SEEP AREA GROUNDWATER CHARACTERIZATION REPORT

KERR-McGEE CHEMICAL LLC
HENDERSON NEVADA FACILITY

Prepared by
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8000 West Lake Mead Drive
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January 18, 2001

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DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
333 W. Nye Lane, Room 138
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April 26, 2002

Susan Crowley
Environmental Scientist
Kerr McGee Chemical Corp.
P.O. Box 55
Henderson, NV 89009

SUBJECT: NPDES Permit NV0023060 Las Vegas Wash Tracer Study

Dear Ms. Crowley:

Your report of the Las Vegas Wash Tracer Study that was required by Condition I.A.16.c of subject permit has been reviewed. We find that it meets said permit condition. We further find that the results of the study clearly establish the boundary of the mixing zone. Therefore, there is no need for a permit modification.

Please call me at (775) 687-4670 ext. 3050 if you have any questions regarding this letter.

Sincerely,

Jon Palm

Jonathan C. Palm, Ph.D., P.E.
Permits Branch Supervisor
Bureau of Water Pollution Control

cc: Leo Drozdoff, NDEP
Jennifer McMartin, NDEP
Doug Zimmerman, NDEP
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SUMMARY

Kerr-McGee Chemical LLC (KMCLLC) is committed to developing and implementing a workable remediation technology to capture and destroy perchlorate entering Las Vegas Wash from its industrial plant in Henderson, Nevada. Because implementation of this remediation strategy involves removal and treatment of perchlorate-bearing water from both the Seep and the Pittman Lateral area it is important to understand the hydrogeological conditions operating in this area. Of primary concern is how the City of Henderson-Rapid Infiltration Basin (COH-RIB) affects the groundwater volume and perchlorate concentration in the Seep and the underlying aquifer. Equally important is the concern of whether or not additional significant perchlorate is entering Las Vegas Wash at other locations. The scope of the present investigation was to answer these concerns. The specific objectives were to:

- determine the hydrogeologic regime in the area between the Pittman Lateral and the Seep,
- determine the representative perchlorate concentration in the saturated thickness of the alluvial aquifer near the Seep,
- determine if any additional pathways exist along Las Vegas Wash for other significant perchlorate contribution,
- determine the rate of movement and the residence time for perchlorate and groundwater between the Pittman Lateral and the Seep and,
- determine potential groundwater pumping strategies.

The results of this investigation indicate that:

- The BMI Lower Ponds area, encompassing the Seep, is the only identified area of groundwater discharge containing significant perchlorate entering Las Vegas Wash.
- In the Lower Ponds area the main north-northeast trending alluvial paleochannel coalesces with a second poorly-defined paleochannel entering the area from the southwest, the perchlorate concentration of which has yet to be determined.
- In the Lower Ponds area, where the two paleochannels coalesce, the entire saturated interval of the alluvial aquifer contains perchlorate >10 mg/l over a width of about 2200 feet.

- The COH-RIB facility contributes huge amounts of treated wastewater at random times for random lengths of time and directly contributes to daylighting of groundwater in the Lower Ponds area and to wide fluctuations in both the flow volume and perchlorate content of the Seep.

- The rate of movement for groundwater and perchlorate between the Pittman Lateral and the Seep averages 35 ft/d and the residence time is about 6 months.

- Pumping of groundwater in the Lower Ponds area would only be a short-term solution. It will be more efficient to pump from the Pittman Lateral area.

Based on the results of this investigation it is recommended that KMCLLC continue to design and plan to build a groundwater capture system near the Pittman Lateral to partly feed the planned IX-Catalytic Destruction plant to be built on the KMCLLC plant facility. It is further recommended that additional drilling and monitor well installation be completed to better define the location and groundwater chemistry of the western paleochannel and that annual sampling and mapping be conducted to monitor any changes in the extent and concentration of the perchlorate and conductivity plumes north of Sunset Road and along Las Vegas Wash.

1.0 GENERAL GEOLOGY AND HYDROLOGY

The regional study area is located in the southeast portion of the Las Vegas Valley within the city limits of Henderson, Nevada. The Las Vegas Valley occupies a topographic and structural basin lying within the Basin and Range physiographic province. The valley is wide, flat, and slopes southeasterly from an elevation of about 2,000 feet above sea level at Las Vegas to about 1,200 feet at Lake Mead. Mountains composed of igneous and sedimentary rocks rise steeply along the borders of the valley and coalescing alluvial fans slope gently from the mountains toward the valley floor. The Las Vegas shear zone cuts diagonally northwest-southeast across Las Vegas Wash 2 miles east of the Seep area. Las Vegas Wash, a shallow, narrow stream that flows southeasterly across the valley, drains into Lake Mead.

The study area is underlain by the Miocene Muddy Creek formation. The Muddy Creek is a valley-fill deposit and has a wide range of lithologies including coarse-grained sands and gravels near the mountain fronts along the south portion of the study area and fine-grained silts and clays toward Las Vegas Wash. Lacustrine gypsiferous clays and silts have been intersected in drill holes in the vicinity of Las Vegas Wash and crop out in an old gravel pit on the east side of the study area. Not all geologists accept that this fine-grained sequence is the Muddy Creek formation and would prefer to equate it to the Pleistocene Chimihuavi formation of the Colorado River valley. Until known interbedded volcanic deposits are age-dated this question will remain unresolved.

Younger Quaternary alluvial deposits rest unconformably on the Muddy Creek formation. The lithology of these alluvial sediments is a heterogeneous, well-graded mixture of sand and gravel with lesser amounts of silt, clay and caliche. Boulders and cobbles are common. Generally, the coarsest-grained alluvial sediments thin and pinch out from south to north toward Las Vegas Wash. These deposits fill erosional paleochannels in the Muddy Creek formation and thin laterally over the interfluvial areas. Paleochannels generally trend northeast-southwest and control the movement of shallow alluvial groundwater. Their linearity may be fracture controlled. Depth to water in these alluvial deposits ranges from near-surface close to the Wash to more than 30 feet on the KMCLLC plantsite. Horizontal hydraulic groundwater gradients are in the range of 0.001 feet per foot (ft/ft) to 0.04 ft/ft and average about 0.017 ft/ft. Closer to the Wash, water levels in wells indicate that hydraulic head is higher in the Muddy Creek formation than in the alluvial deposits with vertical gradient directed upward. Chemical composition of the water is generally a sodium chloride-sulfate type and is classified as slightly to moderately saline.

2.0 SEEP CHARACTERIZATION INVESTIGATION OBJECTIVES

In the March 22, 2000 KMCLLC *Work Plan for Seep Area Groundwater Characterization* and in a NDEP letter dated October 9, 2000 (Pohlmann to Crowley) objectives were to:

- Provide additional information about the physical and chemical characterization of the Seep area groundwater,
- Delineate the perchlorate plume and identify where it enters Las Vegas Wash,
- Determine whether any additional sources of perchlorate exist along the Wash, and
- Provide an analysis of potential short-term options for immediate groundwater treatment in the Seep area.

These objectives were accomplished through:

- Installation of a series of nested monitor wells along an east-west traverse between the Seep and the Lower Ponds,
- Sampling groundwater in the Las Vegas Wash from the Silver Bowl stadium, down stream 4 linear miles, to about 0.75 miles west of the upper dam of Lake Las Vegas,
- Regional sampling of groundwater in monitor wells from the KMCLLC plantsite to the Seep and mapping of physical and chemical perameters,

- Completion of a series of tracer tests to determine the residence time of groundwater and perchlorate between the Pittman Lateral and the Seep area,
- Completion of mapping to determine whether additional seeps are contributing to the perchlorate impact in Las Vegas Wash, and
- Evaluation of groundwater pumping strategies.

3.0 FIELD INVESTIGATION PROCEDURES

Fieldwork for this investigation began during the week of March 6, 2000 and continued through several phases of drilling and sampling until completion during the third week of September 2000. Field work included reconnaissance mapping and sampling of groundwater seeps and springs along Las Vegas Wash, drilling soil borings, installing monitor wells, sampling groundwater from monitor wells, installing and monitoring dataloggers at the 3 tracer test sites, conducting pump tests and tracer tests and surveying the drill locations. Borings and monitor wells were drilled and installed by Compliance Drilling of Las Vegas whereas wells used for tracer tests were drilled and installed by Layne Christensen Company of Chandler, Arizona. Groundwater analyses were performed by the KMCLLC Henderson facility and by Montgomery-Watson Laboratory in Pasadena, California. NEL Laboratories, Las Vegas, performed bromide analyses associated with the tracer tests.

3.1 SOIL BORINGS

A total of 27 soil borings were drilled during this investigation. The placement of 20 of them was within 8 groups of 2 to 3 holes each. The boring locations, designated PC-74 through PC-102, are shown on Figure 1 and Plates 1-5. These holes were drilled using either a 10.5- or 8-inch outside diameter hollow stem auger (HSA) for monitor wells or a 9-inch outside diameter duel-wall reverse-air-circulation percussion hammer for tracer test wells. A split barrel sampler, measuring 2-inchs wide by 1.5-feet long was used to collect soil samples at key intervals during drilling activity to accurately log changes in subsurface lithology. Both soil samples from the split spoon sampler and cuttings from the drilling activity were examined for lithologic type and logged in accordance with the Unified Soil Classification System (ASTM D-2488). All field lithologic information was recorded on soil boring log forms, which are included in Appendix A. All boreholes, not completed as permanent monitor wells, were sealed with cement grout. Hole locations were staked and labeled for subsequent surveying.

3.2 MONITOR WELL INSTALLATION

Twenty-one groundwater monitor and 5 tracer test wells were installed during the investigation program. All except 2 wells were constructed using 2-inch diameter screwthreaded Schedule 40 PVC casing and 0.020-inch factory-slotted screen and installed through the HSA or the percussion hammer assembly. The other 2 wells, used as tracer introduction wells, were constructed using 4-inch PVC and 0.040 screen. The bottom of the well screen section was fitted with a 0.2-foot long bottom plug. The entire annulus surrounding the screen was filled with clean, 8-12 size washed sand to about 3 feet above the top of the screen. An annular seal of bentonite pellets was placed above the filter pack sand to a thickness of 2 to 3 feet. The remaining well annulus from the top of the bentonite seal to the surface was filled with a Portland cement/bentonite grout. After the annular seal was hydrated and allowed to set, the wells were developed with a submersible Grundfos pump until sediment-free water was achieved.

In order to sample discrete intervals of the lower, middle and upper parts of the saturated alluvial aquifer along an east-west traverse in the Lower Ponds area, the wells were placed in 8 groups with 2 to 3 closely-spaced wells each. Horizontal separation of the borings was 10 feet whereas vertical separation of the screened interval was also 10 feet.

Surface completion of all wells was below grade using flush-mounted steel manhole covers set in concrete pads. Locking well caps were utilized for security. Well construction diagrams are included in Appendix B.

3.3 GROUNDWATER SAMPLING

Groundwater samples were collected for laboratory perchlorate analysis during the soil boring phase of the investigation and again following monitor and tracer well installation. All analytical results are included in Appendix C.

3.3.1 Soil Borings

Because most of the soil borings were to be made into nested monitor wells, only 5 groundwater samples were collected from the borings during drilling. These samples were collected through the augers either at the total depth of the boring or at the time the water table was encountered. PVC bailers were used for the sampling and were decontaminated with Alconox and bottled water prior to each use. The samples were analyzed at the KMCLLC facility laboratory for perchlorate and conductivity.

3.3.2 Monitor and Tracer Test Wells

Groundwater samples were collected from 238 existing and new monitor wells and tracer test wells in the regional study area. These samples were analyzed for perchlorate and conductivity at the KMC LLC facility laboratory.

3.3.3 Las Vegas Wash Seeps and Springs

Twenty-two samples of daylighting groundwater from seeps, springs and shallow hand-dug pits were collected along a 4-mile long traverse from the Silver Bowl stadium to within 0.75 miles of the upper dam of Lake Las Vegas. These samples were analyzed for perchlorate and conductivity at the KMCLLC facility laboratory and/or Montgomery Watson in Pasadena.

3.4 ALLUVIAL PUMP TESTS

In preparation for tracer test studies, Errol L. Montgomery & Associates, Inc., Tucson, Arizona conducted 2 pump tests in August 2000 in the tracer introduction wells at tracer test sites B (City of Henderson-Rapid Infiltration Basin) and C (Lower Ponds). Since tracer test site A was sited at the Pittman Lateral to make use of an existing, previously pump-tested, well (PC-70) as a tracer introduction well, no new pump test was performed.

Construction and development of the new 4-inch tracer introduction wells was by Layne Christensen Company, Chandler, Arizona. The test pump was installed and operated by Compliance Drilling, Las Vegas, Nevada. 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 a generator failure, duration of pumping was 29.9 hours for well PC-98R (Site B). For Site A, a 48-hour constant-discharge pumping test was conducted in well PC-70 in September 1998 by Kerr-McGee personnel (Kerr-McGee, 1998).

The details of the PC-70 (Site A) pump-test are presented in Attachment 1 whereas the procedures used for the Sites B and C tests are detailed in a December 19, 2000 report by Errol L. Montgomery and Associates which is presented in Attachment 2.

3.5 TRACER TESTS

Since analysis of the rate of groundwater movement can be used to estimate the rate of mass transport of perchlorate in groundwater, Errol L. Montgomery & Associates, Inc. conducted tracer studies at 3 locations between the Pittman Lateral and the Seep shown in Figure 1 and Plates 1-5. Tracer testing, conducted in September 2000, consisted of natural gradient and drift and pumpback methods using deionized water and bromide as the tracers. Deionized water was made at the Kerr-McGee Apex facility and supplied to the test sites via stainless steel tanker truck. Volumes of deionized water used for the tests ranged from 1,800 gallons at Site A to 2,630 gallons at Site C. Specific conductivity of the injected water was 5 microSiemens/cm. At each site, pairs of wells between 30 and 40 feet apart were drilled and constructed for tracer introduction and downgradient tracer breakthrough observation. Tests lasted for a minimum of 4 hours to a maximum of 1.9 days.

For bromide tracer tests at Sites A and C, bagged solid calcium bromide was mixed in a tanker truck with reverse osmosis water supplied from the Kerr-McGee Henderson facility. The bromide solution was introduced into the wells via a flexible hose which was moved up and down to distribute the solution evenly throughout the well. Immediately following the bromide introduction a conductivity probe was inserted in the well and a vertical conductivity profile was obtained which showed relatively uniform distribution.

At Site A the bromide solution was mixed to yield a concentration of about 3200 mg/l and introduced into well PC-70 containing about 1 mg/l bromide as background. Sampling of groundwater in observation well PC-101R at depths of 23, 32 and 40 feet was conducted using a peristaltic pump and a micro-purge method. In the drift and pumpback test in PC-99R (Site C) a bromide solution similar in strength and composition to the bromide test at Site A was introduced into the well and distributed vertically to get a relatively uniform distribution. Previously determined aquifer parameters were entered into a formula which determined the drift time of the introduced bromide slug, the duration of pumpback time and the frequency for sample collection for bromide analyses. Sampling frequency ranged from 5 minutes per sample during the first part of the test to 15 minutes for the later part. Bromide samples were analyzed at NEL Laboratories, Las Vegas, Nevada.

3.6 COORDINATE AND ELEVATION SURVEY

All soil borings and wells were surveyed for vertical elevation control and horizontal location using a Trimble 4800 survey-grade Global Positioning System (GPS) unit. The survey used existing HARN points and first order benchmarks in the southern Las Vegas Valley to establish an overall control grid for the study area. Monitor and tracer wells were surveyed for TOC elevation, ground elevation and horizontal control whereas soil borings were surveyed for ground elevation and horizontal control.

Locations of the Las Vegas Wash seep/spring/pit samples were either surveyed for horizontal location by Southern Nevada Water Authority (SNWA) personnel using a Trimble Pro-XRS sub-meter (GPS) unit or by digitizing from a high-quality aerial photograph. All survey data are presented in Appendix D.

4.0 FIELD INVESTIGATION RESULTS

This section details the results of the Las Vegas Wash groundwater sampling, drilling, monitor well sampling and analyses, pump test activities and tracer test studies conducted as part of this investigation.

4.1 ALLUVIAL HYDROGEOLOGIC CHARACTERIZATION

Figure 1, the base map of the regional study area, shows the locations of both historic and newly installed monitor wells. New KMCLLC wells are part of the PC-series starting with PC-74 and are located mostly in the Lower Ponds area south and west of the Seep in sections 31 and 36. With only 1 exception all borings were drilled into the underlying Muddy Creek formation and all wells were screened only in the alluvium. Except for the tracer test wells, which were fully screened, all nested-wells sets were installed with 5 or 10-foot screens in order to incrementally sample the lower, middle and upper parts of the alluvial aquifer. Boreholes within nests are 10 feet apart and screened intervals are also 10 feet apart to insure no cross-communication. Lithologic logs for the new borings are presented in Appendix A and well construction diagrams are presented in Appendix B.

4.1.1 Groundwater Flow Conditions

In May 2000 a cooperative regional groundwater sampling event between KMCLLC and American Pacific Corporation (AMPAC) resulted in the sampling of 238 alluvial groundwater monitor wells for water levels, perchlorate and conductivity concentrations. Plate 1, the Potentiometric Surface Map of the Quaternary Alluvium Aquifer, shows the results of this sampling and the location of Plates 2 through 5. This mapping is an update of mapping completed in July 1998 by KMCLLC (Kerr-McGee Chemical LLC, 1998a). Data points for Plate 1 are listed in Appendix C.

Groundwater in the Quaternary alluvium represents the shallow water table in the central and northern portions of the map area. Water flow is generally north-northeast with minor variations. As was the case with the July 1998 mapping, the average horizontal hydraulic gradient between the KMC LLC facility and Las Vegas Wash remains about 0.017. The gradient from south to north is seen to be fairly uniform except in the major north-northeast alluvial channel beneath the northern part of the industrial site (SW 1 and NE 11, T22S R62E) and beneath the City of Henderson Rapid Infiltration Basin (COH-RIB) in section 36. Here, the infiltration of treated wastewater into the alluvial aquifer from the RIBs has caused a mounding of groundwater with a resultant decrease in the hydraulic gradient in the potentiometric surface.

Continuing long-term monitoring of depth to groundwater since July 2000 is being accomplished at all 3 tracer sites through the use of In-Situ, Inc. "Troll 8000" and "Mini-Troll" dataloggers. Figure 4 shows the results of groundwater monitoring in well PC-101 at Site A, upgradient of the RIBs, between September 9th through November 20th. Pumping in adjacent well PC-70 accounts for the small drawdown events seen on September 12th and October 6th. Water levels are seen to be steady to very slowly rising through about October 14th when several rain events were recorded over a several week period. Discounting the data from October 30th to November 14th as probably invalid due datalogger malfunction, the water level in this area continued to slowly rise to a little less than 16 feet below surface through to November 20th when the datalogger permanently malfunctioned. The importance of this graph is in its comparison to the water level changes at Site B (COH-RIB) and Site C (Lower Ponds/Seep).

Figure 5, the graph from tracer test Site B, shows the changes in depth to groundwater (DTW) and conductivity for the 5.5-month period from July 7th to December 26th. That the infiltration of COH-RIB wastewater into the shallow aquifer results in wildly erratic water levels is amply illustrated. The small blip on the DTW and conductivity graphs on July 10-11 is from the pump test in adjacent well PC-98R whereas that on September 13th is from the tracer test. The figure shows that a massive recharge event, starting on September 12th raised the groundwater level from about 13.5 feet to 4.5 feet in about 3 weeks. Since about October 27th the water level has been decreasing. It is obvious from this graph that even forewarned by a schedule of flooding events from COH, trying to model groundwater flow and predict perchlorate mass flow to the Seep and the underlying alluvial aquifer would be futile. Unless a capture and treatment system was dramatically oversized versus average flows, it could not predictably capture and treat the constantly changing water and perchlorate volume entering the Wash.

Figure 6, the datalogger depth-to-water graph for well PC-99 at Site C, shows that, starting about August 9th – eight days after the start of infiltration at the RIBs, the water level began to rise dramatically. The level continued to rise until October 6th when it became relatively static. The drawdown event on August 13-14 is the pump test of adjacent well PC-99R. It is interesting to note that the width of the graph line is due to the diurnal effect presumably of salt cedar evapotranspiration or, as seen starting on about September 23rd, simple evaporation. On about October 31st ground flooding at Site C necessitated abandoning the site and moving the datalogger 400 feet to the west to PC-87. Figure 7 shows that the water level in PC-87, which held relatively constant since October 31st, started to increase again on December 15th. It is no coincidence that the slough just north of the Lower Ponds began flowing again in late July-early August and that widespread daylighting of groundwater has been occurring in the adjacent areas since late September-early October when COH started filling the RIBs with wastewater.

As part of the temporary Ion Exchange (IX) Plant record keeping, KMC LLC personnel monitor the throughput of the plant and the calculated perchlorate mass flow rate and the Seep stream perchlorate concentration. Figure 8 show that since April 4th these data have fluctuated widely based on a combination of natural and man-made conditions. As seen by comparing this graph with the graph of depth to water in the COH-RIB, Figure 5, most of the increase in stream flow since August 12th, and culminating in a flow of 593 gpm on October 14th, is directly due to water from the RIBs. It is interesting to note that the highest Seep stream perchlorate concentration, 120 mg/l on October 16th, occurred during this high flow and has been decreasing ever since. A possible explanation is that the lower density RIB water temporarily displaced the higher density perchlorate-bearing water and pushed it ahead to the Seep.

As of January 9, 2001 the Seep stream flow and perchlorate concentration were 416 gpm and 49 mg/l, respectively, whereas the perchlorate mass flow rate was 245 lbs/day. Since the temporary IX Plant is rated at about 450 gpm it would be possible to pump groundwater to the plant during the low-flow summer period from about May to October or longer, depending on the amount of water infiltration from the COH-RIBs. In the 280 days since the temporary IX plant began operation, the stream flow has averaged 315 gpm and there has only been 31 days with stream flow over 450 gpm. However, as of now, KMC LLC does not have a permit to discharge treated groundwater. This topic will be revisited in a later section.

4.1.2 Alluvial Channel System

The Quaternary alluvial channel system contains the thicker portions of saturated alluvium in the study area. These channels typically act as preferred pathways for groundwater flow, especially groundwater that contains higher TDS and higher densities. Plate 2 shows the contoured thickness of the shallow alluvial aquifer north of Sunset Road. The trace of the main north-northeast channel is particularly prominent on this map. Also shown is evidence for a poorly-defined sub-parallel western channel, at least 40 feet thick, running diagonally across the central part of section 36. The recently completed nested-wells along the northern boundary of sections 31 and 36 substantially refined the subsurface geology in this area. As shown in Figure 2, a 1"=200' east-west hydrogeologic cross-section, the mouth of the western channel is deeper than the mouth of the main eastern channel. It is here, where the two channels coalesce, that the groundwater perchlorate values exceed 10 mg/l over a width of about 2200 feet. Figure 3, the cross-section across the Pittman Lateral is an update of a cross-section presented in a July 1998 report (Kerr-McGee Chemical LLC, 1998). Its scale is 1"=400', the same scale as Plates 2 through 5, and it shows the highly incised nature of the main alluvial channel as well as recent water level conditions and perchlorate concentrations.

The erosional nature of the alluvial channel system into the underlying lithologic unit is apparent on Plate 3, the structure map on top of the Muddy Creek formation. Mapping shows the deep incision of the channel beneath the Pittman Lateral and the poorly defined sub-parallel channel diagonally crossing the center of section 36.

The cross section (Figure 2) also shows an old Stauffer exploration hole, HSC-2, located in the extreme SW corner of section 30. What is interesting about this hole is the lithologic description of massive beds of gypsum and anhydrite below 100 feet. (structural elevation of about 1458 ft). The closest highly gypsiferous beds are in section 32, 1.5 miles to the southeast which lie at structural elevations 100-200 feet higher. These lacustrine evaporite units are probably equivalent. Two tiny seeps in the gypsum beds in the center of section 32 were found to contain up to 28 mg/l perchlorate. A potentiometric surface map of this area made in 1997 shows that groundwater flow in the fine-grained Muddy Creek formation comes from the south-southeast. Only the extreme eastern end of the Upper Ponds is upgradient of these seeps. However, since recent seep sampling found only perchlorate values up to 2.5 mg/l directly downgradient of the main part of the Upper Ponds, the high concentrations in the tiny seeps are probably not coming from the ponds. Furthermore, the alluvium directly upgradient from the high perchlorate seeps is dry. Naturally occurring perchlorate is found associated with evaporates in Chile and this occurrence may be of a similar nature. Regardless, there is currently no evidence that this perchlorate is entering Las Vegas Wash.

4.1.3 Well Pump Tests

Constant-discharge pumping tests were conducted in August 2000 at tracer test Sites B and C to obtain aquifer properties. A pumping test of PC-70 (Site A) was previously performed in September 1998. Results of these aquifer tests show that transmissivity ranges from 50,000 gallons per day per foot (gpd/ft) for site A (Pittman Lateral) to 160,000 gpd/ft at Site C (Lower Ponds/Seep). Hydraulic conductivity ranges from about 1,700 gallons per day per square foot of aquifer (gpd/ft^2) at Site A to 4,600 gpd/ft^2 at Site C. A summary of the aquifer parameters from these three tests is shown in Table 1 below:

TABLE 1

Site	Pumping Rate (gpm)	Transmissivity (gpd/ft)	Aquifer Thickness (feet)	Hydraulic Conductivity (gpd/ft2)
A	45	50,000	30	1,700
B	52	60,000	25	2,200
C	65	160,000	32	4,600

That the transmissivity and hydraulic conductivity is higher in the north end of the area is not surprising given the history of the Lower Ponds. The ponds were constructed in 1943 within highly permeable alluvial sands and gravels. During the next 30 to 40 years the ponds were used as infiltration basins for industrial discharge water. This constant use over such a long period of time guaranteed that whatever fines were originally deposited with the coarse-grained sediments were washed out of the deposits. In the 1970's seepage from the Lower Ponds was reported to be as high as 1500 gpm (Kaufmann, 1978).

4.1.4 Tracer Tests

Rate of groundwater movement provides a good estimate for the rate of mass transport of perchlorate since it is considered a nonreactive ion and should flow at the same rate as the groundwater. Rate of groundwater movement was measured at Site A at the Pittman Lateral, Site B in COH-RIBs and Site C in the Lower Ponds/Seep area. Two methodologies were used – natural gradient and drift and pumpback – with bromide and deionized water used as tracers. Tracer test locations are shown on Figure 1 and Plates 1-5. The procedures used for these tests are detailed in a December 19, 2000 report by Errol L. Montgomery and Associates which is presented in Attachment 2.

The results of tracer testing using deionized water under natural gradient conditions indicated rate of groundwater movement to be about 20 to 25 ft/d at Site A, 45 ft/d at

Site B and 85 ft/d at Site C. Prior to testing it was expected to record tracer breakthrough as the decrease in specific conductivity in the downgradient observation well because, at 5 microSiemens/cm, the deionized water was 3 to 4 orders of magnitude lower than the conductivity of the ambient groundwater. However, tracer breakthrough was seen at Sites A and C as an increase in the conductivity above background, followed by a decrease to pretest levels as the slug of tracer water moved past the observation well. This phenomenon is thought to be the result of changes in the chemistry of the dissolved ions in the groundwater caused by ionic exchange, differences in ionic strength of the solution and differences in pH of the solution due to the addition of the diluting stream. Nevertheless the data could be used to determine groundwater velocities. At Site B the natural gradient test using deionized water yielded a curve that showed a decrease of conductivity as the slug of tracer water went past the observation well. The rapid filling of the nearby RIBs during the test complicated the interpretation of the results.

Calcium bromide was used as a tracer under natural gradient conditions at Site A and under drift and pumpback conditions at Site C. At Site A, samples were collected from depths of 23, 32 and 40 feet in the observation well 30 feet downgradient, to check for differences in breakthrough times at different depths. The results show that breakthrough in the lower part of the aquifer was slightly faster than breakthrough in the upper part. Assuming symmetrical breakthrough and peak concentration represents the center of mass of the bromide slug, travel time between the introduction and observation well pair ranges from 21.5 to 25.2 hours. Rate of groundwater movement is estimated to be about 30 ft/d. At Site C the 4,200 mg/l bromide brine tracer was injected into PC-99R in a manner similar to PC-70. After injection, a conductivity probe determined that a relatively uniform vertical distribution of bromide was achieved. After 2 hours of drift, pumping began and sampling from the pump discharge continued for the next 4 hours. The results show that the center of mass of the bromide pulse was recovered after about 30 minutes of pumping. Subsequent calculations indicate that the rate of groundwater movement is about 60 ft/d and the effective porosity is about 10 percent.

Based on lithologic data obtained from well installation, aquifer test results and tracer test results, a summation of the rate of groundwater movement is presented in Table 2 below:

TABLE 2

Site	Natural Gradient - Deionized Water Tracer Tests (ft/d)	Natural Gradient - Bromide Tracer Tests (ft/d)	Drift and Pumpback - Bromide Tracer Test (ft/d)	Natural Gradient - Darcy's Law (ft/d) Porosity = 10%
A	25-30	30	no test	20
B	45	no test	no test	30
C	85	no test	60	65

Using Darcy's Law and average values for aquifer parameters and groundwater gradient, the minimum estimate of groundwater movement between Site A, Pittman Lateral and Site C, the Lower Ponds/Seep, is 35 ft/d. Based on the distance of 5,700 feet between Pittman Lateral and the Seep the average residence time for perchlorate to move from the Lateral to the Wash is about 6 months.

4.2 GROUNDWATER CHEMICAL CHARACTERIZATION

Groundwater samples were collected as part of this investigation from daylighting seeps, springs and shallow hand-dug pits along Las Vegas Wash and monitor wells between the KMCLLC plant site and the Seep and analyzed for perchlorate and specific conductivity. These analytical results were used to map the extent and concentration of the perchlorate and high conductivity groundwater plumes in the shallow alluvial aquifer and along the banks of Las Vegas Wash. Laboratory analyses of perchlorate and specific conductivity are attached in Appendix C.

4.2.1 Chemical Characterization of Groundwater Along Las Vegas Wash

As part of this investigation reconnaissance mapping and groundwater sampling were conducted along Las Vegas Wash in March and April 2000. Using water samples collected from 22 naturally-occurring seeps, springs and shallow hand-dug pits, the downgradient variation of perchlorate and conductivity was recorded along 4 linear miles of Duck Creek and Las Vegas Wash (LVW) from the Silver Dome eastward.

Results show that even though perchlorate is detected in groundwater throughout the entire length of the survey, the only significant groundwater contribution of perchlorate occurs in the vicinity of the Lower Ponds/Seep area. This is the location where KMCLLC is currently removing perchlorate from surfacing groundwater.

The accompanying color aerial photograph, Figure 9, of a portion of Las Vegas Wash shows the locations of the sample sites used in this survey. Below each sample number is the perchlorate value in ug/l and the field conductivity value in uSm/cm. In the broadest terms the geochemical makeup of the wash can be divided into the following three stretches:

Western Stretch: This zone, between sample KM89 on the west and KM56 on the east, is characterized by low to non-detect perchlorate and moderate to high conductivity. Locations KM68 through KM58, containing between 8000 to 10400 uSm/cm, sampled a plume of highly conductive shallow groundwater flowing into Duck Creek and LVW from the southwest. The low conductivity in sample KM59 may reflect dilution from surface water since it was collected from a dug pit whereas the other three samples are from natural seeps. East of KM58, locations KM57 and KM56 continue to show low perchlorate levels. Conductivity levels also decrease.

Central Stretch: This part of LVW occupies the area between KM71 on the west and KM53 on the east. Samples from the western one-third of this reach contain the highest perchlorate concentrations found anywhere along LVW. Between KM56 and KM55 the perchlorate level in groundwater increases from ND to 57000 ug/l, decreasing again to 4500 ug/l. As shown on the aerial photograph this zone of high perchlorate is directly north and east of the mapped outlet of the north-northeast trending paleochannel and the Lower Ponds/Seep area.

However, because the perchlorate footprint in this part of the wash is so wide it has long been suspected that an additional source of perchlorate is joining the groundwater flow into the wash from the western end of the Lower Ponds. Alluvial thickness mapping indeed found a separate sub-parallel northeast-trending channel coalescing with the main channel just south of the seep. Any perchlorate in this western channel could not have come from the KMCLLC plant site and may have come from the former AMPAC site. However this has yet to be proven.

East of KM55, and continuing all the way to KM53, the photograph shows that both the perchlorate and conductivity levels of groundwater flowing into the wash decrease to the 290 to 400 ug/l and 2500 to 3500 uSm/cm range, respectively. This water quality indicates a cleaner groundwater inflow than found either to the west or the east.

Eastern Stretch: Beginning at KM91, both the perchlorate and conductivity levels increase again to a maximum of 3000 ug/l and 7400 uSm/cm, respectively. These high values occur at sample site KM65, a natural seep located in a fault zone that is part of the Las Vegas Shear Zone. This area has been named the Calico Hills Water Gap (CHWG), the place where Tertiary bedrock is first exposed in the bottom of the Wash. This thinning has the effect of causing the laterally-inflowing groundwater and the sub-wash groundwater, and their contained perchlorate inventory, to rise to the surface at this location. East of this Water Gap the sediments filling the Las Vegas Wash valley remain relatively thin over the uplifted bedrock.

Because KM65 and KM91 to the west, are samples of the rising sub-wash groundwater, it is important to note that these values (2100 to 3000 ug/l) are probably representative of the average perchlorate concentration in storage between the Seep at the Lower Ponds and the CHWG.

The next two samples east of the CHWG are relatively low in perchlorate whereas the third sample, KM67, increases again to 2100 ug/l. These low perchlorate samples are probably due to dilution with groundwater inflowing from adjacent cleaner sources. The higher perchlorate value in the easternmost sample is probably due to communication with the higher perchlorate in the sub-Wash groundwater in another fault zone.

The results of this groundwater sampling program show that the only significant perchlorate source entering the Wash is the known Seep area north of the Lower Ponds. Slightly elevated perchlorate values found east of the Calico Hills Water Gap are the result of surfacing groundwater from the sub-wash storage and not a new source of perchlorate.

4.2.2 Chemical Characterization of the Alluvial Groundwater in the Seep Area

Plates 4 and 5 show the groundwater perchlorate and conductivity plumes north of Sunset Road, respectively. As shown on Plate 4, perchlorate concentrations up to 490 mg/l occur in the main alluvial channel at Sunset Road. Northward, perchlorate content decreases to about 320 mg/l in the COH-RIB area and 150 mg/l or less near the Seep. The two east-west cross sections along the Pittman Lateral (Figure 3) and the Lower Ponds (Figure 2) show the relationship of channel geometry and water chemistry. At the Pittman Lateral perchlorate values >10 mg/l extend eastward 800 feet from the main channel whereas in the Lower Ponds area high perchlorate values extend westward over a width of about 1800 feet from the main channel. The perchlorate isopach map also shows some evidence that perchlorate-bearing groundwater, thought to be the alluvial plume from the former AMPAC plant, may be entering the Seep area from the western sub-parallel channel. AMPAC's perchlorate plume in the Muddy Creek formation has not as yet been identified entering the Wash. Both the map and cross section show that the highest perchlorate values in the total saturated zone occur in nested wells PC-85, 86 and 87 between the two coalescing channels.

Vertical profiling of wells north of the COH-RIB in January 2000 shows that the treated wastewater from the RIBs does not appreciably mix but floats on the underlying denser groundwater. This is shown in the cross section (Figure 2) and the conductivity map (Plate 5) where relatively lower perchlorate and conductivity values occur in the upper part of the aquifer east of the alluvial channel from PC-56 to PC-97. Comparison of the conductivity map with the perchlorate map shows that the trend of conductivity highs, up to 17170 uSm/cm, lies parallel to and west of the main alluvial channel and highest perchlorate concentrations. A second plume of high conductivity may occupy the western northeast-trending channel but has not yet been proven.

5.0 ANALYSIS OF SHORT-TERM GROUNDWATER OPTIONS

The current long-term remedy calls for the construction of an 825 gpm IX-Catalytic Destruction plant to destroy perchlorate on the KMCLLC plantsite. Flow of 400 gpm and 360 gpm, respectively, will come from a proposed well field at the Pittman Lateral and the Seep stream with the remainder coming from the plantsite. At the present time the KMCLLC discharge permit does not allow treatment and release of groundwater from the Seep or the Pittman Lateral area.

The current temporary IX plant operating at the Seep stream can handle a nominal 450 gpm. The Seep stream has been seen to fluctuate in the last year from about 225 gpm in the summer season to about 640 gpm in the winter season. The flow volume in the Seep stream depends, in large part, on the volume of wastewater dumped into the RIBs by COH and evapotranspiration by the vegetation. Since April 4th the stream flow has averaged 315 gpm and only been above 450 gpm for 31 out of 280 days.

The question has been raised by NDEP regarding the ability of the existing temporary IX system to process more water. The answer depends on the actions taken by COH. As long as the Seep stream flow is below 450 gpm the IX plant is not being fully utilized and groundwater could, in theory, be processed. The answer is equivocal because a method for organics destruction must first be in place, the discharge permit must be modified and the pumping wells and pipeline must first be installed.

Increasing the temporary IX plant capacity would require 4-6 months to install new pumps, piping and resin beds. Considering that the planned 825 gpm system will be on-line by the end of 2001, it makes little sense to divert resources and manpower away from the major construction effort to install a second temporary system for only a few months use.

Recovering the perchlorate stream at the Pittman Lateral, where the plume is known to be narrower and higher in concentration would ultimately make a more significant contribution to the perchlorate remediation effort. If, as the tracer tests indicate, the residence time between the Pittman Lateral and the Seep is only 6 months, perchlorate groundwater recovery at the Lateral would quickly form a brightline, the movement of which could be readily measured.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the groundwater-sampling program, borehole drilling, lithologic studies, nested-well installation, datalogger monitoring, pump and tracer testing the following data have been added to the body of knowledge regarding the characterization of the perchlorate plume from the KMCLLC plant site to the Wash:

- From the pump and tracer tests it is now known that the rate of movement of groundwater and perchlorate from the Pittman Lateral to the Wash averages about 35 ft/d and the residence time is therefore about 6 months.

- From continuous datalogger monitoring at the three tracer test sites since July it is now known that when the City of Henderson adds millions of gallons of water to the RIBs it has an almost immediate, drastic and unpredictable effect to the water volume, water level and water chemistry in the Lower Ponds/Seep area and the feed to the temporary IX plant.

- From the groundwater sampling program along Las Vegas Wash it is now known that the bulk of perchlorate enters the Wash at the Lower Ponds/Seep area. The 2-3 mg/l of perchlorate sampled at the Calico Hills Water Gap is likely the average concentration of the sub-Wash perchlorate inventory upgradient from the Water Gap.

- From the additional soil borings in the Lower Ponds area, better control of alluvial thickness and Muddy Creek structure shows the existence of a poorly-defined second alluvial channel which adds some unknown quantity of perchlorate, quite possibly from the alluvial plume from the former AMPAC plant, to the Seep area.

- From the nested well installation in the Lower Ponds area it is now known that the entire saturated thickness of the alluvial aquifer is anomalous in perchlorate for a width of about 2200 feet.

- From regional groundwater sampling and updated potentiometric surface, conductivity and perchlorate concentration maps, a better appreciation for the extent and concentration of the perchlorate and conductivity plumes and the hydraulic gradient from the plant to the Wash is now possible.

Based on the results of this investigation the following five recommendations are made:

- Design and build a groundwater capture system near the Pittman Lateral to partly feed the planned IX-Catalytic Destruction plant to be built on the KMCLLC plant facility.

- Drill a series of boreholes in the poorly-defined alluvial channel in the center of section 36 to delineate the channel and incorporate the new alluvial thickness and Muddy Creek structural data into the maps.

- Install wells in some of these holes to monitor for perchlorate and conductivity.

- Annually sample groundwater in all available monitor wells from the KMCLLC plant to the Seep and analyze for perchlorate and conductivity. Construct up-to-date maps of the plumes using these data.

- Annually sample groundwater seep locations along Las Vegas Wash and monitor changes of perchlorate and conductivity concentrations.

7.0 REFERENCES

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

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Errol L. Montgomery & Associates, 2000, **Analysis of Rate of Groundwater Movement Based on Results of Tracer and Hydraulic Tests Conducted Between Pittman Lateral and the Seep Area, Henderson, Nevada:** prepared December 19, 2000.

Nevada Department of Environmental Protection, 2000, **Workplan and Schedule for Long-Term Remedy for Removal of Perchlorate:** letter from Brenda Pohlmann, NDEP, to Susan Crowley, Kerr-McGee Chemical LLC, February 15, 2000.

Nevada Department of Environmental Protection, 2000, **Hydrogeologic Investigation Report:** letter from Brenda Pohlmann, NDEP, to Susan Crowley, Kerr-McGee Chemical LLC, October 9, 2000.

Figure 1

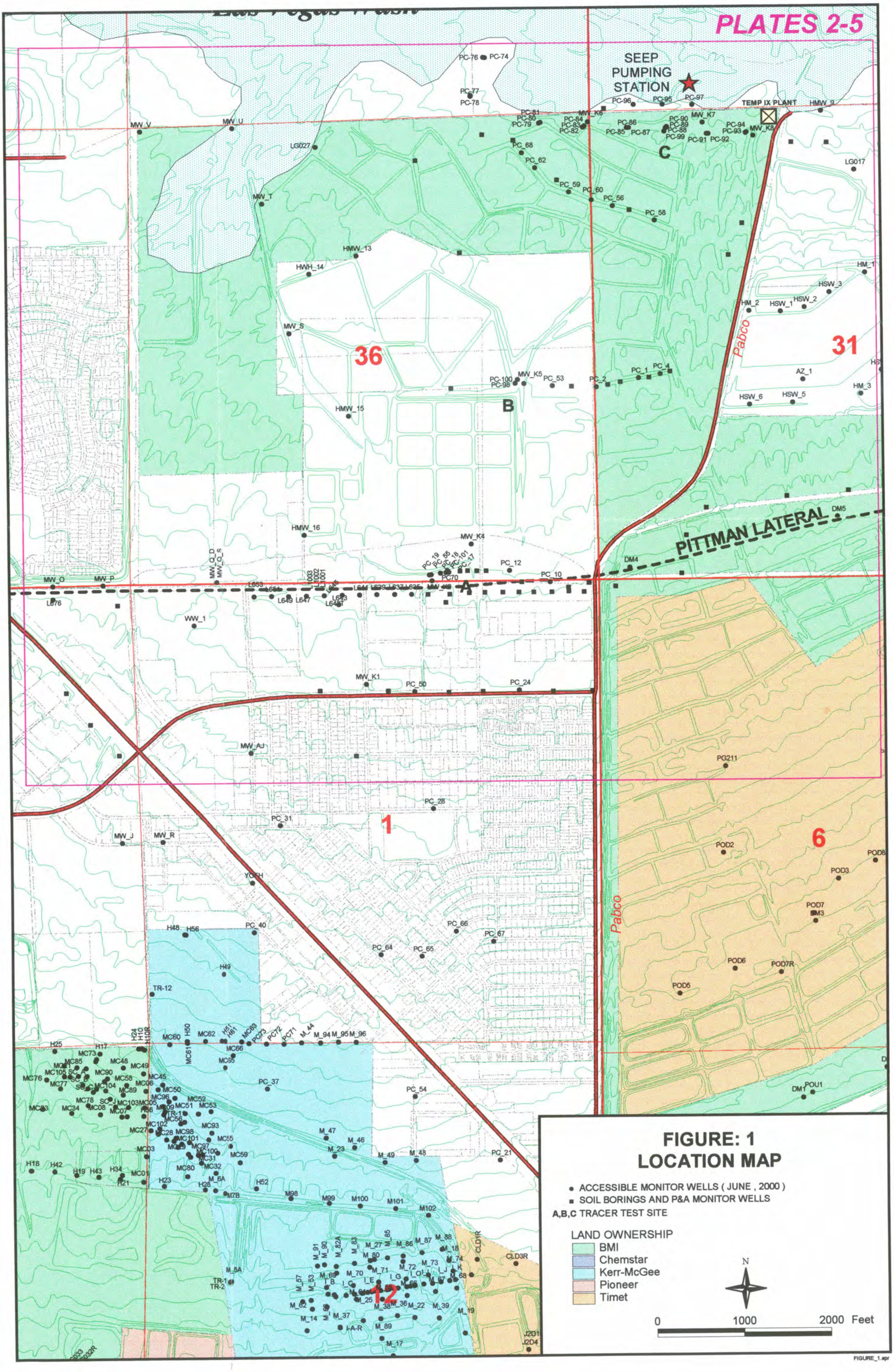


FIGURE: 1
LOCATION MAP

● ACCESSIBLE MONITOR WELLS (JUNE , 2000)

■ SOIL BORINGS AND P&A MONITOR WELLS

A,B,C TRACER TEST SITE

LAND OWNERSHIP

🟩 BMI

▨ Chemstar

▨ Kerr-McGee

▨ Pioneer

▨ Timet

N

0 1000 2000 Feet

Figure 2

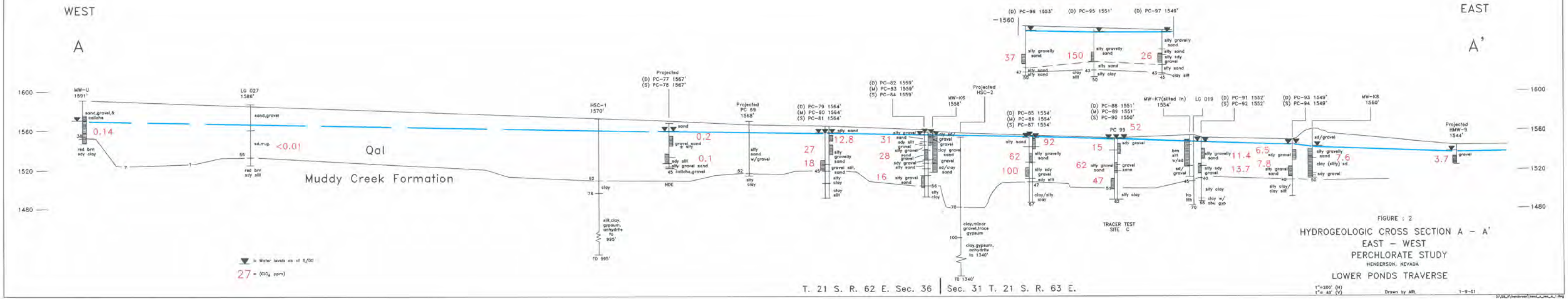


FIGURE : 2

HYDROGEOLOGIC CROSS SECTION A – A'
EAST – WEST
PERCHLORATE STUDY
HENDERSON, NEVADA
LOWER PONDS TRAVERSE

1"=200' (H)
1"= 40' (V)

Drawn by ARL

1-9-01

Figure 3

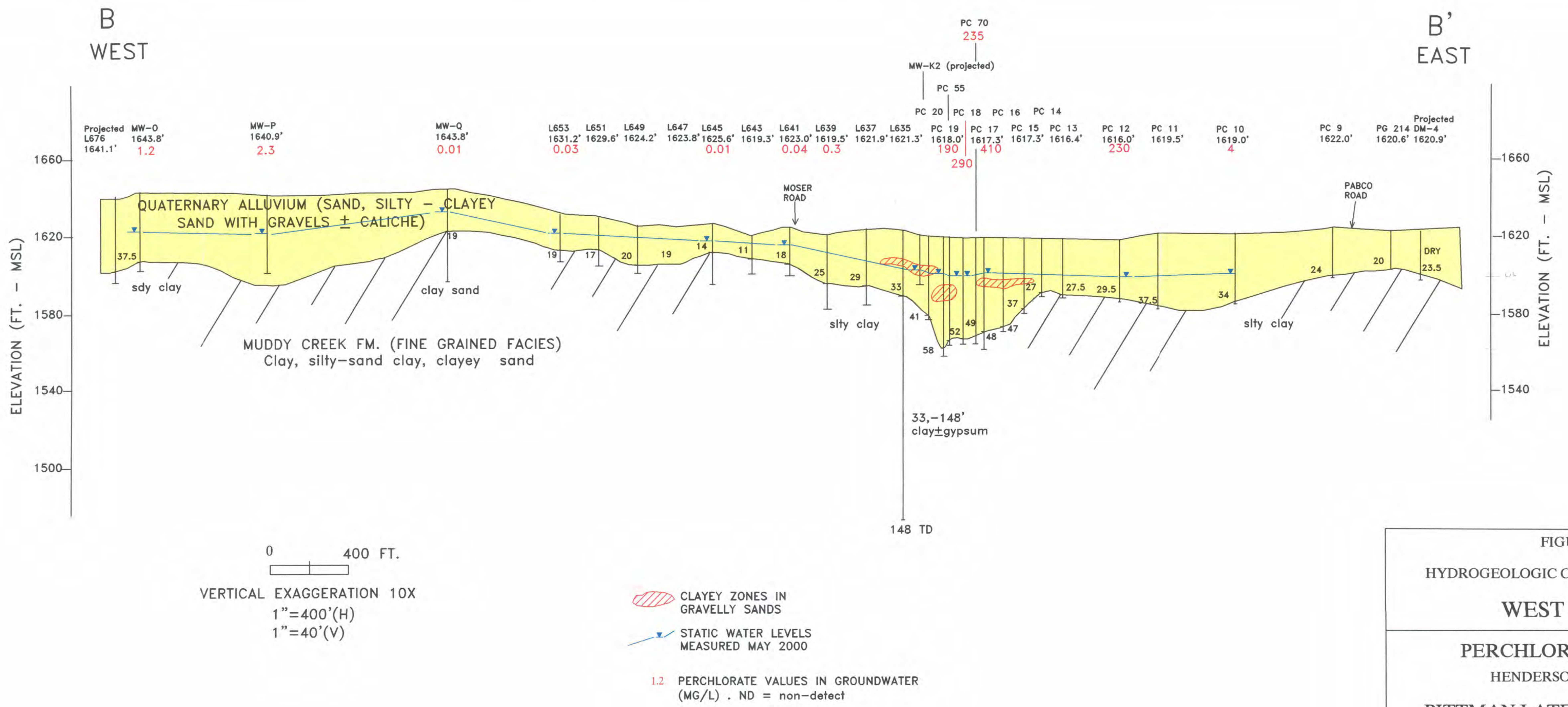


FIGURE : 3

HYDROGEOLOGIC CROSS SECTION B -B'

WEST - EAST

PERCHLORATE STUDY

HENDERSON, NEVADA

PITTMAN LATERAL TRAVERSE

DATE: 7/15/98 REVISED: 1/12/01	DRAWN BY: arl
]

