25
245.	0.1678	895.	0.1835	1545.	0.09445	2230.	-0.2628	3530.	-0.2544
250.	0.1698	900.	0.1891	1550.	0.0949	2240.	-0.2634	3540.	-0.2528
255.	0.1722	905.	0.1812	1555.	0.09595	2250.	-0.2647	3550.	-0.2557
260.	0.1739	910.	0.1859	1560.	0.0956	2260.	-0.2659	3560.	-0.2594
265.	0.1732	915.	0.181	1565.	0.09595	2270.	-0.2679	3570.	-0.2599
270.	0.1762	920.	0.1786	1570.	0.0964	2280.	-0.2696	3580.	-0.2606
275.	0.1779	925.	0.1782	1575.	0.09805	2290.	-0.2716	3590.	-0.2616
280.	0.1763	930.	0.1774	1580.	0.0991	2300.	-0.2734	3600.	-0.2639
285.	0.1777	935.	0.1794	1585.	0.09875	2310.	-0.2761	3610.	-0.2627
290.	0.1793	940.	0.1753	1590.	0.0987	2320	-0.2778	3620.	-0.268
295.	0.1762	945.	0.1742	1595.	0.09915	2330.	-0.28	3630.	-0.2723
300.	0.1778	950.	0.1667	1600.	0.1018	2340.	-0.2806	3640.	-0.2736
305.	0.1802	955.	0.1679	1605.	0.1025	2350.	-0.2832	3650.	-0.2749
310.	0.1816	960.	0.1736	1610.	0.1011	2360.	-0.285	3660.	-0.2743
315.	0.1828	965.	0.1649	1615.	0.1038	2370.	-0.2855	3670.	-0.2745
320.	0.1853	970.	0.164	1620.	0.1064	2380.	-0.2868	3680.	-0.2772
325.	0.1863	975.	0.1634	1625.	0.1063	2390.	-0.289	3690.	-0.2774
330.	0.1882	980.	0.1636	1630.	0.1087	2400.	-0.288	3700.	-0.2773
335.	0.1913	985.	0.1635	1635.	0.1106	2410.	-0.2888	3710.	-0.2814
340.	0.1918	990.	0.1607	1640.	0.1122	2420.	-0.2941	3720.	-0.2816
345.	0.1918	995.	0.1655	1645.	0.1139	2430.	-0.2942	3730.	-0.289
350.	0.1912	1000.	0.1579	1650.	0.1152	2440.	-0.293	3740.	-0.285
355.	0.1961	1005.	0.1601	1655.	0.1181	2450.	-0.2945	3750.	-0.2876
360.	0.1985	1010.	0.156	1660.	0.1182	2460.	-0.2951	3760.	-0.291
365.	0.1994	1015.	0.161	1665.	0.1203	2470.	-0.2971	3770.	-0.2932
370.	0.1997	1020.	0.1574	1670.	0.1214	2480.	-0.2976	3780.	-0.2952
375.	0.1994	1025.	0.1532	1675.	0.1225	2490.	-0.2984	3790.	-0.2982
380.	0.2016	1030.	0.1537	1680.	0.1251	2500.	-0.2985	3800.	-0.2971
385.	0.2014	1035.	0.152	1685.	0.1267	2510.	-0.2999	3810.	-0.299
390.	0.2037	1040.	0.1498	1690.	0.1278	2520.	-0.3018	3820.	-0.3017
395.	0.2042	1045.	0.1548	1695.	0.1296	2530.	-0.3051	3830.	-0.302
400.	0.2064	1050.	0.1564	1700.	0.1318	2540.	-0.3033	3840.	-0.3048
405.	0.2077	1055.	0.1547	1705.	0.1324	2550.	-0.3045	3850.	-0.3044
410.	0.2074	1060.	0.1543	1710.	0.1329	2560.	-0.3042	3860.	-0.3067
415.	0.2087	1065.	0.1533	1715.	0.1363	2570.	-0.3073	3870.	-0.3077
420.	0.2092	1070.	0.1527	1720.	0.139	2580.	-0.3055	3880.	-0.309
425.	0.2102	1075.	0.1515	1725.	0.1394	2590.	-0.3081	3890.	-0.3107
430.	0.2101	1080.	0.1494	1730.	0.1409	2600.	-0.3083	3900.	-0.3116
435.	0.2143	1085.	0.15	1735.	0.1412	2610.	-0.3077	3910.	-0.3123
440.	0.212	1090.	0.148	1740.	0.1443	2620.	-0.3086	3920.	-0.3143
445.	0.2145	1095.	0.1484	1745.	0.1439	2630.	-0.3102	3930.	-0.3131
450.	0.2163	1100.	0.147	1750.	0.1464	2640.	-0.3126	3940.	-0.3142
455.	0.2143	1105.	0.1447	1755.	0.1482	2650.	-0.3128	3950.	-0.3162
460.	0.2158	1110.	0.1447	1760.	0.1494	2660.	-0.3125	3960.	-0.317
465.	0.2167	1115.	0.1439	1765.	0.1538	2670.	-0.3134	3970.	-0.3181
470.	0.2192	1120.	0.1435	1770.	0.1538	2680.	-0.3154	3980.	-0.318
475.	0.219	1125.	0.1422	1775.	0.1553	2690.	-0.3155	3990.	-0.3207
480.	0.2187	1130.	0.1412	1780.	0.1592	2700.	-0.315	4000.	-0.3216
485.	0.2188	1135.	0.1399	1785.	0.1606	2710.	-0.3179	4010.	-0.3228
490.	0.2207	1140.	0.1391	1790.	0.1651	2720.	-0.3188	4020.	-0.323
495.	0.2241	1145.	0.1374	1795.	0.1658	2730.	-0.3193	4030.	-0.3245
500.	0.2256	1150.	0.1372	1800.	0.1653	2740.	-0.3208	4040.	-0.325
505.	0.2274	1155.	0.1356	1805.	0.1671	2750.	-0.3177	4050.	-0.3256
510.	0.2244	1160.	0.1345	1810.	0.1702	2760.	-0.3155	4060.	-0.3264
515.	0.225	1165.	0.1344	1815.	0.1714	2770.	-0.3192	4070.	-0.3268
520.	0.2275	1170.	0.1335	1820.	0.1733	2780.	-0.3191	4080.	-0.327
525.	0.2275	1175.	0.1313	1825.	0.1762	2790.	-0.3184	4090.	-0.3275
530.	0.2283	1180.	0.132	1830.	0.176	2800.	-0.3189	4100.	-0.3295
535.	0.2318	1185.	0.1311	1835.	0.1777	2810.	-0.321	4110.	-0.3297
540.	0.2321	1190.	0.1295	1840.	0.1792	2820.	-0.3215	4120.	-0.3309
545.	0.2332	1195.	0.1283	1845.	0.1817	2830.	-0.3241	4130.	-0.3303