Figure 4

Figure 4: PC-101 (Site A) DEPTH TO WATER

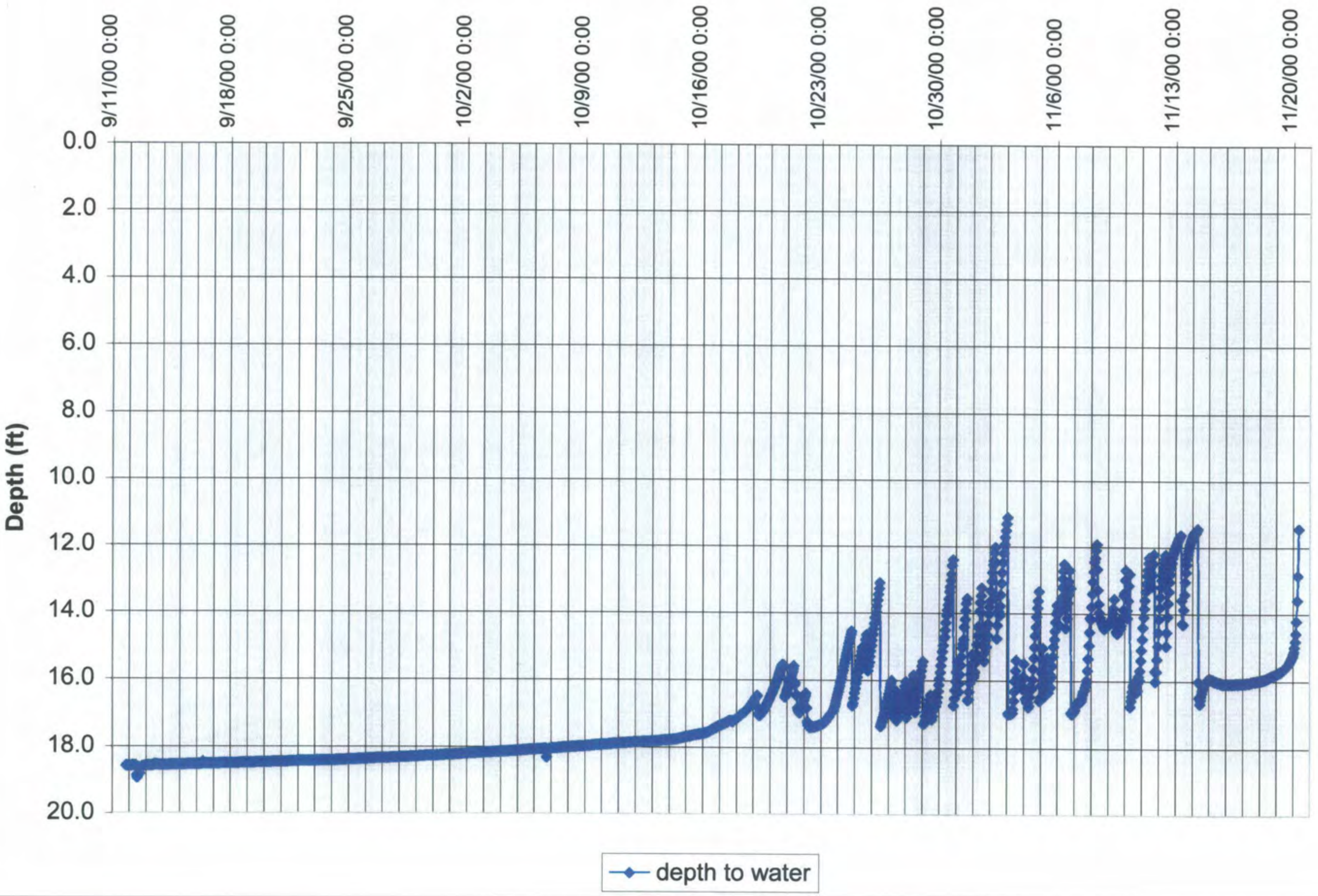


Figure 5

Figure 5: PC-98 (Site B) GRAPH OF WATER LEVEL DEPTH AND CONDUCTIVITY

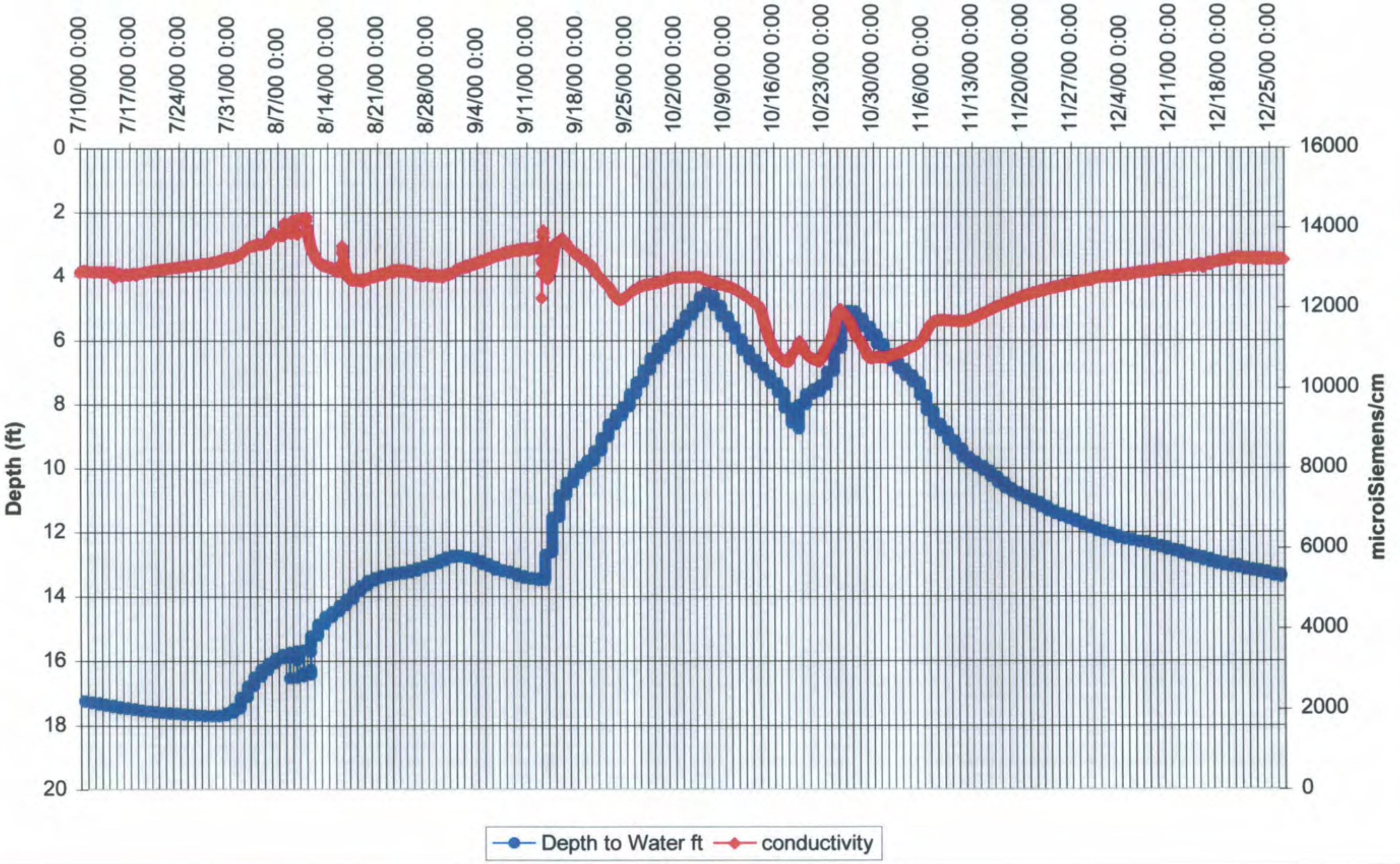


Figure 6

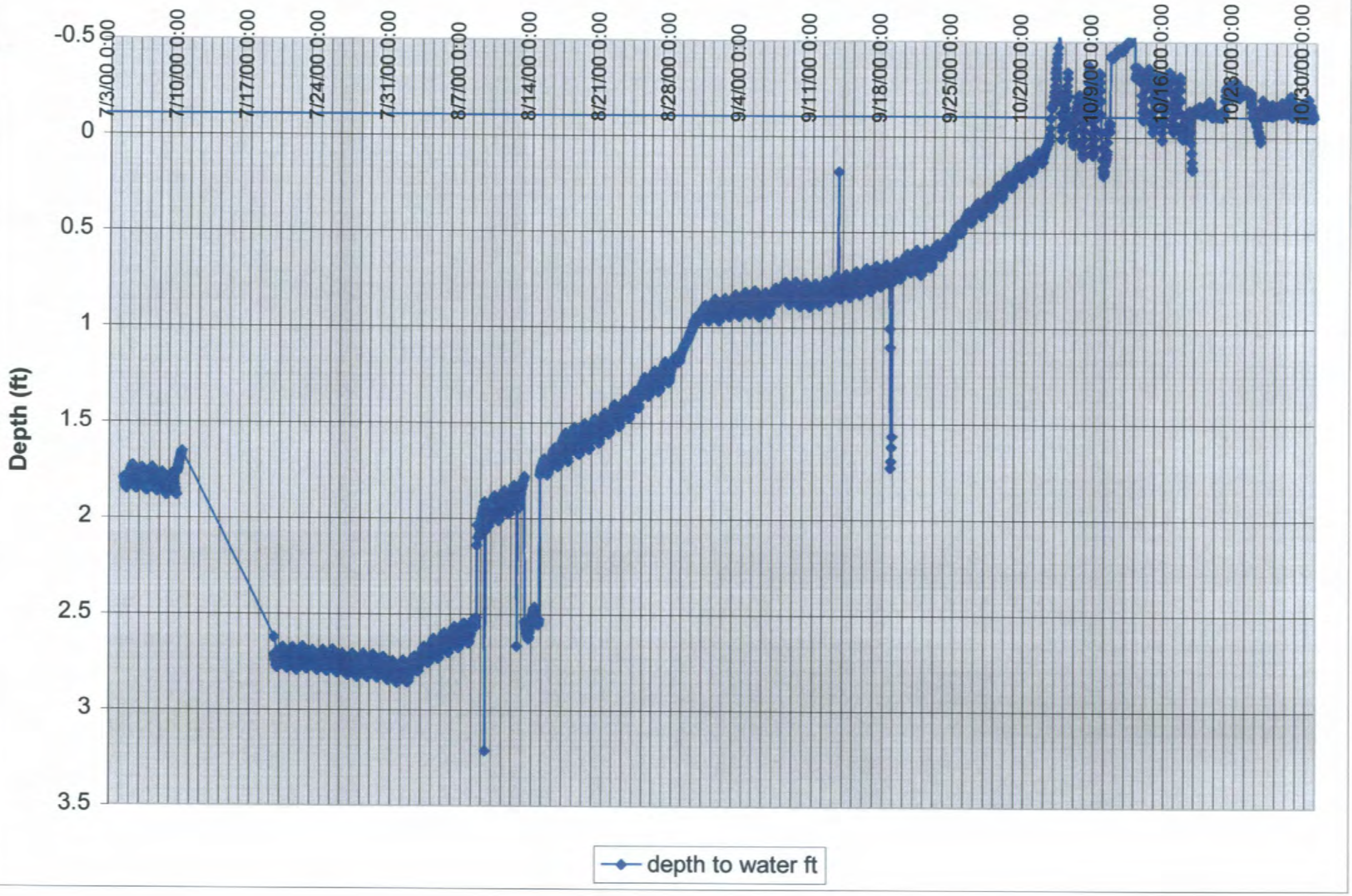


Figure 6: PC-99 (Site C) DEPTH TO WATER

Figure 7

Figure 7: PC-87 (400 ft W of PC-99, Site C) DEPTH TO WATER

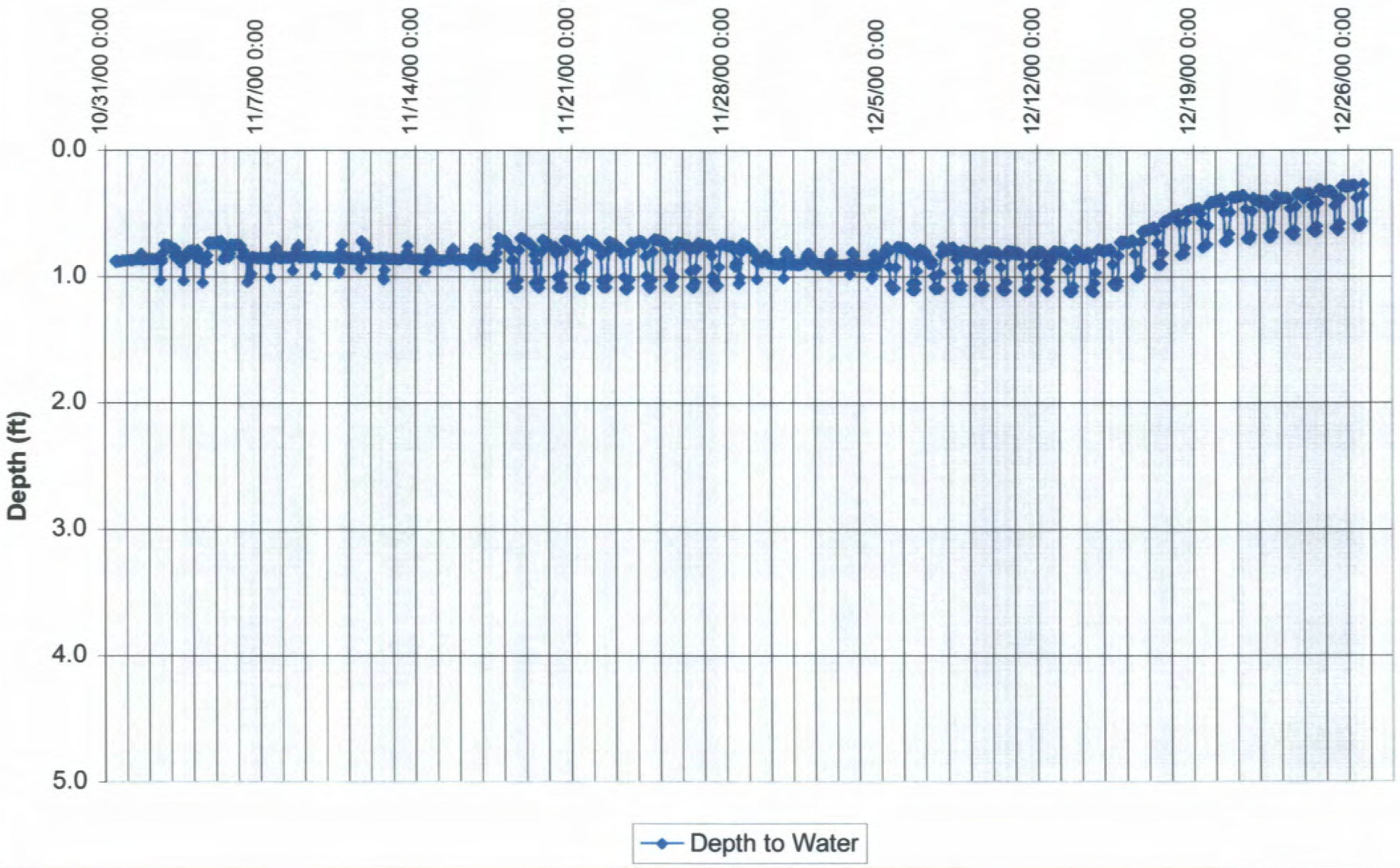
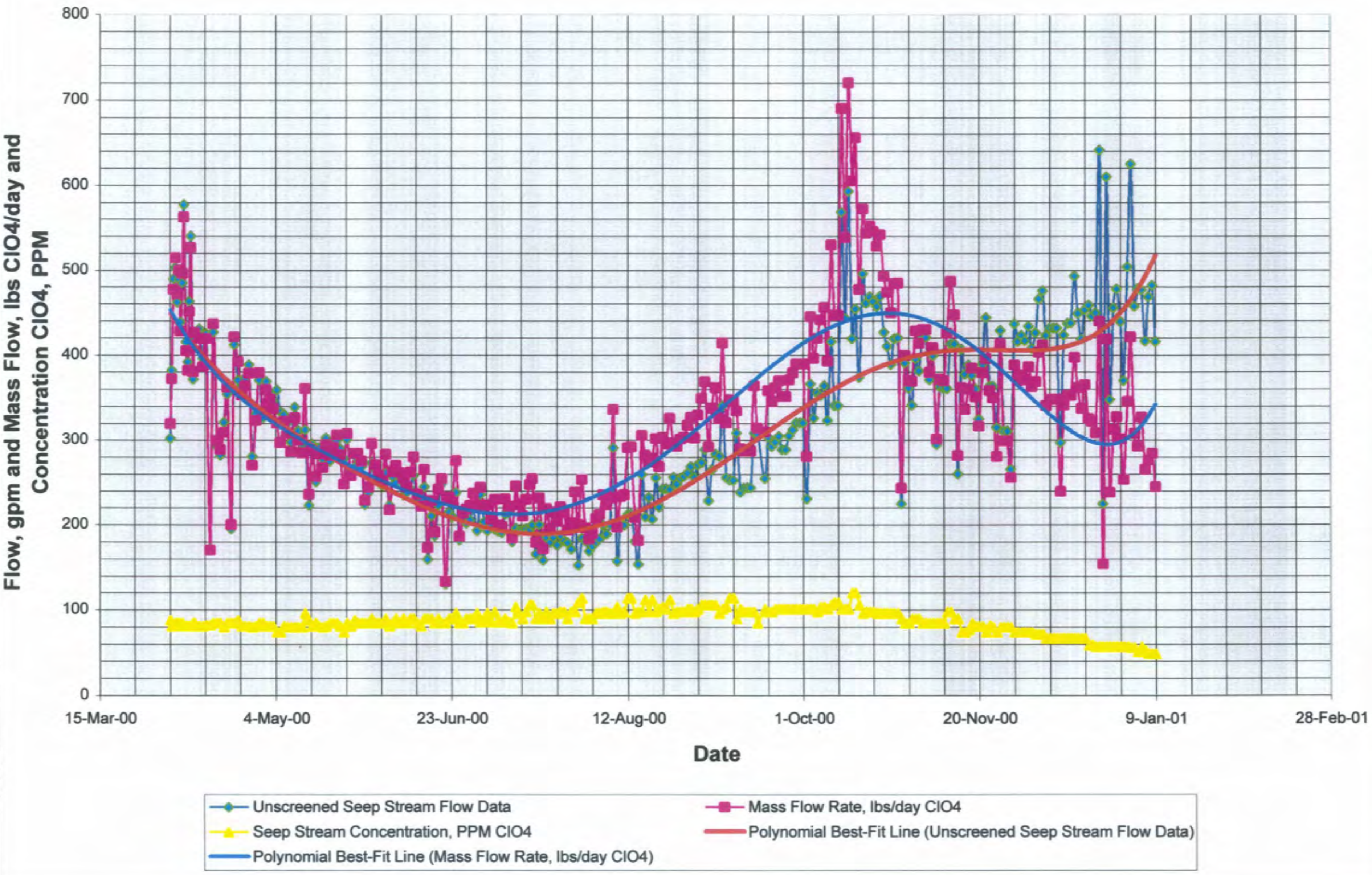


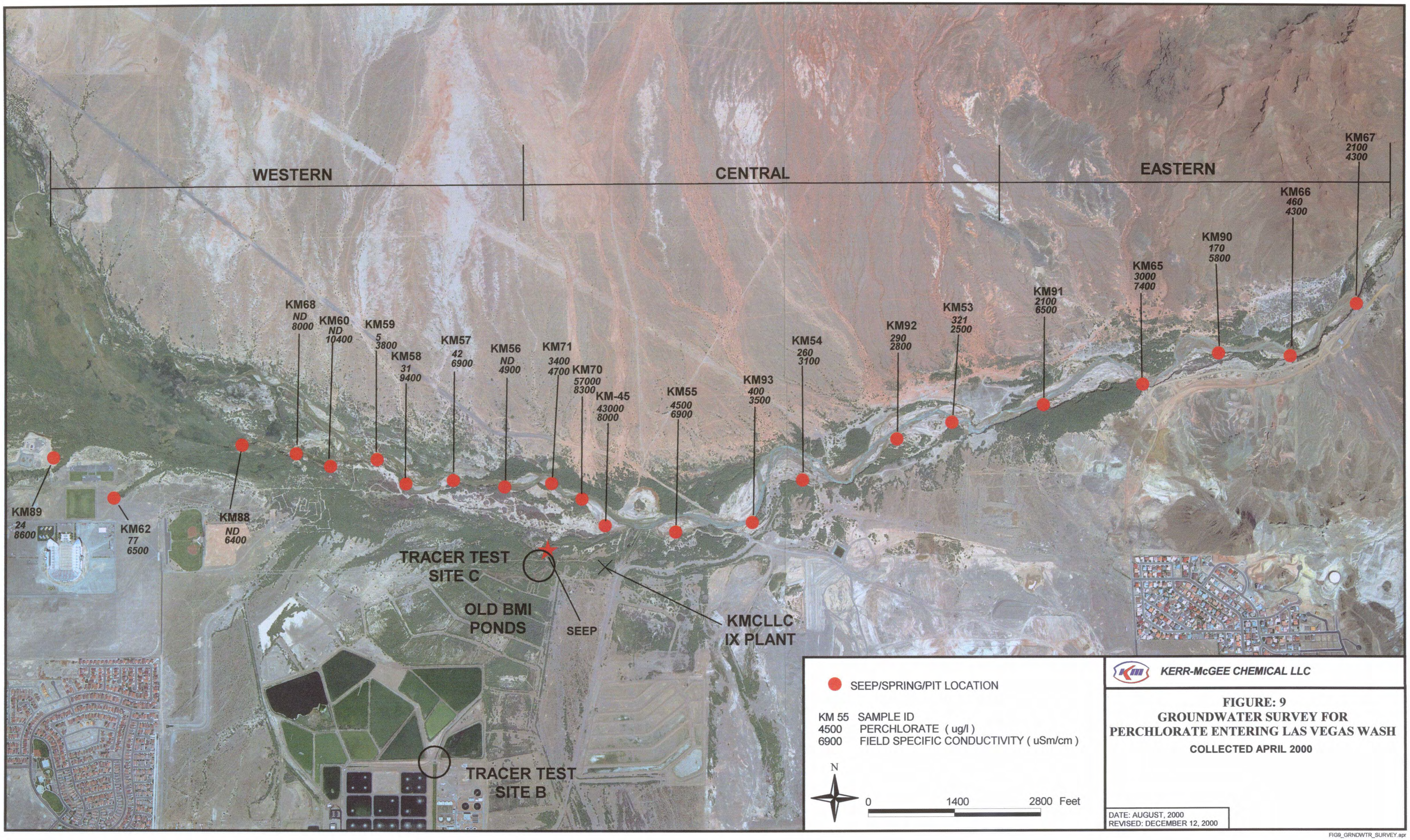
Figure 8

Figure 8: GRAPH OF SEEP FLOW, PERCHLORATE CONCENTRATION AND MASS FLOW



Prepared by Everette M. Spore

Figure 9



KERR-McGEE CHEMICAL LLC

FIGURE: 9
GROUNDWATER SURVEY FOR PERCHLORATE ENTERING LAS VEGAS WASH

COLLECTED APRIL 2000

DATE: AUGUST, 2000
REVISED: DECEMBER 12, 2000

FIG9_GRNDWTR_SURVEY.apr

Plate 1

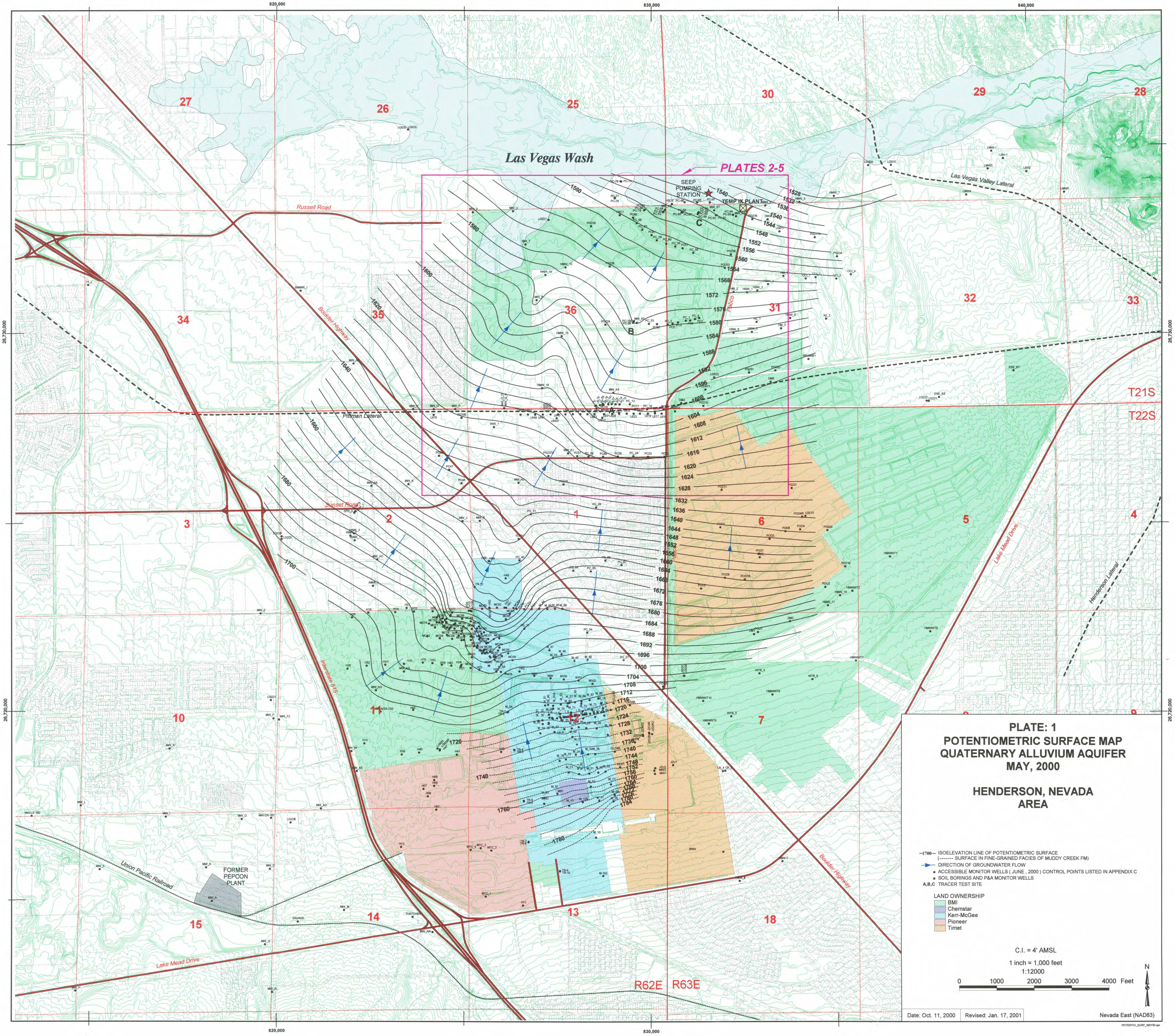


PLATE: 1
POTENTIOMETRIC SURFACE MAP QUATERNARY ALLUVIUM AQUIFER MAY, 2000

HENDERSON, NEVADA AREA

Date: Oct. 11, 2000

Revised: Jan. 17, 2001

Nevada East (NAD83)

POTENTIO_SURF_MAY00.apr

Plate 2

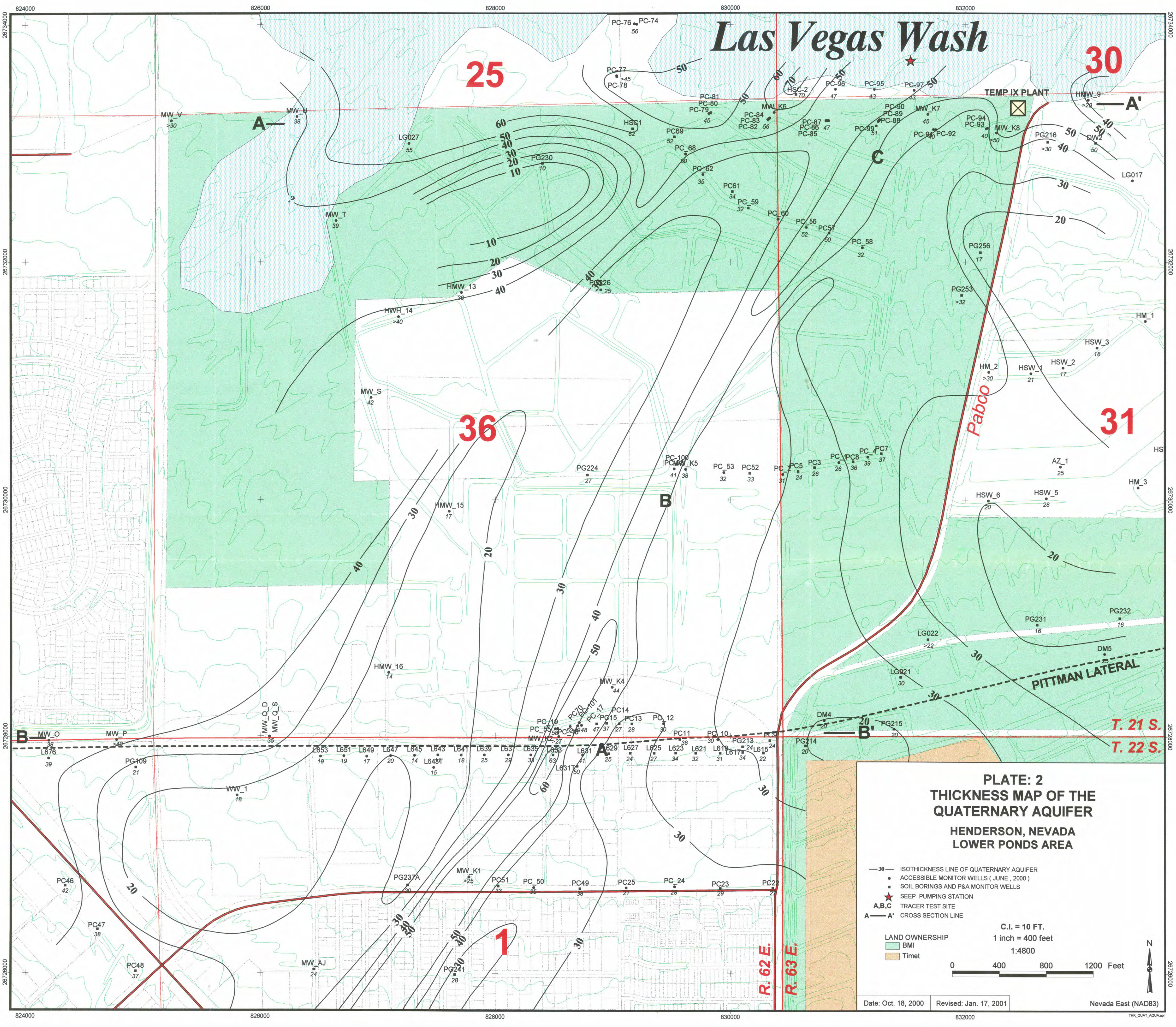


PLATE: 2
THICKNESS MAP OF THE QUATERNARY AQUIFER
HENDERSON, NEVADA
LOWER PONDS AREA

—30—	ISOTHICKNESS LINE OF QUATERNARY AQUIFER
●	ACCESSIBLE MONITOR WELLS (JUNE , 2000)
■	SOIL BORINGS AND P&A MONITOR WELLS
★	SEEP PUMPING STATION
A,B,C	TRACER TEST SITE
A—A'	CROSS SECTION LINE

LAND OWNERSHIP
🟩 BMI
🟧 Timet

C.I. = 10 FT.
1 inch = 400 feet
1:4800

0 400 800 1200 Feet

N

Date: Oct. 18, 2000
Revised: Jan. 17, 2001
Nevada East (NAD83)

Plate 3

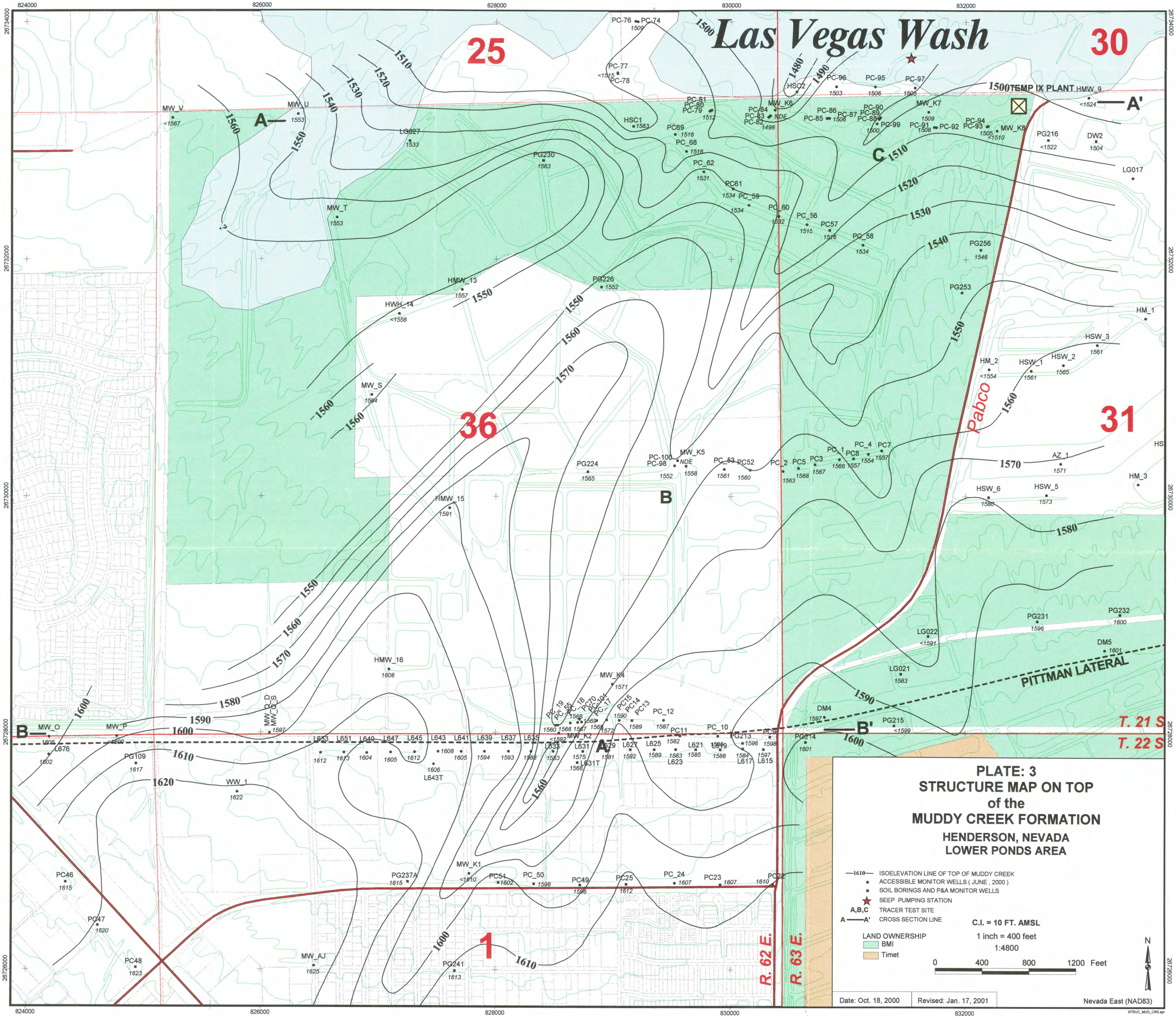


PLATE: 3

STRUCTURE MAP ON TOP of the MUDDY CREEK FORMATION

HENDERSON, NEVADA
LOWER PONDS AREA

Date: Oct. 18, 2000

Revised: Jan. 17, 2001

STRUC_MUD_CRK.apr

Plate 4

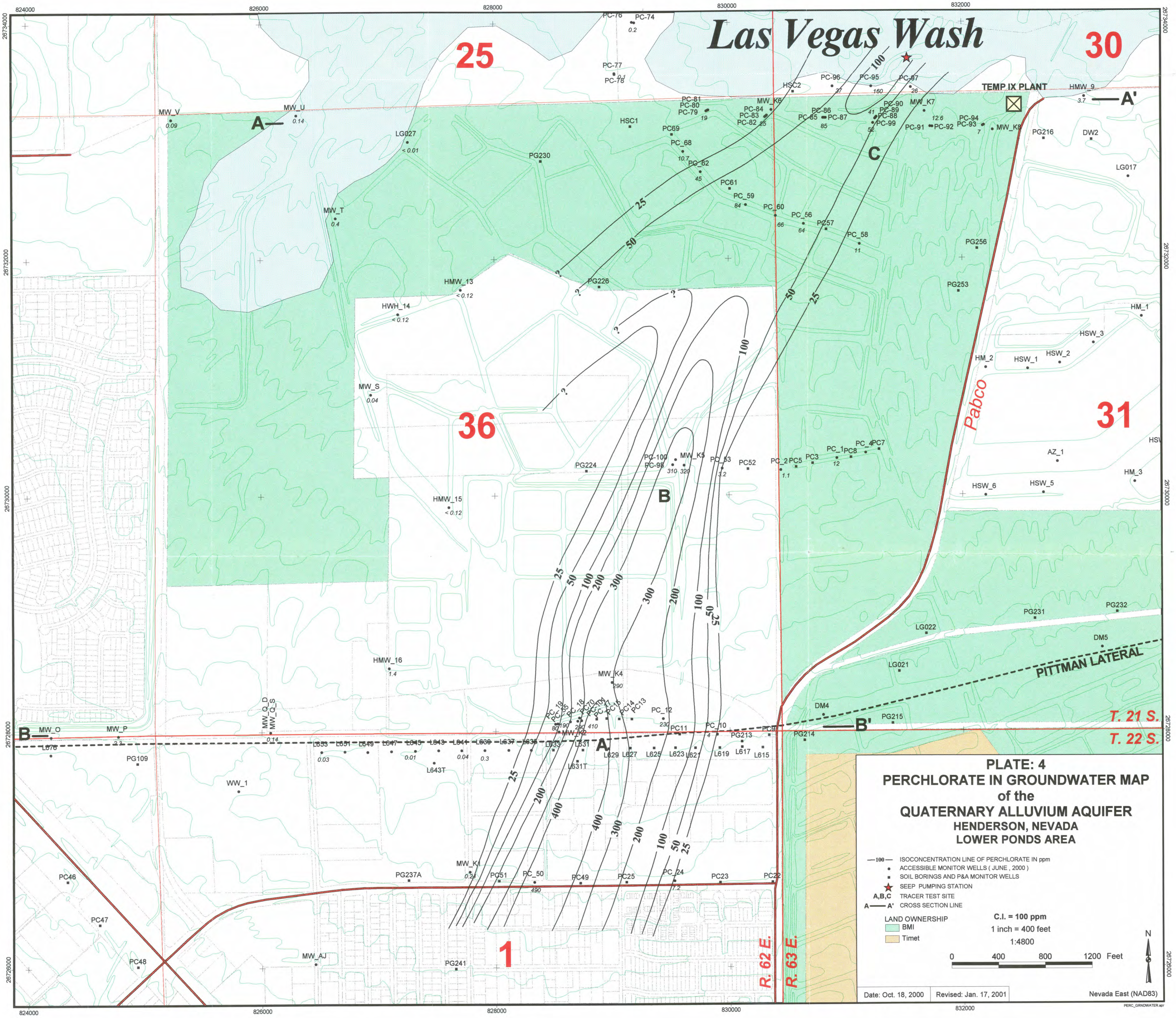


PLATE: 4
PERCHLORATE IN GROUNDWATER MAP of the QUATERNARY ALLUVIUM AQUIFER
HENDERSON, NEVADA
LOWER PONDS AREA

—100— ISOCONCENTRATION LINE OF PERCHLORATE IN ppm

● ACCESSIBLE MONITOR WELLS (JUNE , 2000)

■ SOIL BORINGS AND P&A MONITOR WELLS

★ SEEP PUMPING STATION

A,B,C TRACER TEST SITE

A—— A' CROSS SECTION LINE

LAND OWNERSHIP

🟩 BMI

🟫 Timet

C.I. = 100 ppm

1 inch = 400 feet

1:4800

0 400 800 1200 Feet

N

Date: Oct. 18, 2000

Revised: Jan. 17, 2001

Nevada East (NAD83)

PERC_GRNDWATER.apr

Plate 5

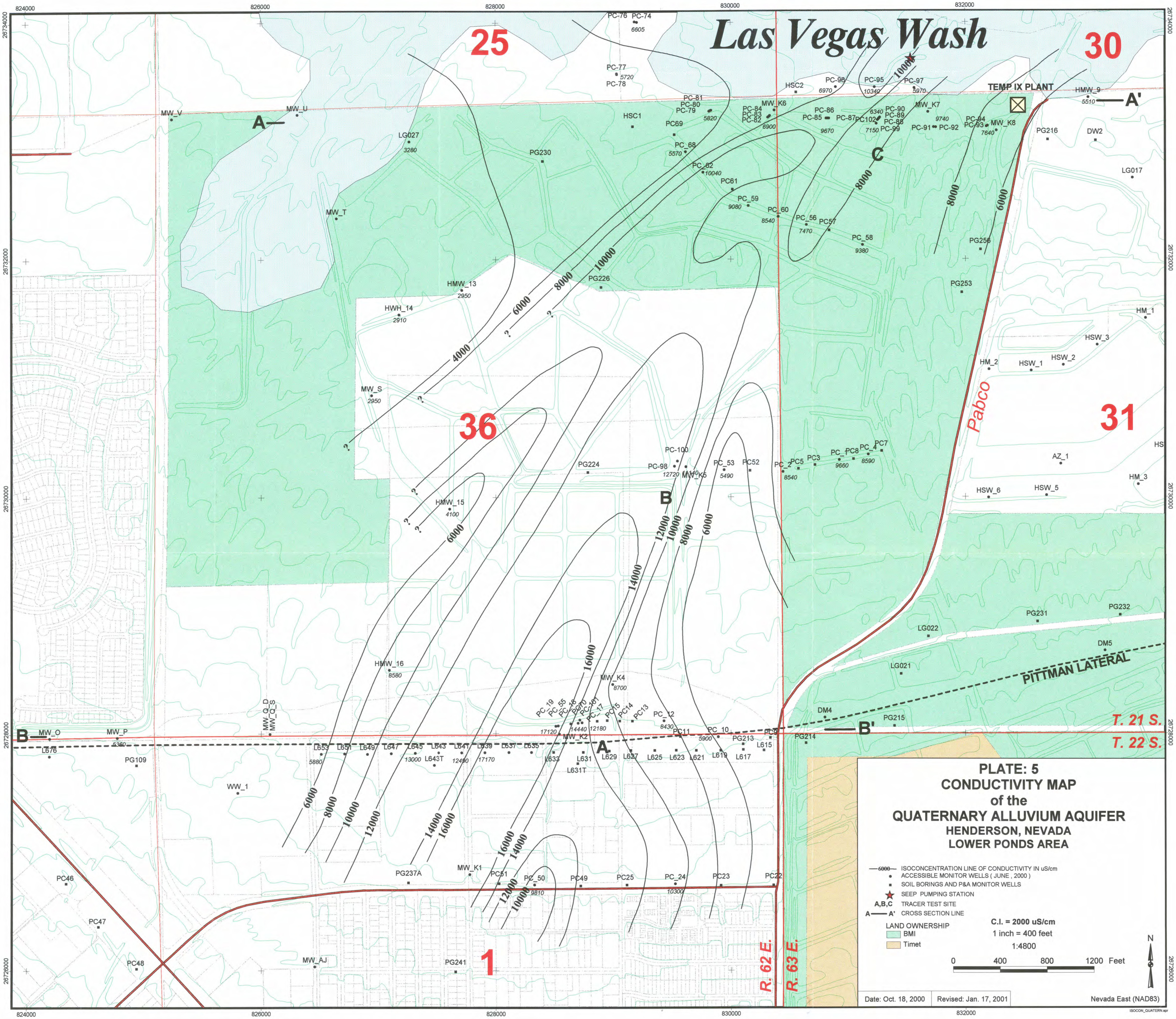


PLATE: 5
CONDUCTIVITY MAP
of the
QUATERNARY ALLUVIUM AQUIFER
HENDERSON, NEVADA
LOWER PONDS AREA

—6000— ISOCONCENTRATION LINE OF CONDUCTIVITY IN uS/cm
● ACCESSIBLE MONITOR WELLS (JUNE , 2000)
■ SOIL BORINGS AND P&A MONITOR WELLS
★ SEEP PUMPING STATION
A,B,C TRACER TEST SITE
A——A' CROSS SECTION LINE

LAND OWNERSHIP
🟩 BMI
🟫 Timet

C.I. = 2000 uS/cm
1 inch = 400 feet
1:4800

0 400 800 1200 Feet

Date: Oct. 18, 2000 | Revised: Jan. 17, 2001

Nevada East (NAD83)

Appendix A

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson NV	BORING NUMBER PC 74

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0 - 8 GRAVEL w/ slty sd, yell orange. 30% gravel + boulders to 2' diam. volcanics 60% vc - vf SA sd 10% silt		GW							
10	8 - 15 slty SAND w/minor gravel. Inc in silt to 25%. gry brn. sd is vf - vc, SA - A. Gravel up to 2"		SM							damp@ 7' @ 12.45' ▼ 4-29-00
15 20	15 - 21 sdy GRAVEL w/minor silt. gry brn volc grav. to 2" w/ sd vc - f SA-A matrix. 10-15% silt		GW-GM							▽ WTR@16' (Perched) 4-26-00 only damp @ 21'
	21 - 24 cly SAND, gry grn, sd f - vc w/ com (40%) clay		SC							▽ WTR@ 24' 4-26-00
25 30 35	24 - 51 Pea Gravel w/ vc - f sd matrix. grn gry. st. slty 25% sd 70% peagravel 27-28.5 w/ com cobbles/ boulders 37-48 boulder zones (thin) scattered throughout		GW							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◫ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
⧅ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	≈ HIGHLY ORGANIC (PEAT)
▒ SAND	▨ SANDY CLAY
⁞ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▨ CLAYEY SILT	☐ ______

DATE DRILLED 4-26-00	PAGE 1 of 2
DRILLING METHOD HSA	
DRILLED BY Compliance	
LOGGED BY E KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson NV	BORING NUMBER PC74

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
45			GW							SCREENED 40'-50' WTR SMPL 4-28-00 pH 7.3 TDS 7100
51	51-56 SAND, m-vc, SA-SR, grn gry, hard. Sl. slty (10%). w/ 10% granules		SW							
56 60 65	56-70 slty sdy CLAY, grn gry & red brn, mottled. Calcareous, sticky, drills slow. w/ 5-15% vf-mg sand in matrix. Contains 10% c-vc-gran sized caliche nodules dissem. throughout		CL-ML							Muddy Creek @ 56'
7	TD 70'									

EXPLANATION

▼	Water Table (24 Hour)
▽	Water Table (Time of Boring)
PID	Photoionization Detection (ppm)
NO.	Identifies Sample by Number
TYPE	Sample Collection Method

☒ SPLIT-BARREL
▐ AUGER
▥ ROCK CORE
■ THIN-WALLED TUBE
▌ CONTINUOUS SAMPLER
▧ NO RECOVERY

DEPTH	Depth Top and Bottom of Sample
REC.	Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▧ SANDY CLAY
⁘ GRAVEL	▧ CLAYEY SAND
▧ SILTY CLAY	☐ ______
▧ CLAYEY SILT	☐ ______

DATE DRILLED 4-26-00	PAGE 2 of 2

DRILLING METHOD: HSA

DRILLED BY: Compliance

LOGGED BY: E KRISH

EXISTING GRADE ELEVATION (FT. AMSL):

LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson NV	BORING NUMBER PC 75

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
5	PC 75 located 10' SW of PC 74. See log of PC 74 for lithology (soil boring)									
10					BORE HOLE NO WELL					
15										▽ 16' 4-27-00
20										DRY @ 21'
25	WTR SAMPLE @25' thru augers pH 7.6 TDS 8200									▽ 24' 4-27-00
30										
35										
	TD 40'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◫ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
▤ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 4-27-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY Compliance	
LOGGED BY E KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson, NV	BORING NUMBER PC 76

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
5	PC 76 located 10' SW of PC75									
10	(20' SW of PC74)									
	see log of PC74 for lithology									SCREEN SET 15'-20'
15										▽ 4-28-00 ▼ 4-29-00 @16.28'
20										WTR SMPL 4-30-00
	TD 22'									PH 7.2 cond. 8600

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▐ AUGER
▐ ROCK CORE
■ THIN-WALLED TUBE
▐ CONTINUOUS SAMPLER
◺ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▧ SANDY CLAY
⁙ GRAVEL	▧ CLAYEY SAND
▧ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 4-28-00
PAGE 1 of 1
DRILLING METHOD HSA
DRILLED BY Compliance
LOGGED BY Ed Krish
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON NV	BORING NUMBER PC 77

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0-11 sl. silty SAND, vf-fg, SA-SR, brown, 10-15% silt below 6' silt inc. to 20-25% w/ tr vc volc grains		SW SM						6.53' ▼ 4-30-00	damp@ 2' moist @ 6' PH 7.2 cond. 5500
11 15 20	11-21 silty gravelly SAND, brn, vf-m, SA-SR, 30% silty matrix. 20% volc + caliche granules + pebbles to 1"		SM-GM							▼ 17.18' 5-3-00 ▽ @ 19' 4-29-00
25 30	21-34 gravelly SAND, vf-vc, brn gry, sl. silty 10-20%, SR-SA volc and caliche 22-24 v. hard calichified gravel 29-34 dec in gravel. to 10%. Mostly vf-vc sand		GW SW							WTR SMPL 5-2-00 PH 7.8 cond. 6800
35	34-40 sdy SILT, brn, 30-40% vfg, SA. sand contains 10-15% matrix supported volc granules		ML							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◨ AUGER
◨ ROCK CORE
■ THIN-WALLED TUBE
◨ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▦ SAND
⁘ GRAVEL
▨ SILTY CLAY
▨ CLAYEY SILT
▨ DEBRIS FILL
▨ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 4/29-5/1/00
PAGE 1 of 2
DRILLING METHOD HSA
DRILLED BY COMPLIANCE
LOGGED BY Ed KRISH
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 77

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
	40-44 silty gravelly SAND, brn, f-vc w/ 30-35% gran. and pebbles of volc and caliche & minor ls.		SM-GM							
45	44-45 v. hard calcified GRAVEL (volc & ls.)									
	TD 45' (too hard to drill)									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▯ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
◺ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▒ SAND	▧ SANDY CLAY
⁞ GRAVEL	▧ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▨ CLAYEY SILT	☐ ______

DATE DRILLED: 4/29-5/1/00
PAGE: 2 of 2
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: Ed KRISH
EXISTING GRADE ELEVATION (FT AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON NV	BORING NUMBER PC 78

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
5										▼ 6.95' 5-3-00 pH 7.5 TDS 4800
10	HOLE LOCATED 10' SOUTH OF PC77.									
15	See PC77 for lith log									
20										▽ @19' 5-2-00
22	TD 22'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY
▥ SILT
▒ SAND
⁘ GRAVEL
▨ SILTY CLAY
▨ CLAYEY SILT
▩ DEBRIS FILL
▭ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-2-00
PAGE 1 of 1
DRILLING METHOD HSA
DRILLED BY COMPLIANCE
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 79

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
	0-6 silty SAND brn, 20-30% silt in vf-vc sd. Contains 5-10%		SM							
5	dissem pea gravel									damp @ 5'
	6-39 silty gravelly SAND brn, 20-30% silt in									
10	vf-vc sd w/ 20-30% volc granules and minor pea gravel, SA-SR 7-12 50% silt									▽@12'
15	15-30 locally com thin caliche cemented zones		SM-GM							
20										
25										
30										
35	36-38 calichified gravel zone									
39	39-42 gravelly SILT,		ML-GM							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

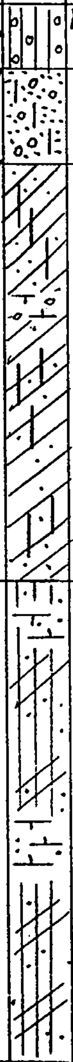
GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-2-00
PAGE 1 of 2
DRILLING METHOD HSA
DRILLED BY COMPLIANCE
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson, NV	BORING NUMBER PC 79



DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
42	grn gray, sticky, 10-20% dissem matrix supported pea gravel (to 1")		ML-GM							
45	42-45 slty gravelly SAND, as above		SM-GM							
55	45-58 slty sdy CLAY, grngry, dk gry and lt tan. (49-50) Calichified zone		CL							MC @ 45
60 65 70	58-73 sdy SILT, cly SILT pale brn w/ minor grn gry. 10% vf-mg, SR-SA sand in matrix. Minor gypsum xtals throughout 59-60 hard, calichified zone 66-73 hard, calichified zone		ML-CL							
	TD 73'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▯ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
◫ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▨ SILTY CLAY
▨ CLAYEY SILT
▩ DEBRIS FILL
☰ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-2-00
PAGE 2 of 2
DRILLING METHOD HSA
DRILLED BY Compliance
LOGGED BY Ed Krish
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 80

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5										
	PC 80 located 10' EAST OF PC79. SEE LITH LOG OF PC 79 for lithology									
10										
										▽ 12' 5-3-00
15										
20										
25										
30										
32										
	TD 32'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◫ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
◺ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▧ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-3-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC81

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
5	PC81 located 10' EAST of PC80. See									
10	Log of PC79 for lithology									▽ 12' 5-3-00
15										
18	TD 18'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
AUGER
ROCK CORE
■ THIN-WALLED TUBE
CONTINUOUS SAMPLER
NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
DEBRIS FILL
SILT
HIGHLY ORGANIC (PEAT)
SAND
SANDY CLAY
GRAVEL
CLAYEY SAND
SILTY CLAY
☐ ______
CLAYEY SILT
☐ ______

DATE DRILLED 5-3-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 82

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6'	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	0-3 disturbed berm material slty grav SAND		SM-GM							@2' damp
5 10	3-12 slty gravelly SAND, dk brn, 20% silt. 40% granules & pea gravel (SR) of volc. 40% vf-vc sd, SA-SR.		SM-GM							▽ @5'
12	12-15 sdy cly SILT, dk brn, 15-25% vf-m, SA-SR, sd, 20% clay, 10% sm volc granules. sticky		ML							
15	15-20 slty sdy GRAVEL, dk brn. SR-SA, 20% silt, 25% vf-vc sd, SA-SR		GM							
20 25	20-30 slty gravelly SAND dk brn, 20% silt, 40% volc granules to pea gravel to 1/2", SR; vf-vc, SR-SA sd		SM-GM							
30	30-33 sdy slty GRAVEL, dk brn, 30% SA-SR, vf-c sd, 20% silt, 50% volc w/ minor ls gravel to 2-3", SR		GM							
33 35	33-39 slty gravelly SAND, as above @38'-39' gravel zone, volc SR up to 3" diam		SM-GM							
	39-46 slty SAND, brn,		SM							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◨ AUGER
◫ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
◸ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	≋ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁙ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED: 5-4-00
PAGE: 1 of 2
DRILLING METHOD: HSA
DRILLED BY: Compliance
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC LLC	HENDERSON, NV	PC82

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
45	SA, 30% silt in 70% vf-f sd w/ minor c-vc grains sticky. calcareous		SM							
50	46-50 slty gravelly SAND, dk brn, as above		SM-GM							
52	50-52 cly, slty SAND, lt. red brn + grn gry. SA-SR vf-fg sd w/ 20% clay + 30% silt. Com sm caliche nodules; calcareous		SM-SC							
56	52-56 slty gravelly SAND, f-c SR-SA w/ 20% silt and 30% volc + ls pebbles to 2"		SM-GM							
60 65 67	56-67 slty CLAY, lt grn yellow, sticky		CL			Muddy Ck @ 56'				
	TD 67'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▯ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
◱ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▒ SAND
⁘ GRAVEL
▨ SILTY CLAY
▨ CLAYEY SILT
▩ DEBRIS FILL
☰ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 5-4-00
PAGE: 2 of 2
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 83

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
5	PC 83 is 11' NORTH of PC82. See log for PC82 for lithology									▽ @5' 5-4-00
10										
15										
20										
25										
30										
35										
	37' TD									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◨ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED: 5-4-00
PAGE: 1 of 1
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 84

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
	PC84 is 11' NORTH of PC 83.									
5	SEE log of PC 82 for lithology									∇ @5' 5-5-00
10										
15										
	TD 17'									

EXPLANATION

▼ Water Table (24 Hour)

∇ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▮ AUGER

▮ ROCK CORE

■ THIN-WALLED TUBE

▮ CONTINUOUS SAMPLER

⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▧ SANDY CLAY
⁙ GRAVEL	▧ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-5-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC LLC	HENDERSON, NV	PC 85