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
550.	0.233	1200.	0.1263	1850.	0.1836	2840.	-0.3227	4140.	-0.33
555.	0.2341	1205.	0.1263	1855.	0.1855	2850.	-0.3242	4150.	-0.3307
560.	0.2332	1210.	0.1253	1860.	0.1849	2860.	-0.3252	4160.	-0.3318
565.	0.2367	1215.	0.1239	1865.	0.1868	2870.	-0.3272	4170.	-0.3317
570.	0.2348	1220.	0.1236	1870.	0.1869	2880.	-0.3285	4180.	-0.3316
575.	0.2366	1225.	0.1231	1875.	0.186	2890.	-0.3299	4190.	-0.3326
580.	0.2356	1230.	0.1215	1880.	0.1886	2900.	-0.3299	4200.	-0.3336
585.	0.2349	1235.	0.1211	1885.	0.1883	2910.	-0.329	4210.	-0.333
590.	0.2365	1240.	0.1201	1890.	0.1885	2920.	-0.3297	4220.	-0.3343
595.	0.2389	1245.	0.1198	1895.	0.1865	2930.	-0.328	4230.	-0.3347
600.	0.2393	1250.	0.1167	1900.	0.1876	2940.	-0.3286	4240.	-0.3335
605.	0.2395	1255.	0.1174	1905.	0.1882	2950.	-0.3271	4250.	-0.3342
610.	0.2394	1260.	0.116	1910.	0.1879	2960.	-0.3259	4260.	-0.3339
615.	0.2394	1265.	0.117	1915.	0.1822	2970.	-0.3264	4270.	-0.3349
620.	0.2392	1270.	0.1164	1920.	0.183	2980.	-0.3242	4280.	-0.3332
625.	0.2395	1275.	0.1142	1925.	0.1834	2990.	-0.3228	4290.	-0.3345
630.	0.2384	1280.	0.1133	1930.	0.1839	3000.	-0.322	4300.	-0.3357
635.	0.2387	1285.	0.1121	1935.	0.1875	3010.	-0.3185	4310.	-0.3365
640.	0.2396	1290.	0.1107	1940.	0.1905	3020.	-0.3164		
645.	0.2395	1295.	0.1089	1945.	0.1923	3030.	-0.3148		
650.	0.238	1300.	0.1081	1950.	0.1912	3040.	-0.3107		

SOLUTION

Aquifer Model: Confined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.251E+05	gal/day/ft
S	0.1878	

Data Set: S:\Projects\448\01\PC99R pumping test - Site C\pc99Rpc88-rec-corrected for baro and trend.aqt
Date: 10/30/00
Time: 14:31:08

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	1.564E+05	gal/day/ft
S'	4477.6	

APPENDIX D

TRACER TEST DATA

Site Piezometer PC-101R Specific Conductance Measurements (in MilliSiemens) During Deionized Water Tracer Test, September 2000