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0-10 sl. slty SAND, gry brn (5YR4/2), SR-SA, poorly sorted vf-vc, 10% silt and 10% volc granules to 1/4"		SW							damp @ 0' ▽ @ 2'
10 15 20 25	10-27 slty gravelly SAND: dk yell brn (10YR4/2) 20-30% silt and 10-20% volc granules and pebbles to 1/2"		SM-GM							
30 35	27-43 slty sdy GRAVEL dk yell brn (10YR4/2). 30% silt, 25% vf-vc, SA-SR sd and 45% granules + pebbles to 1 1/2" 38-43 v. hard drilling calichified gravel		GM							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▐ AUGER
▐ ROCK CORE
■ THIN-WALLED TUBE
▌ CONTINUOUS SAMPLER
⧅ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY
▨ DEBRIS FILL
▥ SILT
▭ HIGHLY ORGANIC (PEAT)
▦ SAND
▧ SANDY CLAY
⁘ GRAVEL
▧ CLAYEY SAND
▧ SILTY CLAY
☐ ______
▥ CLAYEY SILT
☐ ______

DATE DRILLED: 5-10-00
PAGE: 1 of 2
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC LLC	HENDERSON NV	PC 85

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
			GM							
43	43-47 sdy SILT, yell gry + lt brn, 5-10% m-c SR qtz grains + 5-10% c-vc, caliche nodules. Calcareous		ML							MC @ 43'?
47										
50	47-67 CLAY and slty CLAY, interbedded. 15-25% dissem caliche nodules. Calcareous. sticky		CL							
55	47-57 mod red orange 10R6/6									
60	57-64 lt grn gry (5GY 8/1)									
	64-67 med gry (N5)									
65										
	TD 67'									
70										

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▯ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
◫ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▦ SAND
⁘ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
≈ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 5-10-00
PAGE: 2 of 2
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 86

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
										▽ @ 2'
5	PC 86 is 10' east of PC 85.									
	SEE log of PC85									
10	for lithology									
15										
20										
25										
30	TD 30'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◪ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▧ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
≈ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-11-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 87

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
	PC 87 located									
5	10' EAST of PC 86.									
	SEE Log of PC 85 for lithology									
10										
15										
	TD 15'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◫ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

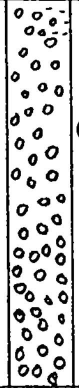
GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▦ DEBRIS FILL
▤ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▧ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-11-00
PAGE 1 of 1
DRILLING METHOD HSA
DRILLED BY COMPLIANCE
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 88

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
5 10	0-12 sdy GRAVEL, pale brn (5YR 5/2). 10% silt, 30% sd (SA-SR, vf-vc) and 60% volc gravel (SA-SR, up to 3" diam.		GW							damp @ 0' ∇ @ 2'
15 20 25 30 35	12 - 51 slty gravelly SAND. pale yell brn (10YR 6/2). Var. silt 20-40%. 20-30% pea gravel to 3/4" (volc). Sand SA-SR vf-vc 12-21 10-20% slty matrix 21-51 com. silt in matrix 30-40% 27-33 gravel zone w/ pebbles to 3". Var. caliche cement 32-33 v. hard. slow drilling abu caliche cement 37-51 Var. amts of gravel (pebbles to 2") up to 50%		SM-GM							

EXPLANATION

▼ Water Table (24 Hour)
∇ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
☒ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

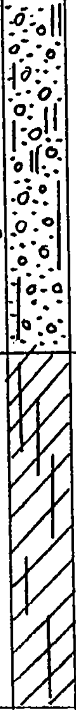
GRAPHIC LOG LEGEND

▧ CLAY	▩ DEBRIS FILL
▥ SILT	≈ HIGHLY ORGANIC (PEAT)
▒ SAND	▧ SANDY CLAY
⁘ GRAVEL	▧ CLAYEY SAND
▧ SILTY CLAY	☐ ____
▥ CLAYEY SILT	☐ ____

DATE DRILLED 5-11-00
PAGE 1 of 2
DRILLING METHOD HSA
DRILLED BY COMPLIANCE
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 88



DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
45	NOTE: Most likely this unit is a series of fluvial fining-upward sediments, from gravels to silts		SM GM							
51	51-62 silty CLAY, grn gry (5GY8/2) and yell gry (5Y8/1)		CL							MC @ 51'
55										
60										
62	TD 62'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-12-00	PAGE 2 of 2
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC89

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
										▽@2'
5	PC89 located 7' east of PC88. See log of PC88 for lithology									
10										
15										
20										
25										
30										
35										
39	TD 39'									

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL | ▮ AUGER | ▮ ROCK CORE

■ THIN-WALLED TUBE | ▮ CONTINUOUS SAMPLER | ⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	≈ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-12-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 90

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
										▽ @ 2'
	PC 90 located 10' east of PC 89.									
5	SEE log of PC 88 for lithology									
10										
15										
18	TD 18'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◺ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁙ GRAVEL	▧ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED: 5-12-00
PAGE: 1 of 1
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC LLC	HENDERSON, NV	PC 91

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
5	0-6 gravelly SAND, mod brn (5YR 4/2), poorly sorted, SA-SR. with 10% silt and 20% SA-SR volc granules and pebbles to 2"		SW							damp@7
10 15 20 25	6-31 slty gravelly SAND, mod brn (5YR 4/2), contain 25% silt in matrix and 25% volc granules and pebbles to 1/2" diam. Sand vf-vc SA-SR. minor small caliche nodules		SM-GM							▽ @ 10'
31 35	31-40 slty sdy GRAVEL mod brn (5YR 4/2). 25% silt, 25% vf-vc SA-SR sd and 50% SR, volc & ls granules and sm pebbles to 1" diam.		GM							

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL ▮ AUGER ▮ ROCK CORE

■ THIN-WALLED TUBE ▮ CONTINUOUS SAMPLER ⍁ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY ▦ DEBRIS FILL

▥ SILT ▭ HIGHLY ORGANIC (PEAT)

▩ SAND ▨ SANDY CLAY

⁘ GRAVEL ▨ CLAYEY SAND

▨ SILTY CLAY ☐ ______

▥ CLAYEY SILT ☐ ______

DATE DRILLED	PAGE
5-13-00	1 of 2

DRILLING METHOD: HSA

DRILLED BY: COMPLIANCE

LOGGED BY: ED KRISH

EXISTING GRADE ELEVATION (FT AMSL):

LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC91

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	40 - 62 slty CLAY sticky w/10% vfg sd 40-42 lt grngry(5GY8/1)									MC @ 40
45	42-58 pale olive(10Y6/2) 58-62 mod grn gry(5G5/1) w/10-20% caliche nodules & ls granules to 1/4"		CL							
50										
55										
60										
	62-65 slty CLAY with abu gypsum xtals. mod grn gry (5G5/1) 1" gyp xtals		CL							
65	TD 65'									

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▮ AUGER

▮ ROCK CORE

■ THIN-WALLED TUBE

▮ CONTINUOUS SAMPLER

▧ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▧ SANDY CLAY
⁙ GRAVEL	▧ CLAYEY SAND
▧ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-13-00

PAGE 2 of 2

DRILLING METHOD HSA

DRILLED BY COMPLIANCE

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 92

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	PC 92 located 20'									
5	west of PC 91..									
	See log of PC 91									damp @ 7'
	for lithology									
10										∇ @ 10'
15										
20										
25										
30	TD 30'									

EXPLANATION

▼ Water Table (24 Hour)
∇ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
▮ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

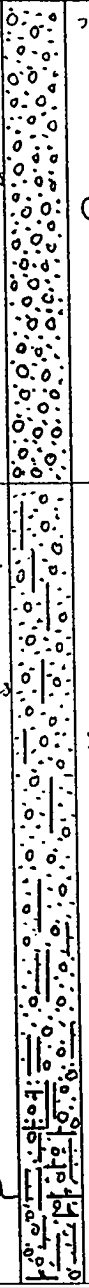
GRAPHIC LOG LEGEND

▨ CLAY	▦ DEBRIS FILL
▥ SILT	≋ HIGHLY ORGANIC (PEAT)
▩ SAND	▧ SANDY CLAY
⁘ GRAVEL	▧ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-12-00
PAGE 1 of 1
DRILLING METHOD HSA
DRILLED BY Compliance
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 93

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	0-15 sdy GRAVEL, mod brn (5YR 4/2). 30% vf-vc, SA-SR sand and 10% silt.		?							
5	60% SA-SR, volc granules and pebbles to 2"		GW							damp @ 6'
10										▽ @ 10'
15	15-40 silty gravelly SAND, mod brn (5YR 4/2) 20-25% silt in matrix									
20	20-30% volc SA-SR granules and sm pebbles to ½-¾". 50-60% vf-vc sand		SM-GM							
25										
30	30-40 increase in silt content to 40%									
35	35-40 inc. in gravel size to 1-1½" diam. Mod caliche cemented									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◨ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
◪ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▦ SAND
⁙ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☰ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 5-13-00
PAGE: 1 of 2
DRILLING METHOD: HSA
DRILLED BY: Compliance
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 93

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
45 50 55	40-57 slty CLAY and cly SILT, interbedded - pale olive (10Y6/2) and lt grn gry (5GY8/1) to 43'; mod grn gry (5G5/1) to 50'; pale olive to 57' 5-15% dissem vf-cg caliche nodules throughout 5-10% vfg sand dissem in matrix		CL-ML							MC @ 40'
57	TD 57'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◿ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	≈ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-13-00	PAGE 2 of 2
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 94

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
5										damp @5'
	PC 94 located 10' east of PC 93. See lg of PC93 for lithology									
10										▽@10'
15										
20										
25	TD 25'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▐ AUGER
▐ ROCK CORE
■ THIN-WALLED TUBE
▐ CONTINUOUS SAMPLER
◺ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-14-00	PAGE 1 of 1
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC95

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0 - 7 BERM MATERIAL- slty gravelly SAND		SM-GM							wet @2' ∇ @5
10 15 20 25 30	7-35 slty gravelly SAND, pale brn (5YR 5/2). 20% in matrix. 30% volc granule to sm pea gravel (SR-SA) to 1" diam. 50% SA-SR, vf-vcg sand 21-35 com. hard caliche cement. Inc in gravel size to 3". Com ls. pebbles		SM-GM							@10' WTR SMPL field cond 13,000 pH 7.4
35	35 - 38 slty SAND, pale yell brn (10YR 6/2). 30% silt in matrix. Sand is vf-mg, SA-SR		SM							
38			SM-GM							

EXPLANATION

▼ Water Table (24 Hour)
∇ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

SPLIT-BARREL
AUGER
ROCK CORE
THIN-WALLED TUBE
CONTINUOUS SAMPLER
NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

CLAY
SILT
SAND
GRAVEL
SILTY CLAY
CLAYEY SILT
DEBRIS FILL
HIGHLY ORGANIC (PEAT)
SANDY CLAY
CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 5-14-00
PAGE: 1 of 2
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER PC95

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
	38-43 gravelly silty, SAND, pale yellow brn and dusky yell grn (5GY5/2). 35% silt, 25% granules and pea gravel to ½-¾". 40% vf-md SR-SA sand. Calcareous		SM-GM							
43 45 50	43-50 cly SILT and slty CLAY, interbedded. Mod gry yell grn (5GY6/2). Dry. Com calcareous		ML-CL							MC @ 43
	TD 50									

EXPLANATION

Water Table (24 Hour)
Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

SPLIT-BARREL
AUGER
ROCK CORE
THIN-WALLED TUBE
CONTINUOUS SAMPLER
NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

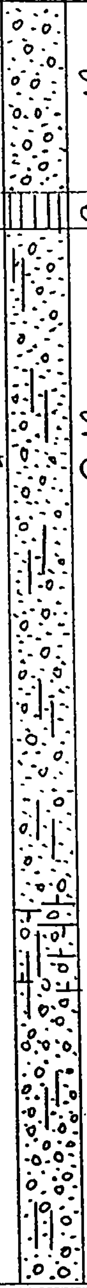
GRAPHIC LOG LEGEND

- CLAY
- DEBRIS FILL
- SILT
- HIGHLY ORGANIC (PEAT)
- SAND
- SANDY CLAY
- GRAVEL
- CLAYEY SAND
- SILTY CLAY
- ☐ ______
- CLAYEY SILT
- ☐ ______

DATE DRILLED 5-14-00
PAGE 2 of 2
DRILLING METHOD
DRILLED BY
LOGGED BY
EXISTING GRADE ELEVATION (FT AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 96



DEPTH IN FEET	LITHOLOGIC DESCRIPTION	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	0-6 BERM MATERIAL Gravelly SAND, brn	SW							damp @3' ▽ @6
6 7	6-7 Organic-rich silt, dkgry	OL							
10 15 20 25 30 35	7-44 silty gravelly SAND, mod yell brn (10YR 5/2), 20-25% silt in matrix, 20-25% volc and ls granules and pebbles to 3" diam. Sand is vf-vc, SR-SA, w/ minor c-vc dissem caliche nodules 7-28 gravel is granules and pea gravel size to 1/2" diam, SR-R 28-31 hard zone - Caliche cemented 31-44 com gravel to 2" diam w/ minor 3"	SM-GM							

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

◨ AUGER

◫ ROCK CORE

■ THIN-WALLED TUBE

◧ CONTINUOUS SAMPLER

⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY

▥ SILT

▩ SAND

⁘ GRAVEL

▨ SILTY CLAY

▥ CLAYEY SILT

▦ DEBRIS FILL

▤ HIGHLY ORGANIC (PEAT)

▧ SANDY CLAY

▨ CLAYEY SAND

☐ ______

☐ ______

DATE DRILLED 5-15-00

PAGE 1 of 2

DRILLING METHOD HSA

DRILLED BY COMPLIANCE

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT. AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson, NV	BORING NUMBER PC96

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
		⁘	SM-GM							
44.	44-47 silty SAND, lt gry orange (10 YR 8/4). vf-fg, mod well sorted, SA-SR. Minor mg w/occ. thin granule beds. Very calcareous	░	SM							
47	47-50 silty sdy CLAY, mod yell grn (5GY 6/2) Matrix contains 20-30% silt and 10-20% vfg SA sand	▨	CL							MC @ 47'
50										

TD 50

EXPLANATION

Water Table (24 Hour)

Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▮ AUGER

▮ ROCK CORE

■ THIN-WALLED TUBE

▮ CONTINUOUS SAMPLER

◿ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧	CLAY	▦	DEBRIS FILL
▥	SILT	☐	HIGHLY ORGANIC (PEAT)
░	SAND	▧	SANDY CLAY
⁘	GRAVEL	▧	CLAYEY SAND
▧	SILTY CLAY	☐	______
▥	CLAYEY SILT	☐	______

DATE DRILLED 5-15-00

PAGE 2 of 2

DRILLING METHOD HSA

DRILLED BY Compliance

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC97

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	0-5 Berm material brn slty gravelly SAND		SW							damp @3'
5	5-20 slty gravelly SAND, pale brn (5YR5/2) 10% silt, 25% volc granules and sm pebbles up to 1" diam Sand is vf-vc, SA-SR		SW							▽ @6'
10										
15										
20	20-25 slty SAND w/ minor gravel. pale yell brn (10YR 6/2). Silt up to 25%, gravel (gran. + pea size up to 20%. Sand as above... vf-vc, SR-SA.		SM							
25	25-36 slty sdy GRAVEL pale yell brn. (10YR 6/2). 25% silt, 25% vf-vc, SA-SR Gravel 50%, SR-SA, granules and pebbles to 2" diam locally com caliche cement		GW							
30										
36	36-42 silty SAND pale yell brn (10YR6/2) bimodal: vf-fg w/ com.		SM							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
▩ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◸ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▧ SANDY CLAY
⁘ GRAVEL	▧ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-16-00	PAGE 1 of 2
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON NV	BORING NUMBER PC97

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
42	c-vc, SR, Sand. 25% silt in matrix. Calcareous	▥	SM		—					
43	42-43 silty gravelly SAND pale yell brn. Gravels up to 3/4" diam w/ minor caliche cement, calcareous	⁘	SW							dense + dry
45	43-45 cly sdy SILT lt grn gry (5GY 8/1), 10-20% clay in matrix, 10-20% vf-fg sand. Calcareous, w/ minor sm. caliche nodules	▧	ML-CL		—					MC @ 43
	TD 45'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
⧅ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▧ SILTY CLAY
▥ CLAYEY SILT
▦ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▧ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-16-00
PAGE 2 of 2
DRILLING METHOD HSA
DRILLED BY COMPLIANCE
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON NV	BORING NUMBER PC 98

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5 10	0-12 gravelly SAND, mod yell brn (10YR 5/4), 20-25% granules & sm. pebbles to 1" diam (volc) sp-mod silt in matrix (10-20%). Sand vf-vc, SR-SA	SP							
	12-16 slty sdy GRAVEL H brn (5YR 5/4), 20% silt 25% vf-vc A-SR sand. 50% volc granules to cobbles up to 6" diam Mod com caliche throughout 13-16 v. hard, dense calichification	GW							damp @ 15
16 20 25 30	16-34 slty gravelly SAND, mod brn (5YR 4/4), 20-25% silt, 20-25% granules and sm pebbles to 3/4". 50% vf-vc A-SR sand	SW							▽ @ 22'
34	34-37 slty SAND. lt yell brn (10YR 6/4). vf-fg w/ minor mg, SR-SA. 25-30% silt. Mod com m-vc caliche nodules. Very calcareous	SM							
37		GC-ML							

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▯ AUGER

▯ ROCK CORE

■ THIN-WALLED TUBE

▮ CONTINUOUS SAMPLER

◺ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY

▥ SILT

▩ SAND

⁘ GRAVEL

▨ SILTY CLAY

▥ CLAYEY SILT

▩ DEBRIS FILL

≋ HIGHLY ORGANIC (PEAT)

▧ SANDY CLAY

▨ CLAYEY SAND

☐ ______

☐ ______

DATE DRILLED 5-16-00

PAGE 1 of 2

DRILLING METHOD HSA

DRILLED BY COMPLIANCE

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 98

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
41	37- 41 sdy grav SILT/slty grav SAND w/ 15% dissem granules to 1/8-1/4", mod gry orange pink (5YR 6/2). Contains 25-50 % vf-f sd in silt/clay matrix. 10-20% vlc +ls granules to 1/8-1/4". Very calcareous w/ mod c-vc caliche nodules.	⚬⚬								
	41-45 slty CLAY, lt grn gry (5GY 8/1) and yell gry (5G 8/1). 25% silt, v. calcareous w/ minor m-vc sized caliche nodules dissem.	▨	CL							MC @ 41'
45	45' TD									

EXPLANATION

- Water Table (24 Hour)
- Water Table (Time of Boring)
- PID Photoionization Detection (ppm)
- NO. Identifies Sample by Number
- TYPE Sample Collection Method
- ☒ SPLIT-BARREL
- AUGER
- ROCK CORE
- THIN-WALLED TUBE
- CONTINUOUS SAMPLER
- NO RECOVERY
- DEPTH Depth Top and Bottom of Sample
- REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

- CLAY
- SILT
- SAND
- GRAVEL
- SILTY CLAY
- CLAYEY SILT
- DEBRIS FILL
- HIGHLY ORGANIC (PEAT)
- SANDY CLAY
- CLAYEY SAND
- ☐ ______
- ☐ ______

DATE DRILLED 5-16-00

PAGE 2 of 2

DRILLING METHOD HSA

DRILLED BY Compliance

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMCC	LOCATION Henderson NV	BORING NUMBER PC 98R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0-5 gravelly SAND gryish brn w/10% Silt. 20-30% granules - pea gravel to 3/4". vf-vc SA sd		SP							
9	5-9 SAND, gry brn w/10% silt and 5-10% volc granules to 1/4". f-vc, SA sand		SW							
12	9-10 sdy GRAVEL (to 1") 25-35% vf-vc sd		GW							
			SW							damp @ 12'
15 20	10-12 SAND, brn, 10% silt, 5% granules. f-vc volc, SA sand 12-24 sdy GRAVEL brn. w/ 5-10% silt, 25% vf-vc, SA-A sand. Granules to pea gravel, A-SA. 1/2"-3/4" w/ minor 3/4"-2" Locally caliche cemented.		GW	6 30 15			☒	20'-21.5'	50%	∇@ 18'
24 26	16'-20' hard. Com caliche cement		SP	25 50			☒	25-26	75%	
30 34	24-26 SAND. gry brn, SR, clean, f-mg w/ c-vcg 26-34 sdy GRAVEL gry brn, 10-15% silt, 25-30% vf-vc, SA sand in granule - pea gravel to 1/2"-3/4' 29-30 - cobbles up to 7"		GW	22 29 30			☒	30'-31.5'	80%	
	34-40.5 gravelly slty SAND 20-30% silt and 10-15% volc granules to 1/4", brn. Com. dissem sd-size		GM/SM	12 13 31			☒	35'-36.5'	100%	

EXPLANATION

▼ Water Table (24 Hour)

∇ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

AUGER

ROCK CORE

THIN-WALLED TUBE

CONTINUOUS SAMPLER

NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

- ▧ CLAY
- SILT
- SAND
- GRAVEL
- SILTY CLAY
- CLAYEY SILT
- DEBRIS FILL
- HIGHLY ORGANIC (PEAT)
- SANDY CLAY
- CLAYEY SAND
- ☐ ______
- ☐ ______

DATE DRILLED 8-8-00

PAGE 1 of 2

DRILLING METHOD Percussion

DRILLED BY LAYNE

LOGGED BY Ed Krish

EXISTING GRADE ELEVATION (FT AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMCC	LOCATION HENDERSON NV	BORING NUMBER PC 98R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
40.5	caliche nodules. Very calcareous. Sand is vf-f w/minor mg, SA-SR	▨	CL							
	40.5-41.5 silty CLAY lt grn, w/ dissem sm gypsum xtals									
	TD 41.5'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◫ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 18-8-00	PAGE 2 of 2
DRILLING METHOD Percussion	
DRILLED BY LAYNE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC99

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0 - 11 sdy GRAVEL, pale brn (5YR 5/2), clean - only 10% silt, 30% SA-SR, vf - vc sd. 60% volc granules and sm. pebbles to 2"		GP							▽ @ 3'
11 15 20 25 30 35	11 - 48 slty gravelly SAND, pale yell brn (10YR 6/2). Var. amts of silt in matrix (20-60%). 20-40% volc granules and sm pebbles to ¾". Sand is poorly sorted, SA-SR, vf-vc 11 - 30 20% silt in matrix. Locally 60% sdy silt in thin stringers 30-48 inc in silt to 30% 30-36 gravel zone, hard, calichified. Volc pebbles up to 3" diam.		SP							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
☐ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▨ DEBRIS FILL
▥ SILT	▨ HIGHLY ORGANIC (PEAT)
▩ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▨ CLAYEY SILT	☐ ______

DATE DRILLED 5-17-00	PAGE 1 of 2
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC LLC	HENDERSON, NV	PC 99

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
45			SP							
48	48-49 Silty SAND, pale yell brn (10YR6/2). 30-40% silt in matrix. Mod' well sorted vf-f sand. Contains 10% dissem volc granules to 1/8"		SM							
49	49-51 Sdy GRAVEL, hard, well calichified. Refusal @ 51'		GP							
51	TD 51'									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
☐ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▨ SILTY CLAY
▨ CLAYEY SILT
▩ DEBRIS FILL
▭ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 5-18-00
PAGE: 2 of 2
DRILLING METHOD: HSA
DRILLED BY: COMPLIANCE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMCC	LOCATION Henderson NV	BORING NUMBER PC 99R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
	0-6 SDY GRAVEL. Brn, vf-vc sd matrix (40%) w/ volc gravel 1/8"-1" w/minor 2"-3". Sparse silt (10%)		GW							▽ @3 3'-6' perched WTR
6 10 15	6'-20' slty SAND lt brn. vf-fg, SA, w/ 30% silt in matrix. Locally com-abu sd size caliche nodules scattered throughout 13-18 abu caliche nodules		SM	7 4 14 6 7 8			☒ ☒	6'-7.5' 16'-17.5	70% 100%	6'-12' damp-partly dry below 12' wet
20	20-24 slty gravelly SAND. brown. 20-30% silt, 10-20% volc. A-SA pea gravel in vf-vc, SA sand		GM/SM							
24	24-30 sdy GRAVEL brn. 5% silt, 30-40% vf-vc SA sd in volc pea gravel to 1"		GW	5/ 18"			☒	26'-27.5	0%	major WTR zone
30	30-34 gravelly SAND, brn 10-15% volc A-SA pea gravel in m-cg sd w/ minor f-vf & vc, 10% silt		SW							
34	34-42 sdy GRAVEL, pale brn. Abu SR-R ls, & caliche clasts to 1½" (60% ls & 40% volc. 20-25% SA-SR f-vc sand. Locally calichified		GW							WITH LS.

EXPLANATION

▼	Water Table (24 Hour)
▽	Water Table (Time of Boring)
PID	Photoionization Detection (ppm)
NO.	Identifies Sample by Number
TYPE	Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◻ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
▭ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 8/8/00
PAGE 1 of 2
DRILLING METHOD PERCUSSION
DRILLED BY LAYNE
LOGGED BY Ed KRISH
EXISTING GRADE ELEVATION (FT AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMcc	LOCATION Henderson NV	BORING NUMBER PC 99R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
			GW							
42	42-52 sdy GRAVEL brn. Dec in ls clasts to 10-20% w/ inc in volc. ave size 1/4"-1½" w/minor local 4"-7". 20% f-vcg SA-SR sand 42-46 ls &/or caliche clasts present 46-52 volc clasts only 48-50 more silty to 20% 50-52 Hard, totally calichified sdy pea/gravels		GW	30 50/4"			☒	46-47.5-	50%	w/o LS.
50			SM							
52 54	52-54 slty clay, lt grn w/ sm gypsum xtals throughout TD 54'		CL							MUDDY CK @52'

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL ▮ AUGER ▮ ROCK CORE

■ THIN-WALLED TUBE ▮ CONTINUOUS SAMPLER ☐ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY ▨ DEBRIS FILL

▥ SILT ▨ HIGHLY ORGANIC (PEAT)

▩ SAND ▨ SANDY CLAY

⁘ GRAVEL ▨ CLAYEY SAND

▨ SILTY CLAY ☐ _____

▥ CLAYEY SILT ☐ _____

DATE DRILLED 8/8/00

PAGE 2 of 2

DRILLING METHOD Percussion

DRILLED BY Layne

LOGGED BY Ed Krish

EXISTING GRADE ELEVATION (FT AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 100

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5 10 15	0-18 gravelly SAND, mod yell brn (10YR5/4). 10% silt, 25% volc granules & sm pebbles up to 1"		SW							damp@16'
20 25	18-29 slty sdy GRAVEL lt brn (5YR5/4). 20-25% silt, 20-25% poorly sorted, SA-SR, vf-vc sd 50% volc granules and pebbles to 3" Locally hard thin calichified zones		SW							▽@25'
29	29-36 slty SAND, lt. yell brn (10YR 6/4). vf-fg w/com m-cg, SR-SA, 25-30% silt. Very calcareous. Minor m-vc size caliche nodules		SM							
36	36-45 slty grav SAND, mod yell brn (10YR 5/4) 25% silt, 25% volc granules		SW							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▯ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
☒ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▦ SAND
⁘ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
▭ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-18-00
PAGE 1 of 2
DRILLING METHOD HSA
DRILLED BY Compliance
LOGGED BY ED KRISH
EXISTING GRADE ELEVATION (FT AMSL)
LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 100

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
	and sm pebbles; vf-vc sd <u>42-45</u> silty gravelly SAND, gry oran pink		SW							
45	(5YR 6/2) 10% clay, 20% silt, 20% volc + ls granules to 1/8"-1/2" dissem throughout Very calcareous w/ minor sm. caliche nodules									MC not reached
	TD 45'									

EXPLANATION

Water Table (24 Hour)

Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

SPLIT-BARREL

AUGER

ROCK CORE

THIN-WALLED TUBE

CONTINUOUS SAMPLER

NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

CLAY

DEBRIS FILL

SILT

HIGHLY ORGANIC (PEAT)

SAND

SANDY CLAY

GRAVEL

CLAYEY SAND

SILTY CLAY

CLAYEY SILT

DATE DRILLED 5-18-00	PAGE 2 of 2
DRILLING METHOD HSA	
DRILLED BY Compliance	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION Henderson, NV	BORING NUMBER PC100R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
4	0-4 gravelly SAND, gry brn w/ 10-15% silt. 20-30% volc granules to pea gravel. vf-vc SA sd		SW							start drilling @ 8:30 am finish @ 9:00
7	4-7 SAND, gry brn w/ 10% silt and 5-10% v. sm granules to 1/10". f-vc, SA-SR sand.		SW							
9	7-9 sdy GRAVEL, brn, A-SA to 1". 30-35% vf-vc sand		GW							
11	9-11 SAND, brn, w/ 10% silt + 5-10% v.sm gran. f-vc, SA sand		SW							
15 20 25	11-25 sdy GRAVEL brn w/ 5-10% silt + 25-30% vf-vc, SR-SA sd. Grav. up to 2" (ave 1/10"-3/4") volc w/ minor caliche coatings		GW							damp @ 12' ▽ @ 18'
27	25-27 SAND brn, mod slty (15-20%). Calcareous. w/ 10-15% sm volc granules vf-vc, SA-SR		SW							
30	27-30 sdy GRAVEL, brn, volc up to 2" (ave 3/4") clean, vf-vc sd		GW							
35	30-35 SAND, brn, vf-c w/ minor vc, SA-SR. 10-15% silt, calcareous		SW							
38	35-38 slty SAND / sdy SILT var amts of silt in vf-fg SA-SR sd		SM							
			GM/SM							

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL ◨ AUGER ◧ ROCK CORE

■ THIN-WALLED TUBE ◨ CONTINUOUS SAMPLER ⧅ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY	▦ DEBRIS FILL
▥ SILT	▤ HIGHLY ORGANIC (PEAT)
▩ SAND	▧ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▧ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED: 8-16-00

PAGE: 1 of 2

DRILLING METHOD: PERCUSSION

DRILLED BY: LAYNE

LOGGED BY: ED KRISH

EXISTING GRADE ELEVATION (FT. AMSL):

LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC100R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
40.5	38-40.5 gravelly silty SAND, brn. 20-25% silt and 10-20% volc sm granules. SA-SR vf-vc sd.	o.ıı.·.								
		▨	CL							MC @ 40.5'
45										
	40.5-41.5 lt grn silty CLAY w/ gyp xtals									
	TD 41.5'									

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▮ AUGER

▯ ROCK CORE

■ THIN-WALLED TUBE

▮ CONTINUOUS SAMPLER

⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▦ DEBRIS FILL
▥ SILT	☰ HIGHLY ORGANIC (PEAT)
▩ SAND	▧ SANDY CLAY
⁙ GRAVEL	▧ CLAYEY SAND
▧ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 8-16-00

PAGE 2 of 2

DRILLING METHOD PERCUSSION

DRILLED BY LAYNE

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT. AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 101

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5 10 15	0-15 gravelly SAND. lt brn (5YR 5/4). 10% silt in sd matrix. Sand is poorly sorted, A-SR, vf-vc. 15-20% volc granules and sm pebbles to 3/4", A-SA Locally com. caliche cement		SW							30 FT N30E OFFSET TO PC-70
20 25	15-25 sdy GRAVEL lt brn (5YR 5/4). 50% volc granules and pebbles to 3". A-SR. locally hard thin calichified zones. 10-20% silt in sd matrix poorly sorted, vf-vc, SA-SR		GM							damp @ 17' ▽ @ 25'
30 35	25-50 slty gravelly SAND, mod yell brn (10YR 6/4). 10-20% silt in vf-vc, SR-SA sd matrix 30% volc granules and sm pebbles ave. to 1" but w/ minor pebbles to 3". Very calcareous. Locally hard caliche cemented *Probably alternating fining upward fluvial sequences (ie grav. → silt)		SW							

EXPLANATION

▼	Water Table (24 Hour)
▽	Water Table (Time of Boring)
PID	Photoionization Detection (ppm)
NO.	Identifies Sample by Number
TYPE	Sample Collection Method

☒ SPLIT-BARREL	▯ AUGER	▯ ROCK CORE
■ THIN-WALLED TUBE	▯ CONTINUOUS SAMPLER	⧄ NO RECOVERY

DEPTH	Depth Top and Bottom of Sample
REC.	Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5-18-00	PAGE 1 of 2
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 101

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
			SW							
45	<u>48-50</u> hard, calichified gravelly SAND. Com. $CaCO_3$ cement but still porous.									
50	<u>50-52</u> silty CLAY, lt grn gry (5GY 8/1). non-calcareous. sticky dense, dry. Minor gypsum xtals.		CL							MC @ 50'
52										
	52' TD									

EXPLANATION

Water Table (24 Hour)
Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
AUGER
ROCK CORE
THIN-WALLED TUBE
CONTINUOUS SAMPLER
NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▧ SILTY CLAY
▥ CLAYEY SILT
▦ DEBRIS FILL
≈ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▧ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 5-18-00	PAGE 2 of 2
DRILLING METHOD HSA	
DRILLED BY COMPLIANCE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 101 R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
5	0-5 sdy GRAVEL grybrn, volc, 25-30% SA, vf-vc sd in granule-pea gravel to 3/4". w/ 10-20% silt		GW							start hole @ 1PM, end 1:45p
10	5-10 grav. slty SAND gry brn, 20-30% silt, 20-30% granules/sm pea gravel in vf-vc, SA sd. 9'-10' calichified		GM/SM							
15 20	10-26 sdy GRAVEL brn to gry brn, 25-30% vf-vc, SA sand w/ var. amts of thin (2-3") silt-rich layers. Gravel is volc granule-pea gravel size up to 3/4", A-SA 20'-22' 70% f-vc sd w/ 30% granules 22'-23' volc cobble layer up to 4"		GW							damp @ 14' WTR @ 20'
26	23'-26' HARD, calichified sd and granules		SM							
30	26-30 slty SAND, brn, 20-25% silt in f-vc SA-SR sand w/ 10-15 1/10" granules 30-38 sdy GRAVEL, brn. Coarsens downward. Sandier (60%)[30'-34'] on top...vf-vc, SR-SA w/ granules		GW							
38	grading down to sdy pea gravel. 37-38' 1"-4" cobbles		GM/SM							

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◫ ROCK CORE
■ THIN-WALLED TUBE
◨ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▧ SILTY CLAY
▥ CLAYEY SILT
▦ DEBRIS FILL
≋ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 8-16-00

PAGE 1 of 2

DRILLING METHOD PERCUSSION

DRILLED BY LAYNE

LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT. AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 101 R

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	38 - 40 slty gravelly SAND, gry brn. 20-25% silt and 20% volc granules to 1/4" SA-SR, in vf-vc sR sand		GM/ SM							
43	40-43 sdy GRAVEL, gry brn. 25-30% vf-vc, SR sd in gran./pea grav to 1/2" w/minor 1-2"		GW							
47	43-47 slty gravelly SAND, brn, 20-25% silt, 20-25% gran. to 1/4" in vf-vc SR sd		GM/ SM							
51	47-51 sdy GRAVEL, brn 25% vf-vc SR sd in gran/ pea gravel, SR-SA, to 1/2" 49-51 hard calichified		CL/ML							Muddy Creek @ 51'
	51-51.5 cly SILT/slty CLAY, lt grn, minor root traces, sp. gypsum xtals									
	51.5' TD									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
■ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
☐ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▧ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☰ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▩ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 8-16-00	PAGE 2 of 2
DRILLING METHOD PERCUSSION	
DRILLED BY LAYNE	
LOGGED BY ED KRISH	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 102

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	0-8 GRAVEL, gry brn, sl. sdy (10-15) m-vc & sl slty (10%). Grav. up to 4", ave 1/2"		GP							start 11AM. finish 11:30 am wet@0' WTR@2'
8	8-14 slty SAND & slty sdy GRAVEL, interbedded 8-9 brn, slty (40%) vf-f sd 9-11 brn slty sdy gravel, 30% silt, 20% f-c sd, 50% pea gravel to 1" 11-14 brn, slty vf-f sd		SM/GM							dry 8-9' wet @9'
14	14-19 sdy SILT and slty SAND, interbedded, brn to ltgrnish brn. vf-f sd		ML/SM							
19	19-22 sdy GRAVEL, gry brn, 30-40% vf-vc, A-SR sd in gran./pea gravel, SR-R, to 1/2" (volc)		GW							
22	22-24 slty SAND, brn 30% silt in vf-fg sd		SM							
24	24-28 slty sdy GRAVEL, dec silt from 30% @ 24 to 15% @ 28'. brn, f-m w/ cg SR sd in pea grav/gran to 1/2-3/4"		GM/SM							
28	28-36 sdy GRAVEL, gry brn & whtish. Contains abu ls. gravels. 20-30% f-vc; SR sd in gran/peagravel ave 1" w/ up to 6" locally		GW							
36			GM/SM							
39			GW							

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▯ AUGER
▯ ROCK CORE
■ THIN-WALLED TUBE
▯ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▧ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▨ DEBRIS FILL
▤ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 8-17-00
PAGE: 1 of 2
DRILLING METHOD: PERCUSSION
DRILLED BY: LAYNE
LOGGED BY: ED KRISH
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC LLC	LOCATION HENDERSON, NV	BORING NUMBER PC 102

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
45	28-30 volc, no ls. below 30'... 50/50 volc & ls. @33' cobbles to 4" @36' cobbles to 6"	⁘	GW							
50	36-39 slty sdy GRAVEL gry brn & whtish. Com ls. gran/pea gravel contains 20-30% silt & 20-30% f-vc SR sd 38-39 volc cobbles to 6"	⁘	GM/SM							Did not reach Muddy Creek
	39-50 sdy GRAVEL, gry wht + brn, SR, gravels of ls + volc to 2-3". w/ 20-30% f-vc, SR sd. Locally caliche coated. @47-49 com silt in matrix to 25-30% no hard caliche like in PC 99R									
	TD @ 50'									

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL	▯ AUGER	▯ ROCK CORE
■ THIN-WALLED TUBE	▯ CONTINUOUS SAMPLER	⧅ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▩ SAND	▨ SANDY CLAY
⁘ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 8-17-00

PAGE 2 of 2

DRILLING METHOD PERCUSSION

DRILLED BY LAYNE

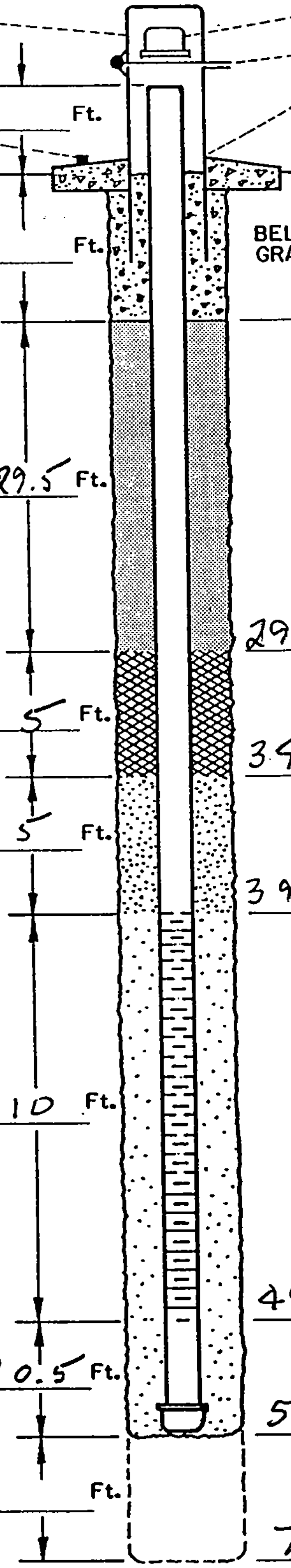
LOGGED BY ED KRISH

EXISTING GRADE ELEVATION (FT. AMSL)

LOCATION OR GRID COORDINATES

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☒ No ☐
Steel ☒ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☒ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 29.5 Ft.
Other: _____

Bentonite Seal 5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒ 10 Ft.
Pea Gravel ☐
Other: _____
Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill _____ Ft.
Grout ☐ Sand ☒
Caved Material ☐
Other: _____

DEPTH

BELOW GRADE	FROM TOP OF CASING
29.5	
34.5	
39.5	
49.5	
50'	
70'	

DRILLING INFORMATION:

1. Borehole Diameter= 10 1/2 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2" Inches, Screen 2" Inches.
5. Slot Size of Screen: 0.02
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☒ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   _____ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

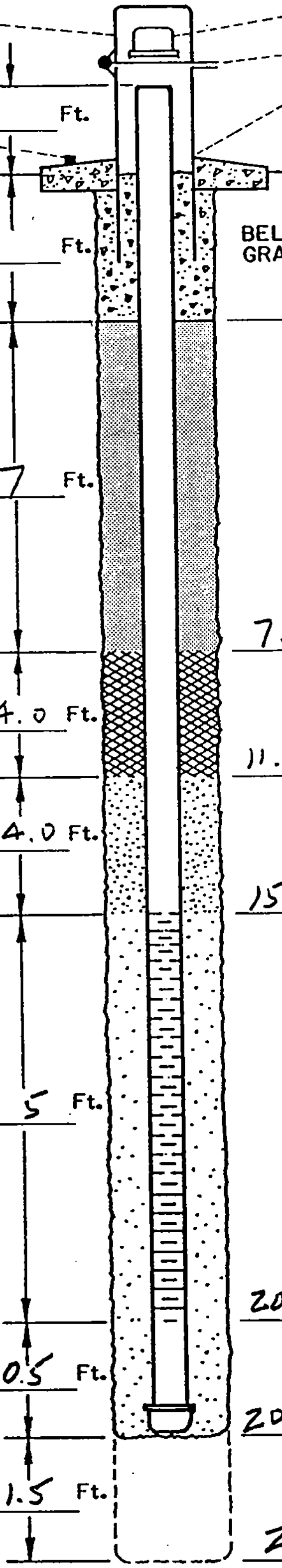
Water Level Summary (From Top of Casing)

During Drilling 24 Ft. Date 4-26-00
Before Development 12.45 Ft. Date 4-29-00
After Development 13.41' Ft. Date 5-11-00

Driller/Firm Compliance
Drill Rig Type Mobile 53
Date Installed 4-26-00
Drill Crew Wells,
Well No. PC 74
Kerr-McGee Hydrologist Ed Krish

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe

Yes ☒ No ☐

Steel ☒ PVC ☐

______ Ft.

Surveying Pin ?

Yes ☐ No ☐

Casing Cap Vent ? Yes ☒ No ☐

Lock ? Yes ☐ No ☐

Weep Hole ? Yes ☐ No ☐

Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix

Yes ☒ No ☐

5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 7 Ft.

Other: ______

Bentonite Seal 4.0 Ft.

Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.0 Ft.

FILTER PACK MATERIAL

Silica Sand ☐

Washed Sand ☒ 5 Ft.

Pea Gravel ☐

Other: ______

Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.

Bottom Plug

Yes ☐ No ☐

Overdrilled Material Backfill 1.5 Ft.

Grout ☐ Sand ☐

Caved Material ☐

Other: ______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
7.0	
11.0	
15.0	
20.0	
20.5	
22	

DRILLING INFORMATION:

1. Borehole Diameter= 10 1/2 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing 8 Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2" Inches, Screen 2 Inches.
5. Slot Size of Screen:
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☒ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ______

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 16' Ft. Date 4-28-00

Before Development 16.28' Ft. Date 4-29-00

After Development 13.60' Ft. Date 5-11-

Driller/Firm Compliance

Drill Rig Type Mobile 53

Date Installed 4-28-00

Drill Crew Wells

Well No. PC 76

Kerr-McGee Hydrologist Ed Krish

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 16.5 Ft.
Other: ______

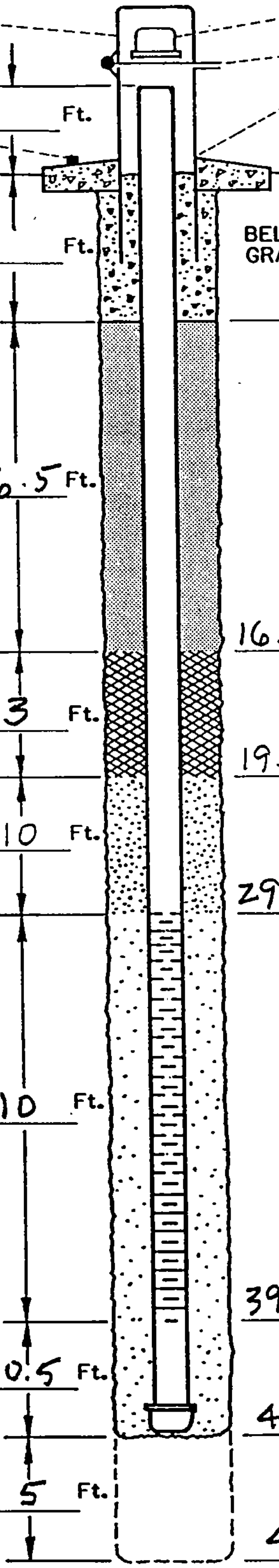
Bentonite Seal 3 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 10 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐ 10 Ft.
Pea Gravel ☐
Other: ______
Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 5 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______



DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
16.5	
19.5	
29.5	
39.5	
40	
45	

DRILLING INFORMATION:

1. Borehole Diameter= 10 1/2 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.02
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______/ 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ______

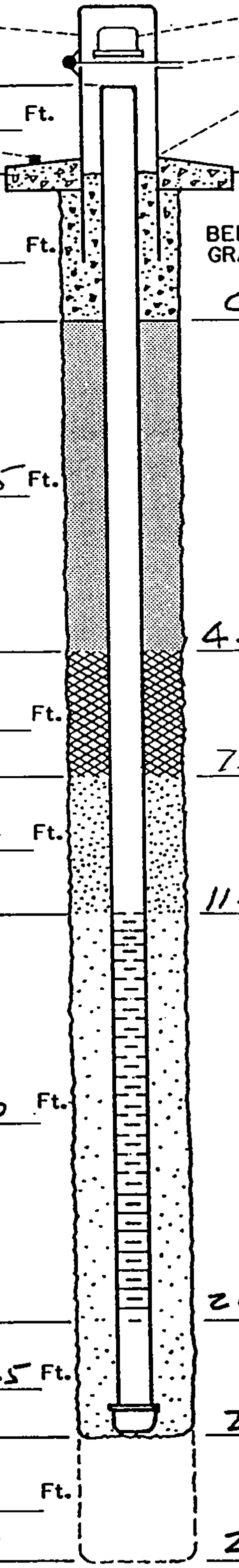
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 19' Ft. Date 4-29-00
Before Development 6.53' Ft. Date 4-30-00
After Development 7.27' Ft. Date 5-11-00

Driller/Firm Compliance
Drill Rig Type Mobile B53
Date Installed 5-1-00
Drill Crew Wells
Well No. PC 77
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
4.5 Ft.
Other: ______

Bentonite Seal
3 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen
4 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐
Pea Gravel ☐
Other: ______
10 Ft.
Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.

Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
1 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
4.5	
7.5	
11.5	
21.5	
22	
23	

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 7 1/2 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
Revert ☐ Bentonite ☐ Water ☐
Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
Casing 2 Inches, Screen 2 Inches
5. Slot Size of Screen: 0.02
6. Type of Screen Perforation: Factory Slotted ☒
Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
______/ 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
If Yes, Describe ______

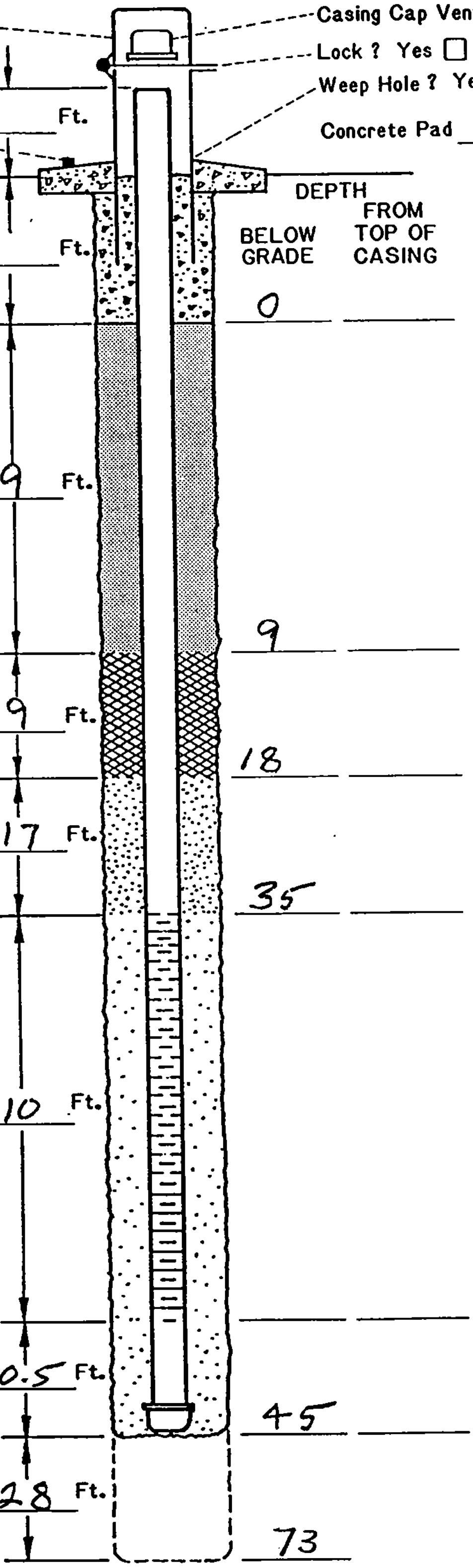
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 19' Ft. Date 5-2-00
Before Development 6.95' Ft. Date 5-3-00
After Development 6.86 Ft. Date 5-11-

Driller/Firm COMPLIANCE
Drill Rig Type MOBILE B-59
Date Installed 5-2-00
Drill Crew WELLS
Well No. PC 78
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 9 Ft.
Other: ______

Bentonite Seal 9 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 17 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒ 10 Ft.
Pea Gravel ☐
Other: ______
Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 28 Ft.
Grout ☐ Sand ☒
Caved Material ☒
Other: ______

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
9	
18	
35	
45	
73	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.02"
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes] / Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ______

WATER LEVEL INFORMATION:

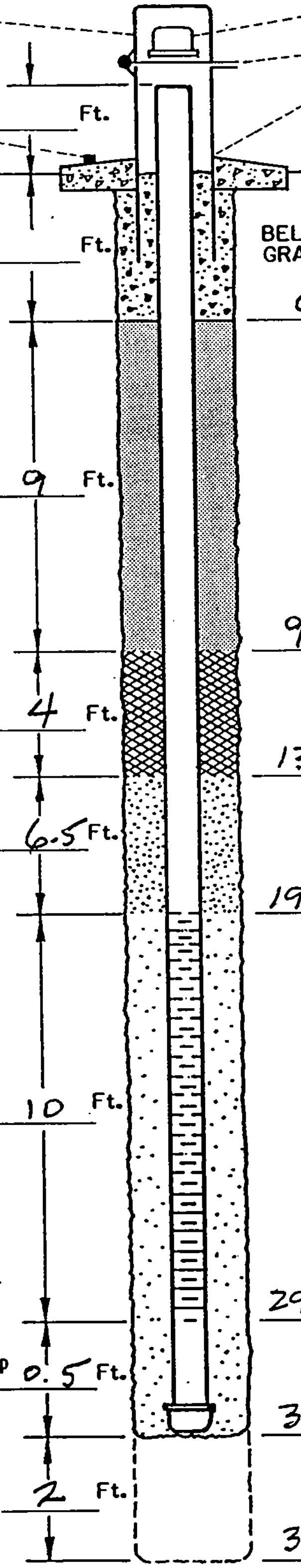
Water Level Summary (From Top of Casing)

During Drilling 12' Ft. Date 5-2-00
Before Development 7.05' Ft. Date 5-11-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type MOBILE B59
Date Installed 5-3-00
Drill Crew WELLS
Well No. PC 79
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
Surveying Pin ? ______ Ft.
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder 9 Ft.
Other: ______

Bentonite Seal 4 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 6.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒ 10 Ft.
Pea Gravel ☐
Other: ______
Sand Size #3

Dense Phase Sampling Cup Bottom Plug 0.5 Ft.
Yes ☒ No ☐

Overdrilled Material Backfill 2 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
9	
13	
19.5	
29.5	
30	
32	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☐
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches
5. Slot Size of Screen: 0.02
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ______

WATER LEVEL INFORMATION:

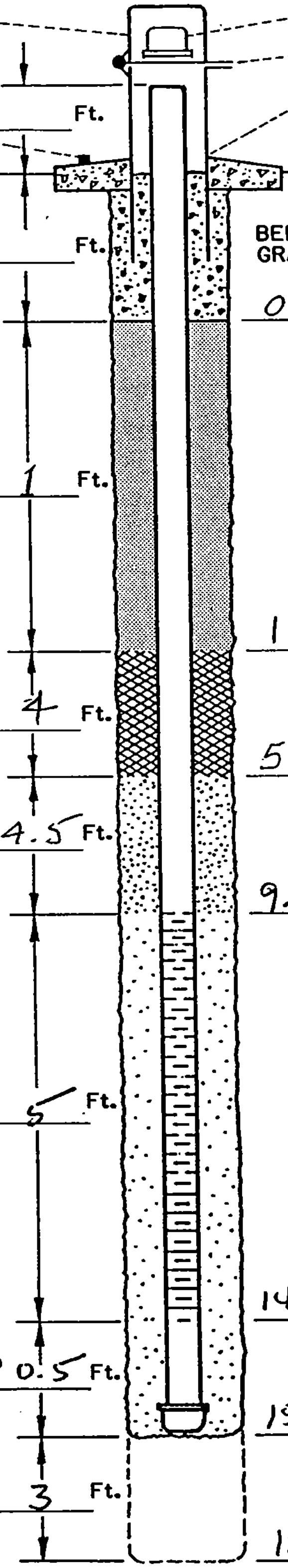
Water Level Summary (From Top of Casing)

During Drilling 12 Ft. Date 5-3-00
Before Development 7.15' Ft. Date 5-11-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-3-00
Drill Crew WELLS
Well No. PC 80
Kerr–McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
1 Ft.
Other: _____

Bentonite Seal 4 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: _____
Sand Size #3
5 Ft.