depth (feet) -->	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
time (minutes)																		
0	10.54	10.5	10.49	10.51	10.5	10.5	10.48	10.55	10.46	10.39	10.33	10.29	10.31	10.28	10.2	10.18	10.1	10.11
212	11.9	12.23	12.37	12.44	12.49	12.48	12.51	12.55	12.59	12.58	12.56	12.55	12.51	12.48	12.29	12.07	11.68	11.24
370	11.72	12.57	12.85	12.87	12.91	12.95	12.96	12.9	12.91	12.9	12.88	12.84	12.8	12.75	12.66	12.45	12.19	11.76
500	12.25	12.77	13.01	13.05	13.13	13.13	13.12	13.05	12.99	12.95	12.87	12.81	12.79	12.74	12.65	12.4	12.12	11.5
575	12.71	12.97	13.09	13.13	13.17	13.17	13.14	13.07	13.02	12.93	12.92	12.85	12.8	12.74	12.65	12.39	12.06	11.52
693	12.83	13.02	13.12	13.16	13.17	13.13	13.16	12.96	12.86	12.82	12.78	12.78	12.71	12.64	12.55	12.27	11.9	11.4
837	13.08	13.1	13.17	13.19	13.21	13.17	13.09	12.99	12.88	12.82	12.76	12.73	12.7	12.57	12.49	12.31	11.94	11.44
1056	13.31	13.34	13.37	13.41	13.39	13.27	12.8	12.79	12.75	12.74	12.71	12.64	12.6	12.47	12.28	11.96	11.61	11.08
1181	13.42	13.39	13.36	13.22	12.99	12.83	12.82	12.82	12.77	12.74	12.72	12.67	12.52	12.37	12.15	11.84	11.41	10.92
1289	13.42	13.39	13.38	13.13	13.13	12.83	12.78	12.76	12.77	12.8	12.77	12.74	12.73	12.64	12.55	12.34	12.33	12.08
1397	13.27	13.07	12.81	12.77	12.77	12.78	12.8	12.81	12.78	12.73	12.67	12.56	12.37	12.25	11.94	11.51	11.18	10.59
1617	10.59	10.64	10.65	10.65	10.65	10.65	10.65	10.63	10.66	10.7	10.56	10.51	10.48	10.44	10.38	10.33	10.29	10.27
1731	10.67	10.68	10.69	10.69	10.68	10.69	10.71	10.71	10.72	10.71	10.62	10.57	10.56	10.5	10.46	10.38	10.36	10.34
2123	10.96	10.97	10.98	10.98	10.97	10.99	11.01	11.02	11.02	10.95	10.86	10.79	10.76	10.76	10.67	10.58	10.54	10.53

Site A, Piezometer PC-101R Specific Conductance Measurements (in MilliSiemens) During Deionized Water Tracer Test, September 2000

depth (feet) -->	38	39	40	41	42	43	44	45	46	47	48
time (minutes)											
0	10.09	10.07	10.05	10.05	10.05	10.06	10.06	10.07	10.07	10.07	10.07
212	10.99	11.04	10.98	10.96	10.96						
370	11.18	11.07	11	10.97	10.95	10.95	10.94	10.94	10.91	10.88	10.88
500	11.13	10.82	10.82	10.8	10.8	10.77	10.76	10.75	10.76	10.74	10.73
575	11.09	10.78	10.72	10.7	10.69	10.68	10.67	10.67	10.66	10.66	10.65
693	10.77	10.58	10.58	10.53	10.51	10.49	10.48	10.47	10.46	10.45	10.46
837	10.94	10.72	10.61	10.54	10.49	10.41	10.37	10.3	10.28	10.27	10.27
1056	10.53	10.25	10.22	10.2	10.16	10.14	10.12	10.11	10.11	10.11	10.11
1181	10.38	10.2	10.16	10.11	10.08	10.05	10.03	10.04	10.04	10.03	10.02
1289	11.73	11.28	10.68	10.65	10.21	10.11	10.07	10.03	10.01	10	10
1397	10.16	10.03	10.02	9.99	9.97	9.97	9.95	9.96	9.96	9.97	9.96
1617	10.26	10.23	10.25	10.2	10.24	10.23	10.23	10.24	10.24	10.22	10.22
1731	10.31	10.24	10.26	10.28	10.28	10.28	10.28	10.27	10.27	10.28	10.29
2123	10.51	10.48	10.47	10.47	10.47	10.47	10.47	10.47	10.46	10.46	10.46

Site E, Piezometer PC-100R Specific Conductance Measurements (in milliSiemens) During Deionized Water Tracer Test, September 2000

	depth --->	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
(t) minutes	(t) days															
0	0.000	13.35	13.3	13.24	13.19	13.09	13	13.01	13.03	13.04	13.02	13.03	13.01	13.02	13.02	13
422	0.293								12.85	12.82	12.85	12.81	12.86	12.86	12.86	12.89
558	0.388	13.07	13.13	13.06	12.89	12.87	12.72	12.59	12.47	12.46	12.46	12.4	12.53	12.64	12.74	12.76
662	0.460	13.02	13.04	13.02	12.9	12.92	12.69	12.47	12.42	12.38	12.36	12.34	12.36	12.42	12.57	12.7
750	0.521	12.98	13	12.9	12.86	12.83	12.63	12.45	12.36	12.35	12.36	12.32	12.28	12.34	12.49	12.6
886	0.615	12.96	13.01	12.93	12.81	12.72	12.62	12.42	12.35	12.33	12.31	12.25	12.19	12.21	12.39	12.54
1029	0.715	12.93	12.98	13.13	12.83	12.83	12.81	12.6	12.38	12.32	12.32	12.31	12.35	12.27	12.19	12.24
1199	0.833	13	13.03	12.93	12.84	12.73	12.57	12.36	12.36	12.36	12.32	12.21	12.2	12.21	12.26	12.29
1310	0.910	12.97	12.89	12.89	12.86	12.92	12.92	12.7	12.47	12.38	12.33	12.35	12.24	12.22	12.24	12.26
1522	1.057	13.02	13.1	13.08	12.94	12.9	12.82	12.71	12.46	12.35	12.3	12.32	12.25	12.21	12.23	12.23
1675	1.163	13.01	13.01	12.97	12.93	12.98	12.8	12.57	12.41	12.37	12.35	12.28	12.25	12.27	12.27	12.27
2004	1.392	13.11	13.11	13.11	13.05	12.96	12.89	12.69	12.5	12.41	12.43	12.33	12.29	12.29	12.29	12.29
2533	1.759	13.15	13.26	13.06	13.07	13.09	12.95	12.87	12.8	12.74	12.65	12.53	12.48	12.46	12.46	12.48
3670	2.549	13.14	13.12	13.06	13.02	12.98	12.89	12.75	12.6	12.54	12.42	12.42	12.37	12.35	12.37	12.34
4067	2.824	13.14	13.19	13.12	13.1	13.07	13	12.86	12.87	12.77	12.6	12.57	12.55	12.5	12.52	12.54
4290	2.979	12.9	12.9	12.89	12.87	12.67	12.58	12.54	12.56	12.58	12.58	12.58	12.56	12.56	12.56	12.56
4708	3.269	12.95	12.97	12.91	12.87	12.89	12.82	12.66	12.55	12.48	12.39	12.33	12.34	12.32	12.32	12.32

Site B, Piezometer PC-100R Specific Conductance Measurements (in milliSiemens) During Deionized Water Tracer Test, September 2000

	depth --->	33	34	35	36	37	38	39	40	41
(t) minutes	(t) days									
0	0.000	13	13.02	13.02	13.02	13.03	13.03	13.09	13.15	
422	0.293	12.91	12.9	12.91	12.9	12.92	12.92	12.96	13.07	
558	0.388	12.74	12.74	12.76	12.78	12.78	12.83	12.89	12.93	
662	0.460	12.76	12.79	12.83	12.83	12.85	12.85	12.87	12.96	
750	0.521	12.73	12.79	12.84	12.85	12.86	12.86	12.86	12.92	
886	0.615	12.76	12.82	12.86	12.88	12.88	12.88	12.89	12.88	12.95
1029	0.715	12.27	12.29	12.59	12.71	12.8	12.81	12.85	12.89	12.88
1199	0.833	12.4	12.59	12.67	12.69	12.71	12.82	12.86	12.92	
1310	0.910	12.27	12.32	12.42	12.53	12.57	12.62	12.73	12.85	12.91
1522	1.057	12.23	12.23	12.25	12.29	12.32	12.32	12.43	12.63	12.82
1675	1.163	12.28	12.3	12.3	12.3	12.32	12.34	12.39	12.73	
2004	1.392	12.29	12.29	12.29	12.29	12.29	12.29	12.3	12.67	
2533	1.759	12.5	12.49	12.49	12.48	12.48	12.48	12.5	12.65	12.64
3670	2.549	12.37	12.36	12.37	12.35	12.36	12.37	12.37	12.64	12.73
4067	2.824	12.54	12.54	12.54	12.56	12.54	12.54	12.55	12.57	12.59
4290	2.979	12.56	12.56	12.57	12.57					
4708	3.269	12.32	12.35	12.34	12.34	12.34	12.34	12.37	12.52	

Site C, Piezometer PC-102 Specific Conductance Measurements (in milliSiemens) During Deionized Water Tracer Test, September 2000

depth -->		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
(t) minutes	(t) days															
0	0.000	8.13	8.11	8.1	8.04	8.04	8.02	8.01	7.98	7.97	7.97	7.97	7.99	7.97	7.98	7.96
205	0.142	8.15	8.17	8.2	8.16	8.17	8.2	8.17	8.18	8.18	8.17	8.18	8.19	8.19	8.23	8.22
331	0.230	8.1	8.1	8.12	8.13	8.13	8.12	8.13	8.13	8.12	8.13	8.12	8.13	8.14	8.15	8.16
444	0.308	8.26	8.27	8.28	8.28	8.29	8.29	8.29	8.29	8.29	8.29	8.29	8.34	8.34	8.29	8.3
529	0.367	8.3	8.3	8.3	8.31	8.31	8.3	8.3	8.3	8.3	8.31	8.31	8.32	8.32	8.33	8.3
684	0.475	8.3	8.3	8.3	8.28	8.28	8.28	8.27	8.28	8.28	8.27	8.28	8.28	8.26	8.27	8.3
975	0.677	8.34	8.34	8.34	8.33	8.33	8.33	8.33	8.33	8.32	8.33	8.33	8.32	8.33	8.29	8.29
1116	0.775	8.19	8.19	8.18	8.18	8.18	8.18	8.17	8.18	8.17	8.16	8.17	8.16	8.16	8.16	8.17
1214	0.843	8.29	8.29	8.27	8.27	8.24	8.24	8.25	8.25	8.25	8.24	8.24	8.23	8.23	8.22	8.22
1322	0.918	8.29	8.28	8.29	8.28	8.28	8.29	8.29	8.26	8.26	8.26	8.25	8.24	8.23	8.24	8.27
1533	1.065	8.25	8.25	8.25	8.24	8.24	8.24	8.25	8.25	8.25	8.22	8.22	8.21	8.21	8.22	8.23
1619	1.124	8.26	8.25	8.25	8.22	8.22	8.22	8.21	8.22	8.21	8.21	8.22	8.23	8.22	8.22	8.22
1726	1.199	8.27	8.27	8.26	8.28	8.27	8.27	8.27	8.29	8.28	8.28	8.29	8.28	8.24	8.26	8.3
1792	1.244	8.22	8.14	8.13	8.12	8.13	8.12	8.12	8.12	8.16	8.13	8.14	8.15	8.17	8.14	8.14
1880	1.306	8.3	8.31	8.34	8.32	8.32	8.32	8.33	8.34	8.34	8.35	8.32	8.29	8.29	8.3	8.32
1965	1.365	8.34	8.34	8.35	8.33	8.3	8.29	8.32	8.3	8.29	8.3	8.33	8.3	8.3	8.31	8.35
2112	1.467	8.34	8.32	8.3	8.29	8.32	8.29	8.29	8.29	8.31	8.29	8.28	8.29	8.32	8.29	8.29
2200	1.528	8.26	8.27	8.26	8.28	8.25	8.25	8.25	8.27	8.25	8.25	8.25	8.28	8.24	8.25	8.28
2292	1.592	8.29	8.26	8.26	8.25	8.28	8.25	8.25	8.25	8.26	8.25	8.24	8.23	8.25	8.24	8.26
2403	1.669	8.28	8.27	8.3	8.27	8.27	8.27	8.29	8.26	8.27	8.27	8.28	8.27	8.27	8.27	8.27
2473	1.717	8.31	8.3	8.3	8.29	8.32	8.28	8.29	8.29	8.31	8.29	8.28	8.29	8.3	8.28	8.3
2699	1.874	8.35	8.35	8.36	8.35	8.34	8.35	8.37	8.34	8.35	8.34	8.38	8.36	8.38	8.37	8.39
2881	2.001	9.73	9.6	9.45	9.14	8.53	8.41	8.43	8.41	8.41	8.4	8.43	8.4	8.41	8.4	8.44
3381	2.348	8.25	8.29	8.36	8.34	8.36	8.38	8.46	8.45	8.48	8.45	8.46	8.45	8.45	8.46	8.49
3927	2.727	8.52	8.52	8.55	8.53	8.53	8.53	8.52	8.5	8.5	8.5	8.53	8.5	8.53	8.53	8.57