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 3 Ft.
Grout ☐ Sand ☐
Caved Material ☐
Other: _____

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
1	
5	
9.5	
14.5	
15	
18	

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.02
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

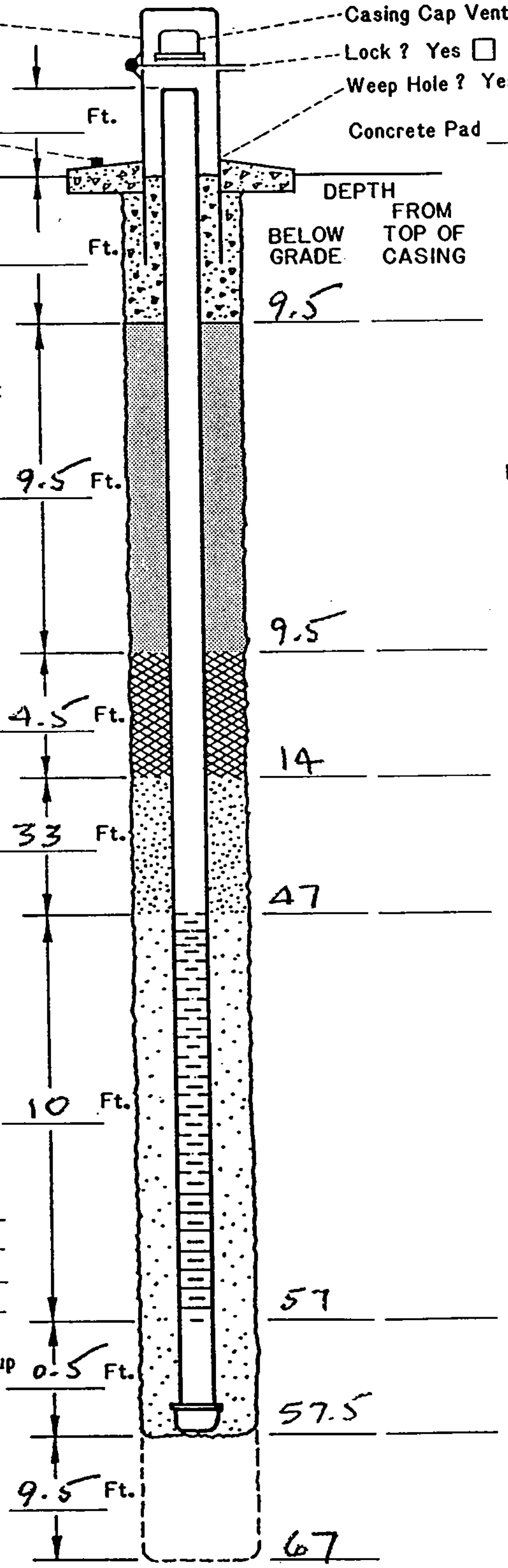
Water Level Summary (From Top of Casing)

During Drilling 12' Ft. Date 5-3-00
Before Development 6.95' Ft. Date 5-11-00
After Development _____ Ft. Date _____

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-3-00
Drill Crew WELLS
Well No. PC 81
Kerr-McGee Hydrologist Ed KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder
9.5 Ft.
Other: ________

Bentonite Seal 4.5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 33 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒ 10 Ft.
Pea Gravel ☐
Other: Cave-in gravel
Sand Size ________

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☐ No ☐

Overdrilled Material Backfill 9.5 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ________

DEPTH BELOW GRADE	FROM TOP OF CASING
9.5	
9.5	
14	
47	
57	
57.5	
67	

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ________
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other ________
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ________
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ________
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ________
2. Time Spent on Well Development ?
   _____ / 60 [✓ Minutes] / Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odcr ? Yes ☐ No ☒
   If Yes, Describe ________
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ________

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 5' Ft. Date 5-4-00
Before Development 4.91' Ft. Date 5-5-00
After Development 5.42' Ft. Date 5-11-r

Driller/Firm COMPLIANCE
Drill Rig Type MOBILE B-59
Date Installed 5-4-00
Drill Crew WELLS
Well No. PC82
Kerr–McGee Hydrologist ED KRUSH

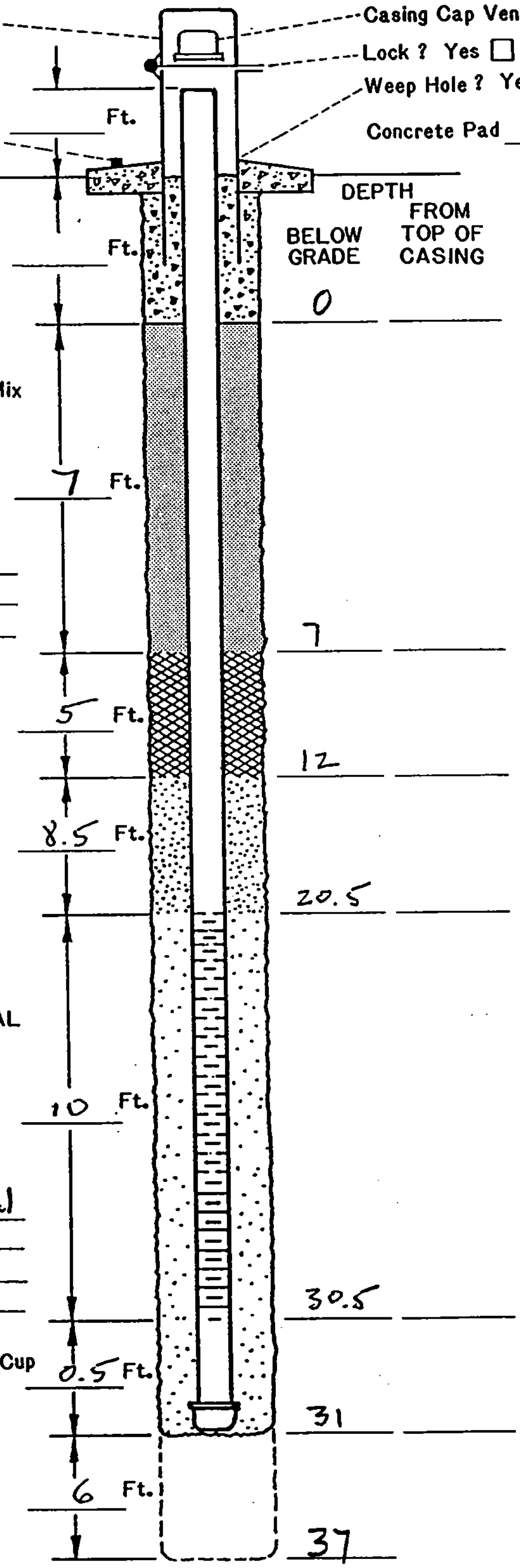
KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐

Concrete Pad _____ Ft. x _____ Ft. x _____ Inches



Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder
7 Ft.
Other: _____

Bentonite Seal
5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen
8.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
10 Ft.
Pea Gravel ☐
Other: caved gravel
Sand Size #3

Dense Phase Sampling Cup Bottom Plug
0.5 Ft.
Yes ☒ No ☐

Overdrilled Material Backfill
6 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: _____

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
7	
12	
20.5	
30.5	
31	
37	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐ Stainless ☐ Other _____
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐ Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒ Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒ Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐ Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒ Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe _____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 5' Ft. Date 5-4-00
Before Development 3.82' Ft. Date 5-11-00
After Development _____ Ft. Date _____

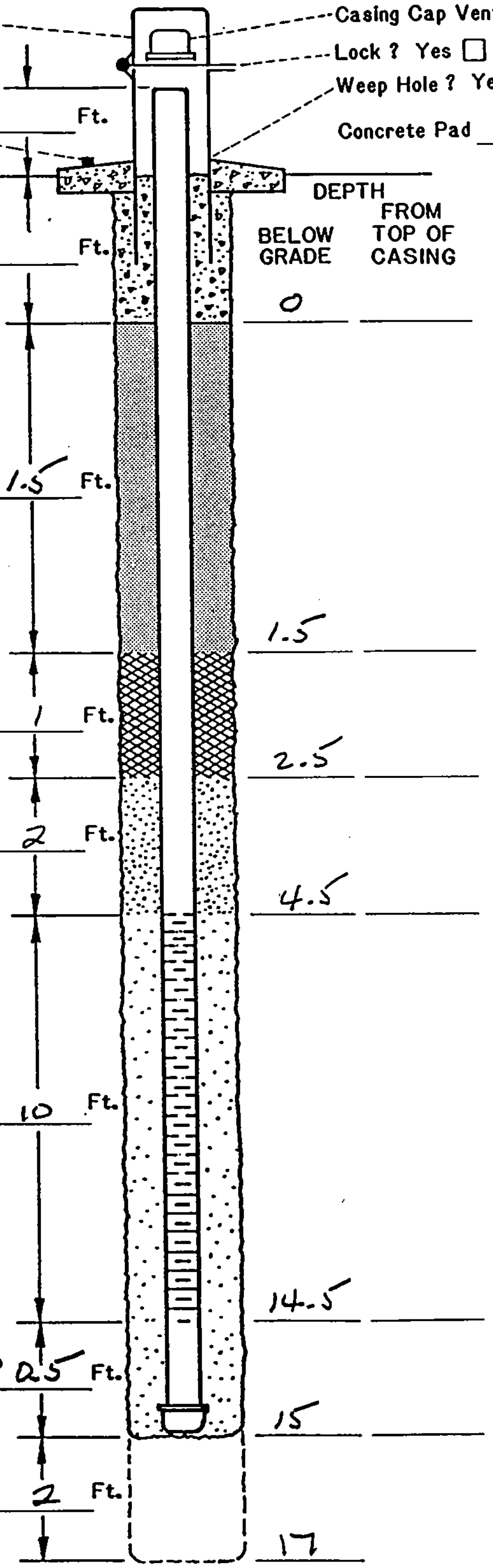
Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-5-00
Drill Crew WELLS
Well No. PC 83
Kerr–McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches



Concrete ______ Ft. — Depth below grade 0

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
Other: ______
1.5 Ft. — Depth below grade 1.5

Bentonite Seal
Pellets ☒ Slurry ☐
1 Ft. — Depth below grade 2.5

Filter Pack Above Screen
2 Ft. — Depth below grade 4.5

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Others: ______
Sand Size #3
10 Ft. — Depth below grade 14.5

Dense Phase Sampling Cup 0.5 Ft. — Depth below grade 15
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
Grout ☐ Sand ☐
Caved Material ☒
Others: ______
2 Ft. — Depth below grade 17

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches
5. Slot Size of Screen: 0.02
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ______

WATER LEVEL INFORMATION:

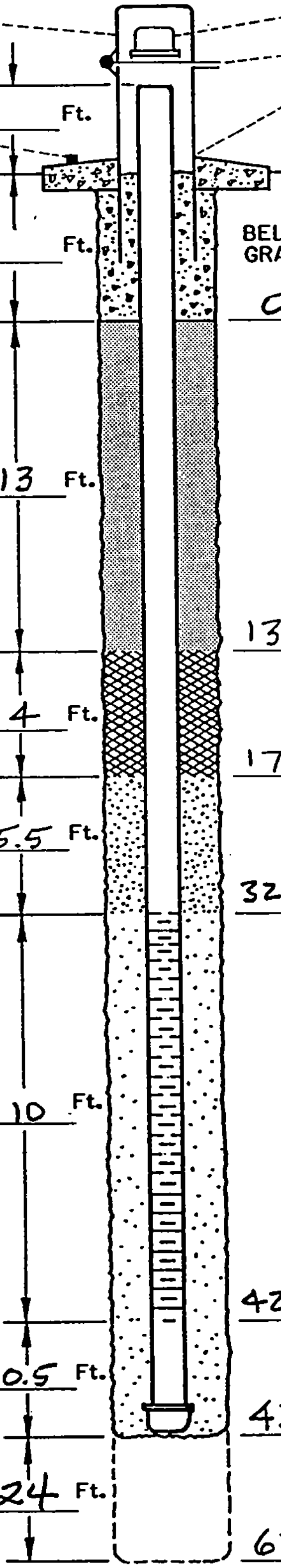
Water Level Summary (From Top of Casing)

During Drilling 5' Ft. Date 5-5-00
Before Development 4.26' Ft. Date 5-11-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-5-00
Drill Crew WELLS
Well No. PC 84
Kerr–McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe Yes ☐ No ☐
Steel ☐ PVC ☐
____ Ft.
Surveying Pin ? Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ____ Ft. x ____ Ft. x ____ Inches

Concrete ____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
13 Ft.
Other: ____

Bentonite Seal
4 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen * 15.5 Ft.
(CAVED GRAVEL)

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: ____
10 Ft.
Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
24 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ____

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
13	
17	
32.5	
42.5	
43	
67	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ____
2. Time Spent on Well Development ?
   ____ / 60 [✓ Minutes] / Hours
3. Approximate Water Volume Removed ? ____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ____

WATER LEVEL INFORMATION:

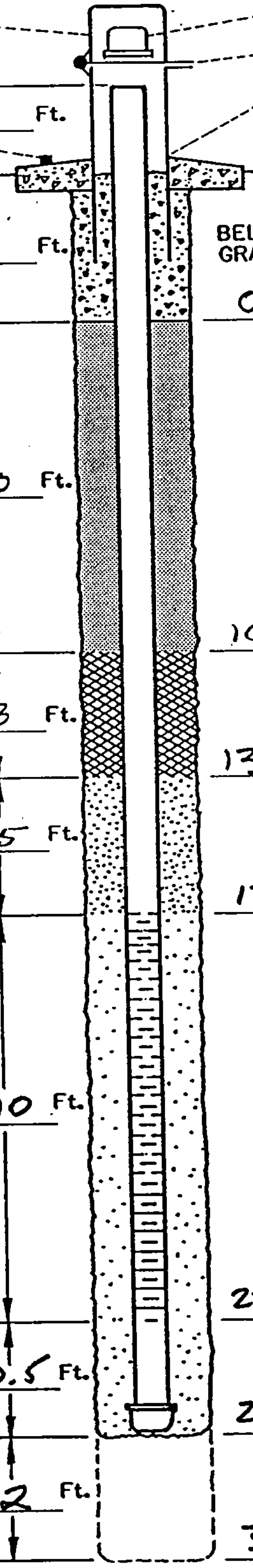
Water Level Summary (From Top of Casing)

During Drilling 2' Ft. Date 5-10-00
Before Development 0.33' Ft. Date 5-12-00
After Development ____ Ft. Date ____

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-10-00
Drill Crew WELLS
Well No. PC 85
Kerr-McGee Hydrologist Ed Krish

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 10 Ft.
Other: ______

Bentonite Seal 3 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.5 Ft.

FILTER PACK MATERIAL 10 Ft.
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: ______
Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 2 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
10	
13	
17.5	
27.5	
28	
30	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inc
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ______

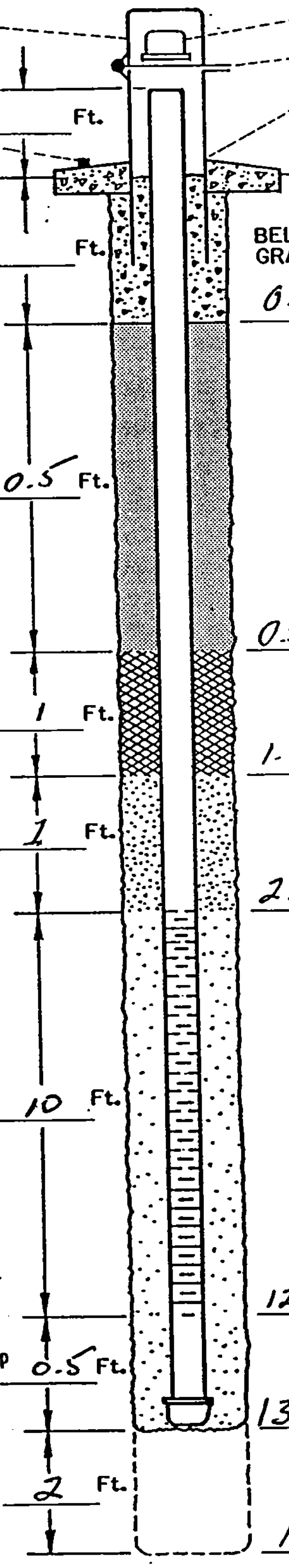
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 2' Ft. Date 5-11-00
Before Development 0.58' Ft. Date 5-12-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B59
Date Installed 5-11-00
Drill Crew WELLS
Well No. PC86
Kerr-McGee Hydrologist Ed Krish

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe

Yes ☐ No ☐

Steel ☐ PVC ☐

_____ Ft.

Surveying Pin ?

Yes ☐ No ☐

Concrete _____ Ft.

Cement/Bentonite Grout Mix

Yes ☒ No ☐

5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 0.5 Ft.

Other: _____

Bentonite Seal 1 Ft.

Pellets ☒ Slurry ☐

Filter Pack Above Screen 1 Ft.

FILTER PACK MATERIAL

Silica Sand ☐

Washed Sand ☒ 10 Ft.

Pea Gravel ☐

Other: _____

Sand Size #3

Dense Phase Sampling Cup 0.5 Ft.

Bottom Plug

Yes ☒ No ☐

Overdrilled Material Backfill 2 Ft.

Grout ☐ Sand ☐

Caved Material ☒

Other: _____

DEPTH	
BELOW GRADE	FROM TOP OF CASING
6.	
0.5	
1.5	
2.5	
12.5	
13	
15	

Casing Cap Vent ? Yes ☐ No ☐

Lock ? Yes ☐ No ☐

Weep Hole ? Yes ☐ No ☐

Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   _____ / 60 [✓ Minutes] / Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 2' Ft. Date 5-11-00

Before Development 1.78' Ft. Date 5-12-00

After Development _____ Ft. Date _____

Driller/Firm COMPLIANCE

Drill Rig Type Mobile B-59

Date Installed 5-11-00

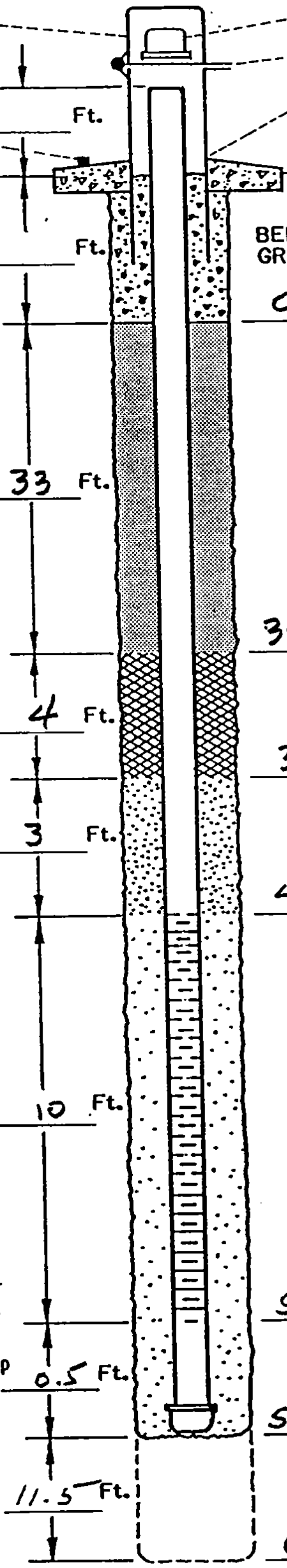
Drill Crew WELLS

Well No. PC 87

Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ? Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
33 Ft.
Other: ______

Bentonite Seal
4 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen
3 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
10 Ft.
Pea Gravel ☐
Other: ______
Sand Size 2-12 MESH

Dense Phase Sampling Cup
0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
11.5 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
33	
37	
40	
50	
50.5	
62	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inche
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______/ 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ______

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 2' Ft. Date 5-11-00
Before Development 0.21' Ft. Date 5-13-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type MOBILE B.59
Date Installed 5-11-00
Drill Crew WELLS
Well No. PC 88
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH Mount

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder
17 Ft.
Other: ______

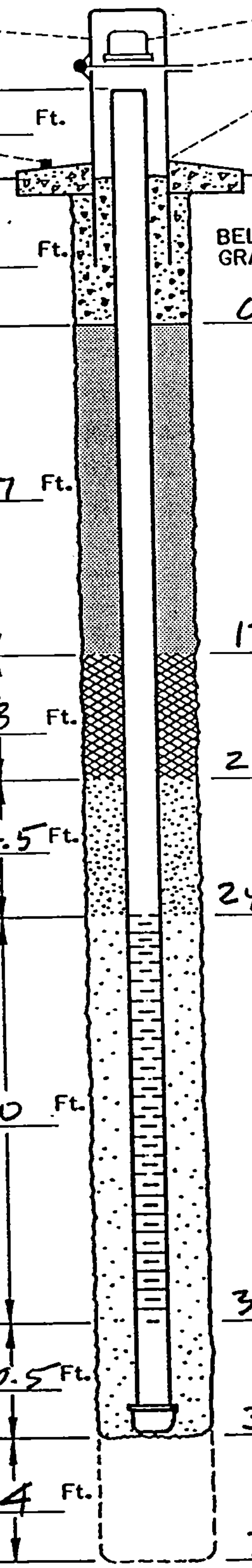
Bentonite Seal 3 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
10 Ft.
Other: ______
Sand Size 3-12 MESH

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 4 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______



Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
17	
20	
24.5	
34.5	
35	
39	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______/ 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ______

WATER LEVEL INFORMATION:

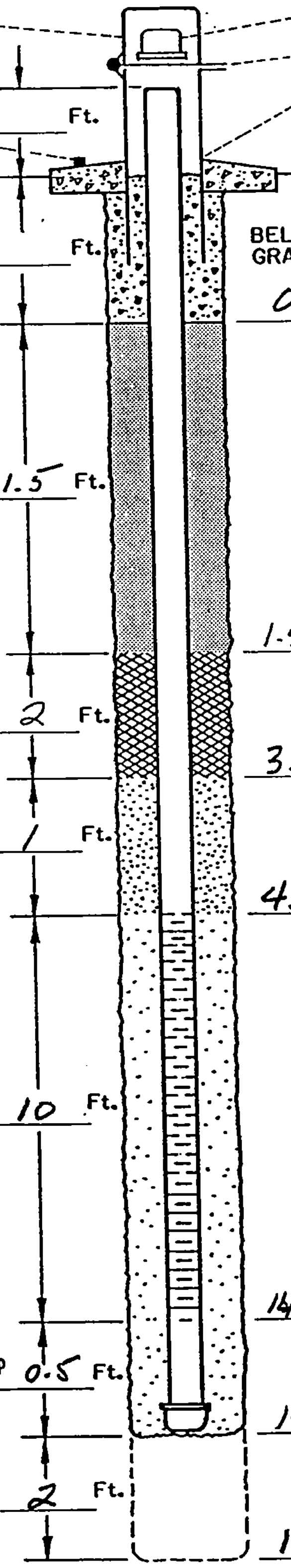
Water Level Summary (From Top of Casing)

During Drilling 2 Ft. Date 5-12-00
Before Development +0.08' Ft. Date 5-13-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-12-00
Drill Crew WELLS
Well No. PC 89
Kerr–McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
____ Ft.
Surveying Pin ? Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ____ Ft. x ____ Ft. x ____ Inches

Concrete ____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
1.5 Ft.
Other: ____

Bentonite Seal 2 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 1 Ft.

FILTER PACK MATERIAL 10 Ft.
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: ____
Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 2 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ____

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
1.5	
3.5	
4.5	
14.5	
15	
17	

DRILLING INFORMATION:
1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:
1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐ Stainless ☐ Other ____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ____
3. Type of Well Screen: PVC ☒ Galvanized ☐ Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inch
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒ Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

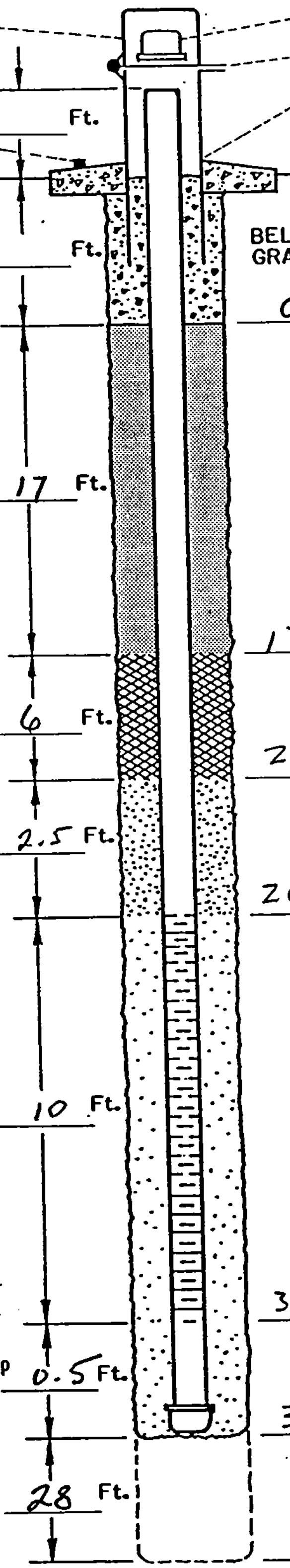
WELL DEVELOPMENT INFORMATION:
1. How was Well Developed ? Bailing ☐ Pumping ☒ Air Surging (Air or Nitrogen) ☐ Other ____
2. Time Spent on Well Development ?
   1 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ____ Gallons
4. Water Clarity Before Development ? Clear ☐ Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒ Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ____

WATER LEVEL INFORMATION:
Water Level Summary (From Top of Casing)
During Drilling 2' Ft. Date 5-12-00
Before Development 0.64' Ft. Date 5-13-00
After Development ____ Ft. Date ____

Driller/Firm COMPLIANCE
Drill Rig Type Mobile
Date Installed 5-12-00
Drill Crew WELLS
Well No. PC 90
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe

Yes ☐ No ☐

Steel ☐ PVC ☐

____ Ft.

Surveying Pin ?

Yes ☐ No ☐

Concrete ____ Ft.

Cement/Bentonite Grout Mix

Yes ☒ No ☐

5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder

17 Ft.

Other: ____

Bentonite Seal 6 Ft.

Pellets ☒ Slurry ☐

Filter Pack Above Screen 2.5 Ft.

FILTER PACK MATERIAL

Silica Sand ☐

Washed Sand ☒ 10 Ft.

Pea Gravel ☐

Other: ____

Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.

Bottom Plug

Yes ☒ No ☐

Overdrilled Material Backfill 28 Ft.

Grout ☐ Sand ☐

Caved Material ☒

Other: ____

Casing Cap Vent ? Yes ☐ No ☐

Lock ? Yes ☐ No ☐

Weep Hole ? Yes ☐ No ☐

Concrete Pad ____ Ft. x ____ Ft. x ____ Inches

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
17	
23	
26.5	
36.5	
37	
65	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ____
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other ____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ____
2. Time Spent on Well Development ?
   1/60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 10' Ft. Date 5-13-00

Before Development 4.19' Ft. Date 5-14-00

After Development ____ Ft. Date ____

Driller/Firm COMPLIANCE

Drill Rig Type Mobile B-59

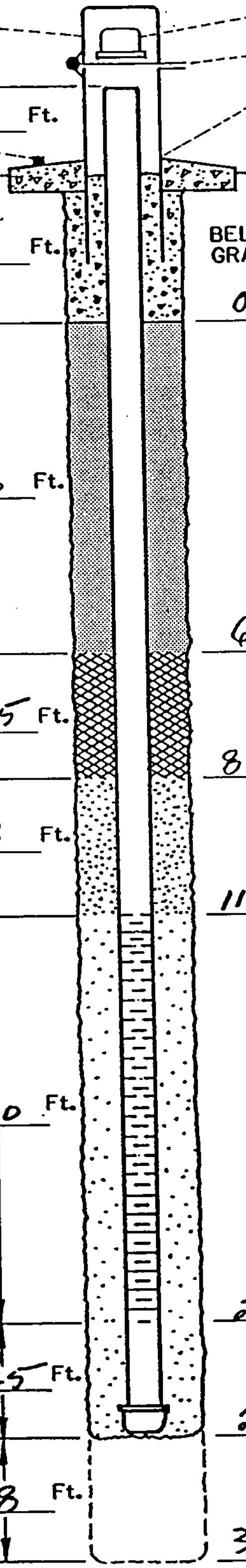
Date Installed 5-13-00

Drill Crew WELLS

Well No. PC 91

Kerr–McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ____ Ft. x ____ Ft. x ____ Inches

	DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
Concrete ____ Ft.	0	
Cement/Bentonite Grout Mix Yes ☒ No ☐ 5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder Other: ____ 6 Ft.	6	
Bentonite Seal Pellets ☒ Slurry ☐ 2.5 Ft.	8.5	
Filter Pack Above Screen 3 Ft.	11.5	
FILTER PACK MATERIAL Silica Sand ☐ Washed Sand ☒ Pea Gravel ☐ Other: ____ Sand Size 2-12 mesh 10 Ft.	21.5	
Dense Phase Sampling Cup Bottom Plug Yes ☒ No ☐ 0.5 Ft.	22	
Overdrilled Material Backfill Grout ☐ Sand ☐ Caved Material ☒ Other: ____ 8 Ft.	30	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inch
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ____
2. Time Spent on Well Development ?
   ____ / 60 [✓ Minutes] / Hours
3. Approximate Water Volume Removed ? ____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 10' Ft. Date 5-12-00
Before Development 4.72' Ft. Date 5-13-00
After Development 4.77' Ft. Date 5-14

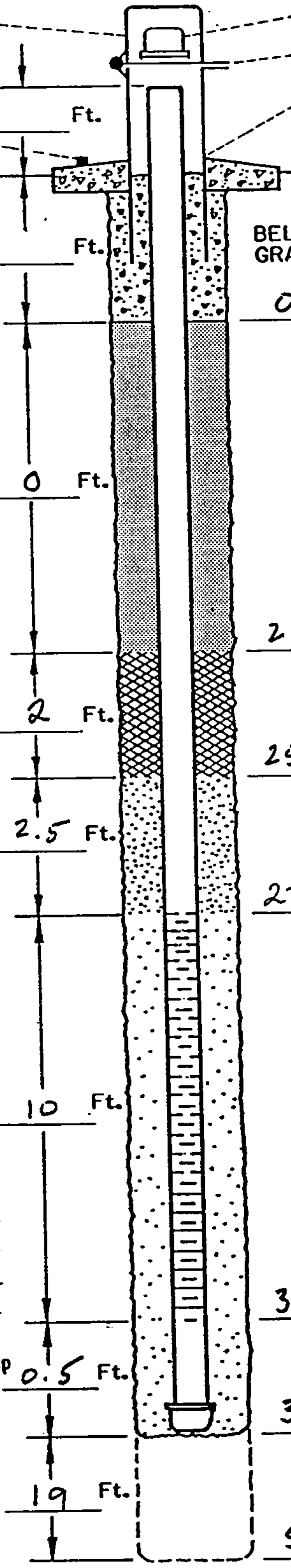
Driller/Firm COMPLIANCE
Drill Rig Type MOBILE B-59
Date Installed 5-12-00
Drill Crew WELLS
Well No. PC 92
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches



Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
0 Ft.
Other: ______

Bentonite Seal 2 Ft.
Pellets ☐ Slurry ☐

Filter Pack Above Screen 2.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☐ 10 Ft.
Pea Gravel ☐
Other: ______
Sand Size ______

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☐ No ☐

Overdrilled Material Backfill 19 Ft.
Grout ☐ Sand ☐
Caved Material ☐
Other: ______

DEPTH

BELOW GRADE	FROM TOP OF CASING
0	
23	
25	
27.5	
37.5	
38	
57	

DRILLING INFORMATION:
1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:
1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

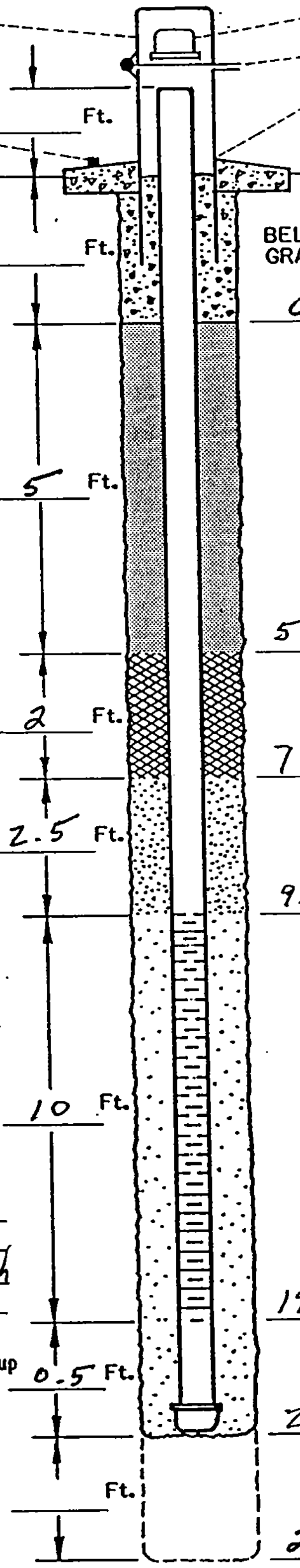
WELL DEVELOPMENT INFORMATION:
1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ______

WATER LEVEL INFORMATION:
Water Level Summary (From Top of Casing)
During Drilling 10' Ft. Date 5-13-00
Before Development 3.89' Ft. Date 5-15-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type ______
Date Installed 5-13-00
Drill Crew WELLS
Well No. PC 93
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 5 Ft.
Other: ______

Bentonite Seal 2 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 2.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒ 10 Ft.
Pea Gravel ☐
Other: ______
Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill ______ Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: ______

DEPTH BELOW GRADE	FROM TOP OF CASING
0	
5	
7	
9.5	
19.5	
20	
25	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inch
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe ______

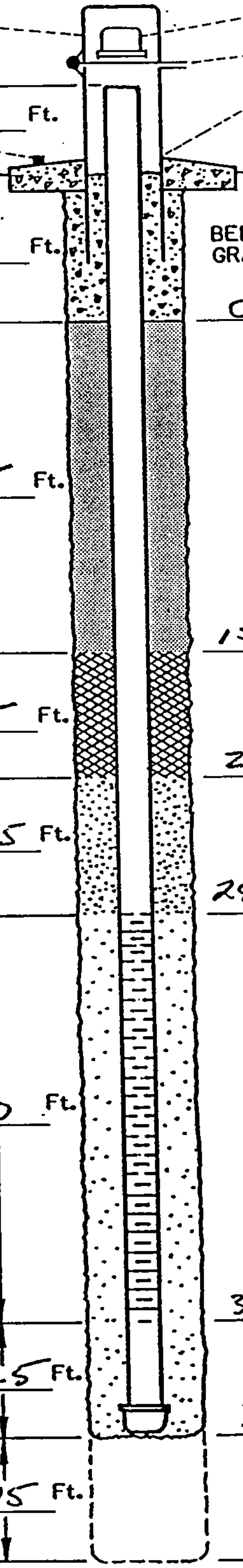
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 10' Ft. Date 5-14-00
Before Development 4.54' Ft. Date 5-15-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-14-00
Drill Crew WELLS
Well No. PC 94
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
15 Ft.
Other: __________

Bentonite Seal 5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒ 10 Ft.
Pea Gravel ☐
Other: __________
Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 15 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: __________

DEPTH

BELOW GRADE	FROM TOP OF CASING
0	
15	
20	
245	
345	
35	
50	

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other __________
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other __________
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other __________
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other __________
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other __________
2. Time Spent on Well Development ?
   _____/ 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe __________
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe __________

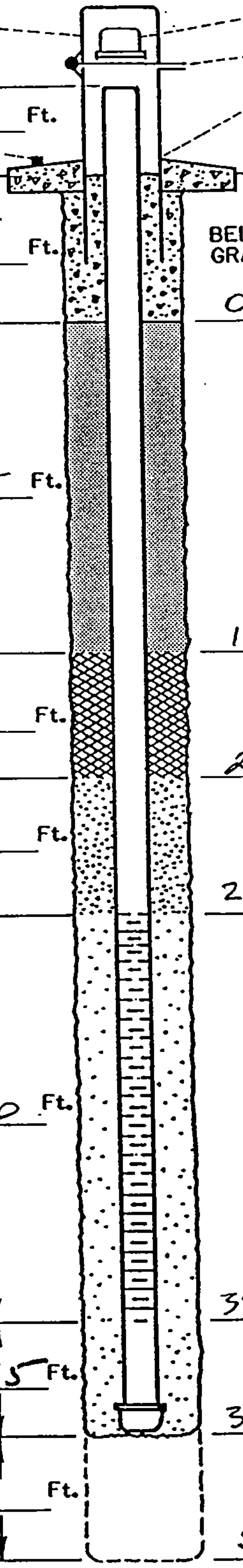
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 5' Ft. Date 5-14-00
Before Development 2.02' Ft. Date 5-17-00
After Development _____ Ft. Date _____

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-15-00
Drill Crew WELLS
Well No. PC-95
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe

Yes ☐ No ☐

Steel ☐ PVC ☐

Surveying Pin ? ____ Ft.

Yes ☐ No ☐

Concrete ____ Ft.

Cement/Bentonite Grout Mix

Yes ☒ No ☐

5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 15 Ft.

Other: ____

Bentonite Seal 7 Ft.

Pellets ☒ Slurry ☐

Filter Pack Above Screen 7 Ft.

FILTER PACK MATERIAL 10 Ft.

Silica Sand ☐

Washed Sand ☒

Pea Gravel ☐

Other: ____

Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.

Bottom Plug

Yes ☒ No ☐

Overdrilled Material Backfill ____ Ft.

Grout ☐ Sand ☐

Caved Material ☒

Others: ____

Casing Cap Vent ? Yes ☐ No ☐

Lock ? Yes ☐ No ☐

Weep Hole ? Yes ☐ No ☐

Concrete Pad ____ Ft. x ____ Ft. x ____ Inches

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
15	
22	
29	
39.	
39.5	
50	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 In
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ____
2. Time Spent on Well Development ?
   1 / 60 Minutes/Hours
3. Approximate Water Volume Removed ? ____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 6 Ft. Date 5-15-00

Before Development 2.89 Ft. Date 5-16-00

After Development ____ Ft. Date ____

Driller/Firm COMPLIANCE

Drill Rig Type Mobile B-59

Date Installed 5-15-00

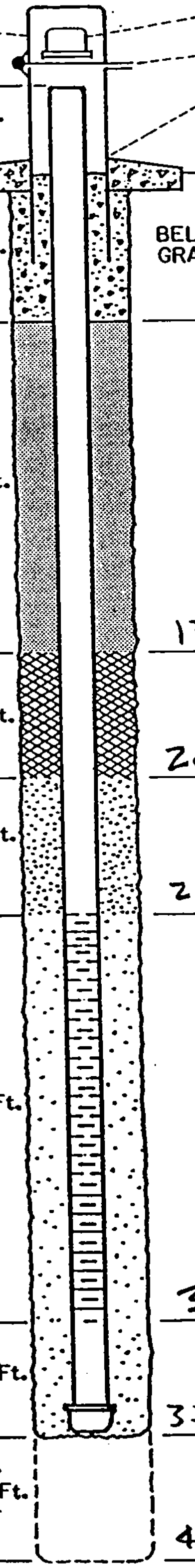
Drill Crew WELLS

Well No. PC 96

Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH Mount



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
_____ Ft.
Other: _____

Bentonite Seal 7 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 3 Ft.

FILTER PACK MATERIAL 10 Ft.
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: _____
Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 11.5 Ft.
Grout ☐ Sand ☐
Caved Material ☒
Other: _____

DEPTH BELOW GRADE	FROM TOP OF CASING
13	
20	
23	
33	
33.5	
45	

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   _____ / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

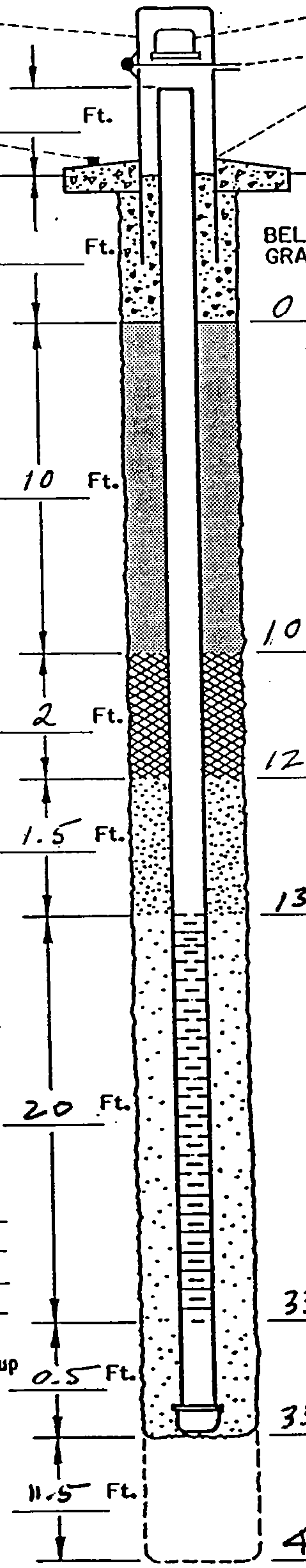
Water Level Summary (From Top of Casing)

During Drilling 6' Ft. Date 5-16-00
Before Development 0.26' Ft. Date 5-17-00
After Development _____ Ft. Date _____

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-29
Date Installed 5-16-00
Drill Crew WELLS
Well No. PC 97
Kerr–McGee Hydrologist ED KRUTH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
________ Ft.
Surveying Pin ? Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ________ Ft. x ________ Ft. x ______ Inches

Concrete ________ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 10 Ft.
Other: ________

Bentonite Seal 2 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 1.5 Ft.

FILTER PACK MATERIAL 20 Ft.
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: ________
Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 11.5 Ft.
Grout ☐ Sand ☒
Caved Material ☒
Others: ________

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
10	
12	
13.5	
33	
33.5	
45	

DRILLING INFORMATION:

1. Borehole Diameter= 10.5 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ________ to ________ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ________
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ________
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ________
4. Diameter of Casing and Well Screen:
   Casing 4 Inches, Screen 4 Inc
5. Slot Size of Screen:
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ________
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ________
2. Time Spent on Well Development ?
   / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ________
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ________

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 22 Ft. Date 5-16-00
Before Development 14.01 Ft. Date 5-17-00
After Development ________ Ft. Date ________

Driller/Firm COMPLIANCE
Drill Rig Type Mobil B-59
Date Installed 5-17-00
Drill Crew Loya
Well No. PC 98
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☒
Steel ☐ PVC ☐
____ Ft.
Surveying Pin ?
Yes ☐ No ☒

Casing Cap Vent ? Yes ☐ No ☒
Lock ? Yes ☐ No ☒
Weep Hole ? Yes ☐ No ☒
Concrete Pad ____ Ft. x ____ Ft. x ____ Inches

Concrete ____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
5 Ft.
Other: ____

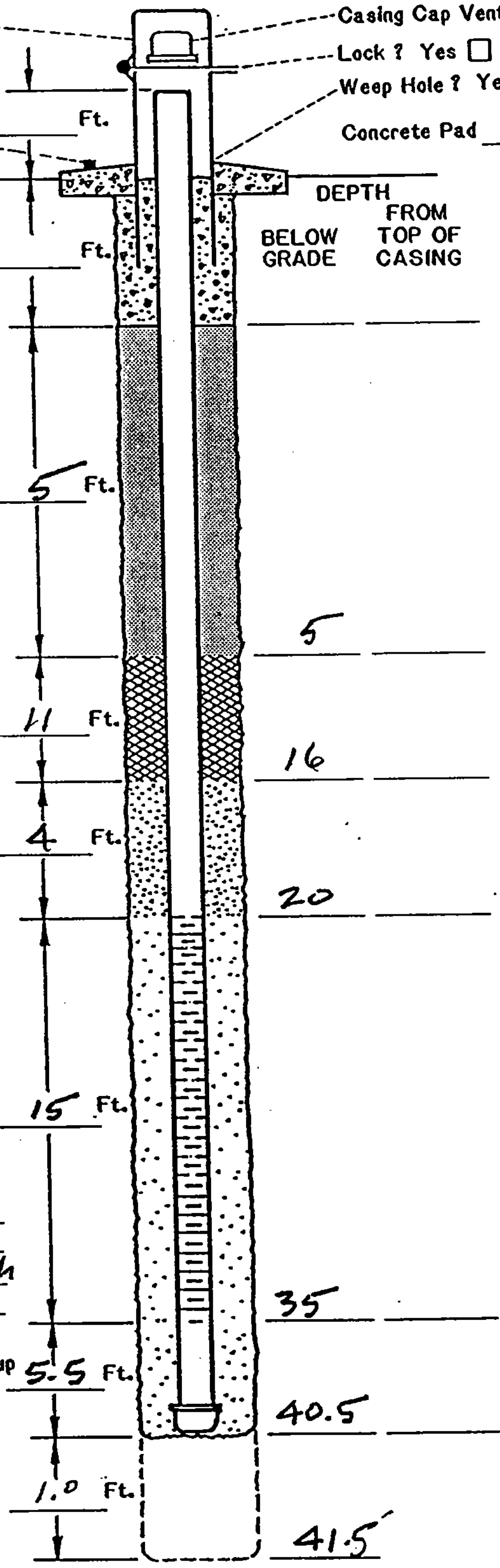
Bentonite Seal
11 Ft.
Pellets ☐ Slurry ☐

Filter Pack Above Screen
4 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐
Pea Gravel ☐
15 Ft.
Other: ____
Sand Size 8-12 mesh

Dense Phase Sampling Cup 5.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
1.0 Ft.
Grout ☐ Sand ☒
Caved Material ☐
Other: ____



DEPTH BELOW GRADE	FROM TOP OF CASING
5	
16	
20	
35	
40.5	
41.5	

DRILLING INFORMATION:

1. Borehole Diameter= 9 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
Revert ☐ Bentonite ☐ Water ☐
Solid Auger ☐ Hollow Stem Auger ☐
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
Stainless ☐ Other ____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ____
3. Type of Well Screen: PVC ☒ Galvanized ☐
Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
Casing 4 Inches, Screen 4 Inches.
5. Slot Size of Screen: 0.040
6. Type of Screen Perforation: Factory Slotted ☒
Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☐
Air Surging (Air or Nitrogen) ☒ Other ____
2. Time Spent on Well Development ?
120 Minutes/~~Hours~~
3. Approximate Water Volume Removed ? ____ Gallons
4. Water Clarity Before Development ? Clear ☐
Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☒ No ☐
If Yes, Describe faint pesticide
7. Did Water have any Color ? Yes ☐ No ☒
If Yes, Describe ____

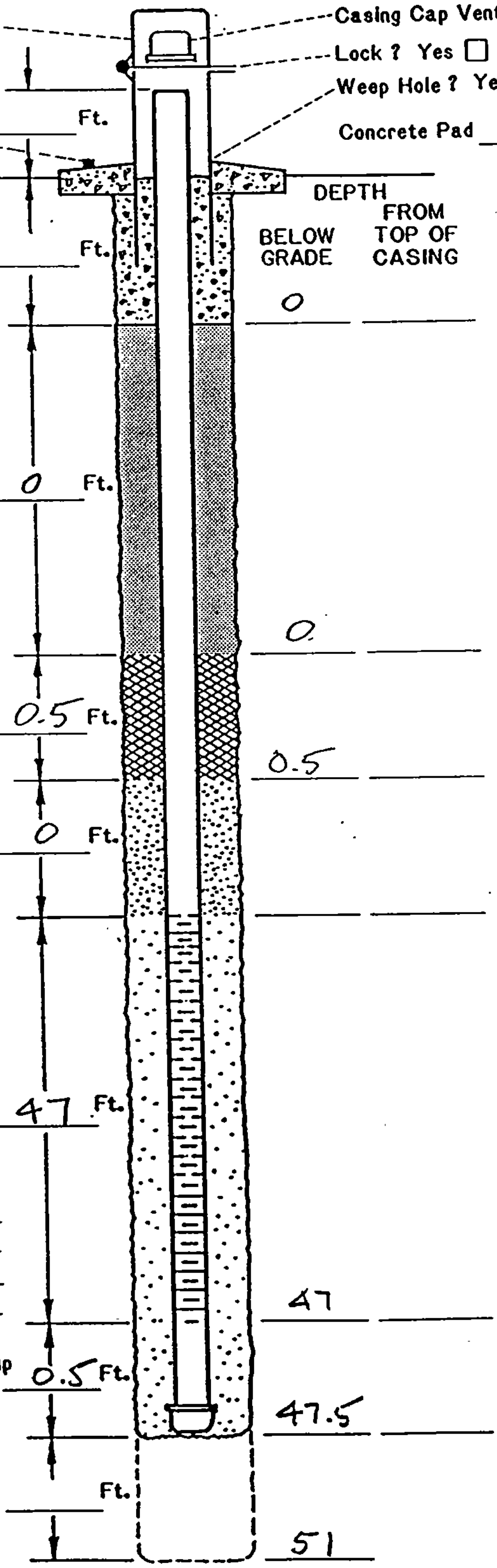
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 18 Ft. Date 8-8-00
Before Development ____ Ft. Date ____
After Development ____ Ft. Date ____

Driller/Firm ____
Drill Crew ____
Drill Rig Type AP-1000
Well No. PC98R
Date Installed 8-8-00
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 0 Ft.
Other: ______

Bentonite Seal 0.5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 0 Ft.

FILTER PACK MATERIAL 47 Ft.
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: ______
Sand Size 2-12 mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill ______ Ft.
Grout ☐ Sand ☒
Caved Material ☒
Others: ______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
0	
0.5	
47	
47.5	
51	

DRILLING INFORMATION:

1. Borehole Diameter= 10 1/2 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 4 Inches, Screen 4 In
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   / 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe ______

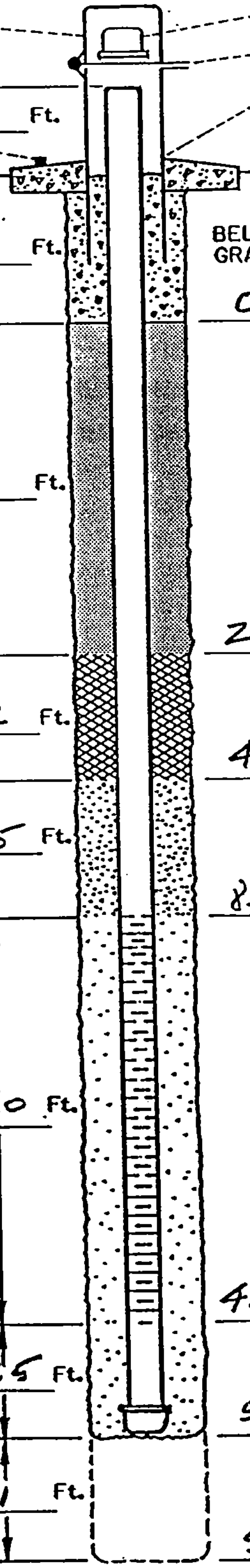
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 3 Ft. Date 5-17-00
Before Development 1.35 Ft. Date 5-18-00
After Development ______ Ft. Date ______

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-17-00
Drill Crew LOYA
Well No. PC 99.
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH Mount



Protective Pipe
Yes ☐ No ☒
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☒

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 2 Ft.
Other: _____

Bentonite Seal 2 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐ 40 Ft.
Pea Gravel ☐
Other: _____
Sand Size 8-12 to 24'
12 to 4

Dense Phase Sampling Cup 5.5 Ft.
Bottom Plug
Yes ☐ No ☒

Overdrilled Material Backfill 1 Ft.
Grout ☐ Sand ☒
Caved Material ☐
Others _____

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
2	
4	
8.5	
48.5	
53	
54	

DRILLING INFORMATION:

1. Borehole Diameter= 9 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☐
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 4 Inches, Screen 4 Inches.
5. Slot Size of Screen: 0.04
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☐
   Air Surging (Air or Nitrogen) ☒ Other _____
2. Time Spent on Well Development ?
   160 Minutes/~~Hours~~
3. Approximate Water Volume Removed ? 2500 Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 3 Ft. Date 8-8-00
Before Development 2 Ft. Date 8-9-00
After Development _____ Ft. Date _____

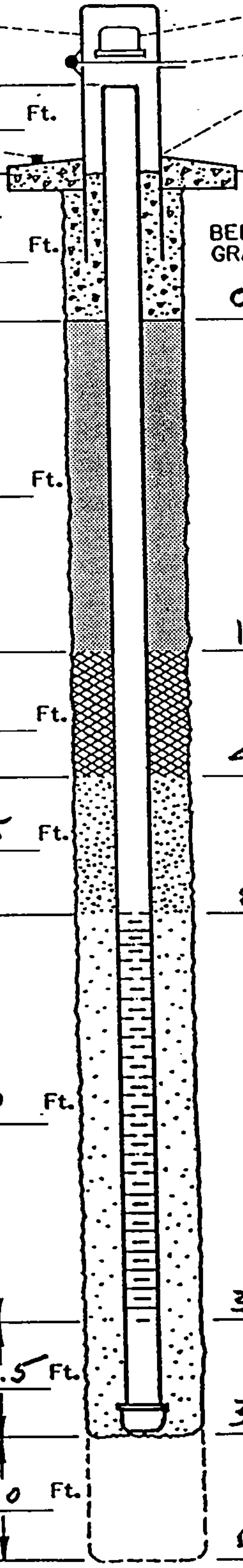
Driller/Firm Layne
Drill Rig Type AP-1000
Date Installed 8-8-00
Drill Crew _____
Well No. PC 99R
Kerr-McGee Hydrologist Ed Krish

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_______ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _______ Ft. x _______ Ft. x _______ Inches



Concrete _______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder 1 Ft.
Other: _______

Bentonite Seal 3 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 4.5 Ft.