Site , Piezometer PC-102 Specific Conductance Measurements (in milliSiemens) During Deionized Water Tracer Test, September 2000

	depth -->	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
(t) minutes	(t) days							9.58	9.62							
0	0.000	7.96	7.97	7.94	7.93	7.92	7.95	8.29	8.36	8.7	8.86	9.01	9.12	9.18	9.19	9.22
205	0.142	8.18	8.18	8.15	8.16	8.54	8.67	8.88	9.08	9.13	9.19	9.24	9.26	9.28	9.36	9.42
331	0.230	8.15	8.14	8.13	8.12	8.51	8.64	8.84	9.01	9.09	9.12	9.14	9.12	9.11	9.1	9.15
444	0.308	8.3	8.29	8.3	8.31	8.31	8.29	8.29	8.3	8.69	8.86	9.07	9.18	9.23	9.25	9.24
529	0.367	8.3	8.29	8.27	8.26	8.68	8.83	9.02	9.14	9.17	9.2	9.16	9.07	9.1	9.04	9.12
684	0.475	8.3	8.27	8.24	8.74	8.82	8.98	9.05	9.08	9.08	9.08	9.07	9.01	9.04	9.09	9.13
975	0.677	8.29	8.28	8.31	8.32	8.31	8.29	8.67	8.81	8.94	9.06	9.1	9.12	9.1	9.11	9.11
1116	0.775	8.19	8.19	8.16	8.17	8.56	8.73	8.82	8.96	8.97	8.97	8.99	8.99	9	9.09	9.18
1214	0.843	8.27	8.24	8.21	8.66	8.78	8.99	9.05	9.02	9.04	9.05	9.1	9.1	9.18	9.32	9.28
1322	0.918	8.29	8.25	8.25	8.66	8.83	8.95	9.06	9.07	9.12	9.13	9.13	9.16	9.22	9.36	9.28
1533	1.065	8.23	8.24	8.23	8.23	8.21	8.19	8.54	8.71	8.86	9.03	9.07	9.08	9.1	9.13	9.15
1619	1.124	8.23	8.23	8.22	8.21	8.19	8.58	8.68	8.87	9.02	9.07	9.09	9.12	9.14	9.16	9.27
1726	1.199	8.28	8.27	8.26	8.61	8.81	8.99	9.1	9.14	9.16	9.17	9.19	9.23	9.38	9.49	9.3
1792	1.244	8.14	8.15	8.14	8.11	8.14	8.52	8.63	8.84	8.97	9.04	9.04	9.06	9.08	9.14	9.23
1880	1.306	8.72	8.82	8.98	9.18	9.19	9.22	9.24	9.3	9.31	9.36	9.48	9.47	9.46	9.49	9.43
1965	1.365	8.32	8.31	8.29	8.3	8.75	8.82	8.99	9.16	9.17	9.21	9.24	9.27	9.29	9.37	9.54
2112	1.467	8.31	8.36	8.34	8.3	8.29	8.25	8.73	8.83	8.99	9.18	9.19	9.22	9.25	9.31	9.34
2200	1.528	8.33	8.27	8.25	8.24	8.81	8.86	8.93	9.15	9.2	9.23	9.25	9.26	9.33	9.45	9.51
2292	1.592	8.27	8.3	8.26	8.22	8.19	8.73	8.8	9.09	9.14	9.2	9.21	9.25	9.26	9.34	9.47
2403	1.669	8.3	8.31	8.28	8.26	8.22	8.68	8.83	9.08	9.18	9.21	9.24	9.26	9.26	9.3	9.33
2473	1.717	8.32	8.34	8.3	8.25	8.25	8.69	8.87	9	9.18	9.27	9.27	9.31	9.34	9.4	9.48
2699	1.874	8.37	8.35	8.33	8.36	8.76	8.86	9.06	9.24	9.29	9.32	9.35	9.42	9.44	9.51	9.63
2881	2.001	8.41	8.41	8.37	8.39	8.38	8.36	8.37	8.39	8.38	8.36	8.37	8.39	8.36	8.36	8.37
3381	2.348	8.47	8.47	8.48	8.5	8.47	8.46	8.47	8.49	8.46	8.43	8.92	8.99	9.23	9.37	9.43
3927	2.727	8.53	8.48	8.49	8.5	9.03	9.06	9.37	9.49	9.52	9.52	9.55	9.62	9.68	9.78	9.84

Site C, Piezometer PC-102 Specific Conductance Measurements (in milliSiemens) During Deionized Water Tracer Test, September 2000

depth -->		40	41	42	43	44	45	46	47	48	49	50
(t) minutes	(t) days											
0	0.000	9.29	9.33	9.25	9.31	9.25	9.26	9.24	9.22	9.24	9.22	9.23
205	0.142	9.33	9.33	9.3	9.2	9.16	9.14	9.14	9.16	9.13	9.12	9.15
331	0.230	9.15	9.15	9.12	8.96	8.95	8.99	8.95	8.93	8.94	8.97	9
444	0.308	9.17	9.15	9.07	9.16	9.18	9.19	8.84	8.9	8.95	8.97	8.97
529	0.367	9.12	9.11	9.04	8.77	8.79	8.87	8.91	8.91	8.91	8.91	8.92
684	0.475	9.13	9.06	8.7	8.71	8.89	8.93	8.94	8.94	8.93	8.93	8.8
975	0.677	9.11	9.25	9.26	9.22	9.27	9.24	8.85	8.98	8.96	8.9	8.96
1116	0.775	9.22	9.14	9.18	9.06	8.91	8.96	9.04	9.04	9.05	9.05	9.06
1214	0.843	9.25	9.28	9.06	8.99	9.03	9.1	9.13	9.15	9.16	9.15	9.14
1322	0.918	9.35	9.32	9.16	9.09	9.16	9.19	9.21	9.22	9.23	9.23	9.23
1533	1.065	9.18	9.28	9.24	9.34	9.35	9.24	9.24	9.23	9.25	9.24	9.25
1619	1.124	9.39	9.3	9.35	9.37	9.31	9.27	9.26	9.28	9.26	9.26	9.29
1726	1.199	9.41	9.46	9.29	9.34	9.33	9.34	9.33	9.33	9.35	9.36	
1792	1.244	9.33	9.25	9.34	9.34	9.23	9.19	9.22	9.22	9.21	9.23	9.25
1880	1.306	9.43	9.39	9.4	9.38	9.41	9.39	9.4	9.4	9.42	9.38	9.39
1965	1.365	9.46	9.48	9.46	9.39	9.39	9.38	9.39	9.39	9.41	9.37	
2112	1.467	9.45	9.49	9.45	9.46	9.5	9.4	9.38	9.33	9.37	9.37	9.41
2200	1.528	9.41	9.49	9.49	9.37	9.36	9.34	9.35	9.35	9.35	9.39	9.4
2292	1.592	9.57	9.46	9.51	9.45	9.47	9.34	9.34	9.32	9.35	9.36	9.41
2403	1.669	9.5	9.56	9.44	9.53	9.53	9.42	9.36	9.36	9.42	9.38	9.39
2473	1.717	9.58	9.46	9.55	9.49	9.49	9.4	9.39	9.4	9.4	9.41	9.44
2699	1.874	9.61	9.6	9.58	9.57	9.49	9.47	9.5	9.46	9.49	9.5	9.52
2881	2.001	8.41	8.39	8.42	8.42	8.4	8.37	8.33	8.75	8.91	9.05	9.25
3381	2.348	9.52	9.53	9.57	9.59	9.75	9.76	9.73	9.77	9.8	9.67	9.63
3927	2.727	9.77	9.8	9.78	9.64	9.63	9.65	9.67	9.65	9.67	9.68	9.69

Field paramaters and bromide concentrations in groundwater at depth specific intervals in well PC-101R during bromide tracer test at Site A, September 2000