FILTER PACK MATERIAL 30 Ft.
Silica Sand ☐
Washed Sand ☒
Pea Gravel ☐
Other: _______
Sand Size 2-12 MESH

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 1.0 Ft.
Grout ☐ Sand ☒
Caved Material ☒
Other: _______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
1	
4	
8.5	
38.5	
39	
40	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _______ to _______ Feet.
4. Borehole Diameter for Outer Casing _______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _______
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other _______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 In
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other _______
2. Time Spent on Well Development ?
   _______/ 60 [✓ Minutes]/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _______
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe _______

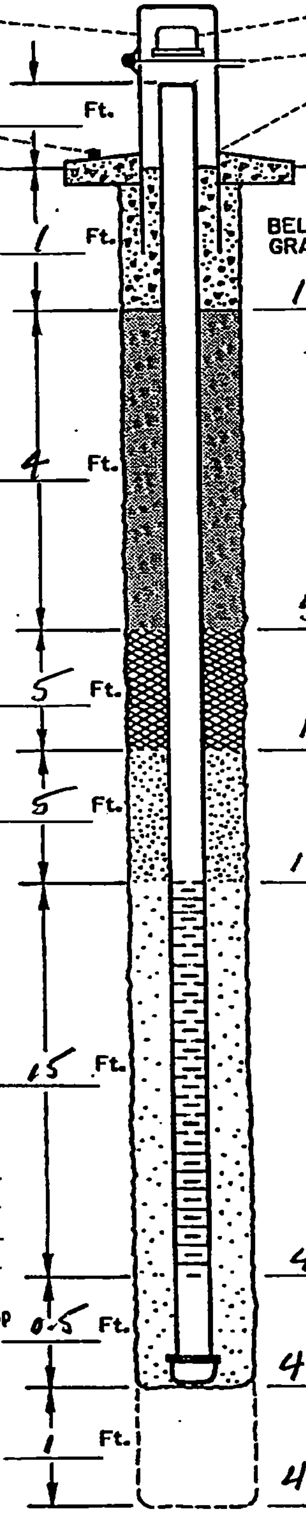
WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 25 Ft. Date 5-18-00
Before Development 14.03 Ft. Date 5-19-00
After Development _______ Ft. Date _______

Driller/Firm Compliance
Drill Rig Type Mobile B-59
Date Installed 5-18-00
Drill Crew Loya
Well No. PC 100
Kerr–McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ? Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

Concrete 1 Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 4 Ft.
Other:

Bentonite Seal 5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 5 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐
Pea Gravel ☐
Others:
15 Ft.
Sand Size 8-12

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 1 Ft.
Grout ☐ Sand ☒
Caved Material ☐
Other:

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
1	
5	
10	
15	
40	
40.5	
41.5	

DRILLING INFORMATION:

1. Borehole Diameter= 9 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☐
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.040
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☐
   Air Surging (Air or Nitrogen) ☒ Other _____
2. Time Spent on Well Development ?
   2 / _____ ~~Minutes~~/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☐
   Turbid ☒ Opaque ☐
6. Did Water have Odor ? Yes ☒ No ☐
   If Yes, Describe Pesticide
7. Did Water have any Color ? Yes ☒ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

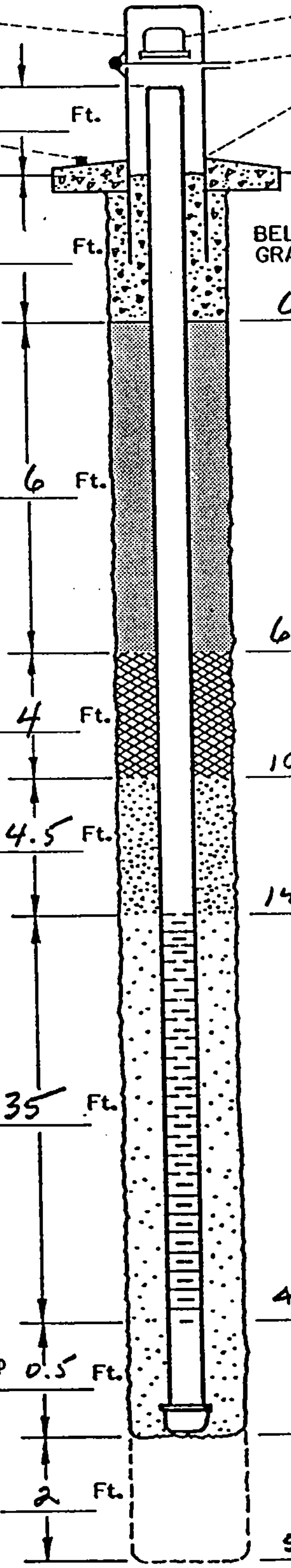
Water Level Summary (From Top of Casing)

During Drilling 18' Ft. Date 8-16-00
Before Development _____ Ft. Date _____
After Development 13.64 Ft. Date 8-17-00

Driller/Firm HORMANN / LAYNE
Drill Rig Type AP-1000
Date Installed 8-16-00
Drill Crew _____
Well No. PC 100R
Kerr-McGee Hydrologist Ed Krish

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
6 Ft.
Other: _____

Bentonite Seal
4 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen
4.5 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☒
35 Ft.
Pea Gravel ☐
Other: _____
Sand Size 2-12 Mesh

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
2 Ft.
Grout ☐ Sand ☒
Caved Material ☒
Other: _____

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
6	
10	
14.5	
49.5	
50	
52	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inc
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   _____/ 60 [✓ Minutes] Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes, Describe _____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)
During Drilling 25 Ft. Date 5-18-00
Before Development 19.01 Ft. Date 5-19-00
After Development _____ Ft. Date _____

Driller/Firm COMPLIANCE
Drill Rig Type Mobile B-59
Date Installed 5-18-00
Drill Crew LUYA
Well No. PC 101
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT

Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder
5 Ft.
Other: _____

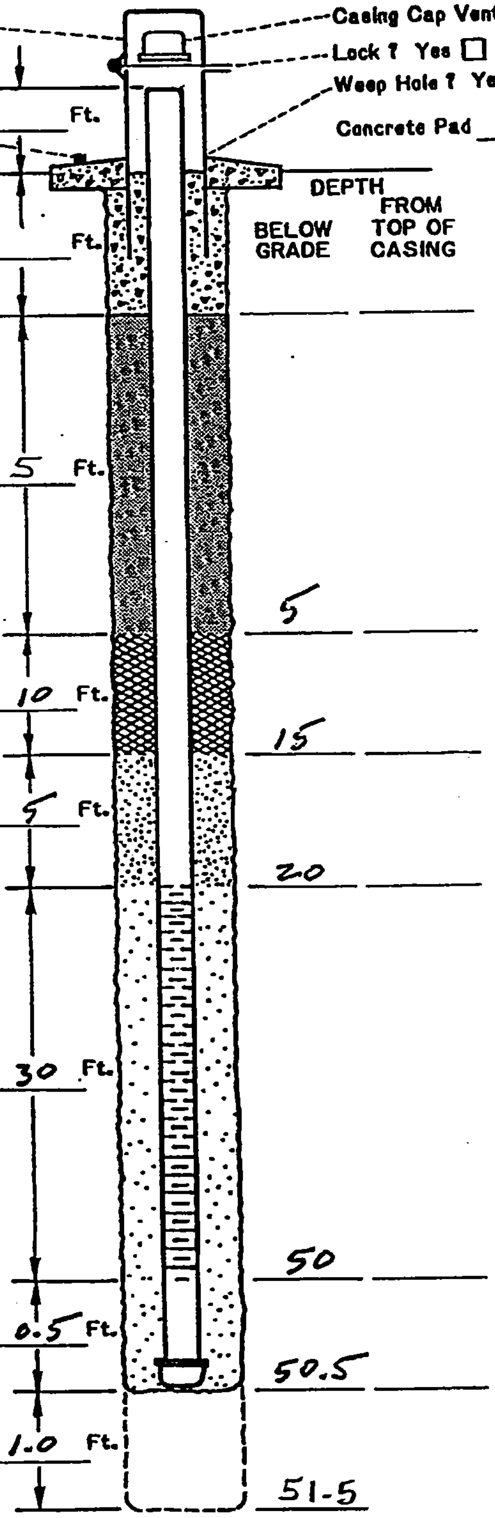
Bentonite Seal
Pellets ☒ Slurry ☐
10 Ft.

Filter Pack Above Screen
5 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐
Pea Gravel ☐
Others: _____
Sand Size 8-12
30 Ft.

Dense Phase Sampling Cup
0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill
1.0 Ft.
Grout ☐ Sand ☒
Caved Material ☐
Other: _____



DEPTH

BELOW GRADE	FROM TOP OF CASING
5	
15	
20	
50	
50.5	
51-5	

DRILLING INFORMATION:

1. Borehole Diameter= 9 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☐
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 0.040
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☐
   Air Surging (Air or Nitrogen) ☒ Other _____
2. Time Spent on Well Development ?
   1hr, 45min Minutes/Hours
3. Approximate Water Volume Removed ? _____ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☐
   Turbid ☒ Opaque ☐
6. Did Water have Odor ? Yes ☒ No ☐
   If Yes, Describe organics
7. Did Water have any Color ? Yes ☒ No ☐
   If Yes, Describe whitish

WATER LEVEL INFORMATION:

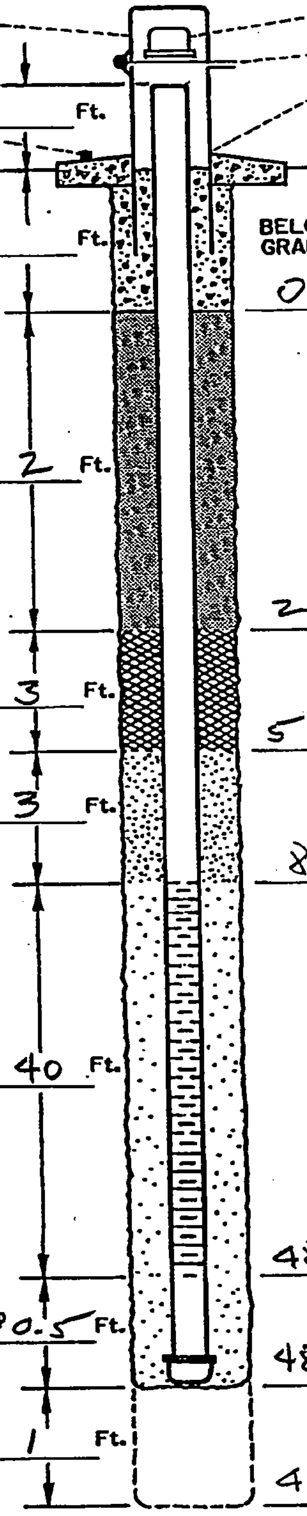
Water Level Summary (From Top of Casing)

During Drilling 20 Ft. Date 8-16-00
Before Development _____ Ft. Date _____
After Development 19.54 Ft. Date 8-18-00

Driller/Firm Harmann / Layne
Drill Rig Type AP-1000
Date Installed 8-16-00
Drill Crew _____
Well No. PC 101R
Kerr-McGee Hydrologist ED KRISH

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

FLUSH MOUNT



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
Surveying Pin ? ______ Ft.
Yes ☐ No ☐

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder
2 Ft.
Other: ______

Bentonite Seal 3 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 3 Ft.

FILTER PACK MATERIAL
Silica Sand ☒
Washed Sand ☐
Pea Gravel ☐
Others ______
40 Ft.
Sand Size 8-12

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill 1 Ft.
Grout ☐ Sand ☒
Caved Material ☐
Other: ______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
2	
5	
8	
48	
48.5	
49.5	

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad ______ Ft. x ______ Ft. x ______ Inches

DRILLING INFORMATION:

1. Borehole Diameter= 9 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☐
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw–Couple ☒ Glue–Couple ☐ Other ______
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inch
5. Slot Size of Screen: 0.040
6. Type of Screen Perforation: Factory Slotted ☒
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☐ No ☒

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☐
   Air Surging (Air or Nitrogen) ☒ Other ______
2. Time Spent on Well Development ?
   2 hr, 20 Minutes/~~Hours~~
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☐
   Turbid ☒ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☒ No ☐
   If Yes, Describe lt brn (silt)

WATER LEVEL INFORMATION:
Water Level Summary (From Top of Casing)

During Drilling 2 Ft. Date 8-17-00
Before Development ______ Ft. Date ______
After Development 0.81 Ft. Date 8-18-00

Driller/Firm HORMANN/LAYNE
Drill Rig Type AP 1000
Date Installed 8-17-00
Drill Crew ______
Well No. PC 102
Kerr–McGee Hydrologist ED KRISH

Appendix C

APPENDIX C: GROUNDWATER LEVEL DATA AND CHEMICAL ANALYSES

WELL ID	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
CLD-1R	22S-62E	12	25.95	1717.10	3850	25900	7.74
CLD-2	22S-62E	12	30.62	1719.38	4950	13810	7.81
CLD-2R	22S-62E	12	28.37	1723.07	6430	16330	7.25
CLD-3R	22S-62E	12	29.00	1721.19	4540	11560	7.51
CLD-4R	22S-62E	12	37.57	1742.30	4220	12030	7.86
DM1	22S-63E	7	39.43	1690.13	243	2830	na
DM2	22S-63E	7	40.48	1687.91	12200	4330	na
H-17	22S-62E	11	36.97	1671.65	192	9190	na
H-20	22S-62E	11	38.17	1695.32	115	1433	na
H-28	22S-62E	1	40.92	1690.88	5860	8900	7.76
H-42	22S-62E	11	37.07	1693.23	48	4460	na
H-43	22S-62E	11	37.50	1693.80	na	na	na
H-48	22S-62E	1	31.05	1650.72	470	34900	na
H-50	22S-62E	1	37.77	1664.07	29	12950	na
H-51	22S-62E	1	37.58	1661.42	4420	12130	na
H-52	22S-62E	1	**DRY**	-	ns	ns	ns
H-55	22S-62E	11	42.99	1709.21	59	5350	na
H-59	22S-62E	11	**DRY**	-	ns	ns	ns
H-67	22S-62E	1	36.53	1657.97	22	11850	na
HMW-7	21S-63E	31	21.99	1525.08	1380	5490	na
HMW-8	21S-63E	31	13.06	1532.25	9990	9010	na
HMW-9	21S-63E	31	5.63	1538.00	3660	5510	na
HMW-13	21S-62E	36	17.25	1578.18	34	2950	na
HMW-14	21S-62E	36	18.16	1581.69	12	2910	na
HMW-15	21S-62E	36	11.65	1600.32	36	4100	na
HMW-16	21S-62E	36	9.76	1611.67	1370	8580	na
I-B	22S-62E	12	43.19	1709.51	1600000	7170	7.19
I-C	22S-62E	12	43.62	1709.18	1600000	12170	7.31
I-D	22S-62E	12	43.42	1709.28	1100000	12170	6.94
I-E	22S-62E	12	34.50	1717.90	1000000	11950	7.27
I-F	22S-62E	12	32.81	1716.89	1800000	18520	7.12
I-G	22S-62E	12	39.73	1712.77	3100000	16290	7.12
I-H	22S-62E	12	34.83	1718.37	2600000	17300	6.92
I-I	22S-62E	12	25.92	1719.58	900000	18080	7.28
I-J	22S-62E	12	40.70	1709.40	760000	7240	7.33
I-K	22S-62E	12	30.23	1715.77	15000	11390	7.47
I-L	22S-62E	12	39.68	1712.02	4600000	11670	7.17
I-M	22S-62E	12	40.25	1712.65	880000	11960	7.26
I-N	22S-62E	12	34.24	1717.16	1300000	13190	7.02
I-O	22S-62E	12	32.58	1720.22	2600000	16920	6.96
I-P	22S-62E	12	31.83	1719.87	2400000	14990	7.02
I-Q	22S-62E	12	nm	-	2500000	16590	
I-R	22S-62E	12	34.74	1716.66	3200000	8530	7.41
I-S	22S-62E	12	38.78	1711.22	2300000	12370	6.93
I-T	22S-62E	12	41.58	1710.62	3100000	16710	6.81
I-U	22S-62E	12	37.30	1714.90	2500000	15970	6.94
I-V	22S-62E	12	39.48	1712.62	2600000	15710	7.19
639	22S-62E	1	9.64	1613.30	291	17170	na

WELL ID	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
L641	22S-62E	1	7.48	1615.53	42	12490	na
L645	22S-62E	1	8.17	1617.38	13	13000	na
L653	22S-62E	1	10.02	1620.69	30	5580	na
LG025	22S-63E	7	33.13	1705.17	822	11310	na
LG027	21S-62E	36	17.00	1570.00	<9.5	3280	na
LG225	22S-62E	2	18.44	1695.10	96	2930	na
LG231	21S-63E	32	65.9	1594.10	357	8100	na
M-2A	22S-62E	12	41.78	1739.42	780000	15350	7.39
M-5A	22S-62E	12	39.44	1712.36	21400	14400	7.32
M-6A	22S-62E	12	40.60	1692.60	10600	8310	7.69
M-7B	22S-62E	12	36.69	1696.11	13000	8410	7.62
M-10	22S-62E	13	48.50	1786.26	15000	4570	7.36
M-11	22S-62E	12	43.30	1770.16	72,000	5480	8.08
M-12A	22S-62E	12	42.50	1770.30	1600000	19100	7.79
M-13	22S-62E	12	46.65	1768.25	61000	6540	7.12
M-14	22S-62E	12	33.95	1724.88	16000	4210	7.79
M-15	22S-62E	12	32.81	1716.55	1000000	12450	7.11
M-17	22S-62E	12	35.35	1734.19	2200000	21900	7.16
M-18	22S-62E	12	23.86	1714.42	16000	10970	7.79
M-19	22S-62E	12	34.50	1731.76	7360	11190	7.62
M-21	22S-62E	12	41.67	1750.43	50000	6240	7.52
M-22	22S-62E	12	30.36	1727.40	2800000	16230	7.31
-23	22S-62E	12	24.64	1695.71	1700000	11300	7.23
-25	22S-62E	12	33.53	1724.29	820000	11900	7.16
M-27	22S-62E	12	**DRY**	-	ns	ns	ns
M-29	22S-62E	12	34.14	1779.86	423	6490	6.41
M-31	22S-62E	12	40.00	1748.06	2100000	13960	7.25
M-32	22S-62E	12	49.01	1750.89	1400000	10220	7.09
M-33	22S-62E	12	48.36	1751.94	16000	1939	7.53
M-34	22S-62E	12	37.44	1739.66	1700000	18110	7.22
M-35	22S-62E	12	35.22	1739.79	820000	9030	7.31
M-36	22S-62E	12	32.29	1725.65	3500000	20000	7.35
M-37	22S-62E	12	31.55	1727.73	9200000	16040	6.98
M-38	22S-62E	12	31.30	1726.64	2200000	21200	7.09
M-39	22S-62E	12	31.70	1727.61	190000	7560	7.54
M-44	22S-62E	12	18.69	1679.63	2000000	14300	7.48
M-48	22S-62E	12	21.48	1699.30	390000	9200	7.42
M-50	22S-62E	12	46.66	1747.21	1700000	30200	7.24
M-52	22S-62E	12	39.65	1762.25	3100000	16380	7.36
M-54	22S-62E	12	29.26	1719.67	4600000	12390	7.47
M-55	22S-62E	12	32.15	1717.20	880000	11830	7.33
M-56	22S-62E	12	32.03	1714.57	2700000	10010	7.00
M-57	22S-62E	12	31.10	1721.19	13000	3930	7.81
M-58	22S-62E	12	30.97	1718.28	2700000	16400	7.31
M-59	22S-62E	12	23.72	1719.29	240000	7970	7.35
M-60	22S-62E	12	31.82	1718.31	3300000	17470	7.49
M-61	22S-62E	12	25.11	1720.44	26000	7460	7.43
-64	22S-62E	12	30.35	1719.41	880000	11970	7.47

APPENDIX C: GROUNDWATER LEVEL DATA AND CHEMICAL ANALYSES

WELL ID	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
M-65	22S-62E	12	32.87	1720.01	2100000	17080	7.31
M-66	22S-62E	12	31.60	1720.73	2800000	17470	7.16
M-67	22S-62E	12	22.24	1722.64	180000	7760	7.44
M-68	22S-62E	12	24.52	1722.92	14000	10120	7.48
M-69	22S-62E	12	31.31	1717.46	760000	6340	7.90
M-70	22S-62E	12	30.87	1716.09	880000	12340	7.44
M-71	22S-62E	12	31.07	1714.81	1600000	14620	7.30
M-72	22S-62E	12	28.37	1717.12	2700000	16770	7.56
M-73	22S-62E	12	22.17	1717.88	640000	10490	7.67
M-74	22S-62E	12	24.77	1718.65	17000	10290	7.61
M-75	22S-62E	12	42.53	1741.67	180000	8850	7.74
M-76	22S-62E	12	39.56	1740.44	160000	8030	7.80
M-77	22S-62E	12	37.14	1761.86	54000	5170	7.40
M-78	22S-62E	12	35.14	1715.87	1100000	12230	7.16
M-79	22S-62E	12	28.80	1714.13	2800000	11880	7.83
M-80	22S-62E	12	33.60	1712.13	1600000	12600	7.07
M-81A	22S-62E	12	30.09	1711.99	2900000	17000	7.14
M-82A	22S-62E	12	25.53	1712.82	3400000	12000	7.43
M-83	22S-62E	12	29.18	1711.65	1700000	12800	7.54
M-84	22S-62E	12	27.93	1711.70	1700000	8650	7.40
M-85	22S-62E	12	29.41	1711.78	160000	1340	7.90
M-86	22S-62E	12	30.80	1711.93	2700000	15800	7.45
-87	22S-62E	12	30.01	1712.26	800000	11200	7.44
-88	22S-62E	12	25.25	1712.74	34000	7780	7.64
M-89	22S-62E	12	33.46	1731.79	1600000	18600	7.92
M-92	22S-62E	12	38.80	1761.28	729	2490	8.03
M-93	22S-62E	12	37.52	1759.64	14000	3770	7.79
M-94	22S-62E	12	10.18	1684.52	2000000	14200	7.44
M-95	22S-62E	12	9.4	1684.70	2100000	15470	7.35
M-96	22S-62E	12	9.20	1684.30	1400000	13580	7.46
M-97	22S-62E	12	41.31	1759.49	22000	3460	8.09
M-98	22S-62E	12	31.24	1700.66	180000	9070	7.78
M-99	22S-62E	12	29.57	1701.13	1500000	10000	7.60
M-100	22S-62E	12	27.86	1703.04	1600000	8970	7.47
M-101	22S-62E	12	26.44	1704.36	1900000	13300	7.56
M-102	22S-62E	12	33.51	1706.69	120000	8050	7.62
MC-8	22S-62E	11	29.17	1690.54	122	7220	na
MC-27	22S-62E	12	37.00	1684.40	121	40000	na
MC-45	22S-62E	12	32.44	1678.56	57	27500	na
MC-48	22S-62E	11	31.19	1678.71	536	7970	na
MC-49	22S-62E	11	31.65	1678.55	37	11420	na
MC-53	22S-62E	12	34.36	1680.94	15	10490	na
MC-59	22S-62E	12	DRY	-	ns	ns	ns
MC-60	22S-62E	12	33.07	1670.15	ns	ns	ns
MC-61	22S-62E	12	DRY	-	ns	ns	ns
MC-62	22S-62E	1	37.95	1662.68	383	51500	na
MC-63	22S-62E	1	35.96	1663.33	460000	9550	na
C-65	22S-62E	12	38.53	1666.94	900000	11400	na

WELL ID	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
MC-66	22S-62E	12	37.48	1664.91	780000	11400	na
MC-71	22S-62E	12	36.41	1674.75	1980	7620	na
MC-81	22S-62E	12	32.26	1692.85	13300	11350	na
MC-85	22S-62E	11	25.21	1688.19	2050	7590	na
MC-89	22S-62E	11	26.72	1688.08	1990	7570	na
MC-92	22S-62E	12	33.57	1680.46	91	23800	na
MC-97	22S-62E	12	39.67	1684.31	7620	8050	na
MW-A	22S-62E	15	66.83	1823.77	10760	na	na
MW-DX-16	22S-62E	15	16.81	1813.27	610710	na	na
MW-AA	21S-62E	35	11.5	1638.22	193	na	na
MW-AB	22S-62E	2	13.49	1662.53	840	na	na
MW-AC	22S-62E	2	14.62	1682.83	14000	4360	na
MW-AE	22S-62E	11	43.44	1740.53	3310	na	na
MW-AGX-9	22S-62E	11	38.27	1718.05	5	na	na
MW-AH	22S-62E	11	41.67	1694.65	4	na	na
MW-AJ	22S-62E	1	11.18	1638.12	46	na	na
MW-AL	22S-62E	14	131.05	1820.76	7110	na	na
MW-C	22S-62E	15	34.64	1817.26	318130	na	na
MW-D2D	22S-62E	15	24.32	1812.85	487150	na	na
MW-F2	22S-62E	11	34.72	1747.40	345820	na	na
MW-J	22S-62E	2	18.23	1651.54	1097	na	na
MW-K	22S-62E	2	17.25	1650.78	2496	na	na
MW-K1	22S-62E	1	9.8	1624.57	241	na	na
MW-K2	21S-62E	36	18.92	1600.35	44790	na	na
MW-K4	21S-62E	36	19.22	1596.10	290000	8770	na
MW-K5	21S-62E	36	19.98	1578.99	320000	11140	na
MW-K6	21S-63E	31	3.76	1554.01	44980	na	na
MW-K8	21S-63E	31	18.63	1541.62	7570	na	na
MW-L	22S-62E	10	52.4	1831.67	ns	ns	ns
MW-N	21S-62E	35	19.24	1648.72	2880	5710	na
MW-O	21S-62E	35	18.71	1643.61	1200	5550	na
MW-P	21S-62E	35	17.7	1640.49	2300	5360	na
MW-QS	21S-62E	36	12.33	1621.13	145	na	na
MW-R	22S-62E	1	18.32	1649.38	14	na	na
MW-S	21S-62E	36	22.72	1583.30	39	na	na
MW-T	21S-62E	36	17.34	1574.68	397	na	na
MW-U	21S-62E	36	20.02	1571.21	89	na	na
MW-V	21S-62E	36	20.4	1577.07	144	na	na
MW-X	22S-62E	10	9.07	1809.46	<3	na	na
PC-1	21S-63E	31	20.29	1578.84	12000	9660	na
PC-2	21S-63E	31	16.63	1580.44	1070	8540	na
PC-4	21S-63E	31	22.56	1577.86	9550	8590	na
PC-10	22S-62E	1	20.20	1598.83	3980	5900	na
PC-12	21S-62E	36	18.76	1597.70	230000	8430	na
PC-17	21S-62E	36	17.75	1599.23	410000	12180	na
PC-18	21S-62E	36	19.10	1599.39	290000	14440	na
PC-19	21S-62E	36	17.92	1600.34	80000	16220	na
PC-24	22S-62E	1	19.80	1613.68	7180	10300	na

WELL ID	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
PC-28	22S-62E	1	11.78	1639.07	520000	8690	na
PC-31	22S-62E	1	14.21	1643.65	196	13070	na
PC-37	22S-62E	1	24.03	1683.69	160000	8870	7.62
PC-40	22S-62E	1	28.03	1651.20	370000	15140	na
PC-50	22S-62E	1	12.05	1621.41	490000	9810	na
PC-53	21S-62E	36	16.47	1578.56	3220	5490	na
PC-54	22S-62E	12	13.13	1691.30	350000	10180	7.43
PC-55	21S-62E	36	17.52	1600.00	190000	17120	na
PC-56	21S-63E	31	5.87	25.13	64000	7470	na
PC-58	21S-63E	31	6.12	24.88	11000	9380	na
PC-59	21S-63E	31	5.97	25.03	84000	9080	na
PC-60	21S-62E	36	5.81	30.19	66000	8540	na
PC-62	21S-62E	36	8.41	27.59	45000	10040	na
PC-64	22S-62E	1	5.90	1669.39	740000	10870	na
PC-65	22S-62E	1	5.14	1670.07	740000	10280	na
PC-66	22S-62E	1	9.02	1664.51	84000	18080	na
PC-67	22S-62E	1	9.11	1664.71	6370	11850	na
PC-68	21S-62E	36	7.64	1559.33	10700	5570	na
PC-71	22S-62E	12	23.69	1675.01	1400000	13680	7.49
PC-72	22S-62E	12	30.87	1668.53	1100000	11680	7.35
PC-73	22S-62E	12	35.37	1664.13	740000	10110	7.09
PC-74	21S-62E	25	13.41	1551.93	421	6000	na
C-76	21S-62E	25	13.6	1551.50	25	7210	na
C-77	21S-62E	25	7.27	1559.63	110	6100	na
PC-78	21S-62E	25	6.86	1559.86	174	5340	na
PC-79	21S-62E	36	7.05	1557.11	18000	5620	na
PC-80	21S-62E	36	7.15	1557.16	27000	6220	na
PC-81	21S-62E	36	6.65	1557.38	12800	5610	na
PC-82	21S-62E	36	5.42	1553.89	16000	8170	na
PC-83	21S-62E	36	3.82	1555.50	28000	5810	na
PC-84	21S-62E	36	4.26	1554.94	31000	6720	na
PC-85	21S-63E	31	0.33	1553.32	100000	10550	na
PC-86	21S-63E	31	0.58	1553.27	62000	6690	na
PC-87	21S-63E	31	1.78	1552.22	92000	11760	na
PC-88	21S-63E	31	0.21	1550.80	47000	6320	na
PC-89	21S-63E	31	0	1551.10	62000	7190	na
PC-90	21S-63E	31	0.64	1549.82	15000	5510	na
PC-91	21S-63E	31	4.19	1548.14	13700	8480	na
PC-92	21S-63E	31	4.77	1547.28	11400	11000	na
PC-93	21S-63E	31	3.89	1544.87	7550	7510	na
PC-94	21S-63E	31	4.54	1544.41	6540	7760	na
PC-95	21S-63E	31	2.02	1548.60	150000	10140	na
PC-96	21S-63E	31	2.79	1549.78	37000	6970	na
PC-97	21S-63E	31	0.26	1548.27	26000	5970	na
PC-98	21S-62E	36	14.03	1579.38	310000	12610	na
PC-99	21S-63E	31	1.35	1550.62	52000	7150	na
PC-100	21S-62E	36	14.03	1578.80	ns	ns	ns
C-101	21S-62E	36	19.01	1599.08	270000	14140	na

APPENDIX C: GROUNDWATER LEVEL DATA AND CHEMICAL ANALYSES

WELL ID	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
PG219	22S-63E	6	**DRY**	-	ns	ns	ns
PG220	22S-63E	6	**DRY**	-	ns	ns	ns
POD4	22S-63E	6	56.11	1638.73	242	3480	na
POD7	22S-63E	6	**DRY**	-	ns	ns	ns
RRUMW1	21S-63E	31	11.86	1602.14	1120	6230	
na = not analyzed							
ns = no sample							
nm = not measured							

APPENDIX C: LABORATORY ANALYTICAL DATA FOR WATER SAMPLES COLLECTED DURING DRILLING

WELL ID	SAMPLE DEPTH (ft)	TWP-RANGE	SECTION	DEPTH TO WATER TOC (ft)	WATER ELEVATION TOC (ft)	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)	pH
PC-74	15	21S-62E	25	-	-	347	6060	na
PC-74	50	21S-62E	25	-	-	337	6060	na
PC-75	25	21S-62E	25	-	-	390	8230	na
PC-77	10	21S-62E	25	-	-	97	5800	na
PC-95	10	21S-63E	31	-	-	130000	12140	na

APPENDIX C: LABORATORY ANALYTICAL DATA FOR GROUNDWATER SAMPLES COLLECTED ALONG LAS VEGAS WASH

WELL ID	SAMPLE TYPE	PERCHLORATE (ug/l)	SPECIFIC CONDUCTIVITY (uS/cm)
KM45	Dug Pit	43000	8000
KM53	Seep	321	2500
KM54	Dug Pit	280	3100
KM55	Seep	4500	6900
KM56	Seep	ND	4900
KM57	Spring	42	6900
KM58	Seep	31	9400
KM59	Dug Pit	5	3800
KM60	Seep	ND	10400
KM62	Drain	77	6500
KM65	Spring	3000	7400
KM66	Seep	460	4300
KM67	Spring	2100	4300
KM68	Seep	ND	8000
KM70	Seep	57000	8300
KM71	Seep	3400	4700
KM88	Seep	ND	6400
KM89	Dug Pit	24	8800
KM90	Seep	170	5800
KM91	Seep	2100	8500
KM92	Dug Pit	290	2800
KM93	Seep	400	3500
ND = non-detect			

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CC : Ed Krish

Laboratory Report

for

Kerr McGee Henderson Plant
P.O. Box 55

Henderson , NV 89009

Attention: Susan Crowley
Fax: (702) 651-2310

MONTGOMERY WATSON LABS.
SUBMITTED ON
APR 28 2000
A Eaton

ADE Andy Eaton

Report#: 64971
CL04

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Laboratory Report #64971

Kerr McGee Henderson Plant
Susan Crowley
P.O. Box 55
Henderson , NV 89009

Samples Received
14-apr-2000 09:40:00

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MRL	Dilution
KM88LVW (2004140201) Sampled on 04/05/00								
	04/21/00	114427	(CADHS/EPA314)	Perchlorate	ND	ug/l	8.0	2
KM62LVW (2004140202) Sampled on 04/05/00								
	04/18/00	114236	(CADHS/EPA314)	Perchlorate	77	ug/l	8.0	2
KM89LVW (2004140203) Sampled on 04/05/00								
	04/21/00	114427	(CADHS/EPA314)	Perchlorate	24	ug/l	8.0	2
KM66LVW (2004140204) Sampled on 04/07/00								
	04/18/00	114236	(CADHS/EPA314)	Perchlorate	460	ug/l	80	20
KM90LVW (2004140205) Sampled on 04/07/00								
	04/18/00	114236	(CADHS/EPA314)	Perchlorate	170	ug/l	20	5
KM65LVW (2004140206) Sampled on 04/07/00								
	04/18/00	114236	(CADHS/EPA314)	Perchlorate	3000	ug/l	400	100
KM91LVW (2004140207) Sampled on 04/07/00								
	04/18/00	114236	(CADHS/EPA314)	Perchlorate	2100	ug/l	400	100
KM92LVW (2004140208) Sampled on 04/07/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	290	ug/l	40	10
KM93LVW (2004140209) Sampled on 04/07/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	400	ug/l	40	10

Kerr McGee Henderson Plant
(continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MRL	Dilution
KM70LVW (2004140210) Sampled on 04/11/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	57000	ug/l	8000	2000
KM71LVW (2004140211) Sampled on 03/23/00								
	04/18/00	114233	(CADHS/EPA314)	Perchlorate	3400	ug/l	400	100
KM67LVW (2004140212) Sampled on 04/03/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	2100	ug/l	400	100
KM53LVW (2004140213) Sampled on 04/03/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	500	ug/l	80	20
K[illegible]LVW (2004140214) Sampled on 04/03/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	260	ug/l	40	10
KM55LVW (2004140215) Sampled on 04/03/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	4500	ug/l	800	200
GW-3 (2004140216) Sampled on 04/03/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	43000	ug/l	8000	2000
KM68LVW (2004140217) Sampled on 04/05/00								
	04/21/00	114427	(CADHS/EPA314)	Perchlorate	ND	ug/l	8.0	2
KM60LVW (2004140218) Sampled on 04/05/00								
	04/21/00	114427	(CADHS/EPA314)	Perchlorate	ND	ug/l	8.0	2
KM59LVW (2004140219) Sampled on 04/05/00								
	04/19/00	114237	(CADHS/EPA314)	Perchlorate	4.9	ug/l	4.0	1

Kerr McGee Henderson Plant
(continued)

Prepared	Analyzed	QC Batch#	Method	Analyte	Result	Units	MRL	Dilution
KM58LVW (2004140220)			**Sampled on 04/05/00**					
	04/21/00	114427	(CADHS/EPA314)	Perchlorate	31	ug/l	8.0	2
KM57LVW (2004140221)			**Sampled on 04/05/00**					
	04/21/00	114427	(CADHS/EPA314)	Perchlorate	42	ug/l	8.0	2
KM56LVW (2004140222)			**Sampled on 04/05/00**					
	04/26/00	114755	(CADHS/EPA314)	Perchlorate	ND	ug/l	20	5

Report
Comments
#64971

(Sample#: 2004140201)
Test: Perchlorate
SAMPLE WAS DILUTED DUE TO HIGH EC.

(Sample#: 2004140203)
Test: Perchlorate
SAMPLE WAS DILUTED DUE TO EC.

(Sample#: 2004140217)
Test: Perchlorate
SAMPLE WAS DILUTED DUE TO HIGH EC.

(Sample#: 2004140218)
Test: Perchlorate
SAMPLE WAS DILUTED DUE TO HIGH EC.

(Sample#: 2004140220)
Test: Perchlorate
SAMPLE WAS DILUTED DUE TO HIGH EC.

(Sample#: 2004140221)
Test: Perchlorate
SAMPLE WAS DILUTED DUE TO HIGH EC.

(Sample#: 2004140222)
Test: Perchlorate
SAMPLE WAS TREATED AND ANALYZED ON 4/21/00, BUT THE DATA WAS NOT REPORTABLE DUE TO HIGH EC OF SAMPLE. DILUTION WAS MADE ON THIS RUN PER ALI'S INSTRUCTION.

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Laboratory
QC Summary Report
#64971

Kerr McGee Henderson Plant

QC Batch #114233 - Perchlorate **Analysis Date: 04/18/2000**

2004140211	KM71LVW

QC Batch #114236 - Perchlorate **Analysis Date: 04/18/2000**

2004140202	KM62LVW
2004140204	KM66LVW
2004140205	KM90LVW
2004140206	KM65LVW
2004140207	KM91LVW

QC Batch #114237 - Perchlorate **Analysis Date: 04/19/2000**

2004140208	KM92LVW
2004140209	KM93LVW
2004140210	KM70LVW
2004140212	KM67LVW
2004140213	KM53LVW
2004140214	KM54LVW
2004140215	KM55LVW
2004140216	GW-3
2004140219	KM59LVW

QC Batch #114427 - Perchlorate **Analysis Date: 04/21/2000**

2004140201	KM88LVW
2004140203	KM89LVW
2004140217	KM68LVW
2004140218	KM60LVW
2004140220	KM58LVW
2004140221	KM57LVW

QC Batch #114755 - Perchlorate **Analysis Date: 04/26/2000**

2004140222	KM56LVW

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Laboratory QC Report #64971

Kerr McGee Henderson Plant

QC Batch #114233 Perchlorate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MS	Spiked sample	Lab # 20	01410046		(0.00 - 0.00)	
LCS1	Perchlorate	25.0	22.6	90.4	(90.00 - 110.00)	
LCS2	Perchlorate	25.0	23.0	92.0	(90.00 - 110.00)	1.8
MBLK	Perchlorate	ND				
MS	Perchlorate	25.0	24.2	96.8	(75.00 - 125.00)	
MSD	Perchlorate	25.0	24.4	97.6	(75.00 - 125.00)	0.82

QC Batch #114236 Perchlorate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MS	Spiked sample	Lab # 20	04140203		(0.00 - 0.00)	
LCS1	Perchlorate	25.0	22.6	90.4	(90.00 - 110.00)	
LCS2	Perchlorate	25.0	23.9	95.6	(90.00 - 110.00)	5.6
MBLK	Perchlorate	ND				

QC Batch #114237 Perchlorate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MS	Spiked sample	Lab # 20	04140203		(0.00 - 0.00)	
LCS1	Perchlorate	25.0	23.9	95.6	(90.00 - 110.00)	
LCS2	Perchlorate	25.0	22.6	90.4	(90.00 - 110.00)	5.6
MBLK	Perchlorate	ND				

QC Batch #114427 Perchlorate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MS	Spiked sample	Lab # 20	04140085		(0.00 - 0.00)	
LCS1	Perchlorate	25.0	25.0	100.0	(90.00 - 110.00)	
LCS2	Perchlorate	100	104	104.0	(90.00 - 110.00)	
MBLK	Perchlorate	ND				
MS	Perchlorate	25.0	23.1	92.4	(75.00 - 125.00)	
MSD	Perchlorate	25.0	23.8	95.2	(75.00 - 125.00)	3.0

Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and DUP are advisory only and not applicable for ICR monitoring.

Kerr McGee Henderson Plant
(continued)

QC Batch #114755 Perchlorate

QC	Analyte	Spiked	Recovered	Yield (%)	Limits (%)	RPD (%)
MS	Spiked sample	Lab # 20	04210166		(0.00 - 0.00)	
LCS1	Perchlorate	25.0	24.0	96.0	(90.00 - 110.00)	
LCS2	Perchlorate	100	106	106.0	(90.00 - 110.00)	
MBLK	Perchlorate	ND				
MS	Perchlorate	25.0	25.6	102.4	(75.00 - 125.00)	
MSD	Perchlorate	25.0	25.4	101.6	(75.00 - 125.00)	0.78

Spikes which exceed Limits and Method Blanks with positive results are highlighted by <u>Underlining.</u>
Criteria for MS and DUP are advisory only and not applicable for ICR monitoring.

Report Summary of positive results, PR64971

			Result	MDL	UNITS
Analyzed	2004140201	KM88LVW			
Analyzed	2004140202	KM62LVW			
04/18/00	Perchlorate		77	8.000	UGL
Analyzed	2004140203	KM89LVW			
04/21/00	Perchlorate		24	8.000	UGL
Analyzed	2004140204	KM66LVW			
04/18/00	Perchlorate		460	80.000	UGL
Analyzed	2004140205	KM90LVW			
04/18/00	Perchlorate		170	20.000	UGL
Analyzed	2004140206	KM65LVW			
04/18/00	Perchlorate		3000	******	UGL
Analyzed	2004140207	KM91LVW			
04/18/00	Perchlorate		2100	******	UGL
Analyzed	2004140208	KM92LVW			
04/19/00	Perchlorate		290	40.000	UGL
Analyzed	2004140209	KM93LVW			
04/19/00	Perchlorate		400	40.000	UGL
Analyzed	2004140210	KM70LVW			
04/19/00	Perchlorate		57000	******	UGL
Analyzed	2004140211	KM71LVW			
04/18/00	Perchlorate		3400	******	UGL
Analyzed	2004140212	KM67LVW			
04/19/00	Perchlorate		2100	******	UGL
Analyzed	2004140213	KM53LVW			
04/19/00	Perchlorate		500	80.000	UGL
Analyzed	2004140214	KM54LVW			
04/19/00	Perchlorate		260	40.000	UGL
Analyzed	2004140215	KM55LVW			

04/19/00	Perchlorate	4500	******	UGL
Analyzed	2004140216	GW-3		
04/19/00	Perchlorate	43000	******	UGL
Analyzed	2004140217	KM68LVW		
Analyzed	2004140218	KM60LVW		
Analyzed	2004140219	KM59LVW		
04/19/00	Perchlorate	4.9	4.000	UGL
Analyzed	2004140220	KM58LVW		
04/21/00	Perchlorate	31	8.000	UGL
Analyzed	2004140221	KM57LVW		
04/21/00	Perchlorate	42	8.000	UGL
Analyzed	2004140222	KM56LVW		

M GOMERY WATSON LABORATORIES

CHAIN OF STODY RECORD

555 E. Walnut St., Pasadena, CA 91101
(626) 568-6400 (800) 566-5227

MWLABS USE ONLY:

LOGIN COMMENTS:

SAMPLES CHECKED/LOGGED IN BY: NR

SAMPLE TEMP, RECEIPT AT LAB: 21°C W/ ice r'd

BLUE ICE: FROZEN ___ PARTIALLY FROZEN ___ THAWED ok post

TO BE COMPLETED BY SAMPLER: FROM SUSAN CROWLEY, KERR McGEE Chemical, Henderson NV

PROJECT NAME: HENDERSON

PROJECT JOB # / P.O.#: IX TESTING (AFE 10181-01)

SAMPLER(S): PRINTED NAME AND SIGNATURE: EDWARD KRISH Edward Krish

REFER TO ATTACHED BOTTLE ORDER FOR ANALYSES ☐ (check for yes)

ANALYSES REQUIRED (mark an 'X' in all tests required for each sample line)

TIME	DATE	LOCATION	IDENTIFIER	GRAB	COMP	C/04	FIELD TDS SAMPLER COMMENTS
330p	3-23-00	LVW	KM71 LVW	X			4700
230p	4-3-00	LVW	KM67 LVW	X			4300
330p	"	LVW	KM53 LVW	X			2500
350p	"		KM54 LVW	X			3100
415p	"		KM55 LVW	X			6900
430p	"		GW-3	X			8000
7AM	4-5-00		KM68 LVW	X			8000
720a	"		KM60 LVW	X			10400
750A	"		KM59 LVW	X			3800
8AM	"		KM58 LVW	X			9400
810	"		KM57 LVW	X			6900
830	"		KM56 LVW	X			4900

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
RELINQUISHED BY:	Edward Krish	EDWARD KRISH	KERR McGEE, SR. Geol	4-12-00	
RECEIVED BY:	NR	N Rodriguez	MWL	4/14/00	9:40AM
RELINQUISHED BY:					
RECEIVED BY:					
RELINQUISHED BY:					
RECEIVED BY:					

C-O-C#

PAGE ___ OF ___

M TGOMERY WATSON LABORATORIES

CHAIN OF STODY RECORD

64172

555 E. Walnut St., Pasadena, CA 91101
(626) 568-6400 (800) 566-5227

MWLABS USE ONLY:

LOGIN COMMENTS:

SAMPLES CHECKED/LOGGED IN BY: NR

SAMPLE TEMP, RECEIPT AT LAB: 21°C N/ice

BLUE ICE: FROZEN ___ PARTIALLY FROZEN ___ THAWED ___ ok part

TO BE COMPLETED BY SAMPLER: FROM SUSAN CROWLEY, KERR McGEE CHEMICAL, HENDERSON, NV

PROJECT NAME: HENDERSON

PROJECT JOB # / P.O.# IX TESTING (AFE 10181-01)

SAMPLER(S): PRINTED NAME AND SIGNATURE: EDWARD KRISH Edward Krish

REFER TO ATTACHED BOTTLE ORDER FOR ANALYSES ☐ (check for yes)

ANALYSES REQUIRED (mark an 'X' in all tests required for each sample line)

TIME	DATE	LOCATION	IDENTIFIER	GRAB	COMP	ClO4	FIELD TDS SAMPLER COMMENTS
930a	4-5-00	LVW	KM88 LVW	X		↓	6400
945	"	"	KM62 LVW	X			6500
10A	"	"	KM89 LVW	X			8600
6A	4-7-00	"	KM66 LVW	X			4300
630	"	"	KM90 LVW	X			5800
730	"	"	KM65 LVW	X			7400
8A	"	"	KM91 LVW	X			6500
9A	"	"	KM92 LVW	X			2800
945	"	"	KM93 LVW	X			3500
1215	4-11-00	"	KM70 LVW	X			8300

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
RELINQUISHED BY:	Edward Krish	EDWARD KRISH	KERR McGEE, Sr. Geol	4.12.00	
RECEIVED BY:	NR	N Rodriguez	MWL	4/14/00	9:40A
RELINQUISHED BY:					
RECEIVED BY:					
RELINQUISHED BY:					
RECEIVED BY:					

C-O-C#

PAGE ___ OF ___

Appendix D

APPENDIX D: PC-SERIES MONITOR WELLS AND SOIL BORING GPS SURVEYED LOCATIONS (STATE PLANE COORDINATES)

DRILL HOLE I.D.	HOLE TYPE	X COORD. (EASTING) FT MSL	Y COORD. (NORTHING FT MSL	GROUND ELEVATION FT MSL	TOP OF CASING FT MSL	CASING STICKUP FT MSL
PC-74	Monitor	829203.52	26734003.52	1564.54	1565.34	0.80
PC-75	Boring	829194.53	26734004.98	1564.48	none	none
PC-76	Monitor	829183.79	26734006.74	1564.51	1565.10	0.59
PC-77	Monitor	829031.63	26733568.07	1566.63	1566.90	0.27
PC-78	Monitor	829033.25	26733560.32	1566.64	1566.72	0.08
PC-79	Monitor	829815.28	26733246.69	1564.33	1564.16	-0.17
PC-80	Monitor	829823.75	26733250.46	1564.07	1564.31	0.24
PC-81	Monitor	829833.37	26733254.71	1564.03	1564.03	0.00
PC-82	Monitor	830317.05	26733194.85	1559.44	1559.31	-0.13
PC-83	Monitor	830325.65	26733201.29	1559.47	1559.32	-0.15
PC-84	Monitor	830332.58	26733208.53	1559.14	1559.20	0.06
PC-85	Monitor	830816.05	26733185.56	1553.70	1553.65	-0.05
PC-86	Monitor	830826.99	26733185.76	1554.08	1553.85	-0.23
PC-87	Monitor	830837.82	26733185.37	1554.09	1554.00	-0.09
PC-88	Monitor	831259.41	26733178.42	1550.91	1551.01	0.10
PC-89	Monitor	831264.70	26733184.33	1550.90	1551.10	0.20
PC-90	Monitor	831271.92	26733192.63	1550.53	1550.46	-0.07
PC-91	Monitor	831729.99	26733110.85	1552.42	1552.33	-0.09
PC-92	Monitor	831749.30	26733109.85	1552.12	1552.05	-0.07
PC-93	Monitor	832179.60	26733117.81	1548.86	1548.76	-0.10
PC-94	Monitor	832189.05	26733122.48	1548.84	1548.95	0.11
PC-95	Monitor	831227.21	26733449.91	1550.61	1550.62	0.01
PC-96	Monitor	830896.56	26733450.83	1552.69	1552.57	-0.12
PC-97	Monitor	831565.69	26733441.54	1548.78	1548.53	-0.25
PC-98	Monitor	829519.86	26730256.09	1593.35	1593.41	0.06
PC-98R	Monitor	unsurveyed				
PC-99	Monitor	831242.35	26733140.18	1551.99	1551.97	-0.02
PC-99R	Monitor	unsurveyed				
PC-100	Monitor	829544.65	26730298.84	1592.93	1592.83	-0.10
PC-100R	Monitor	unsurveyed				
PC-101	Monitor	828714.87	26728110.71	1617.86	1618.09	0.23
PC-102	Monitor	unsurveyed				

APPENDIX D: LOCATIONS OF SAMPLED SEEPS, SPRINGS AND PITS ALONG LAS VEGAS WASH

SAMPLE ID	X COORD. (EASTING) FT MSL	Y COORD. (NORTHING FT MSL	COMMENTS
KM45	832386.25	26734058.66	aka GW-3
KM53	837948.75	26735704.49	
KM54	835563.33	26734782.61	
KM55	833443.74	26733871.49	
KM56	830688.33	26734647.20	
KM57	829847.52	26734744.77	
KM58	829059.14	26734665.94	
KM59	828731.66	26735090.45	
KM60	827894.77	26734969.16	
KM62	824322.81	26734477.94	
KM65	841063.33	26736298.24	
KM66	843459.17	26736735.74	
KM67	844636.25	26737652.41	
KM68	827283.22	26735178.34	
KM70	831860.21	26734475.32	
KM71	831427.92	26734699.28	
KM88	826449.88	26735305.01	
KM89	823369.86	26735145.01	
KM90	842287.29	26736777.41	
KM91	839443.54	26735980.53	
KM92	837068.54	26735397.20	
KM93	834741.53	26734095.88	

Attachment 1

PRELIMINARY REPORT ON A HYDROGEOLOGIC INVESTIGATION OF CHANNEL-FILL ALLUVIUM AT THE PITTMAN LATERAL HENDERSON, NEVADA

KERR-McGEE CHEMICAL LLC
HENDERSON, NEVADA FACILITY

Prepared by
Steven R. Lower
Hydrology Services Group
Assessment and Remediation Department
Kerr-McGee Safety and Environmental Affairs Division

October 19, 1998

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Photograph

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LIST OF PHOTOGRAPHS (continued)

Photograph

EXECUTIVE SUMMARY

Hydrogeologic investigations were conducted in an area referred to as the Pittman Lateral in the southeast portion of the Las Vegas Valley in June and August of 1998. This area is located north of Kerr-McGee's Henderson, Nevada, facility The purpose of the investigations was to determine the hydrogeologic characteristics of channel-fill alluvial sediments that overlie the Muddy Creek Formation at the Pittman Lateral Test Site. The results of these investigations were inconclusive.

To better quantify the hydrogeologic characteristics of the channel-fill alluvium, further hydrogeologic investigations were centered around a new well which was constructed and tested at the Pittman Lateral Test Site in September 1998. The hydrogeologic data resulting from the construction and testing of well PC-70 is the subject of this report.

Based upon the report that follows, the following conclusions can be reached regarding the hydrogeology of the channel-fill alluvium at the Pittman Lateral Test Site:

- The well was completed in Quaternary channel-fill alluvium overlying the Tertiary Muddy Creek Formation.

- The channel-fill alluvium at the Pittman Lateral Test Site was found to consist of an alternating sequence of light-brown, fine-grained sand and fine- to coarse-grained sand and gravel. The top of the Muddy Creek Formation, which was encountered at a depth of about 49 feet, was found to consist of a gravelly clay.

- An aquifer test consisting of a 48-hour constant discharge pumping test followed by 21 hours of recovery was performed at Well PC-70. Water levels were monitored in the pumping well and three observation wells.

- Drawdown and recovery data resulting from the aquifer test were analyzed using several different methodologies. Comparison of aquifer coefficients resulting from the analyses of drawdown data show very good consistency. Recovery data are not considered valid due to the effects of storm event-related recharge.

- The transmissivity of the channel-fill alluvium at the Pittman Lateral Test Site ranges from 39,666 gpd/ft to 66,000 gpd/ft, averaging 50,425 gpd/ft. These values are consistent with sand and gravels containing fine sands and silts.

- Storage coefficients were found to range from 0.03 to 0.11, averaging 0.06, which is consistent with an unconfined aquifer under water-table conditions.

PRELIMINARY REPORT ON A HYDROGEOLOGIC INVESTIGATION OF CHANNEL-FILL ALLUVIUM AT THE PITTMAN LATERAL HENDERSON, NEVADA

INTRODUCTION

In June and August of 1998, hydrogeologic investigations were conducted in an area referred to as the Pittman Lateral located north of Kerr-McGee Chemical-LLC's (Kerr-McGee) Henderson, Nevada, facility. The Pittman Lateral Test Site is located in the southeast portion of the Las Vegas Valley within the limits of the City of Henderson. The site is bounded on the north by the Henderson wastewater treatment facility and on the south by Sunset Boulevard.

The purpose of the hydrogeologic investigations was to determine the hydrogeologic characteristics of channel-fill alluvial sediments that overlie the Muddy Creek Formation. The results of those investigations were inconclusive.

To better quantify the hydrogeologic characteristics of the channel-fill alluvium, further hydrogeologic investigations were centered around a new well, PC-70, which was constructed and tested at the Pittman Lateral Test Site in September 1998. Since Test Well PC-70 was to be a groundwater production well rather than a monitor well, every effort was made in the design, construction, and development of the well to make it as efficient as possible. The hydrogeologic data resulting from the construction and testing of well PC-70 is the subject of this report.

Hydrogeology of the Pittman Lateral Test Site and Vicinity

The Las Vegas Valley occupies a topographic and structural basin which lies within the Basin and Range physiographic province. The valley is bordered by steeply rising mountains composed of igneous and sedimentary rocks. Coalescing alluvial fans slope gently from the mountains toward the valley floor. The valley itself is wide, flat, and drains southeasterly towards Lake Mead and the Colorado River. The Las Vegas Wash, a shallow, narrow stream that flows southeasterly across the valley towards Lake Mead, is the principal surface water feature in the area (Kerr-McGee Chemical LLC, 1998). A tributary of the Las Vegas Wash runs west to east close by, and parallel to, the Test Site.

The Pittman Lateral Test Site is underlain by the late Tertiary-age Muddy Creek Formation. The Muddy Creek is a valley fill deposit and has a wide range of lithologies. It consists of coarse-grained sands and gravels near the mountain front forming the southern border of the valley, becoming fine grained beneath the valley. At the Test Site itself, the Muddy Creek Formation is composed of sandy clay and silty clay with lesser amounts of clayey sand (Kerr-McGee Chemical LLC, 1998).

Younger, Quaternary-age alluvial sediments resting unconformably on the Muddy Creek Formation, are a heterogeneous, poorly sorted mixture of sand and gravel with lesser amounts of silt and clay. Boulders and cobbles are common in some areas. Due to the mode of deposition of these alluvial fan deposits, no distinct beds or units are continuous over the entire area (Kerr-McGee Chemical LLC, 1998).

The sedimentary processes that deposited the Quaternary alluvium eroded the upper surface of the Muddy Creek Formation. These sediments are of greater thickness within erosional paleochannels cut into the underlying Muddy Creek Formation and thin laterally over the interfluvial areas.

A major hydrogeologic feature of the Quaternary alluvial sediments are the sands and gravels that were deposited within channels cut into the surface of the Muddy Creek Formation at a time in the geologic past when the local base level was lower than it is now. These deposits conform to the old channel boundaries, which are characteristically linear and narrow in configuration. The sediments are thickest within the channels, and thin laterally over the interfluvial areas. The paleochannels trend roughly southwest-northeast in the area reflecting past regional drainage patterns (Kerr-McGee Chemical LLC, 1998).

Groundwater in the Las Vegas Valley in general, and at the Pittman Lateral Study Site in particular, occurs mainly in the unconsolidated sediments of the channel-fill alluvium. The hydrologic characteristics of the alluvial aquifer are typical of alluvial fan deposits, exhibiting a wide range of permeabilities over relatively short distances.

The greatest concentrations of groundwater flow are expected to be found where the paleochannels cut into the clays of the underlying Muddy Creek Formation clay have been filled with coarser-grained sediments. The importance of these channel-fill deposits is that they control the occurrence and movement of groundwater in portions of the Las Vegas Valley. These channel-fill sediments are typically very permeable, and can transmit large quantities of groundwater in transient storage. The channel-fill deposits typically exhibit higher permeabilities than do those in the adjacent interfluvial areas (Kerr-McGee Chemical LLC, 1998).

The alluvium is a shallow aquifer, and is generally under water-table conditions. Groundwater flow through the shallow alluvial sediments is generally from south to north, ultimately discharging into the Las Vegas Wash (Kerr-McGee Chemical LLC, 1998).

DRILLING AND LOGGING OF THE PC-70 TEST BORING

Prior to construction of Test Well PC-70, a test boring was drilled at the site on September 8, 1998. The purpose of the boring was to determine the lithology of the alluvial sediments at the well site as a first step in designing the well. The sediments were sampled continuously from a depth of five feet to the total depth (52 feet) using split spoons. The samples provided a vertical section of the alluvium at the site. Representative samples of the alluvium from the intervals 20-25 feet, 30-35 feet, and 40-45 feet were selected for analysis. These samples were transmitted to Dames and Moore in Las Vegas for grain-size analyses.

Lithology of the Channel-Fill Alluvium at the Pittman Lateral Test Site

A lithologic log of Test Well PC-70 is included as Addendum A. Color photographs of selected intervals are included as Photographs 1 through 7 at the back of the report.

The Pittman Lateral Test Site extends east-west in a line perpendicular to the trend of a channel cut into the Muddy Creek Formation and filled with channel-fill alluvium. The alluvial sequence was found to consist of channel-fill sands and sand and gravel mixtures. No significant quantities of clay were found in the alluvial sediments. The top of the Muddy Creek Formation, which was encountered at a depth of about 49 feet, was found to consist of a gravelly clay.

The upper part of the channel-fill alluvium underlying the Site to a depth of 15 feet consists of light-brown, silty fine sand with some gravel. In the interval 15 feet to 26 feet the alluvium consists of poorly sorted, reddish-brown, fine- to coarse-grained sand and small gravel (see Photograph 1). The bottom two feet of this sequence is cemented and very hard. The sediments became damp at a depth of about 17 feet.

Below a depth of 26 feet, the channel-fill alluvium to the total depth consisted of an alternating sequence of light-brown, fine-grained sand and fine- to coarse-grained sand and gravel (see Photographs 2 and 3). The interlayering of the fine-grained sand and the sand and gravel appeared to be rather uniform in intervals of one to two feet.

Photographs 4 and 5 show the poorly sorted characteristic of the typical fine- to coarse-grained sand and gravel channel-fill alluvial sequence. As shown in Photograph 6, the interlayered sand and the sand and gravel sequences continued to the bottom of the alluvial sequence. Photograph 7 shows the auger bit thickly covered with the dense gravelly clay of the Muddy Creek Formation.

Grain Size Distribution in the Channel-Fill Alluvial Sequence

The PC-70 test boring sediment samples were analyzed for grain-size distribution by Dames and Moore (see Addendum B). Dames and Moore also prepared recommendations on well screen slot size and sand pack size based upon the results of the grain-size analyses.

The grain-size distributions for the three samples analyzed by Dames and Moore are summarized in Table 1 below and are plotted on Figure 1 presented at the back of the report. Review of these data show that, while the coarsest gravel clasts are found in the shallow interval 20 to 25 feet, the greatest accumulation of coarse material is found in the depth interval 30 to 35 feet.

CONSTRUCTION AND DEVELOPMENT OF TEST WELL PC-70

Test Well PC-70 was designed to both promote the efficient production of groundwater for aquifer testing purposes. Results of the aquifer test shows that the design was successful in meeting that criterion.

Test Well PC-70 was constructed on September 12, 1998, by Compliance Drilling Company of Las Vegas, Nevada. A well completion diagram is included in Addendum C. All phases of well design, construction, and development were directly supervised by S. R. Lower of Kerr-McGee's Safety and Environmental Affairs Division.

TABLE 1
GRAIN-SIZE DISTRIBUTION IN THE ALLUVIAL SEQUENCE
PITTMAN LATERAL TEST WELL PC-70
HENDERSON, NEVADA

Samples Collection Date: September 8, 1998

Grain size (inches)	USGS Classification	Cumulative Percent Retained		
		Depth Interval 20-25 feet	Depth Interval 30-35 feet	Depth Interval 40-45 feet
0.003	Very Fine Sand	89.4	94.4	95.3 12
0.006	Fine Sand	77.9	88.2	83.8 18
0.010	Medium Sand	61.3	77.4	66.0 21
0.017	Medium Sand	42.9	64.4	44.8 21
0.034	Coarse Sand	26.0	49.4	23.5 22
0.080	Gravel	11.8	23.2	1.9
0.190	Gravel	5.8	7.4	0.3
0.375	Gravel	1.7	1.9	0.0
0.750	Gravel	0.8	0.0	0.0

>0.750

Compliance Drilling used a Mobile B-59 drilling rig to drill and complete the well using hollow-stem auger technologies. The well borehole was drilled to a total depth of 50.5 feet below grade using an 8-inch (ID) hollow stem auger with an outside diameter of 12 inches. The top of the Muddy Creek Formation was found at a depth of 49 feet below grade.

Based upon the recommendations presented in the attached Dames and Moore report, the well design called for completion using 6-inch (ID) PVC well screen with a slot opening size of 0.020-inch. To promote well efficiency, the well was completed with Bort-Longyear "Circumslot" continuous-wrap PVC screen. The use of continuous-wrap PVC screen provides 34 square inches (24%) of open area per square foot of 6-inch casing as compared to 13 square inches (9%) of open area per square foot in conventional slotted casing. Close-up views of the continuous-wrap PVC screen are shown in Photographs 8 and 9.

Test Well PC-70 was completed to a depth of 50.5 feet below grade using 6-inch (ID), Schedule 40 PVC screw-coupled blank casing and screen. The casing string consisted of 18 feet of blank casing set in the interval 0.5 foot below grade to 18.5 feet. A total of 30 feet of the Bort-Longyear continuous-wrap PVC screen was set in the interval 18.5 feet to 48.5 feet below grade. A two-foot length of blank casing was set in the interval 48.5 feet to 50.5 feet to provide a sump to collect any fines that may be produced during well development and testing. Since the wellhead was completed below ground surface, the bottom of the casing string is at a depth of 50 feet below the top of the casing.

Following installation of the casing, the well annulus was filled with sand. The annulus between the casing and the borehole was packed with washed and sized 8-12 filter pack material from a depth of 50.5 feet to 15 feet below grade. The remainder of the annular pack and seal were not completed until after initial development had been completed.

The initial development of Test Well PC-70 was performed using a surge block. A picture of the surge block used is shown in Photograph 10.

The surge block method of well development was chosen because of its effectiveness in eliminating damage to the borehole wall that may have been caused by drilling, thus opening the formation to the well. In addition, surge-block development stabilizes the sand in the filter pack, removing any small sand bridges in the process. On the down stroke of surge-block development, water is forced through the well screen and into the annulus, agitating the sand pack. On the up stroke, water is pulled from the formation, through the sand pack and into the well casing. This forces the agitated sand to settle and pack tightly in the annulus as it is designed to do.

During the first period of the surge-block development of Test Well PC-70, the top of the sand pack dropped from 15 feet to 20.3 feet as the sand grains packed tightly in the annulus. After the sand was brought back up to 16 feet, more surge-block development was done. The sand level dropped 1 foot, to 17 feet, during the second period of surge-block development.

Following the completion of surge-block development, the sand level was brought up to 15.5 feet. An annular seal consisting of bentonite pellets was placed in the interval 11 feet to 15.5 feet below grade and hydrated in place with clean water. in place. The remainder of the annulus to a depth of about one foot below grade was filled with a cement/bentonite grout.

Further development of Test Well PC-70 was performed on September 14. This development work consisted of pump surging to stimulate the formation.

TEST OF PITTMAN LATERAL WELL PC-70

During the period September 14 through 17, 1998, a test of the channel-fill alluvial aquifer was performed at the Pittman Lateral Test Site. The objective of the test was to determine the hydraulic characteristics (transmissivity, permeability, storage coefficient) of the alluvial sediments that overlies the Muddy Creek Formation at the Test Site.

This aquifer test consisted of a 48-hour constant discharge pumping test of Test Well PC-70 followed by a 21-hour period of recovery. Water-level measurements were taken during the test in PC-70 and in three existing monitor wells. The test was performed by S. R. Lower of Kerr-McGee's Safety and Environmental Affairs Division, with the assistance of Tracy Williams, also with the Kerr-McGee Safety and Environmental Affairs Division, and Mark Porterfield and Shimi Mathew of the Kerr-McGee Henderson Facility.

Descriptions of the Test and Observation Wells

A total of four wells, a pumping well (Test Well PC-70) and three observation wells, were used in this aquifer test. All four wells are location along an east-west line that runs perpendicular to the trend of the alluvial channel cut into the Muddy Creek Formation. Observation Well PC-17 is located about 30 feet east of Test Well PC-70. Observation Well PC-18 is located about 60 feet west of the test well, and Observation Well PC-55 about 160 feet to the west. Lithologic logs for all of the wells are included in Addendum A. Well completion diagrams are included in Addendum C.

As described above, Test Well PC-70 is completed in the channel-fill alluvial aquifer in the interval 15.5 feet to 50.5 feet below grade. Observation Well PC-55, located 160 feet west of Test Well PC-70, is completed in the interval 11 feet to 54 feet below ground surface in channel-fill alluvium. It was constructed using 6-inch (ID) PVC blank and slotted casing set in a 12-inch borehole. A total of 40 feet of 6-inch (ID), 20-slot PVC slotted casing was run in the interval 14 feet to 54 feet below grade.

Observation wells PC-17 and PC-18 were similarly constructed in 8-inch boreholes. Observation well PC-17 is completed in the interval 8 feet to 51 feet, with a total of 40 feet of 2-inch (ID), 20-slot PVC slotted casing set in the interval 10 feet to 50 feet below grade. Observation well PC-18 is completed in the interval 9.5 feet to 52 feet, with a total of 40 feet of 2-inch (ID), 20-slot PVC slotted casing set in the interval 11.5 feet to 51.5 feet below grade.

It should be noted that review of the lithologic log for Observation Well PC-55 (see Addendum A) shows that the lithology of the channel-fill alluvium at this location is substantially different than that at the locations of Test Well PC-70 and Observation Wells PC-17 and PC-18 located to the east. The well is completed through three separate alluvial intervals representing changes in deposition. The upper zone, which consists of sand, gravel, and cobbles, extends to a depth of 25 feet. A unit consisting of clayey sand with small gravel extends to a depth of 33 feet. This unit is underlain by a third zone consisting of silty sands and gravels to the total depth.

Descriptions of Water-Level Fluctuations in the Alluvium

Water levels were measured at the Pittman Lateral Test Site for several days prior to the start of the aquifer test. These data were compared to recent historical data to establish trends and to detect any unusual water-level fluctuations. What was found was a slowly rising water level in all wells. Adding to this trend was the pronounced impact on the water levels by a storm event, which occurred three days before the pump test.

Table 2 below shows the data resulting from the Pittman Lateral water-level measurements. Between April 8 and September 8, 1998, water levels in Observation Wells PC-17 and PC-18 rose 0.93 foot and 0.31 foot, respectively. Some of this change could be attributed to water-level stabilization following well completion. However, between June 4 and September 8, water levels in Observation Wells PC-18 and PC-55 rose 0.16 foot and 0.20 foot, respectively. These latter data clearly show the effect of a wetter-than-normal summer on the alluvial aquifer at the Pittman Lateral Test Site. Between September 8 and 11, water levels in the three observation wells appear to have stabilized.

The pronounced effect of storm events on an alluvial water-table aquifer was demonstrated following a major precipitation event on the afternoon of September 11, 1998. This precipitation event, which was a flash-flood storm that dropped 0.83-inch of precipitation on the Henderson area in a matter of minutes, flooded major and local roads as well as the Pittman Lateral Test Site. Photographs of the test site showing

TABLE 2
PITTMAN LATERAL WATER LEVELS
Pittman Lateral Test Site
Henderson, Nevada
April through October 1998

Date	Time	PC-17		PC-18		Remarks
		Static Water Level (ft BTOC)	Rate of Rise (ft/hour)	Static Water Level (ft BTOC)	Rate of Rise (ft/hour)	
4/8/98		19.20		19.90		Well Completion Water Levels
6/4/98				19.75		June '98 Test Data
8/25/98		18.36				
9/8/98		18.27		19.59		
9/11/98	1645	18.27		19.58		2 hours after 0.83" ppt storm
9/12/98	0600	18.21	0.004	19.53	0.004	
9/12/98	1800	18.19	0.002	19.50	0.003	
9/13/98	0800	18.15	0.003	19.47	0.002	
9/13/98	1700	18.13	0.002	19.45	0.002	
9/14/98	1100	18.11	0.001	19.42	0.002	Pre-Test Static Water Levels
10/1/98	1200	17.92	0.0005	19.27	0.0004	

TABLE 2 (continued)
PITTMAN LATERAL WATER LEVELS
Pittman Lateral Test Site
Henderson, Nevada
April through October 1998

Date	Time	PC-55		PC-70		Remarks
		Static Water Level (ft BTOC)	Rate of Rise (ft/hour)	Static Water Level (ft BTOC)	Rate of Rise (ft/hour)	
4/8/98						Well Completion Water Levels
6/4/98		18.25				June '98 Test Data
8/25/98		18.15				
9/8/98		18.05				
9/11/98	1645	18.05				2 hours after 0.83" ppt storm
9/12/98	0600	17.98	0.005			
9/12/98	1800	17.96	0.002	18.80		
9/13/98	0800	17.91	0.004	18.77	0.002	
9/13/98	1700	17.90	0.001	18.75	0.002	
9/14/98	1100	17.87	0.002	18.73	0.001	Pre-Test Static Water Levels
10/1/98	1200	17.74	0.0003	18.57	0.0004	

flood waters in a channeled tributary to the Las Vegas Wash that parallels the test site were taken once access to the area was possible following the storm. By that time, the flood level had dropped some, permitting limited access to the site. These pictures are included as Photographs 11, 12, and 13.

Review of the water levels shown on Table 2 shows the impact of this storm event. Water-level measurements taken two hours after the storm had ended showed no effect from the floodwaters. During the three days following the September 11 storm and prior to the start of the test on September 14, water levels at the Pittman Lateral Test Site were rising at a rate ranging up to 0.005 foot per hour. The rate of water-level rise decreased to about 0.001 to 0.002 foot per hour, which amounts to 0.024 to 0.048 foot per day.

The effect of the storm on water levels had a noticeable effect on the results of the aquifer test. Water-level data collected during the recovery part of the test clearly showed the arrival of a recharge front through the alluvial sediments.

Description of the Pittman Lateral Aquifer Test

The Pittman Lateral aquifer testing program consisted of a 48-hour constant discharge pumping test of Test Well PC-70 followed by a 21-hour period of recovery. Drawdown and recovery water-level data were collected in the pumping well, Test Well PC-70, and the three observation wells PC-17, PC-18, and PC-55. The test was conducted using a 1 horsepower submersible pump powered by a trailer-mounted, diesel-powered 480 volt generator providing 220 volts at 50 amps to the pump. The intake of the pump was set at a depth of about 45 feet below grade.

Water was delivered to the surface through 2-inch (ID) PVC pipe. Adjustments in the flow rate were made using a ball valve (see Photograph 14). The flow rate was measured using an in-line totallizing flow meter with a 10 gallon per minute (gpm) sweep (see Photographs 14 and 15). The flow rate was periodically confirmed using a two-gallon calibrated bucket and stopwatch. Water levels were monitored during the test using electric lines.

Groundwater was discharged from the well to a two-inch diameter plastic hose. Due to a concern with gravity drainage through the obviously porous alluvium, and thus the possibility of recycling locally-discharged groundwater back to the aquifer, the groundwater was discharged far from the wellhead. As shown on Photograph 16, the blue-colored discharge hose was run 350 feet east from the wellhead to the concrete-lined portion of the channeled, east-flowing Las Vegas Wash tributary that runs parallel to the Test Site.

Description of the Calibration Test - Following installation of the pump on the morning of September 14, and after pump surge development had been completed, the pump was run at a constant rate to determine a rate the well could sustain for a 48-hour period. With the ball valve fully open, the pump produced 50 gallons per minute (gpm) with less than three feet of drawdown. The valve was closed slightly until the flow meter read a constant pumping rate of 45gpm. The 48-hour pumping test of well PC-70 was thus performed at a constant rate of 45 gallons per minute.

Description of the Test - The constant discharge pumping portion of the PC-70 aquifer test was conducted for a total of 48 hours commencing at 1500 hours (3pm) on September 14, 1998. The pumping rate was maintained at a constant 45 gallons per minute. The discharged groundwater was clear (see Photograph 17).

As shown on Figure 2, drawdown was established in all three of the observation wells soon after pumping started. Review of Figure 2 shows that the shape of the drawdown cone remained the same throughout the length of the 48-hour pumping test, the only change being the increasing drawdown as more water was removed from the aquifer. A total of nearly 130,000 gallons of groundwater were pumped from the aquifer during the 48-hour pumping test.

The recovery portion of the PC-70 aquifer test commenced with the termination of pumping at 1500 hours (3pm) on September 16, 1998. After an initial rapid rise in water level, recovery was slow during the 21-hour recovery test. A notable increase in the rate of recovery near the end of the test showed the possible arrival of the recharge front resulting from the September 11 storm event.

Tabulations and graphs of drawdown and recovery data for Test Well PC-70 are included in Addendum D. From a starting water level of 18.73 feet, drawdown was 2.36

feet to a pumping level of 21.09 feet. The specific capacity in Test Well PC-70 was 19 gallon per minute per foot of drawdown at the end of the 48-hour pumping test.

Tabulations and graphs of drawdown and recovery data for Observation Well PC-17 are included in Addendum E. From a starting water level of 18.1 feet, drawdown was 0.63 feet to a depth of 18.73 feet.

Tabulations and graphs of drawdown and recovery data for Observation Well PC-18 are included in Addendum F. From a starting water level of 19.42 feet, drawdown was 0.42 feet to a depth of 19.84 feet.

Tabulations and graphs of drawdown and recovery data for Observation Well PC-55 are included in Addendum G. From a starting water level of 17.87 feet, drawdown was 0.36 feet to a depth of 18.23 feet.

ANALYSES OF PC-70 AQUIFER TEST DATA

Data gathered during the constant discharge pumping and recovery tests of Test Well PC-70 were analyzed using the Theis log-log type curve matching, the Boulton log-log delayed drainage curve matching, and the Jacobs semi-log straight line methodologies (Davis and DeWiest, 1966; Johnson UOP, 1975; Lohman, 1972). Analyses of the test data are provided in Addendums D, E, F, G, and H. Analytical results are summarized in Table 3 below.

TABLE 3
COMPILATION OF HENDERSON PC-70 TEST DATA
Date of Test: September 14-17, 1998

Well No.	Test Phase	Analysis	Transmissivity (gpd/ft)	Permeability (gpd/ft2)	Hydraulic Conductivity (ft/day)	Storage Coefficient
PC-70 Saturated Interval = 32 ft	Drawdown	Jacobs (Semi-Log) Time vs Drawdown	49500	1547	207	
	Recovery	Jacobs (Semi-Log) t/t' vs Drawdown	69882	2184	292	
PC-17 Saturated Interval = 33 ft	Drawdown	Jacobs (Semi-Log) Time vs Drawdown	49500	1500	201	0.08
	Drawdown	Theis (Log-Log) Type Curve Match	56048	1698	227	0.03
	Drawdown	Boulton (Log-Log) Delayed Drainage	46877	1421	190	0.04
	Recovery	Jacobs (Semi-Log) t/t' vs Residual Drawdown	79200	2400	321	
PC-18 Saturated Interval = 33 ft	Drawdown	Jacobs (Semi-Log) Time vs Drawdown	40966	1241	166	0.03
	Drawdown	Theis (Log-Log) Type Curve Match	54282	1645	220	0.08
	Drawdown	Boulton (Log-Log) Delayed Drainage	53714	1628	218	0.09
	Recovery	Jacobs (Semi-Log) t/t' vs Residual Drawdown	108000	3273	438	
PC-55 Saturated Interval = 37 ft	Drawdown	Jacobs (Semi-Log) Time vs Drawdown	66000	1748	239	0.11
	Drawdown	Theis (Log-Log) Type Curve Match	46877	1267	169	0.03
	Drawdown	Boulton (Log-Log) Delayed Drainage	39666	1072	143	0.04
	Recovery	Jacobs (Semi-Log) t/t' vs Residual Drawdown	132000	3568	477	
Distance-Drawdown Graphs for Test Average Saturated Interval = 34 ft	Drawdown	Distance-Drawdown at 100 minutes	51652	1519	203	0.04
	Drawdown	Distance-Drawdown at 720 minutes	49500	1456	195	0.08
	Drawdown	Distance-Drawdown at 1440 minutes	48490	1426	191	0.10
	Drawdown	Distance-Drawdown at 2160 minutes	51652	1519	203	0.08
	Drawdown	Distance-Drawdown at 2880 minutes	51652	1519	203	0.06

The effects of casing storage during the early part of the test were taken into account during the analyses of these test data. Given the approximately 50 gallons of water residing in the 6-inch (ID) casing and screen in Test Well PC-70, at a pumping rate of 45 gallons per minute the effects of casing storage would be eliminated in less than two minutes. After that time, casing storage became negligible.

Calculations of Aquifer Coefficients

As noted above, data gathered during the constant discharge pumping and recovery tests of Test Well PC-70 were analyzed using the Theis type curve, the Boulton delayed drainage, and the Jacobs methodologies. These methodologies were used to calculate the transmissivity and storage coefficient of the channel-fill alluvial aquifer at the respective well sites. From the transmissivity data permeabilities and hydraulic conductivities of the alluvial aquifer were calculated. It should be noted that, for permeability calculations, Test Well PC-70 and the three observation wells all fully penetrated the entire saturated thickness of the channel-fill alluvium.

Calculations of aquifer coefficients for Test Well PC-70 and Observation Wells PC-17, PC-18, and PC-55 are presented on their respective data plots and on separate tabulations presented in Addendums D, E, F, and G, respectively. The data set for Test Well PC-70 includes tabulations of drawdown and recovery data, an arithmetic plot of drawdown and recovery data, a Jacobs (semi-log) plot of time versus drawdown data, and a Jacobs (semi-log) plot of t/t' (recovery) versus drawdown data. The respective data sets for the three observation wells include tabulations of drawdown and recovery data, an arithmetic plot of drawdown and recovery data, a Jacobs (semi-log) plot of time versus drawdown data, a Theis (log-log) type curve match plot, a Boulton (log-log) delayed drainage type curve match plot, and a Jacobs (semi-log) plot of t/t' (recovery) versus drawdown data.

Jacobs Modified Semi-Log Straight-Line Analyses of Drawdown Data - As shown in Table 3 above, transmissivities calculated from the Jacobs (semi-log) straight-line analyses of the time versus drawdown data for Test Well PC-70 and the three observation wells range from 40,966 gallons per day per foot (gpd/ft) to 66,000 gpd/ft, averaging 51,492 gpd/ft. Corresponding permeabilities range from 1,241 gallons per day per square foot (gpd/ft^2) to 1,547 gpd/ft^2, averaging 1,509 gpd/ft^2. Storage coefficients range from 0.03 to 0.11, averaging 0.07.

Theis Log-Log Type Curve Match Analyses of Drawdown Data - Review of the log-log plots of time versus drawdown data for Observation Wells PC-17 and PC-18 show very good matches with the Theis Type Curve (Lohman Plate 9, 1972) after about the first 100 minutes of the pumping test. The log-log plot of time versus drawdown data for Observation Well PC-55 shows a very good match with the Theis Type Curve after about the first 300 minutes of the pumping test.

As shown in Table 3 above, transmissivities calculated from the Theis (log-log) curve-matching analyses of the time versus drawdown data for the three observation wells range from 46,877 gpd/ft to 56,048 gpd/ft, averaging 52,402 gpd/ft. Corresponding permeabilities range from 1,267 gpd/ft^2 to 1,698 gpd/ft^2, averaging 1,537 gpd/ft^2. Storage coefficients range from 0.03 to 0.08, averaging 0.05.

Boulton Log-Log Delayed Drainage Curve Match Analyses of Drawdown Data - Review of the log-log plots of time versus drawdown data for the three observation wells show good matches with diversions of the early-time data plots from the Theis Type Curve (Lohman Plate 8, 1972) due to the effects of delayed drainage from storage in the unconfined alluvial aquifer. As shown in Table 3 above, transmissivities calculated from the Boulton delayed drainage curve-matching analyses of the time versus drawdown data for the three observation wells range from 39,666 gpd/ft to 53,714 gpd/ft, averaging 46,752 gpd/ft. Corresponding permeabilities range from 1,072 gpd/ft^2 to 1,628 gpd/ft^2, averaging 1,374 gpd/ft^2. Storage coefficients range from 0.04 to 0.09, averaging 0.06.

Jacobs Semi-Log Straight-Line Analyses of Recovery Data - Review of the semi-log plots of t/t' versus residual drawdown recovery data show the effects of both a limited aquifer and unusual recharge derived from the September 11, 1998 storm event. Initial straight-line trends of the t/t' versus residual drawdown plots do not go through the origin, indicating a limited aquifer. The slow recovery of the water levels in Test Well PC-70 and the three observation wells suggest some dewatering of the channel-fill alluvial aquifer.

The upward trend of the late t/t' versus residual drawdown data, however, show the effects of a recharge event. This is believed to reflect the arrival of the recharge front resulting from the flooding in the area during the September 11, 1998 storm event.

Transmissivities calculated from the Jacobs (semi-log) straight-line analyses of the t/t' versus residual drawdown recovery data for Test Well PC-70 and the three observation wells are shown in Table 3 above. However, due to the effects of storm event-related recharge, these data are not considered accurate and reliable and are not used in this report to represent the channel-fill alluvial aquifer.

Jacobs Semi-Log Straight-Line Analyses of Distance-Drawdown Data - While semi-log plots of time-distance data show the lowering of the water level at any time within the cone of depression, semi-log plots of distance-drawdown data show the shape and position of the cone of depression at any given time (Johnson UOP, 1975). These diagrams can be used to calculate transmissivity and storage coefficient.

Semi-log plots of distance-drawdown data were generated for time periods 100 minutes, 720 minutes (12 hours), 1,440 minutes (24 hours), 2,160 minutes (36 hours), and 2,880 minutes (48 hours) into the pumping test. As shown in Table 3 above, transmissivities calculated from these analyses are very consistent, ranging from 48,490 gpd/ft to 51,652 gpd/ft, averaging 50,598 gpd/ft. Corresponding permeabilities range from 1,398 gpd/ft^2 to 1,519 gpd/ft^2, averaging 1,488 gpd/ft^2. Storage coefficients range from 0.04 to 0.10, averaging 0.07. Calculations of aquifer coefficients for the five distance-drawdown analyses are presented on their respective data plots and tabulations presented in Addendum H.

Estimation of Test Well Efficiency from Distance-Drawdown Data

The efficiency of Test Well PC-70 can be estimated by comparing the theoretical drawdown calculated for the pumping well to the actual drawdown on a plot of distance-drawdown data (Johnson UOP, 1975). This is done by extending the straight distance-drawdown line to a point where it intercepts the radius of the pumping well on the horizontal scale.

The resulting projection of well efficiency is presented in Addendum I. Comparing a theoretical drawdown of 1.95 feet to the actual drawdown of 2.36 feet after 48 hours of pumping yields a projected well efficiency of 83%.

CONCLUSIONS

This investigation, which was centered around the construction and testing of Test Well PC-70, was performed to better quantify the hydrogeologic characteristics of the channel-fill alluvial aquifer at the Pittman Lateral. Since PC-70 was to be a groundwater production well rather than a monitor well, every effort was made in the design, construction, and development of the well to make it as efficient as possible. Review of the data resulting from the Pittman Lateral Aquifer Test suggests that the goal of an efficient well was met.

The channel-fill alluvium at the Pittman Lateral Test Site was found to consist of an alternating sequence of light-brown, fine-grained sand and fine- to coarse-grained sand and gravel. No significant quantities of clay were found in the alluvial sediments. The top of the Muddy Creek Formation, which was encountered at a depth of about 49 feet, was found to consist of a gravelly clay.

An aquifer test consisting of a 48-hour constant discharge pumping test followed by 21 hours of recovery was performed at the Pittman Lateral Test Site. The testing program included the pumping of Test Well PC-70 at a constant rate of 45 gallons per minute and the monitoring of water levels in it and three observation wells, PC-17, PC-18, and PC-55.

Drawdown and recovery data resulting from the aquifer test were analyzed using the Jacobs semi-log straight-line, the Theis log-log curve matching, the Boulton log-log delayed drainage curve matching, and the Jacobs semi-log distance-drawdown analysis methodologies. Comparison of aquifer coefficients resulting from the analyses of drawdown data from the show excellent consistency. Due to the effects of storm event-related recharge, recovery data are not considered accurate and reliable and were not used in this report to represent the channel-fill alluvial aquifer.

Based upon the results of the Pittman Lateral Aquifer Test, it can be concluded that the transmissivity of the channel-fill alluvium at the test site ranges from 39,666 gpd/ft to 66,000 gpd/ft, averaging 50,425 gpd/ft. Likewise, it can be concluded that corresponding permeabilities range from 1,072 gpd/ft^2 to 1,698 gpd/ft^2, averaging 1,393 gpd/ft^2. These values are consistent with sand and gravels containing fine sands and silts.

Storage coefficients were found to range from 0.03 to 0.11, averaging 0.06, which is consistent with an unconfined aquifer under water-table conditions. A storage coefficient of 0.06 in an unconfined aquifer translates to a specific yield of 6%.

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Johnson, UOP, 1975, Ground Water and Wells: Johnson Division UOP, Inc., 440p.

Kerr-McGee Chemical LLC, 1998, Phase II Groundwater Perchlorate Investigation Report:: Document, 21 pages.

Lohman, S. W., 1972, Ground-Water Hydraulics: U.S. Geological Survey Professional Paper 708, 70p.

FIGURES

FIGURE 1
GRAIN-SIZE GRADATION CURVES FOR TEST BORING SEDIMENT SAMPLES
PITTMAN LATERAL TEST WELL PC-70
Date Samples Collected: September 8, 1998

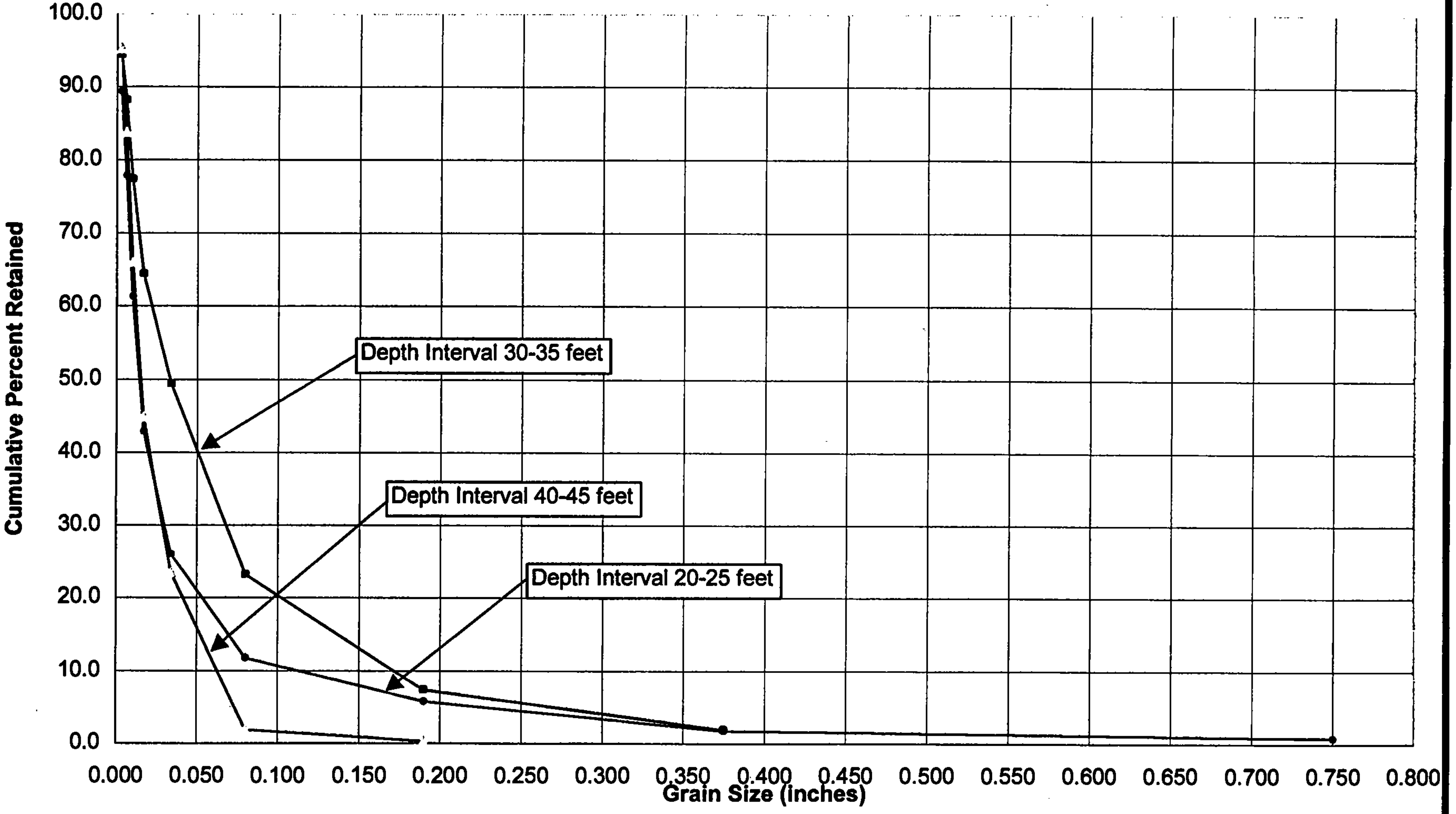
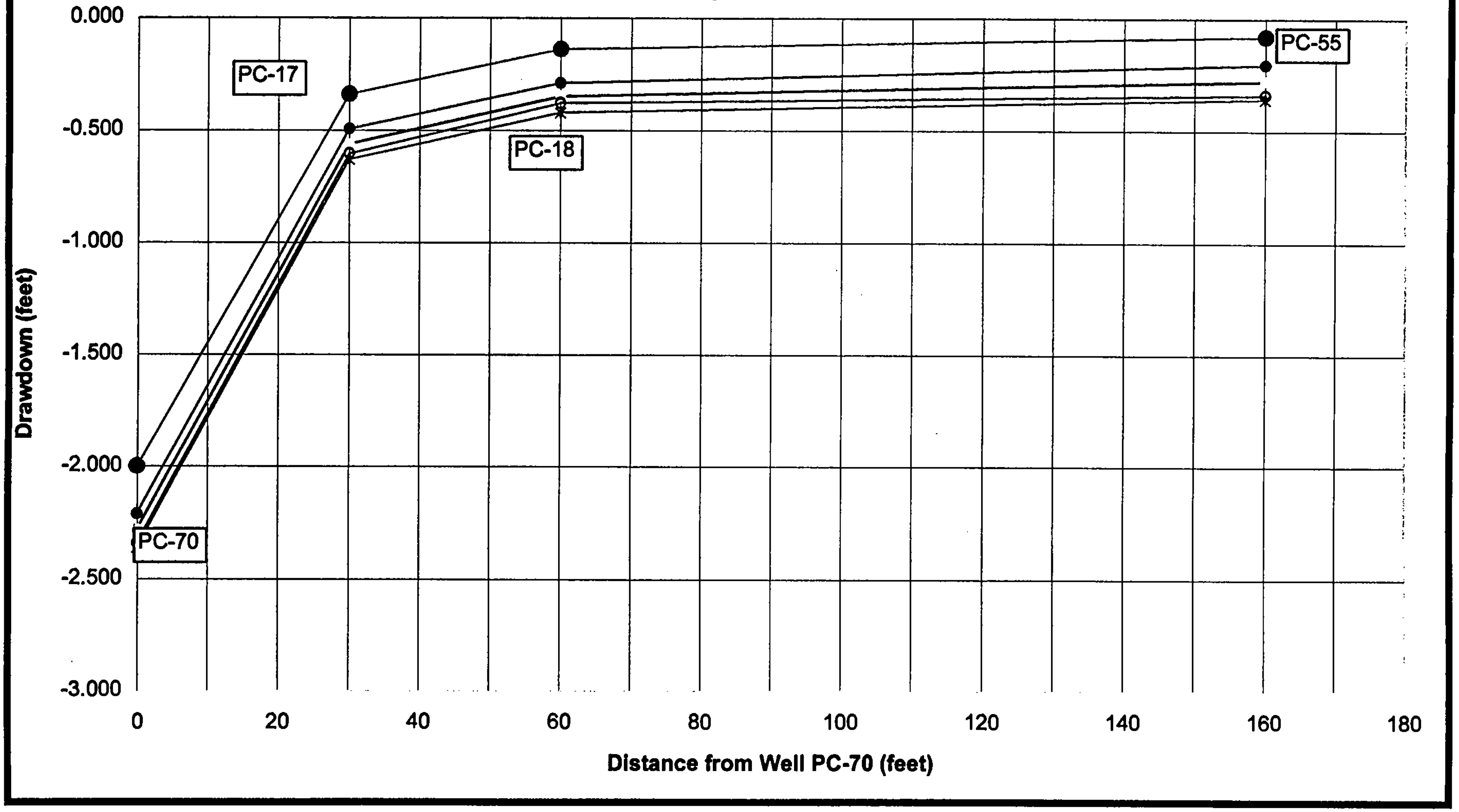


FIGURE 2
GROWTH OF THE DRAWDOWN CONE
AT 100, 720, 1440, 2160, AND 2880 MINUTES
CONSTANT DISCHARGE TEST OF PITTMAN LATERAL TEST WELL PC-70
Date of Test: September 14-17, 1998



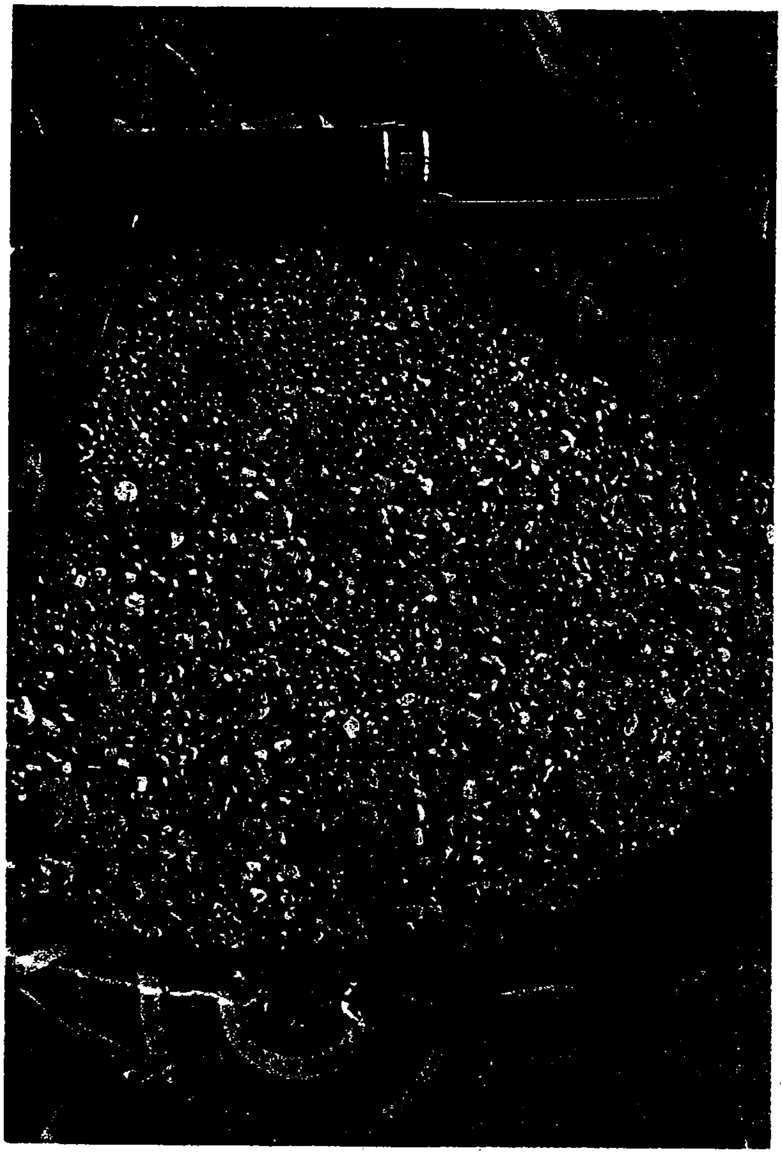
PHOTOGRAPHS

PHOTOGRAPH 1: Tan to light-brown, poorly sorted, fine-to-coarse grained sand with small gravel clasts in the depth interval 21-22 feet. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98

PHOTOGRAPH 2: Alternating sequence of light-brown fine sand and poorly sorted gravel in the depth interval 28.5-30.5 feet. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98

PHOTOGRAPH 3: Alternating sequence of light-brown fine sand and poorly sorted gravel in the depth interval 35-36.5 feet. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98

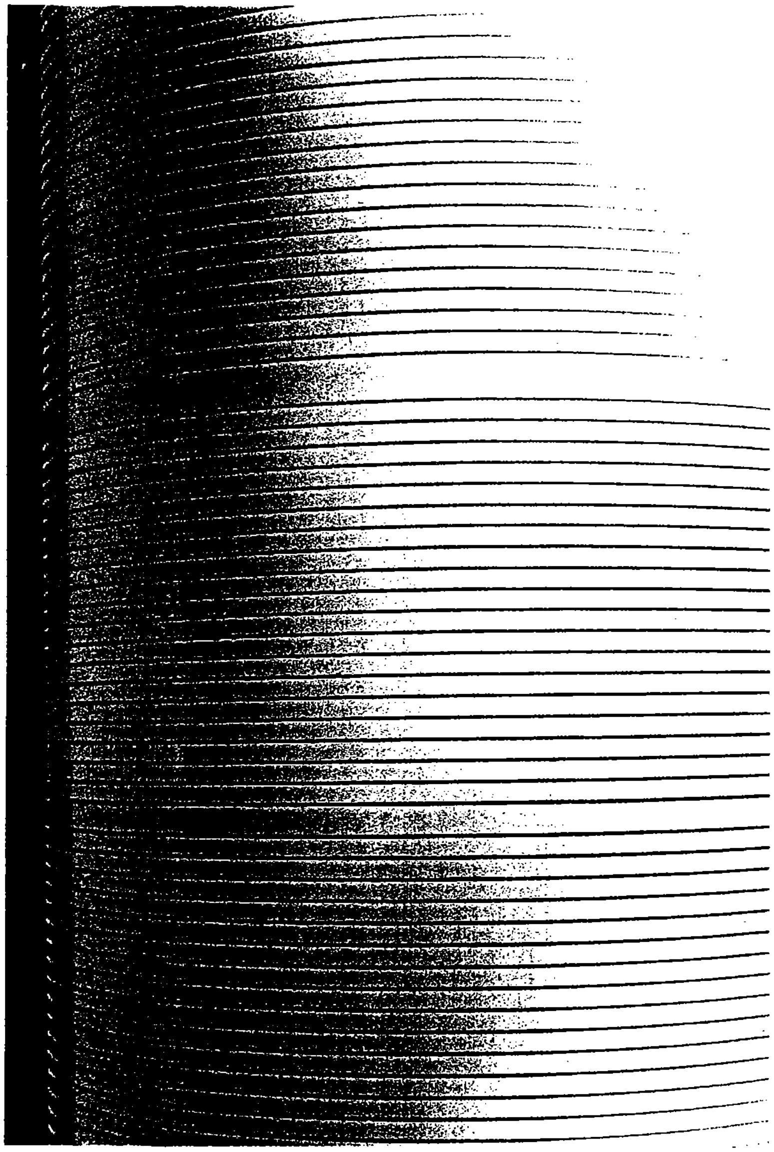
PHOTOGRAPH 4: Close-up view of a portion of core showing the poorly sorted sand and gravel in the depth interval 35-36.5 feet. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98



PHOTOGRAPH 5: Close-up of disaggregated gravel sample from the 35-36.5 foot interval showing poorly sorted grain-size distribution. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98

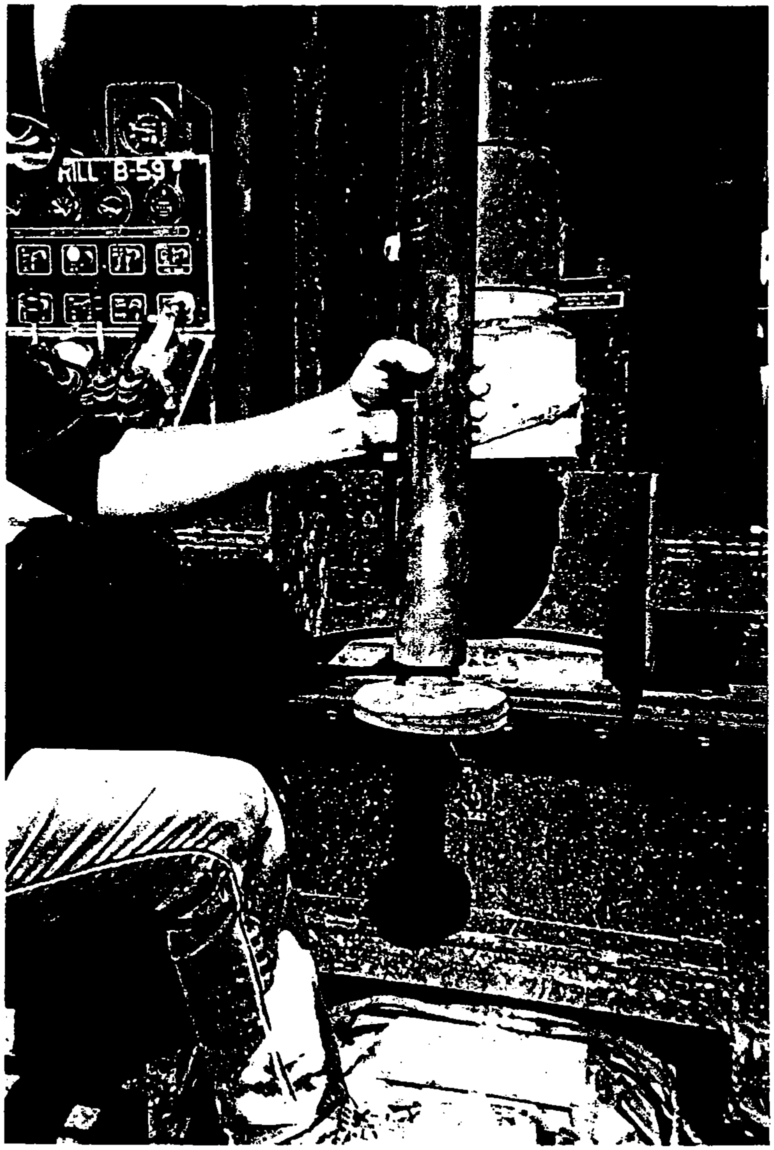
PHOTOGRAPH 6: Alternating sequence of fine-to coarse-grained sand and poorly sorted gravel in the depth interval 40-42 feet. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98

PHOTOGRAPH 7: Close-up view of the uppermost gravelly clay of the Muddy Creek in the interval 50-51 feet. Test Well PC-70 exploratory borehole, Pittman Lateral, Henderson, Nevada; 9/8/98

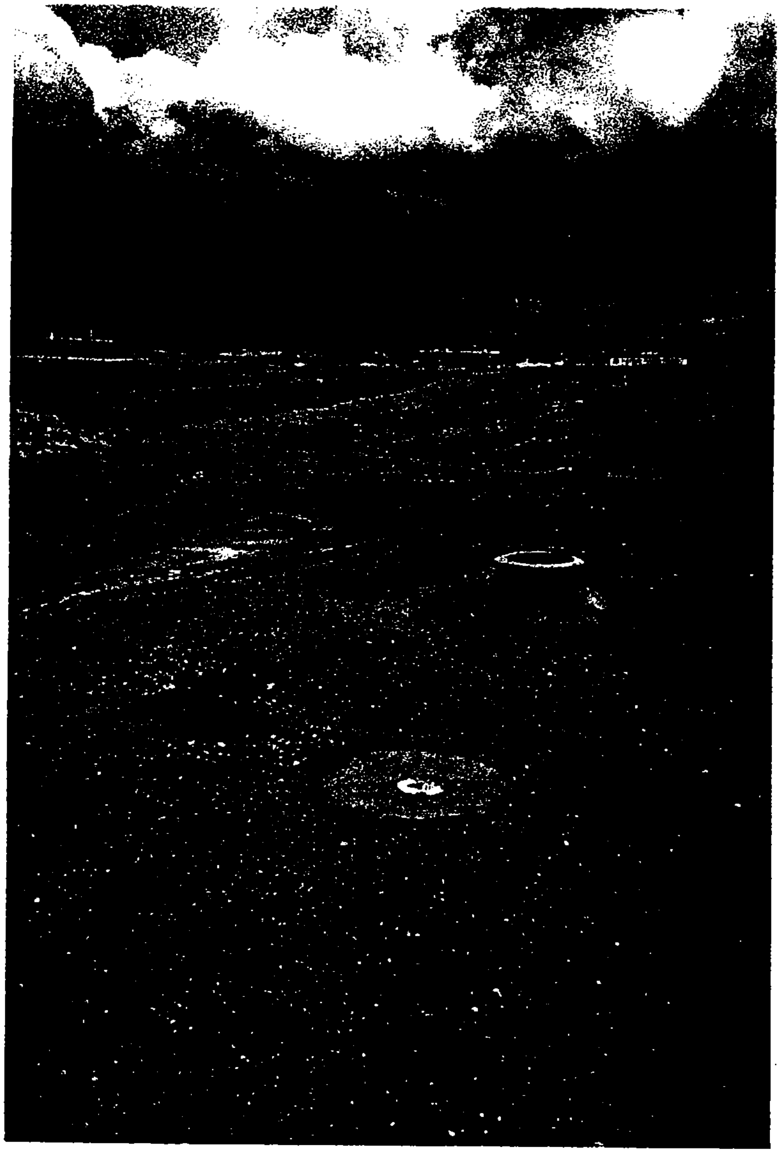


PHOTOGRAPH 8: Close-up view of the 20-slot, Bort-Longyear "Circumslot" continuous-wrap PVC screen used in the construction of Test Well PC-70.. Pittman Lateral, Henderson, Nevada; 9/12/98.

PHOTOGRAPH 9: Close-up inside view of the 20-slot, Bort-Longyear "Circumslot" PVC screen to show the internal ribbing that supports the single piece of PVC extrusion, which permits the continuous-wrap, circumferential slotting. Pittman Lateral, Henderson, Nevada; 9/12/98.