Sample (Bag) ID	Minutes After Injection	pH			EC			Bromide (mg/L)		
		23 feet	32 feet	40 feet	23 feet	32 feet	40 feet	23 feet	32 feet	40 feet
56	0		8.18	8.14	10710	10020	10050	1	1	1
1	30	8.16	8.14	8.21	10690	10930	10630	1	1	1
2	60	8.33	8.40	8.39	11050	11260	10610			
3	90	8.56	8.56	8.52	11350	11530	10760			
4	120	8.41	8.65	8.79	11420	12050	10620	1	1	1
5	150	8.57	8.63	8.74	11830	12000	10780			
6	180	8.44	8.54	8.59	12020	12040	10760			
7	210	8.69	8.72	8.67	11890	12230	10600	1	1	1
8	240	8.57	8.73	8.82	12240	12370	10660			
9	270	8.68	8.75	8.81	12020	12450	10740			
10	300	8.59	8.80	8.90	12190	12380	10560	1	1	1
11	330	8.74	8.88	8.79	11920	12280	10630			
12	360	8.89	8.88	8.95	11900	12240	10660			
13	390	8.95	8.98	9.31	11910	12480	10550	1	1	1.5
14	420	8.97	9.23	9.30	12010	12490	10460			
15	450	9.15	9.31	9.34	12110	12520	10640			
16	480	8.82	9.10	9.19	12100	12430	10580	1	1	7.4
17	510	9.04	9.20	9.20	12170	12550	10710			
18	540	8.78	8.96	9.02	12170	12470	10520			
19	570	8.92	8.97	8.93	12110	12690	10620	1	1	22
20	600	8.66	8.65	8.66	12230	12320	10370			
21	630	8.86	8.66	8.72	12220	12250	10130			52
22	660	8.51	8.64	8.68	12240	12540	10490	1	1.3	66
23	690	8.47	8.53	8.64	12030	12150	10550			
24	720	8.44	8.49	8.52	12370					
25	750		8.47	8.41		12420	10520	1	1	76
26	780	8.30	8.32	8.32	12430	12000	10420			110
27	810	8.23	8.20	8.21	12260	12540	10440			
28	840	8.31	8.26	8.25	12500	12400	10340	1	2.5	110
29	870	8.30	8.25	8.28	12200	12500	10500			
30	900	8.17	8.17	8.20	12600	12200	10750			
31	930	8.24	8.20	8.20	12220	12350	10400	1	5.3	100
32	960	8.24	8.09	8.08	12680	12050	10270			140
33	990	8.10	8.10	8.27	12240	12250	10410			
34	1020	8.27	8.12	8.13	12600	11550	10100	2.2	9.2	140
35	1050	8.15	8.17	8.26	12300	12400	10250			
36	1080	8.30	8.17	8.18	12720	11900	10100			
37	1110	8.14	8.11	8.21	12300	12300	10350	2.9	15	130
38	1140	8.20	8.08	8.10	12550	11890	10200			160
39	1170	8.12	8.05	8.25	12550	12240	10350			
40	1200	8.27	8.10	8.08	12970	11960	10200	5	20	160
41	1230	8.11	8.07	8.25	12700	12220	10350			
42	1260	8.17	8.08	8.15	12800	11750	10140			150
43	1290	8.08	8.07	8.09	12550	11880	10240	8.3	36	140

Field paramaters and bromide concentrations in groundwater at depth specific intervals in well PC-101R during bromide tracer test at Site A, September 2000

Sample (Bag) ID	Minutes After Injection	pH			EC			Bromide (mg/L)		
		23 feet	32 feet	40 feet	23 feet	32 feet	40 feet	23 feet	32 feet	40 feet
44	1320	8.05	8.03	8.03	12670	11470	10300		52	160
45	1350	8.10	8.09	8.18	12390	11210	10300		73	150
46	1380	8.14	8.10	8.12	12360	10760	10150	24	100	150
47	1410	8.19	8.17	8.23	11620	10550	10160	68	110	160
48	1440	8.19	8.24	8.27	11080	10410	10000	96	130	170
49	1470	8.65	8.64	8.52	10790	10440	10000	88	110	130
50	1500	8.32	8.35	8.40	10800	10360	10120	120	140	160
51	1530	8.36	8.49	8.42	10690	10420	10100	120	130	160
52	1560	8.24	8.51	8.53	10840	10490	10120	98	110	130
53	1590	8.56	8.61	8.53	10630	10840	10380	120	130	160
54	1620	8.40	8.71	8.79	10690	10560	10280	120	140	160
55	1650	8.75	8.86	8.75	10720	10260	10200	100	100	140
57	samples at 0738 and 0809: Bromide slug							3000	and	3600

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 46 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-39

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT		R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	150	J1	20.	100	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 46 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-38
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	100	4.	20	EPA 300.0	mg/L	9/29/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 46 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-37

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	24	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 45 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-36

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	150	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 45 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-35
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	73	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 44 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-33
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 44 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-32
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	52	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 43 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-30

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	140	4.	20	EPA 300.0	mg/L	9/29/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 43 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-29
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	36	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
F. - Dilution Factor
- Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 43 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-28

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	8.3	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 42 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-27
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	150	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 40 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-21
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	4.	20	EPA 300.0	mg/L	9/29/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 40 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-20
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	20	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 40 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-19

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	5.0	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 38 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-15
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 37 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-12
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	4.	20	EPA 300.0	mg/L	9/29/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 37 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-11
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	15	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 37 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-10
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	2.9	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 34 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-03

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	140	4.	20	EPA 300.0	mg/L	9/29/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 34 32 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-02

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	9.2	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 34 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-01
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	2.2	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 32 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009199-96

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	140	20.	100	EPA 300.0	mg/L	10/10/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 31 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-93
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	100	4.	20	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 31 32 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009199-92

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	5.3	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 31 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009199-91

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 28 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-84
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	110	4.	20	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 28 32 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-83

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	2.5	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 28 23 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-82

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 26 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-78
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	110	20.	100	EPA 300.0	mg/L	10/10/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 25 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-75
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	76	2.	10	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 25 32 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-74

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	3.3	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 25 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-73
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 22 40 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-66

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	66	2.	10	EPA 300.0	mg/L	9/29/00

R.L. - Reporting Limi
D.F. - Dilution Factor
( ) - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 22 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-65
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R.L.	D.F.	METHOD	UNITS	ANALYZED
Bromide	1.3	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 22 23 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-64

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 21 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-63
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	52	20.	100	EPA 300.0	mg/L	10/10/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 19 40 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-57

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	22	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 19 32 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-56

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 19 23 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-55