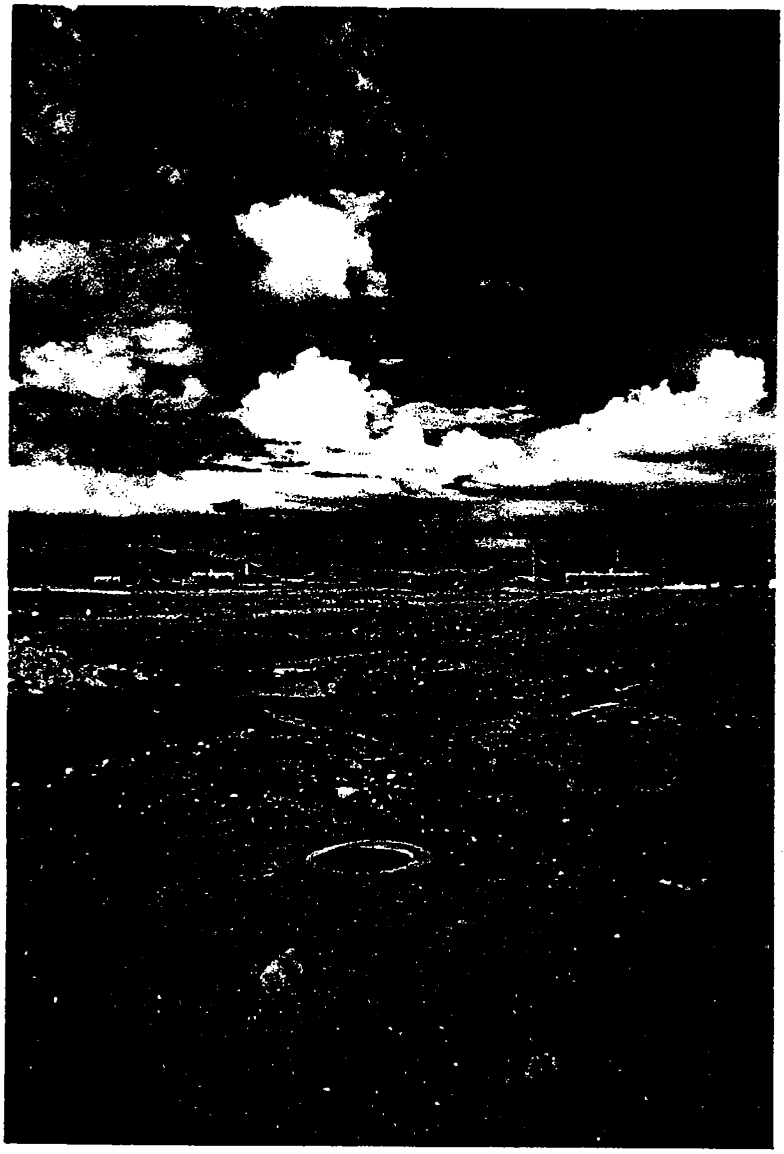


PHOTOGRAPH 10: View of the surge block used in the development of Test Well PC-70. Pittman Lateral, Henderson, Nevada; 9/12/98.



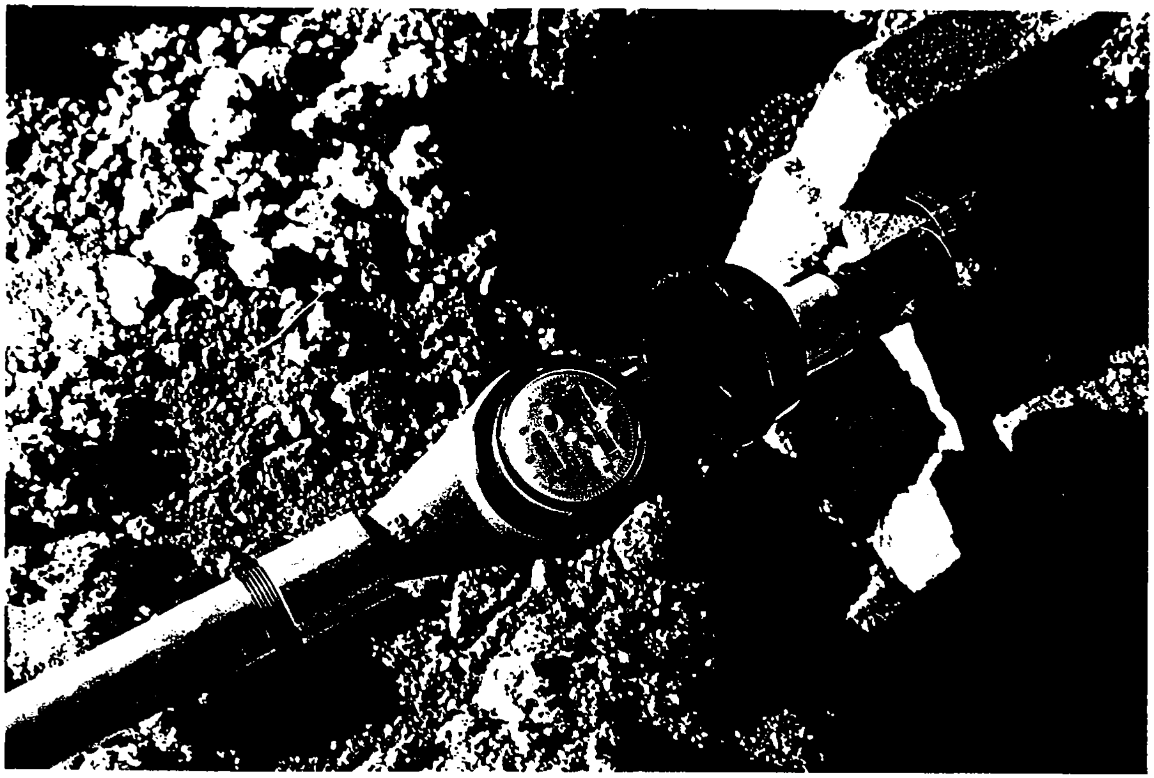
PHOTOGRAPH 11: View to the east at Pittman Lateral test site after the peak of the September 11, 1998 flash-flood event. Locations of Test Well PC-70 and Observation Wells PC-18 and PC-55 are shown. Pittman Lateral, Henderson, Nevada; 9/11/98.

PHOTOGRAPH 12: View to the west at Pittman Lateral test site after the peak of the September 11, 1998 flash-flood event. Location of Observation Well PC-55 is shown. Pittman Lateral, Henderson, Nevada; 9/11/98.



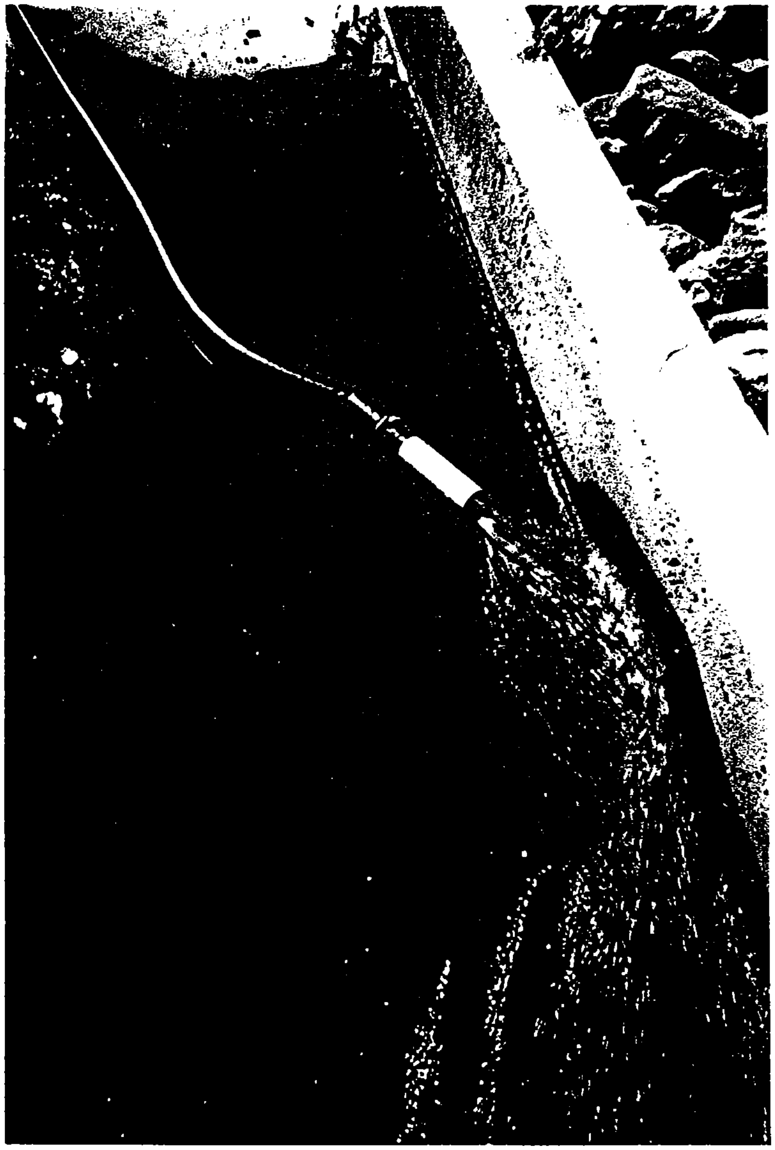
PHOTOGRAPH 13: View to the east at Pittman Lateral test site after the September 11, 1998 flash-flood event. Location of Observation Well PC-55 is shown. Pittman Lateral, Henderson, Nevada; 9/11/98.

PHOTOGRAPH 14: View of Test Well PC-70 well head showing ball valve, flow meter, and discharge line. Pittman Lateral, Henderson, Nevada; 9/14/98.



PHOTOGRAPH 15: Close-up view of 10 gallon per minute totallizing flow meter used to measure discharge from Test Well PC-70. Pittman Lateral, Henderson, Nevada; 9/15/98.

PHOTOGRAPH 16: View to the east showing the 350-foot run of the discharge line from the Test Well PC-70 well head to the concrete lined portion of the channel. Pittman Lateral, Henderson, Nevada; 9/15/98



PHOTOGRAPH 17: Close-up view of the Test Well PC-70 discharge of clean water to the concrete lined portion of the channel. Pittman Lateral, Henderson, Nevada; 9/15/98.

ADDENDUM A

Lithologic Logs for Test Well PC-70 and Observation Wells PC-17, PC-18, and PC-55

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC-LLC	LOCATION HENDERSON NV	BORING NUMBER PC-17

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	SILTY SAND RD BRN W/ GRAVEL LOOSE DRY	GM							
5									
10									
15									
	GRAVELY SAND RD BRN DRY to SLI MOIST SILTY	GM							GROUNDWATER SAMPLE COLLECTED AT 19'
	– – – – – – – – – –	▽							
20	GRAVELY SAND W/ CLAY GRAYISH BRN SLI COHESIVE	GC							
25									
30									POOR RETURNS BELOW ▽
35									

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▮ AUGER
▮ ROCK CORE
▪ THIN-WALLED TUBE
▮ CONTINUOUS SAMPLER
◪ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▨ SILTY CLAY
▥ CLAYEY SILT
▩ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▩ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 4/1/98	PAGE 1 of 2
DRILLING METHOD HSA	
DRILLED BY WEBER	
LOGGED BY J. CRAWFORD	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC-LLC	HENDERSON NV	PC-17

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE				REMARKS OR FIELD OBSERVATIONS
						NO.	TYPE	DEPTH	REC.	
	SAND/GRAVEL	⁙					■			
45		⁙					■			
50	SILTY CLAY V. LIGHT GRAY TO GRAYISH WHITE V. SOFT SATURATED	▨	CL				■			T/ MUDDY CREEK 48'
	BCMG GRAYISH GREEN SLI MOIST FIRM	▨					■			TD 55
55							☒			

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▯ AUGER

▯ ROCK CORE

■ THIN-WALLED TUBE

▯ CONTINUOUS SAMPLER

⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▩ DEBRIS FILL
▥ SILT	≈ HIGHLY ORGANIC (PEAT)
▦ SAND	▨ SANDY CLAY
⁙ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 4/1/98	PAGE 2 of 2
DRILLING METHOD HSA	
DRILLED BY WEBER	
LOGGED BY J. CRAWFORD	
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC-LLC	LOCATION HENDERSON NV	BORING NUMBER PC-18

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	SILTY SAND RD BRN DRY WELL GRADED GRAVELS		SM							
5										
10										
15			GM							
20										COLLECT GROUNDWATER SAMPLE AT 22'
25	Sand/gravel brn very moist WELL graded									
	- - - - - - - - -		∇							
30										
	SAND/GRAVEL GRAYISH BROWN WELL GRADED SAT SILTY		GM							

EXPLANATION

▼ Water Table (24 Hour)
∇ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▐ AUGER
▐ ROCK CORE
■ THIN-WALLED TUBE
▐ CONTINUOUS SAMPLER
⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▨ SILTY CLAY
▨ CLAYEY SILT
▩ DEBRIS FILL
▤ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED: 4/2/98
PAGE: 1 of 2
DRILLING METHOD: HSA
DRILLED BY: WEBER
LOGGED BY: J. CRAWFORD
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY	LOCATION	BORING NUMBER
	KMC-LLC	HENDERSON NV	PC-18

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	Sand/Gravel BRW WELL GRADED	GM				☒			SPLIT SPOON AT 42'
55									POOR RETURNS
50	SAND BRN F-CRS gr sm 1/4" GRAVEL WELL GRADED SAT LOOSE SLI SILTY	SW				☒			T/MUDDY GREEK 52'
T/MC	SILTY CLAY RD BRN w/ sm FINE SAND + SMALL GRAVELS	CL				☒			
	SILTY CLAY GREENISH GRAY W/ TAN to BROWN VARIG. BLOCKY								DRILL TD 53'

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
AUGER
ROCK CORE
THIN-WALLED TUBE
CONTINUOUS SAMPLER
NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

CLAY
DEBRIS FILL
SILT
HIGHLY ORGANIC (PEAT)
SAND
SANDY CLAY
GRAVEL
CLAYEY SAND
SILTY CLAY
☐ ______
CLAYEY SILT
☐ ______

DATE DRILLED: 4/2/98
PAGE 2 of 2
DRILLING METHOD: HSA
DRILLED BY: WEBER
LOGGED BY: J. CRAWFORD
EXISTING GRADE ELEVATION (FT. AMSL):
LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC-LLC	LOCATION HENDERSON NV	BORING NUMBER PC-55

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
	SILTY SAND BRN - RD BRN w/ GRAVEL WELL GRADED DRY									Mobile B-61 12" HOLE
5										
10										
	INCREASE GRAVELS 13-17'									
15										
20	COBBLES 19-21'									
25	CLAYEY SAND w/ SM GRAVEL FIRM WET									DRILLS HARD 25-29'
30										
	SILTY SAND w/ GRAVEL BRN - DK BRN WELL GRADED WET									
35										
40										

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL

▮ THIN-WALLED TUBE

◧ AUGER

◧ CONTINUOUS SAMPLER

◫ ROCK CORE

⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY	▦ DEBRIS FILL
▥ SILT	☐ HIGHLY ORGANIC (PEAT)
▩ SAND	▨ SANDY CLAY
⁙ GRAVEL	▨ CLAYEY SAND
▨ SILTY CLAY	☐ ______
▥ CLAYEY SILT	☐ ______

DATE DRILLED 5/5/98

PAGE 1 of 2

DRILLING METHOD HSA

DRILLED BY WEBER

LOGGED BY J. CRAWFORD

EXISTING GRADE ELEVATION (FT. AMSL)

LOCATION OR GRID COORDINATES

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY KMC-LLC	LOCATION HENDERSON NV	BORING NUMBER PC-55

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	SOIL SAMPLE TYPE	SOIL SAMPLE DEPTH	SOIL SAMPLE REC.	REMARKS OR FIELD OBSERVATIONS
			SM/ GM				■			
45	SAND GRAY BRN w/ SMALL GRAVEL WELL GRADED						■			
50							■			
	-----? MUDDY CREEK?------						■			
55										POSSIBLE +/ MUDDY CREEK AT 52' BASED ON DRILL ACTION
	TD 55									UNABLE TO SAMPLE DUE TO BOTTOM PLATE IN BIT. EXAMINATION OF AUGER FLIGHTS INCONCLUSIVE FOR MUDDY CREEK

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
◧ AUGER
◫ ROCK CORE
■ THIN-WALLED TUBE
◧ CONTINUOUS SAMPLER
◪ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁙ GRAVEL
▧ SILTY CLAY
▤ CLAYEY SILT
▦ DEBRIS FILL
☰ HIGHLY ORGANIC (PEAT)
▧ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED	5/5/98
PAGE	2 of 2
DRILLING METHOD	HSA
DRILLED BY	WEBER
LOGGED BY	J. CRAWFORD
EXISTING GRADE ELEVATION (FT. AMSL)	
LOCATION OR GRID COORDINATES	

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY: Chemical	LOCATION: Henderson, NV	BORING NUMBER: PC-70

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
	Light brown silty fine sand with some gravel clasts No clay		SM							
5							☒	5-7	2'	Time 1005
							☒	7-8.5	1'	1010
							☒	8.5-10.5	2'	1020
10							☒	10.5-11.5	25	1025
							☒	11.5-13.5	2'	1035
							☒	13.5-14.5	1'	1040
15	poorly sorted fine-to-coarse sand and small gravel, wet @ 17 ft.		GM				☒	14.5-19	2.5	1045
							☒	17-18	1'	1105
							☒	18-19	1'	1110
20										No recovery
	20'-25 Grain size distribution 20% Gravel 69% SAND mgd 11% SILT + CLAY						☒	20-21	1'	1120 photo
							☒	21-22	1'	1125 photo
							☒	22-23	1'	1135
							☒	23-24'	1'	1140
25	Hard cemented sand and small gravel		SM							No recovery
	Alternating light brown fine sand and poorly sorted Fine-to-~~medium~~ coarse sand and small gravel, Hard cemented at 34-35' 30'-35' Grainsize 32% GRAVEL 62% SAND 6% SILT & CLAY		SM + GM				☒	25-27	2'	1150 photo
							☒	27-28.5	1.5	1200
30							☒	28.5-30.5	2'	1210 photo
							☒	30.5-32	1.5	1220
							☒	32-33.5	1.5	1225
35							☒	33.5-35	1.5	1230
							☒	35-36.5	1.5	1235 photo
							☒	36.5-38	1.5	1240
40							☒	38-40	0	1245 no recovery

EXPLANATION

▼ Water Table (24 Hour)

▽ Water Table (Time of Boring)

PID Photoionization Detection (ppm)

NO. Identifies Sample by Number

TYPE Sample Collection Method

☒ SPLIT-BARREL | ◨ AUGER | ◨ ROCK CORE

■ THIN-WALLED TUBE | ◨ CONTINUOUS SAMPLER | ⧄ NO RECOVERY

DEPTH Depth Top and Bottom of Sample

REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY | ▩ DEBRIS FILL

▥ SILT | ☐ HIGHLY ORGANIC (PEAT)

▦ SAND | ▨ SANDY CLAY

⁞ GRAVEL | ▨ CLAYEY SAND

▨ SILTY CLAY | ☐ ______

▥ CLAYEY SILT | ☐ ______

DATE DRILLED: 9-8-98

PAGE: 1 of 2

DRILLING METHOD: HSA / Split Spoon

DRILLED BY: Compliance Drilling

LOGGED BY: S.L. Lower

EXISTING GRADE ELEVATION (FT AMSL):

LOCATION OR GRID COORDINATES:

SOIL BORING LOG KM-5655-B

KERR-McGEE CORPORATION Hydrology Dept. - S&EA Division	KM SUBSIDIARY CHemical	LOCATION Henderson, NV	BORING NUMBER PC-70

DEPTH IN FEET	LITHOLOGIC DESCRIPTION	GRAPHIC LOG	UNIFIED SOIL FIELD CLASS.	BLOWS PER 6"	PID (ppm)	SOIL SAMPLE NO.	TYPE	DEPTH	REC.	REMARKS OR FIELD OBSERVATIONS
40	Alternating Light brown sand and poorly sorted fine- to coarse-grained sand and gravel 40'-45' 2% GRAVEL 93 % SAND mg > 5% SILT + CLAY	⁘	SM + GM				☒	40-42	1.5	1300
								42-43.5	1.5	1305
45								43.5-45.5	2.0	1315
								45.5-47	0.5	1320
								47-48.5	0.5	1340
								48.5-50	0.5	1400
50	Gray gravelly clay Muddy Creek Formation							50-52	1.5	1420
55										

EXPLANATION

▼ Water Table (24 Hour)
▽ Water Table (Time of Boring)
PID Photoionization Detection (ppm)
NO. Identifies Sample by Number
TYPE Sample Collection Method

☒ SPLIT-BARREL
▐ AUGER
▐ ROCK CORE
■ THIN-WALLED TUBE
▐ CONTINUOUS SAMPLER
⧅ NO RECOVERY

DEPTH Depth Top and Bottom of Sample
REC. Actual Length of Recovered Sample in Feet

GRAPHIC LOG LEGEND

▨ CLAY
▥ SILT
▩ SAND
⁘ GRAVEL
▧ SILTY CLAY
▦ CLAYEY SILT
▩ DEBRIS FILL
☐ HIGHLY ORGANIC (PEAT)
▨ SANDY CLAY
▨ CLAYEY SAND
☐ ______
☐ ______

DATE DRILLED 9-8-98
PAGE 2 of 2
DRILLING METHOD HSA w/Split Spoon
DRILLED BY Compliance Drilling
LOGGED BY S. Lower
EXISTING GRADE ELEVATION (FT. AMSL)
LOCATION OR GRID COORDINATES

ADDENDUM B

Dames and Moore Report on PC-70 Test Boring Grain-Size Analyses

RECEIVED

SEP 15 1998

HYDROLOGY

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

7115 Amigo Street, Suite 110
Las Vegas, Nevada 89119
702 837 1500 Tel
702 837 1600 Fax

September 10, 1998

Compliance Drilling Corporation
P.O. Box 94136
Las Vegas, NV 89193

Attention: Mr. Brian Johnson

Subject: **Soil Physical Testing and Well Design Assistance**
Proposed Monitoring Well,
Kerr-McGee Chemical Corporation, Henderson, Nevada

Dear Mr. Johnson:

Dames & Moore (D&M) is pleased to provide Compliance Drilling Corporation (Compliance) with this summary of our soil testing and well design recommendations for a proposed groundwater monitoring at Kerr-McGee Chemical Corporation (KMCC). It is our understanding that the proposed well will be 6-inch diameter PVC, have a total depth of about 60 feet below ground surface (bgs), and be screened from slightly above the water table (about 15 feet bgs) to the total depth of the boring. A pilot hole was first drilled in order to log the lithology and to collect soil samples for physical testing.

Four bulk soil samples and a soil boring log were delivered to the D&M Las Vegas office on September 8, 1998. The samples were collected from the intervals of 15-17, 20-25, 30-35, and 40-45 feet bgs. The samples were shipped overnight to D&M's Salt Lake City soils laboratory for grain size analysis. Results of the grain size tests (attached) indicate the soils consist primarily of well graded sands with minor amounts of gravel and fines.

Calculations to determine the optimum screen size and filter pack were performed on the lower three samples. The uppermost sample, 15-17 feet bgs, was not considered because those soils are above the water table according to the boring log. Grain size tests indicate the lower two samples from 30-35 and 40-45 feet bgs are nearly identical, while the sample from 20-25 feet bgs is slightly finer grained. Accordingly, the 20-25 foot sample was determined to be the guiding sample in the screen and filter pack selection.

Based on the grain size tests and calculations, we recommend a 0.020-inch screen size and a Monterey number 2/12 filter pack or equivalent. We further recommend using a "v"-shaped, continuous wire screen, which should allow for a more thorough development and enhance water yield from the well.

If you have any questions or require additional assistance, please do not hesitate to call.

Sincerely,
DAMES & MOORE

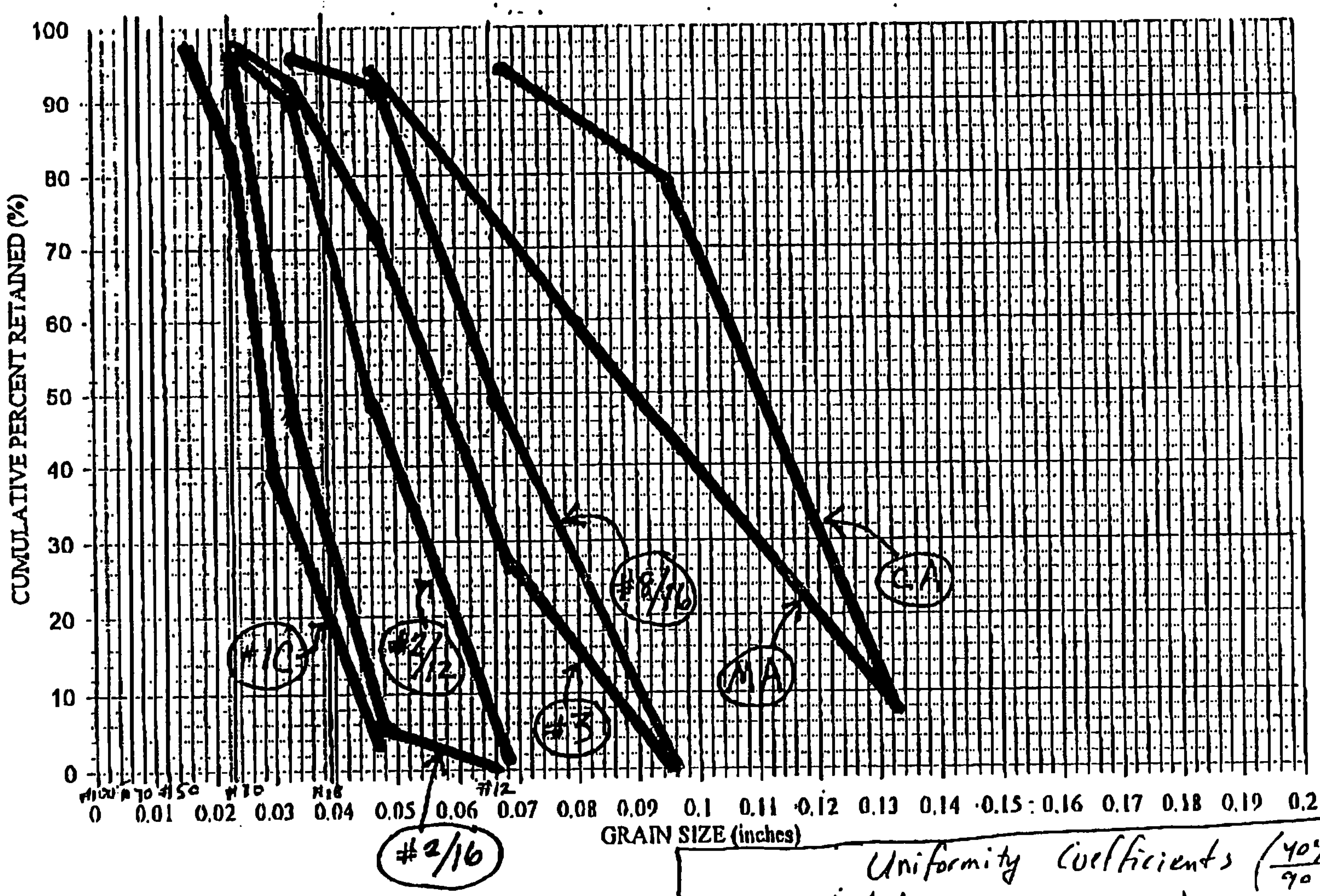
Mark H. Allen, R.G., C.E.M.
Project Geologist

Attachments: Grain Size Test Results with calculations

cc: Mr. Mark Porterfield, KMCC, via fax, (702) 651-2310
Mr. Steve Lower, KMCC, via fax, (405) 270-4244

C:\OFFICE\WPWIN\WPDOCS\LETTERS\KMCCWEL.LET September 10, 1998

Lone Star Sand Curves

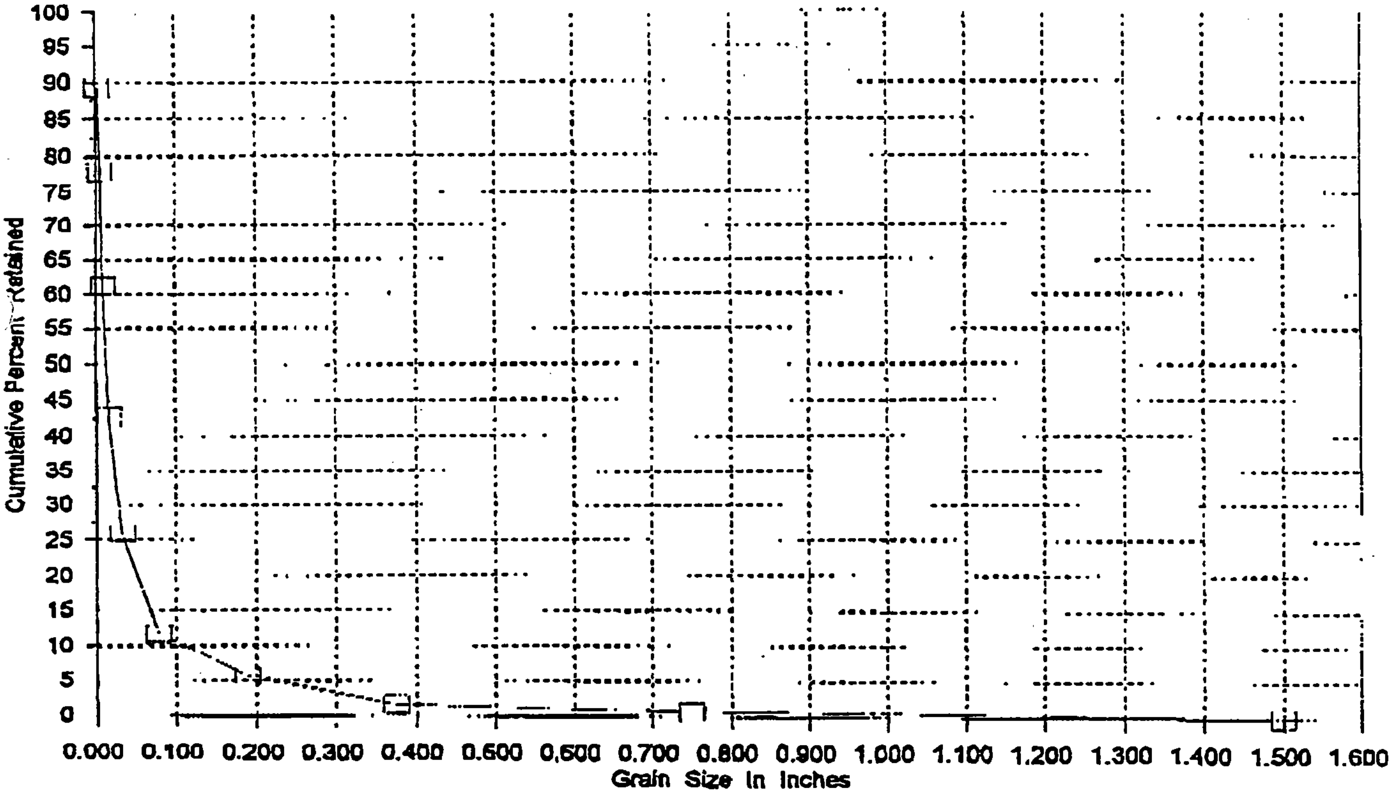


Uniformity Coefficients $\left(\frac{40\%}{90\%}\right)$

# 1C	1.6	# 8/16	1.5
# 2/16	1.5	MA	1.9
# 2/12	1.6	CA	1.5
# 3	1.8		

GRADATION CURVE

Sample KM 20-25



Kerr McGee Chemical
Henderson NV

Sample KM 20-25

Wt soil and dish	88.07
Dry soil & dish	83.39
Dish	43.51
-#4 Total for sieve	160.1

Moisture Content - -# 4 material 11.7

SIEVE ANALYSIS

as received	1458.5 g
Total sample dry	1305.32 g
Weight of sample split # 4	143.285 g

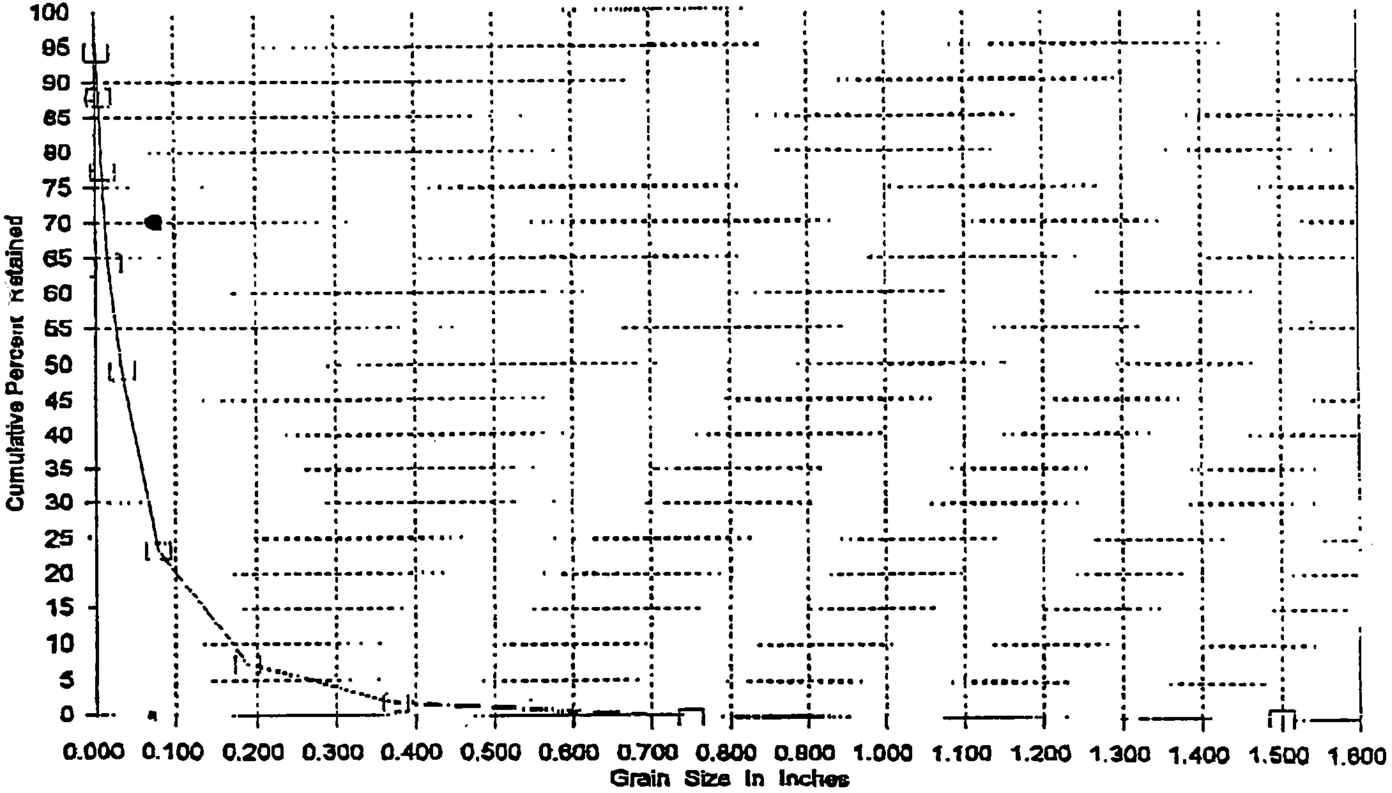
Sieve #	weight retained	finer	% retained	mm	inches
6.0 inch	0	*******	0.0	152	6
4.0 inch	0	*******	0.0	100	4
3.0 inch	0	*******	0.0	75.0	3
1.5 inch	0	*******	0.0	37.5	1.5
3/4 inch	10.35	99.21%	0.8	19.0	0.75
3/8 inch	22.24	98.30%	1.7	9.5	0.375
# 4	75.08	94.25%	5.8	4.8	0.1895
# 10	9.19	88.20%	11.8	2.0	0.07896
# 20	30.78	74.00%	26.0	0.85	0.03356
# 40	56.47	57.10%	42.9	0.43	0.01698
# 60	84.38	38.75%	61.3	0.25	0.00987
# 100	109.76	22.05%	77.9	0.15	0.00592
# 200	127.16	10.61%	89.4	0.075	0.00296

missing 10.6%

90% Ret	40% Ret	UC	70% Ret	Factor	70% x Factor	
0.003	0.016	5.3	0.005	7	0.035	
				8	0.04 ✓	#2/12
				9	0.045	0.02 slot

GRADATION CURVE

Sample KM 30-35



90% Ret	40% Ret	UC	70% Ret	Factor	70% Ret × factor
0.0028	0.027	9.7	0.01	7	0.07
				8	0.08 ✓
				9	0.09

MA Lonestar w/ 0.05 slot size, but using finer #2/12 w/ 0.02 slot should be fine

Kerr McGee Chemical
Henderson NV

Sample KM 30-35

Wt soil and dish	84.37
Dry soil & dish	80.5
Dish	43.79
-#4 Total for sieve	172.2

Moisture Content - 10.5
-# 4 material

SIEVE ANALYSIS

as received	1376.8 g
Total sample dry	1245.5 g
Weight of sample split # 4	155.778 g

Sieve #	weight retained	finer	% retained	mm	inches
6.0 inch	0	*******	0.0	152	6
4.0 inch	0	*******	0.0	100	4
3.0 inch	0	*******	0.0	75.0	3
1.5 inch	0	*******	0.0	37.5	1.5
3/4 inch	0	*******	0.0	19.0	0.75
3/8 inch	23.94	98.08%	1.9	9.5	0.375
# 4	91.84	92.63%	7.4	4.8	0.1895
# 10	26.7	76.75%	23.2	2.0	0.07896
# 20	70.68	50.60%	49.4	0.85	0.03356
# 40	95.87	35.62%	64.4	0.43	0.01698
# 60	117.72	22.63%	77.4	0.25	0.00987
# 100	135.87	11.84%	88.2	0.15	0.00592
# 200	146.28	5.65%	94.4	0.075	0.00296

Kerr McGee Chemical
Henderson NV

Sample KM 40-45

Wt soil and dish	108.62
Dry soil & dish	99.17
Dish	43.34
-#4 Total for sieve	219.7

Moisture Content = 16.9
-# 4 material

SIEVE ANALYSIS

as received	1359.9 g
Total sample dry	1163.04 g
Weight of sample split # 4	187.896 g

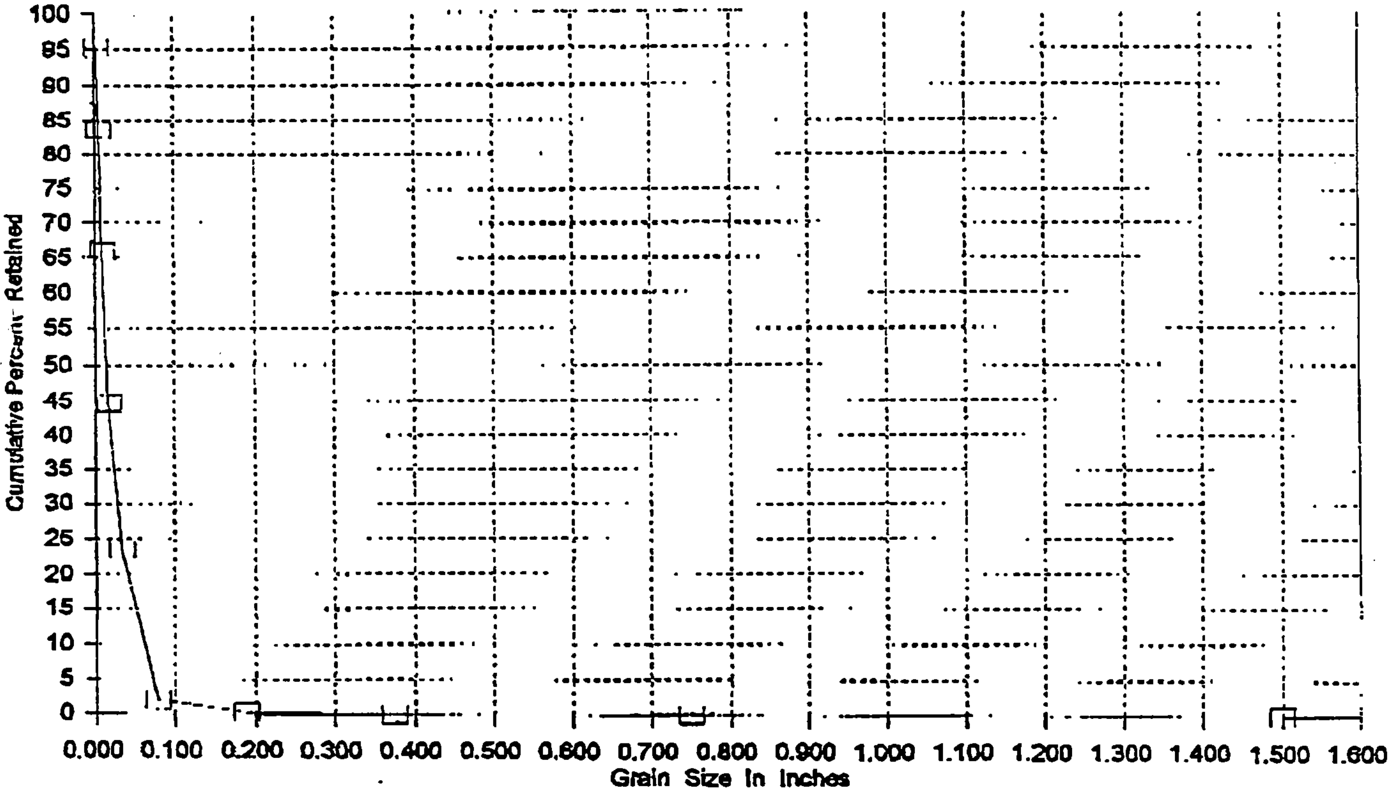
Sieve #	weight retained	finer	% retained	mm	inches
6.0 inch	0	*******	0.0	152	6
4.0 inch	0	*******	0.0	100	4
3.0 inch	0	*******	0.0	75.0	3
1.5 inch	0	*******	0.0	37.5	1.5
3/4 inch	0	*******	0.0	19.0	0.75
3/8 inch	0	*******	0.0	9.5	0.375
# 4	3.19	99.73%	0.3	4.8	0.1895
# 10	3.09	98.09%	1.9	2.0	0.07896
# 20	43.8	76.48%	23.5	0.85	0.03356
# 40	83.97	55.16%	44.8	0.43	0.01698
# 60	123.76	34.04%	66.0	0.25	0.00987
# 100	157.45	16.16%	83.8	0.15	0.00592
# 200	178.99	4.73%	95.3	0.075	0.00296

90% Ret	40% Ret	UC	70% Ret	Factor	70% x Factor
0.003	0.019	6.3	0.009	7	0.063
				8	0.072
				9	0.081

#8/6 Lonestar w/ 0.05 slot, but #2/12 sand ; 0.02 slot should be fine

GRADATION CURVE

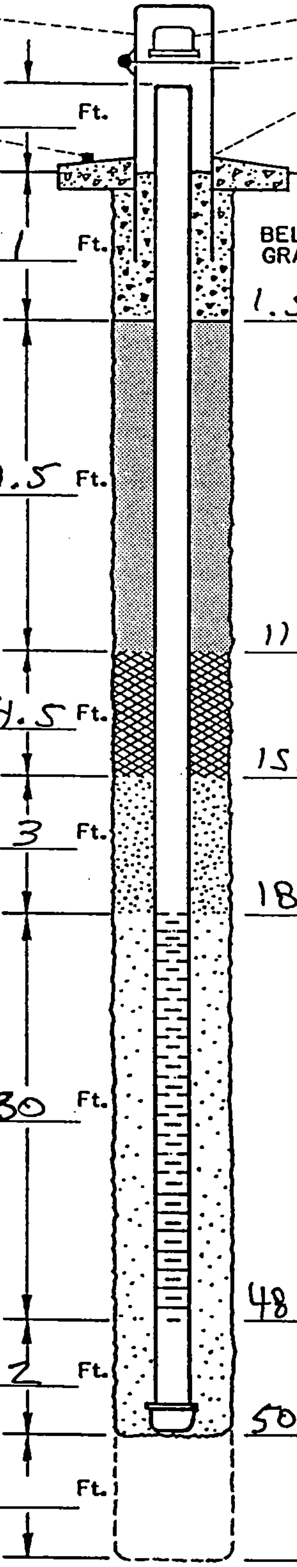
Sample KM 40-45



ADDENDUM C

Well Construction Diagrams for Test Well PC-70 and Observation Wells PC-17, PC-18, and PC-55

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM



Protective Pipe
Yes ☐ No ☒
Steel ☐ PVC ☐
_____ Ft.

Surveying Pin ? Yes ☐ No ☒

Casing Cap Vent ? Yes ☐ No ☒
Lock ? Yes ☒ No ☐
Weep Hole ? Yes ☐ No ☒

Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

Concrete 1 Ft.

Cement/Bentonite Grout Mix
Yes ☒ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder 9.5 Ft.
Other: _____

Bentonite Seal 4.5 Ft.
Pellets ☒ Slurry ☐

Filter Pack Above Screen 3 Ft.

FILTER PACK MATERIAL 30 Ft.
Silica Sand ☒
Washed Sand ☐
Pea Gravel ☐
Other: _____
Sand Size 8-12

Dense Phase Sampling Cup 2 Ft.
Bottom Plug
Yes ☒ No ☐

Overdrilled Material Backfill _____ Ft.
Grout ☐ Sand ☒
Caved Material ☐
Other: _____

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
1.5	1.0
11.0	10.5
15.5	15
18.5	18
48.5	48
50.5	50

DRILLING INFORMATION:

1. Borehole Diameter= 12 Inches.
2. Were Drilling Additives Used ? Yes ☐ No ☒
   Revert ☐ Bentonite ☐ Water ☐
   Solid Auger ☐ Hollow Stem Auger ☒
3. Was Outer Steel Casing Used ? Yes ☐ No ☒
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☒ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☒ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☒ Galvanized ☐
   Stainless ☐ Teflon ☒ Other Wire-Wrap PVC
4. Diameter of Casing and Well Screen:
   Casing 6 Inches, Screen 6 Inches.
5. Slot Size of Screen: 0.020
6. Type of Screen Perforation: Factory Slotted ☐
   Hacksaw ☐ Drilled ☐ Other Wire-Wrapped
7. Installed Protector Pipe w/Lock: Yes ☒ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☒
   Air Surging (Air or Nitrogen) ☒ Other Surging
2. Time Spent on Well Development ?
   _____ / 2 ~~Minutes~~/Hours
3. Approximate Water Volume Removed ? 1500 Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☒ Opaque ☐
5. Water Clarity After Development ? Clear ☒
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☒
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☒
   If Yes , Describe _____

WATER LEVEL INFORMATION:

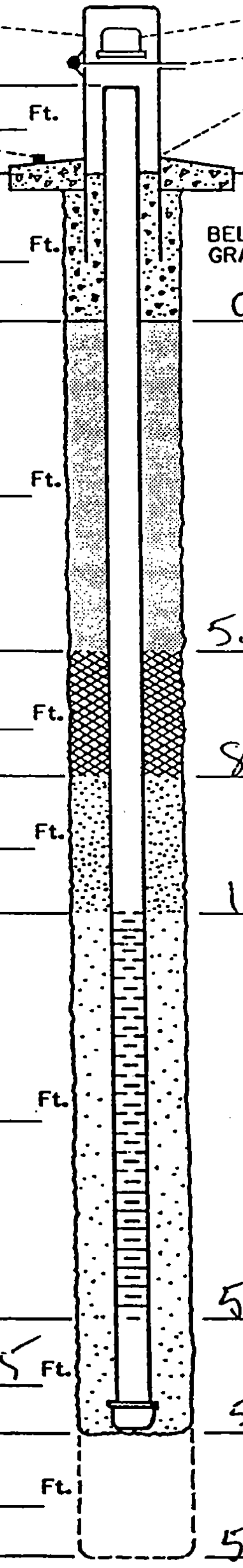
Water Level Summary (From Top of Casing)

During Drilling 17 Ft. Date 9-8-98
Before Development 19.44 Ft. Date 9-12-98
After Development 18.73 Ft. Date 9-14-98

Driller/Firm Compliance Drilling
Drill Rig Type Mobile
Date Installed 9-12-98
Drill Crew _____
Well No. PC-70
Kerr-McGee Hydrologist Steven R. Lower

FLUSHMOUNT WELL

KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
_____ Ft.
Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐
Concrete Pad _____ Ft. x _____ Ft. x _____ Inches

Concrete _____ Ft.

Cement/Bentonite Grout Mix
Yes ☑ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder _____ Ft.
Other: _____

Bentonite Seal _____ Ft.
Pellets ☑ Slurry ☐

Filter Pack Above Screen _____ Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☑ _____ Ft.
Pea Gravel ☐
Other: _____
Sand Size 8-12

Dense Phase Sampling Cup 0.5 Ft.
Bottom Plug
Yes ☑ No ☐

Overdrilled Material Backfill _____ Ft.
Grout ☐ Sand ☐
Caved Material ☐
Other: _____

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
0	
5.5	
8	
10	
50.5	
51	
55	

DRILLING INFORMATION:

1. Borehole Diameter= _____ Inches.
2. Were Drilling Additives Used ? Yes ☑ No ☐
   Revert ☐ Bentonite ☐ Water ☑
   Solid Auger ☐ Hollow Stem Auger ☑
3. Was Outer Steel Casing Used ? Yes ☐ No ☐
   Depth= _____ to _____ Feet.
4. Borehole Diameter for Outer Casing _____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☑ Galvanized ☐ Teflon ☐
   Stainless ☐ Other _____
2. Type of Casing Joints: Screw-Couple ☑ Glue-Couple ☐ Other _____
3. Type of Well Screen: PVC ☑ Galvanized ☐
   Stainless ☐ Teflon ☐ Other _____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: .010
6. Type of Screen Perforation: Factory Slotted ☑
   Hacksaw ☐ Drilled ☐ Other _____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☑
   Air Surging (Air or Nitrogen) ☐ Other _____
2. Time Spent on Well Development ?
   _____ / 1 Minutes/Hours
3. Approximate Water Volume Removed ? 110 Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☑ Opaque ☐
5. Water Clarity After Development ? Clear ☑
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☑
   If Yes, Describe _____
7. Did Water have any Color ? Yes ☐ No ☑
   If Yes , Describe _____

WATER LEVEL INFORMATION:

Water Level Summary (From Top of Casing)

During Drilling 19' Ft. Date 4/1/98
Before Development 19.2' Ft. Date 4/17/98
After Development 19.2' Ft. Date 4/17/98

Driller/Firm WEBEL
Drill Rig Type Mobile 61
Date Installed 4/8/98
Drill Crew LEE ROBERTSON
Well No. PC-17
Kerr-McGee Hydrologist Tim Crawford

FLUSH
MOUNT

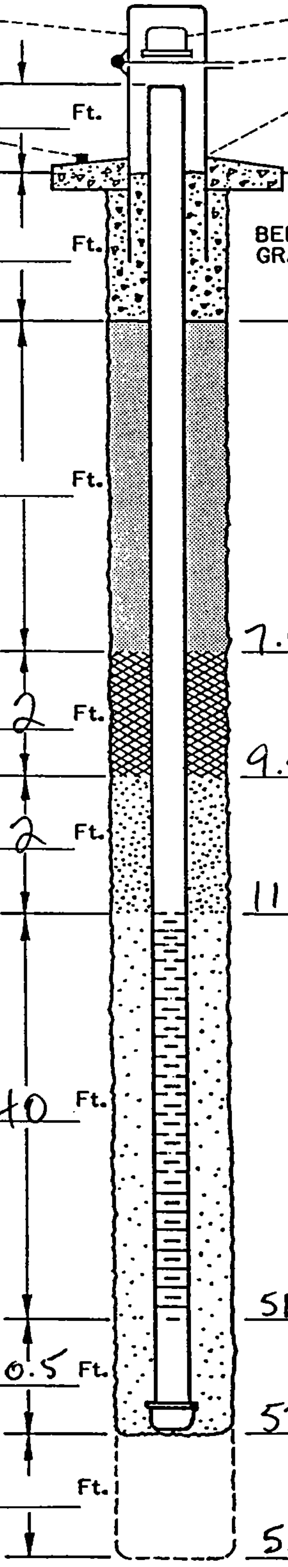
KERR-McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM

~~Protective Pipe~~
~~Yes ☐ No ☐~~
~~Steel ☐ PVC ☐~~
~~Surveying Pin ? Yes ☐ No ☐~~

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☑ No ☐
Weep Hole ? Yes ☐ No ☐

____ Ft.

Concrete Pad ____ Ft. x ____ Ft. x ____ Inches



	DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
Concrete ____ Ft.		
Cement/Bentonite Grout Mix Yes ☑ No ☐ 5.5 Gallons Water to 94Lb. Bag Cement & 3-5 Lb. Bentonite Powder Other: ____ ____ Ft.	7.5	
Bentonite Seal 2 Ft. Pellets ☑ Slurry ☐	9.5	
Filter Pack Above Screen 2 Ft.	11.5	
FILTER PACK MATERIAL 40 Ft. Silica Sand ☒ Washed Sand ☐ Pea Gravel ☐ Other: ____ Sand Size 8-12	51.5	
Dense Phase Sampling Cup 0.5 Ft. Bottom Plug Yes ☑ No ☐	52	
Overdrilled Material Backfill ____ Ft. Grout ☐ Sand ☐ Caved Material ☑ Other: ____	53	

DRILLING INFORMATION:

1. Borehole Diameter= 8 Inches.
2. Were Drilling Additives Used ? Yes ☑ No ☐
   Revert ☐ Bentonite ☐ Water ☑
   Solid Auger ☐ Hollow Stem Auger ☑
3. Was Outer Steel Casing Used ? Yes ☐ No ☑
   Depth= ____ to ____ Feet.
4. Borehole Diameter for Outer Casing ____ Inches.