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/26/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 16 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-48
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	7.4	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 16 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-47
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 16 23 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-46

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 13 40 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-39

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	1.5	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
) - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 13 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-38
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 13 23 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-37

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 10 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-30
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 10 32 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-29

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 10 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-28
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 7 40 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-21

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 7 32 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-20

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 7 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-19
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 4 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-12
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 4 32 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-11

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 4 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-10
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
ROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 1 40 ft.**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009199-03

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
- Dilution Factor
- Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 1 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-02
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 1 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009199-01
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/22/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 47 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-40
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	68	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D. F. - Dilution Factor
( ) - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 47 32 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-41

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	110	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 47 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-42

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 48 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-43

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	96	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 48 32 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-44

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 48 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-45
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	170	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 49 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-46
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	88	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 49 32 ft**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-47

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	110	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 49 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-48

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 50 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-49

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	120	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 50 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-50
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	140	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 50 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-51

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 51 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-52
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	120	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
F. - Dilution Factor
) - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 51 32 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-53

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 51 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-54

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 52 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-55

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	98	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 52 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-56
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	110	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 52 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-57

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	10.	50	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 53 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-58

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	120	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 53 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-59
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 53 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-60
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
) - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 54 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-61

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	120	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 54 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-62
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	140	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
- Dilution Factor
- Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 54 40 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-63

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 55 23 ft.**
DATE SAMPLED: 9/17/00
NEL SAMPLE ID: L0009267-64

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	100	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
( ) - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 55 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-65
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	100	4.	20	EPA 300.0	mg/L	9/25/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 55 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-66
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	140	4.	20	EPA 300.0	mg/L	10/23/00

R.L. - Reporting Limit
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 56 Baseline**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-67
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 56 Baseline**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009267-68
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 56 Baseline**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009267-69

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	ND	1.	5	EPA 300.0	mg/L	9/24/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 57 Tanker Truck @ 08:09 &**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009267-70

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	3000	200.	1000	EPA 300.0	mg/L	9/30/00

R.L. - Reporting Limi
D.F. - Dilution Factor
- Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Bag 57 Tanker Truck @ 08:09 &**
DATE SAMPLED: 9/16/00
NEL SAMPLE ID: L0009267-71

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	3600	200.	1000	EPA 300.0	mg/L	9/30/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

Bromide concentration in groundwater samples obtained during drift and pumpback test, well PC-99R, September 2000

Sample No.	Clock Time (HHMM)	Minutes after Pumping Started	Bromide Concentration (mg/L)
1	17:01	1	840
2	17:05	5	1000
3	17:10	10	1100
4	17:15	15	970
5	17:20	20	840
6	17:25	25	680
7	17:30	30	580
8	17:35	35	490
9	17:40	40	420
10	17:45	45	380
11	17:50	50	
12	17:55	55	
13	18:00	60	260
14	18:05	65	
15	18:10	70	
16	18:15	75	210
17	18:20	80	
18	18:25	85	
19	18:30	90	160
20	18:35	95	
21	18:40	100	
22	18:45	105	130
23	18:50	110	
24	18:55	115	
25	19:00	120	100
26	19:10	130	
27	19:20	140	
28	19:30	150	74
29	19:40	160	
30	19:50	170	
31	20:00	180	54
32	20:10	190	
33	20:20	200	
34	20:30	210	42
35	20:40	220	
36	20:50	230	
37	21:00	240	33

39			8.4	truck w/ RO water
41			4600	truck full
42			4200	truck 1/2 full
43			4100	truck 1/4 full
44			3700	truck empty

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #44**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-44

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	3700	200.	1000	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D. F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #43**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-43

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	4100	200.	1000	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #42**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-42

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	4200	200.	1000	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #41**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-41

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	4600	200.	1000	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #39**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-39

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	8.4	1.	5	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #37**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-37

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	33	1.	5	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #34**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-34

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	42	1.	5	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #31**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-31

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	54	2.	10	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #28**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-28

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	74	2.	10	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
) Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #25**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-25

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	100	4.	20	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #22**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-22

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	130	4.	20	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #19**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-19

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	160	5.	25	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #16**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-16

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	210	40.	200	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
F. - Dilution Factor
- Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #13**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-13

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	260	40.	200	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #10**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-10

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	380	50.	250	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
) - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #9**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-09

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	420	20.	100	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #8**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-08

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	490	20.	100	EPA 300.0	mg/L	10/10/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #7**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009200-07
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	580	100.	500	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #6**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-06

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	680	20.	100	EPA 300.0	mg/L	10/10/00

R.L. - Reporting Limi
F. - Dilution Factor
D - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #5**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-05

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	840	20.	100	EPA 300.0	mg/L	10/10/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #4**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-04

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	970	100.	500	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #3**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009200-03
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	1100	40.	200	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01

CLIENT ID: **Sample #2**
DATE SAMPLED: 9/18/00
NEL SAMPLE ID: L0009200-02

TEST: **Inorganic Non-Metals**
MATRIX: Aqueous

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	1000	40.	200	EPA 300.0	mg/L	10/11/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #1**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	NEL SAMPLE ID:	L0009200-01
TEST:	**Inorganic Non-Metals**		
MATRIX:	Aqueous		

PARAMETER	RESULT	R. L.	D. F.	METHOD	UNITS	ANALYZED
Bromide	840	100.	500	EPA 300.0	mg/L	9/28/00

R.L. - Reporting Limi
D.F. - Dilution Factor
ND - Not Detected