WELL CONSTRUCTION INFORMATION:

1. Type of Casing: PVC ☑ Galvanized ☐ Teflon ☐ Stainless ☐ Other ____
2. Type of Casing Joints: Screw-Couple ☑ Glue-Couple ☐ Other ____
3. Type of Well Screen: PVC ☑ Galvanized ☐ Stainless ☐ Teflon ☐ Other ____
4. Diameter of Casing and Well Screen:
   Casing 2 Inches, Screen 2 Inches.
5. Slot Size of Screen: 10
6. Type of Screen Perforation: Factory Slotted ☑ Hacksaw ☐ Drilled ☐ Other ____
7. Installed Protector Pipe w/Lock: Yes ☐ No ☐

WELL DEVELOPMENT INFORMATION:

1. How was Well Developed ? Bailing ☐ Pumping ☑ Air Surging (Air or Nitrogen) ☐ Other ____
2. Time Spent on Well Development ?
   ____/ 1 Minutes/Hours
3. Approximate Water Volume Removed ? 110 Gallons
4. Water Clarity Before Development ? Clear ☐ Turbid ☐ Opaque ☑
5. Water Clarity After Development ? Clear ☑ Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☑
   If Yes, Describe ____
7. Did Water have any Color ? Yes ☐ No ☑
   If Yes , Describe ____

WATER LEVEL INFORMATION:

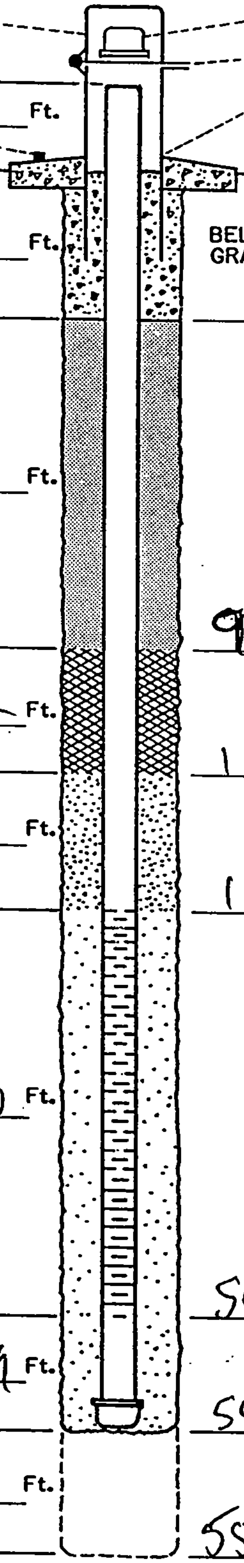
Water Level Summary (From Top of Casing)

During Drilling 22 Ft. Date 4/8/98
Before Development 19.80' Ft. Date 4/17/98
After Development 19.90' Ft. Date 4/17/98

Driller/Firm WEBER
Drill Rig Type MOBILE B-61 XD
Date Installed 4/8/98
Drill Crew LEE ROBERTSON
Well No. PC-18
Kerr-McGee Hydrologist J. CRAWFORD

3" BLG

KERR–McGEE CORPORATION
HYDROLOGY DEPARTMENT
MONITORING WELL INSTALLATION DIAGRAM



Protective Pipe
Yes ☐ No ☐
Steel ☐ PVC ☐
______ Ft.

Surveying Pin ?
Yes ☐ No ☐

Casing Cap Vent ? Yes ☐ No ☐
Lock ? Yes ☐ No ☐
Weep Hole ? Yes ☐ No ☐

Concrete Pad ________ Ft. x ________ Ft. x ______ Inches

Concrete ______ Ft.

Cement/Bentonite Grout Mix
Yes ☐ No ☐
5.5 Gallons Water to 94Lb. Bag Cement & 3–5 Lb. Bentonite Powder ______ Ft.
Other: ______

Bentonite Seal 2 Ft.
Pellets ☑ Slurry ☐

Filter Pack Above Screen 3 Ft.

FILTER PACK MATERIAL
Silica Sand ☐
Washed Sand ☑ 40 Ft.
Pea Gravel ☐
Other: ______
Sand Size 8-12

Dense Phase Sampling Cup 0.9 Ft.
Bottom Plug
Yes ☑ No ☐

Overdrilled Material Backfill ______ Ft.
Grout ☐ Sand ☐
Caved Material ☐
Other: ______

DEPTH BELOW GRADE	DEPTH FROM TOP OF CASING
9	
11	
14	
54	
549	
55	

DRILLING INFORMATION:
1. Borehole Diameter= 12 Inches.
2. Were Drilling Additives Used ? Yes ☑ No ☐
   Revert ☐ Bentonite ☐ Water ☑
   Solid Auger ☐ Hollow Stem Auger ☑
3. Was Outer Steel Casing Used ? Yes ☐ No ☑
   Depth= ______ to ______ Feet.
4. Borehole Diameter for Outer Casing ______ Inches.

WELL CONSTRUCTION INFORMATION:
1. Type of Casing: PVC ☑ Galvanized ☐ Teflon ☐
   Stainless ☐ Other ______
2. Type of Casing Joints: Screw–Couple ☑ Glue–Couple ☐ Other ______
3. Type of Well Screen: PVC ☑ Galvanized ☐
   Stainless ☐ Teflon ☐ Other ______
4. Diameter of Casing and Well Screen:
   Casing 6 Inches, Screen 6 Inches.
5. Slot Size of Screen:
6. Type of Screen Perforation: Factory Slotted ☑
   Hacksaw ☐ Drilled ☐ Other ______
7. Installed Protector Pipe w/Lock: Yes ☑ No ☐

WELL DEVELOPMENT INFORMATION:
1. How was Well Developed ? Bailing ☐ Pumping ☐
   Air Surging (Air or Nitrogen) ☐ Other ______
2. Time Spent on Well Development ?
   ______/______ Minutes/Hours
3. Approximate Water Volume Removed ? ______ Gallons
4. Water Clarity Before Development ? Clear ☐
   Turbid ☐ Opaque ☐
5. Water Clarity After Development ? Clear ☐
   Turbid ☐ Opaque ☐
6. Did Water have Odor ? Yes ☐ No ☐
   If Yes, Describe ______
7. Did Water have any Color ? Yes ☐ No ☐
   If Yes , Describe ______

WATER LEVEL INFORMATION:
Water Level Summary (From Top of Casing)

During Drilling ______ Ft. Date ______
Before Development ______ Ft. Date ______
After Development ______ Ft. Date ______

Driller/Firm WEBER
Drill Rig Type MOBILE B-61
Date Installed 5/6/98
Drill Crew LEE ROBERTSON
Well No. PC 55
Kerr–McGee Hydrologist J. CRAWFORD

ADDENDUM D

Tabulations and Graphs of Drawdown and Recovery Data and Calculations of Aquifer Coefficients for Test Well PC-70

Drawdown Data For Pumping Well PC-70
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

Pre-Test Water Level: 18.73 feet top of casing
Pumping Rate: 45gpm

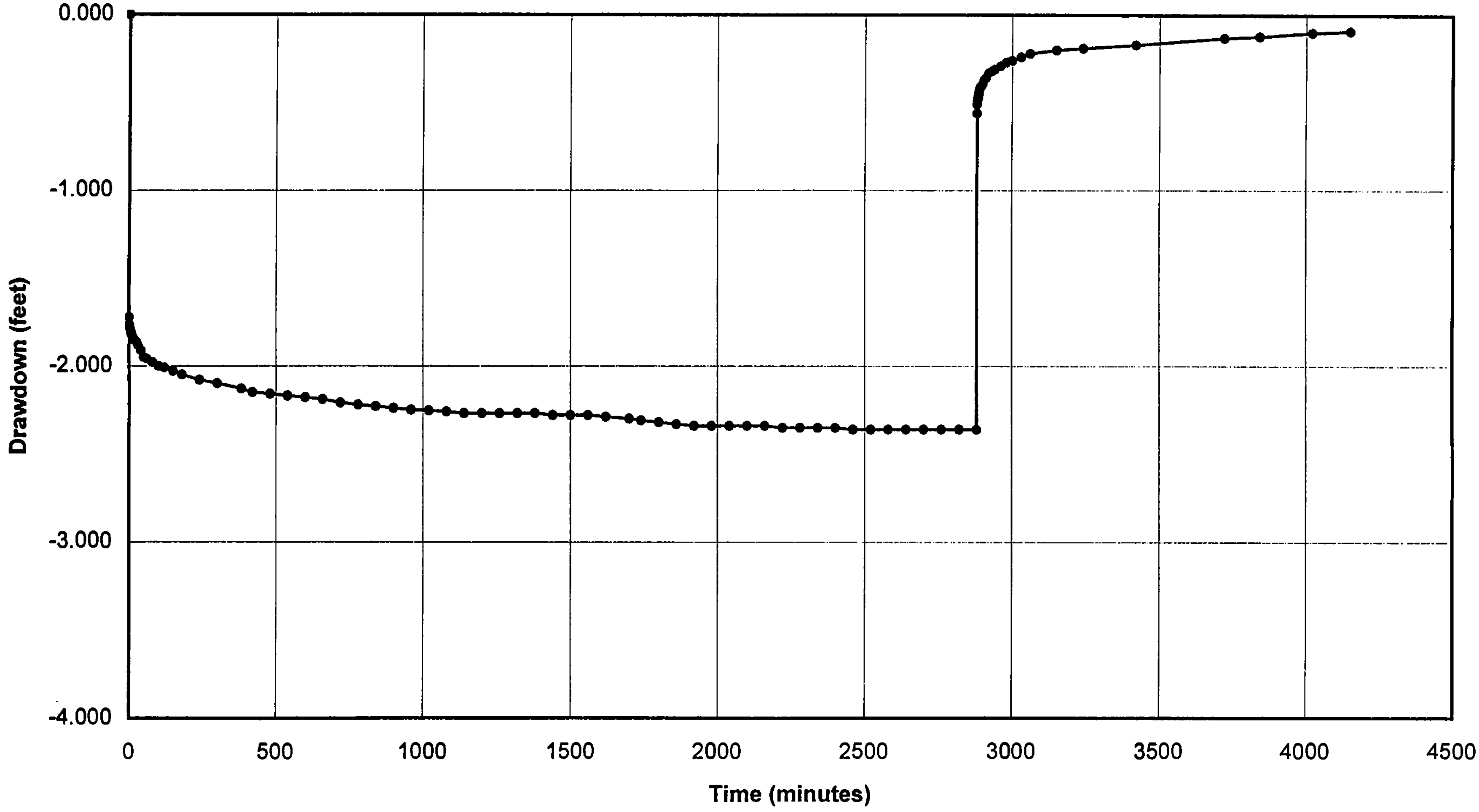
Date	24 Hour Clock Time	Elapsed Time Since Test Started (minutes)	Depth to Water (feet)	Drawdown (feet)	Pumping Rate (gpm)	Remarks
9/14/98	1500	0	18.730	0.000	0	Static WL
	1500.5	0.5	20.450	1.720	45	
	1501	1	20.490	1.760	45	
	1502	2	20.500	1.770	45	
	1503	3	20.510	1.780	45	
	1504	4	20.515	1.785	45	
	1505	5	20.520	1.790	45	
	1506	6	20.530	1.800	45	
	1507	7	20.540	1.810	45	
	1508	8	20.540	1.810	45	
	1509	9	20.550	1.820	45	
	1510	10	20.555	1.825	45	
	1512	12	20.560	1.830	45	
	1514	14	20.570	1.840	45	
	1516	16	20.575	1.845	45	
	1518	18	20.580	1.850	45	
	1520	20	20.585	1.855	45	
	1525	25	20.590	1.860	45	
	1530	30	20.610	1.880	45	
	1540	40	20.640	1.910	45	
	1550	50	20.680	1.950	45	
	1600	60	20.690	1.960	45	
	1620	80	20.710	1.980	45	
	1640	100	20.730	2.000	45	
	1700	120	20.740	2.010	45	
	1730	150	20.760	2.030	45	
	1800	180	20.780	2.050	45	
	1900	240	20.810	2.080	45	
	2000	300	20.830	2.100	45	
	2122	382	20.860	2.130	45	
	2200	420	20.880	2.150	45	
	2300	480	20.890	2.160	45	
9/15/98	2400	540	20.900	2.170	45	
	0100	600	20.910	2.180	45	
	0200	660	20.920	2.190	45	
	0300	720	20.940	2.210	45	
	0400	780	20.950	2.220	45	
	0500	840	20.960	2.230	45	
	0600	900	20.970	2.240	45	
	0700	960	20.980	2.250	45	
	0800	1020	20.985	2.255	45	
	0900	1080	20.990	2.260	45	
	1000	1140	21.000	2.270	45	
	1100	1200	21.000	2.270	45	
	1200	1260	21.000	2.270	45	
	1300	1320	21.000	2.270	45	
	1400	1380	21.000	2.270	45	
	1500	1440	21.010	2.280	45	
	1600	1500	21.010	2.280	45	
	1700	1560	21.010	2.280	45	
	1800	1620	21.020	2.290	45	
	1920	1700	21.030	2.300	45	
	2000	1740	21.040	2.310	45	
	2100	1800	21.050	2.320	45	
	2200	1860	21.060	2.330	45	
	2300	1920	21.070	2.340	45	
9/16/98	2400	1980	21.070	2.340	45	
	0100	2040	21.070	2.340	45	
	0200	2100	21.070	2.340	45	
	0300	2160	21.070	2.340	45	
	0400	2220	21.080	2.350	45	
	0500	2280	21.080	2.350	45	
	0600	2340	21.080	2.350	45	
	0700	2400	21.080	2.350	45	
	0800	2460	21.090	2.360	45	
	0900	2520	21.090	2.360	45	
	1000	2580	21.090	2.360	45	
	1100	2640	21.090	2.360	45	
	1200	2700	21.090	2.360	45	
	1300	2760	21.090	2.360	45	
	1400	2820	21.090	2.360	45	
	1500	2880	21.090	2.360	45	Pump Off

Recovery Data for Pumping Well PC-70
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

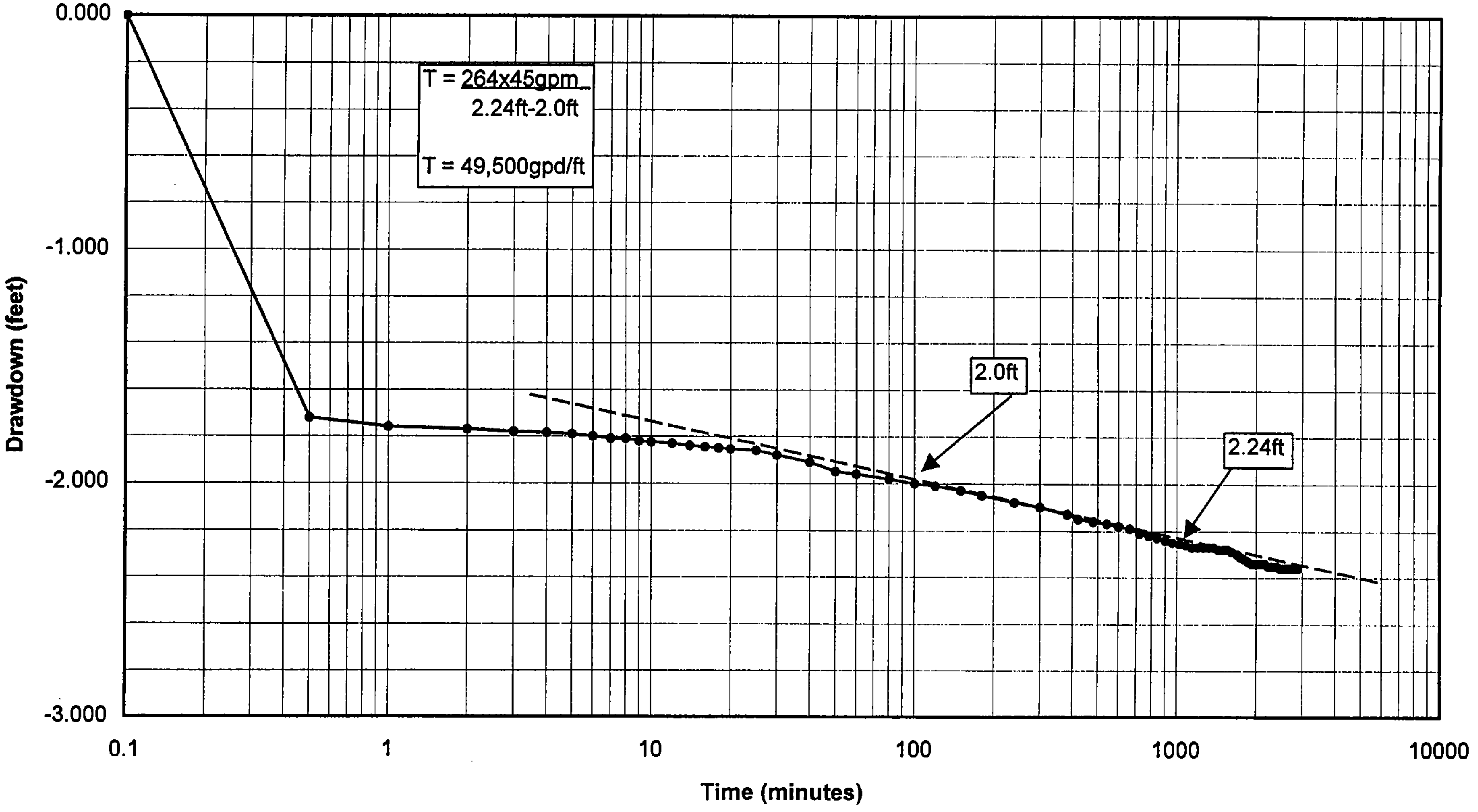
Pre-Test Water Level: 18.73 feet below top of casing
Pumping Rate: 45gpm

Date	24 Hour Clock Time	Time Since Pump Test Started (t, minutes)	Time Since Pump Stopped (t', minutes)	Ratio t/t'	Depth to Water (feet)	Residual Drawdown (s', feet)	Remarks
9/16/98	1500	2880.0	0.0	288000.0	21.090	2.360	Pump Off
	1500.5	2880.5	0.5	5761.0	19.290	0.560	
	1501	2881	1.0	2881.0	19.240	0.510	
	1502	2882	2.0	1441.0	19.220	0.490	
	1503	2883	3.0	961.0	19.205	0.475	
	1504	2884	4.0	721.0	19.200	0.470	
	1505	2885	5.0	577.0	19.190	0.460	
	1506	2886	6.0	481.0	19.180	0.450	
	1507	2887	7.0	412.4	19.170	0.440	
	1508	2888	8.0	361.0	19.160	0.430	
	1509	2889	9.0	321.0	19.155	0.425	
	1510	2890	10.0	289.0	19.150	0.420	
	1512	2892	12.0	241.0	19.140	0.410	
	1514	2894	14.0	206.7	19.140	0.410	
	1516	2896	16.0	181.0	19.130	0.400	
	1518	2898	18.0	161.0	19.125	0.395	
	1520	2900	20.0	145.0	19.120	0.390	
	1525	2905	25.0	116.2	19.100	0.370	
	1530	2910	30.0	97.0	19.090	0.360	
	1540	2920	40.0	73.0	19.060	0.330	
	1550	2930	50.0	58.6	19.050	0.320	
	1600	2940	60.0	49.0	19.040	0.310	
	1620	2960	80.0	37.0	19.020	0.290	
	1640	2980	100.0	29.8	19.000	0.270	
	1700	3000	120.0	25.0	18.990	0.260	
	1730	3030	150.0	20.2	18.970	0.240	
	1800	3060	180.0	17.0	18.950	0.220	
	1930	3150	270.0	11.7	18.930	0.200	
	2100	3240	360.0	9.0	18.920	0.190	
9/17/98	2400	3420	540.0	6.3	18.900	0.170	
	0500	3720	840.0	4.4	18.860	0.130	
	0700	3840	960.0	4.0	18.850	0.120	
	1000	4020	1140.0	3.5	18.830	0.100	
	1210	4150	1270.0	3.3	18.820	0.090	End of Test

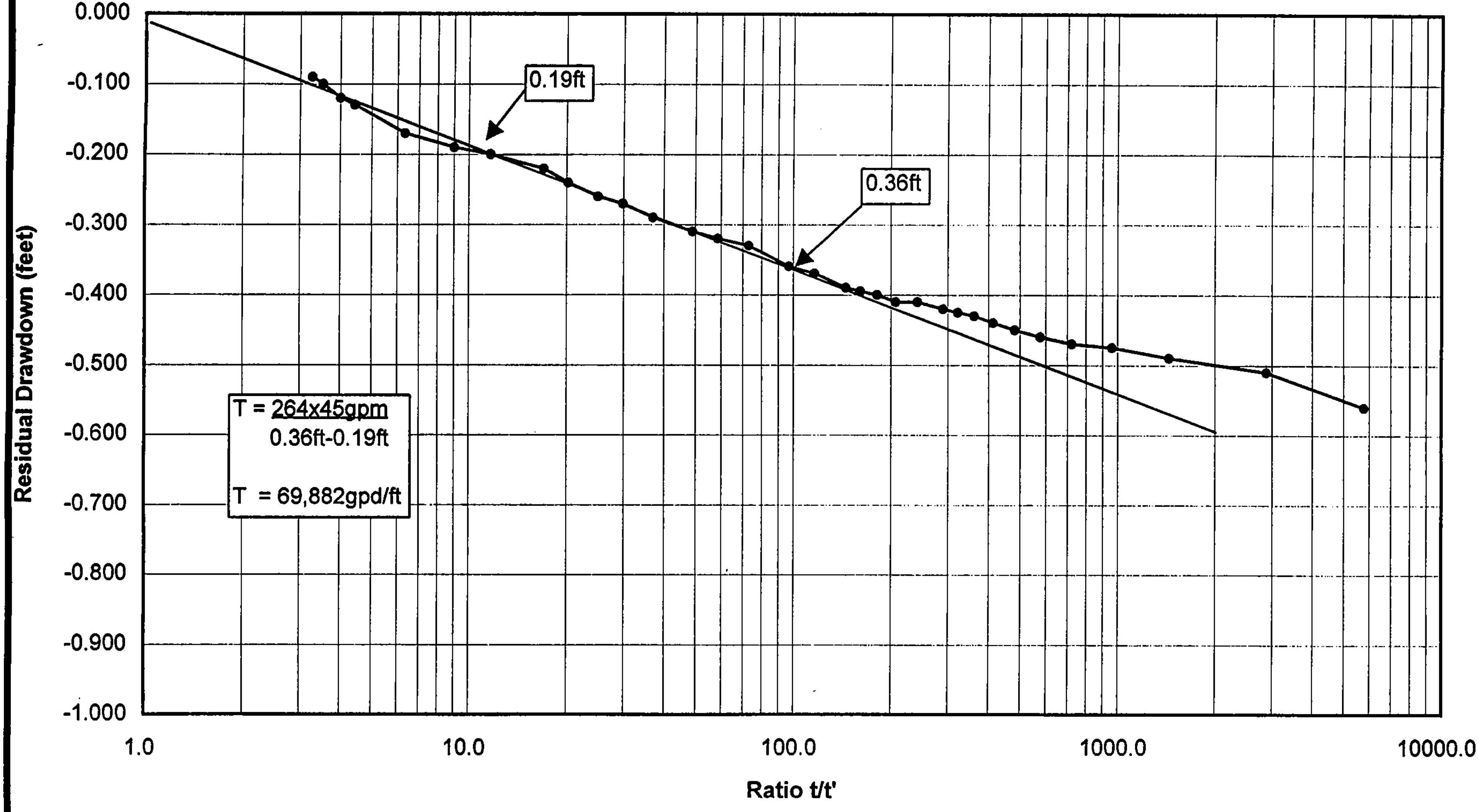
ARITHMETIC PLOT OF DRAWDOWN AND RECOVERY DATA FOR TEST WELL PC-70
CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



JACOBS SEMI-LOG ANALYSIS OF TIME vs DRAWDOWN DATA
FOR TEST WELL PC-70
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



JACOBS SEMI-LOG ANALYSIS OF t/t' vs RESIDUAL DRAWDOWN DATA
FOR TEST WELL PC-70
CONSTANT DISCHARGE RECOVERY TEST OF HENDERSON TEST WELL PC-70
Date of Recovery Test: September 16-17, 1998



CALCULATION OF AQUIFER COEFFICIENTS FOR TEST WELL PC-70
CONSTANT DISCHARGE PUMPING TEST
OF PITTMAN LATERAL TEST WELL PC-70

Jacobs Semi-Log Straight-Line Analysis of Drawdown Data

Transmissivity = 49,500 gallons per day per foot
Permeability = 1,547 gallons per day per square foot
(49500/32 feet of saturation)
Hydraulic Conductivity = 207 feet per day (1547/7.48gallons per cubic foot)

Jacobs Semi-Log Straight-Line Analysis of Recovery Data

Transmissivity = 69,882 gallons per day per foot
Permeability = 2,184 gallons per day per square foot
(69882/32 feet of saturation)
Hydraulic Conductivity = 292 feet per day (2184/7.48gallons per cubic foot)

ADDENDUM E

Tabulations and Graphs of Drawdown and Recovery Data and Calculations of Aquifer Coefficients for Test Well PC-17

Drawdown Data For Observation Well PC-17
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

Pre-Test Water Level: 18.10 feet below top of casing
Pumping Rate: 45gpm

Date	24 Hour Clock Time	Elapsed Time Since Test Started (minutes)	Depth to Water (feet)	Drawdown (feet)	Pumping Rate (gpm)	Remarks
9/14/98	1500	0	18.100	0.000	0	Static WL
	1502.5	2.5	18.300	0.200	45	
	1511	11	18.330	0.230	45	
	1515	15	18.340	0.240	45	
	1519	19	18.350	0.250	45	
	1521	21	18.350	0.250	45	
	1527	27	18.360	0.260	45	
	1531	31	18.380	0.280	45	
	1541	41	18.390	0.290	45	
	1553	53	18.410	0.310	45	
	1602	62	18.420	0.320	45	
	1623	83	18.430	0.330	45	
	1643	103	18.440	0.340	45	
	1703	123	18.460	0.360	45	
	1732	153	18.470	0.370	45	
	1802	182	18.490	0.390	45	
	1903	243	18.510	0.410	45	
	2002	302	18.530	0.430	45	
	2123	383	18.550	0.450	45	
	2205	425	18.560	0.460	45	
	2302	482	18.570	0.470	45	
9/15/98	0002	542	18.580	0.480	45	
	0102	602	18.585	0.485	45	
	0202	662	18.590	0.490	45	
	0302	722	18.595	0.495	45	
	0402	782	18.600	0.500	45	
	0502	842	18.610	0.510	45	
	0602	902	18.620	0.520	45	
	0702	962	18.620	0.520	45	
	0802	1022	18.630	0.530	45	
	0902	1082	18.630	0.530	45	
	1002	1142	18.635	0.535	45	
	1102	1202	18.640	0.540	45	
	1202	1262	18.650	0.550	45	
	1302	1322	18.650	0.550	45	
	1402	1382	18.660	0.560	45	
	1502	1442	18.660	0.560	45	
	1602	1502	18.660	0.565	45	
	1702	1562	18.665	0.565	45	
	1802	1622	18.665	0.565	45	
	1902	1682	18.670	0.570	45	
	2002	1742	18.680	0.580	45	
	2102	1802	18.685	0.585	45	
	2202	1862	18.690	0.590	45	
	2302	1922	18.690	0.590	45	
9/16/98	0002	1982	18.690	0.595	45	
	0102	2042	18.700	0.600	45	
	0202	2102	18.700	0.600	45	
	0302	2162	18.700	0.605	45	
	0402	2222	18.700	0.605	45	
	0502	2282	18.700	0.605	45	
	0602	2342	18.710	0.610	45	
	0702	2402	18.710	0.610	45	
	0802	2462	18.730	0.615	45	
	0902	2522	18.730	0.615	45	
	1002	2582	18.730	0.620	45	
	1102	2642	18.730	0.620	45	
	1202	2702	18.730	0.625	45	
	1302	2762	18.730	0.625	45	
	1402	2822	18.730	0.630	45	
	1500	2880	18.730	0.630	45	Pump Off

Recovery Data for Observation Well PC-17
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

Pre-Test Water Level: 18.10 feet below top of casing
Pumping Rate: 45gpm

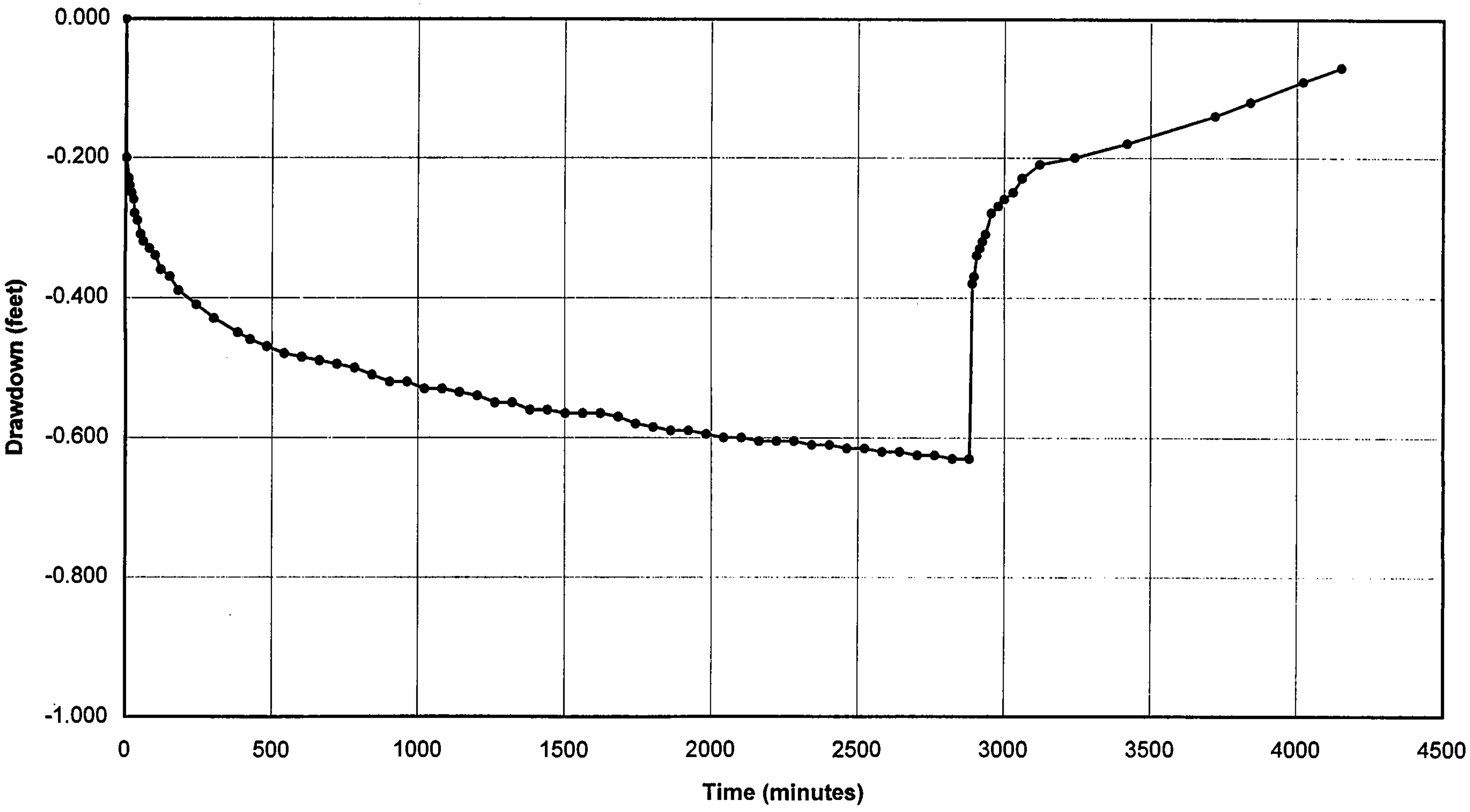
Date	24 Hour Clock Time	Time Since Pump Test Started (t, minutes)	Time Since Pump Stopped (t', minutes)	Ratio t/t'	Depth to Water (feet)	Residual Drawdown (s', feet)	Remarks
9/16/98	1500	2880	0.0	288000.0	18.730	0.630	Pump Off
	1511	2891	11.0	262.8	18.480	0.380	Recovery
	1517	2897	17.0	170.4	18.470	0.370	
	1526	2906	26.0	111.8	18.440	0.340	
	1536	2916	36.0	81.0	18.430	0.330	
	1546	2926	46.0	63.6	18.420	0.320	
	1556	2936	56.0	52.4	18.410	0.310	
	1616	2956	76.0	38.9	18.380	0.280	
	1640	2980	100.0	29.8	18.370	0.270	
	1700	3000	120.0	25.0	18.360	0.260	
	1730	3030	150.0	20.2	18.350	0.250	
	1800	3060	180.0	17.0	18.330	0.230	
	1930	3120	240.0	13.0	18.310	0.210	
	2100	3240	360.0	9.0	18.300	0.200	
9/17/98	2400	3420	540.0	6.3	18.280	0.180	
	0500	3720	840.0	4.4	18.240	0.140	
	0700	3840	960.0	4.0	18.220	0.120	
	1000	4020	1140.0	3.5	18.190	0.090	
	1210	4150	1270.0	3.3	18.170	0.070	End of Test

Drawdown Data For Observation Well PC-18
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

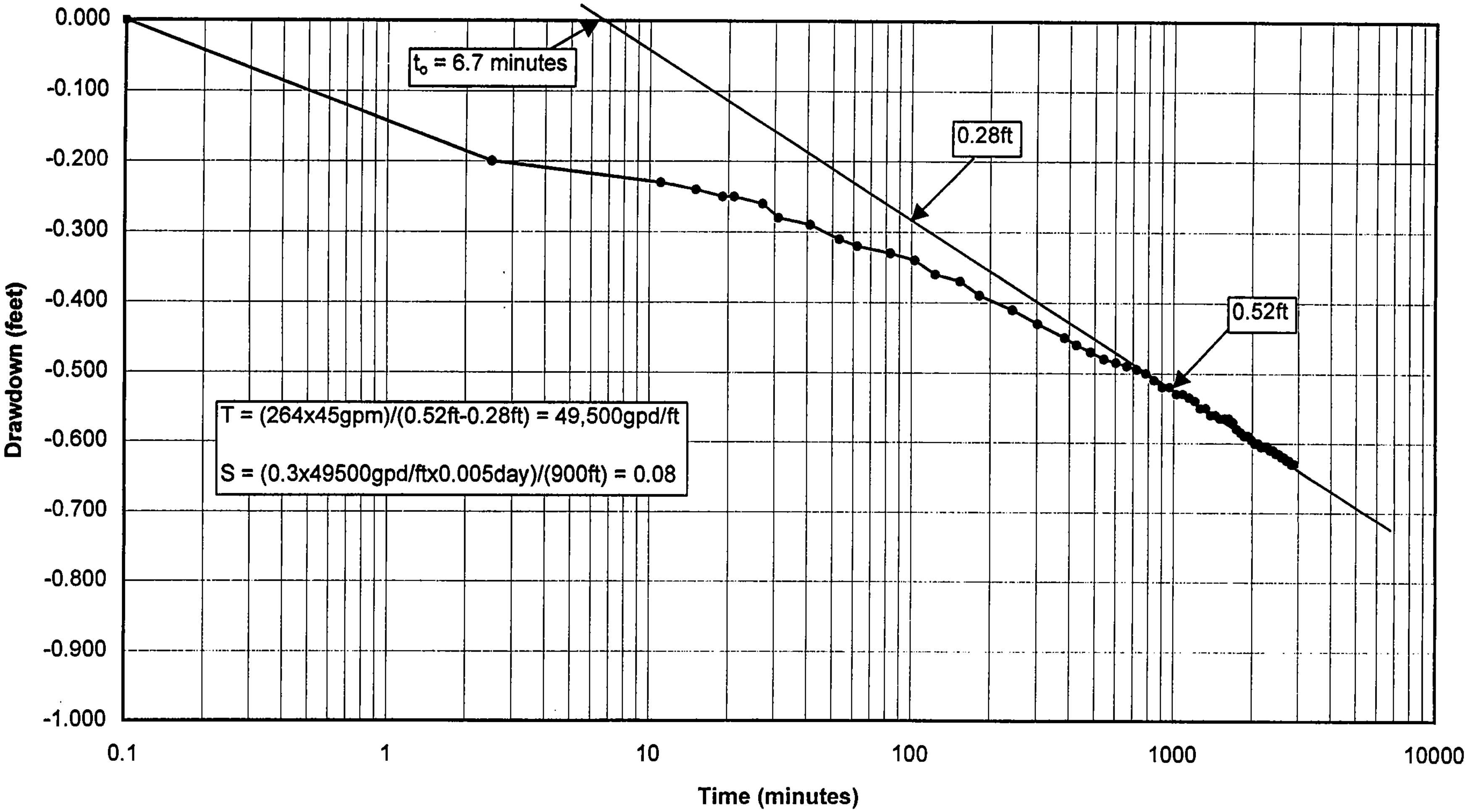
Pre-Test Water Level: 19.42 feet top of casing
Pumping Rate: 45gpm

Date	24 Hour Clock Time	Elapsed Time Since Test Started (minutes)	Depth to Water (feet)	Drawdown (feet)	Pumping Rate (gpm)	Remarks
9/14/98	1500	0	19.420	0.001	0	Static WL
	1513	13	19.490	0.070	45	
	1517	17	19.500	0.080	45	
	1522	22	19.510	0.090	45	
	1528	28	19.510	0.090	45	
	1533	33	19.520	0.100	45	
	1543	43	19.530	0.110	45	
	1555	55	19.540	0.120	45	
	1604	64	19.550	0.130	45	
	1625	85	19.560	0.140	45	
	1645	105	19.560	0.140	45	
	1705	125	19.570	0.150	45	
	1734	154	19.590	0.170	45	
	1804	184	19.600	0.180	45	
	1905	245	19.620	0.200	45	
	2005	305	19.640	0.220	45	
	2125	385	19.650	0.230	45	
	2207	427	19.670	0.250	45	
	2304	484	19.670	0.250	45	
9/15/98	0004	544	19.690	0.270	45	
	0104	604	19.700	0.280	45	
	0204	664	19.705	0.285	45	
	0304	724	19.710	0.290	45	
	0404	784	19.715	0.295	45	
	0504	844	19.720	0.300	45	
	0604	904	19.730	0.310	45	
	0704	964	19.730	0.310	45	
	0804	1024	19.740	0.320	45	
	0904	1084	19.750	0.330	45	
	1004	1144	19.760	0.340	45	
	1104	1204	19.770	0.350	45	
	1204	1264	19.770	0.350	45	
	1304	1324	19.770	0.350	45	
	1404	1384	19.770	0.350	45	
	1504	1444	19.770	0.350	45	
	1604	1504	19.770	0.350	45	
	1704	1564	19.770	0.350	45	
	1804	1624	19.770	0.350	45	
	1904	1684	19.775	0.355	45	
	2004	1744	19.775	0.355	45	
	2104	1804	19.780	0.360	45	
	2204	1864	19.790	0.370	45	
	2304	1924	19.790	0.370	45	
9/16/98	0004	1984	19.790	0.370	45	
	0104	2044	19.800	0.380	45	
	0204	2104	19.800	0.380	45	
	0304	2164	19.800	0.380	45	
	0404	2224	19.810	0.390	45	
	0504	2284	19.810	0.390	45	
	0604	2344	19.810	0.390	45	
	0704	2404	19.820	0.400	45	
	0804	2464	19.820	0.400	45	
	0904	2524	19.830	0.410	45	
	1004	2584	19.830	0.410	45	
	1104	2644	19.830	0.410	45	
	1204	2704	19.830	0.410	45	
	1304	2764	19.835	0.415	45	
	1404	2824	19.835	0.415	45	
	1500	2880	19.840	0.420	45	Pump Off

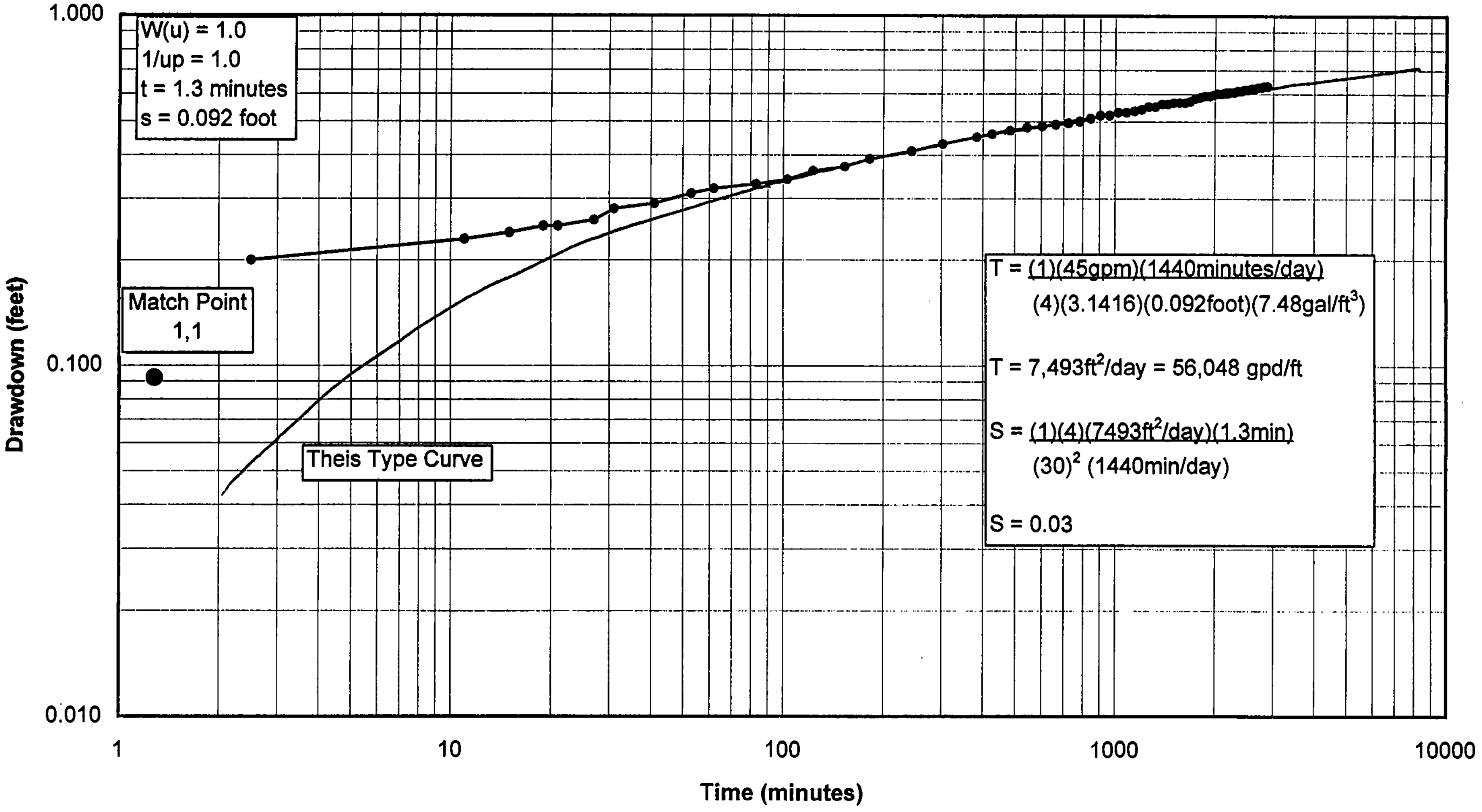
ARITHMETIC PLOT OF DRAWDOWN AND RECOVERY DATA
FOR OBSERVATION WELL PC-17
CONSTANT DISCHARGE TEST OF HENDERSON MONITOR WELL PC-70
Date of Test: September 14-17, 1998



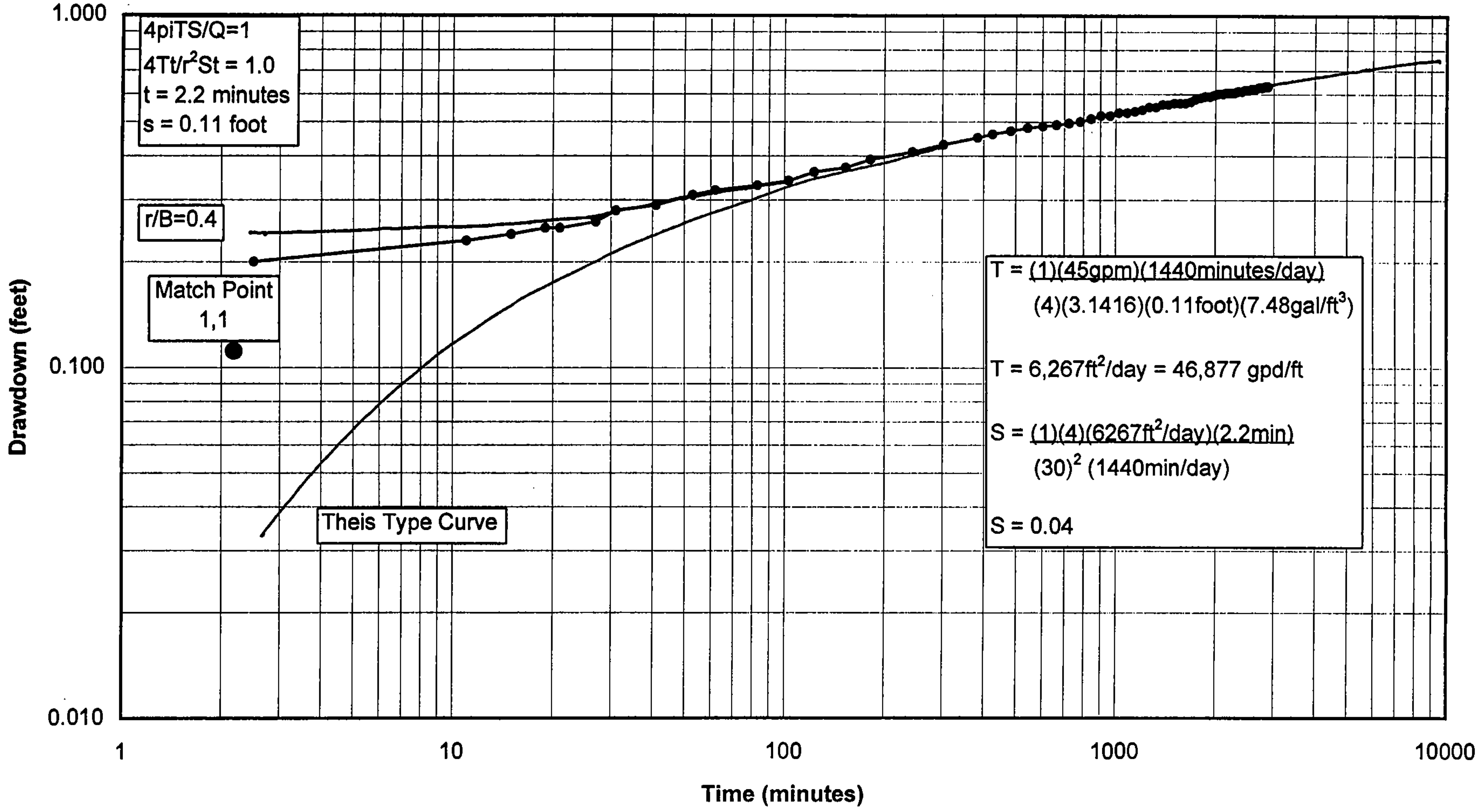
SEMI-LOG PLOT OF TIME vs DRAWDOWN DATA FOR OBSERVATION WELL PC-17
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-16, 1998



THEIS TYPE-CURVE ANALYSIS
LOG-LOG PLOT OF TIME vs DRAWDOWN DATA FOR OBSERVATION WELL PC-17
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-16, 1998



BOULTON DELAYED DRAINAGE ANALYSIS
LOG-LOG PLOT OF TIME vs DRAWDOWN DATA FOR OBSERVATION WELL PC-17
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-16, 1998



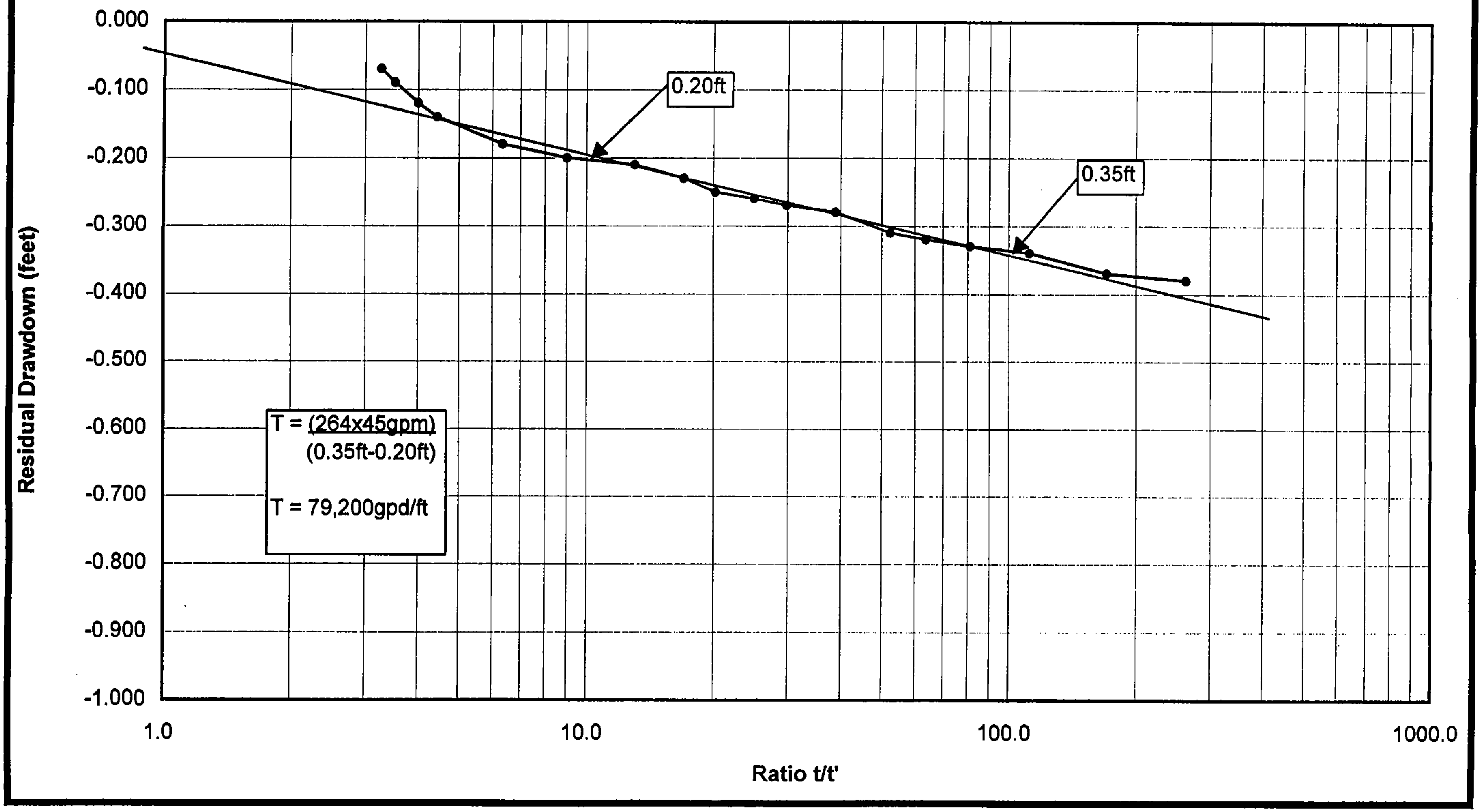
$$T = \frac{(1)(45\text{gpm})(1440\text{minutes/day})}{(4)(3.1416)(0.11\text{foot})(7.48\text{gal/ft}^3)}$$

$T = 6{,}267\text{ft}^2\text{/day} = 46{,}877$ gpd/ft

$$S = \frac{(1)(4)(6267\text{ft}^2\text{/day})(2.2\text{min})}{(30)^2\ (1440\text{min/day})}$$

$S = 0.04$

JACOBS SEMI-LOG ANALYSIS OF t/t' vs RESIDUAL DRAWDOWN DATA
FOR OBSERVATION WELL PC-17
CONSTANT DISCHARGE RECOVERY TEST OF HENDERSON TEST WELL PC-70
Date of Recovery Test: September 16-17, 1998



CALCULATION OF AQUIFER COEFFICIENTS FOR OBSERVATION WELL PC-17
CONSTANT DISCHARGE PUMPING TEST
OF PITTMAN LATERAL TEST WELL PC-70

Jacobs Semi-Log Straight-Line Analysis of Drawdown Data

Transmissivity = 49,500 gallons per day per foot
Permeability = 1,500 gallons per day per square foot
(49500/33 feet of saturation)
Hydraulic Conductivity = 201 feet per day (1500/7.48gallons per cubic foot)
Storage Coefficient = 0.08

Theis Log-Log Type Curve Match Analysis of Drawdown Data

Transmissivity = 56,048 gallons per day per foot
Permeability = 1,698 gallons per day per square foot
(56048/33 feet of saturation)
Hydraulic Conductivity = 227 feet per day (1698/7.48gallons per cubic foot)
Storage Coefficient = 0.08

Boulton Log-Log Delayed Drainage Curve Match Analysis of Drawdown Data

Transmissivity = 46,877 gallons per day per foot
Permeability = 1,421 gallons per day per square foot
(46877/33 feet of saturation)
Hydraulic Conductivity = 190 feet per day (1421/7.48gallons per cubic foot)
Storage Coefficient = 0.09

Jacobs Semi-Log Straight-Line Analysis of Recovery Data

Transmissivity = 79,200 gallons per day per foot
Permeability = 2,400 gallons per day per square foot
(79200/33 feet of saturation)
Hydraulic Conductivity = 321 feet per day (2400/7.48gallons per cubic foot)

ADDENDUM F

Tabulations and Graphs of Drawdown and Recovery Data and Calculations of Aquifer Coefficients for Test Well PC-18

Drawdown Data For Observation Well PC-18
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

Pre-Test Water Level: 19.42 feet top of casing
Pumping Rate: 45gpm

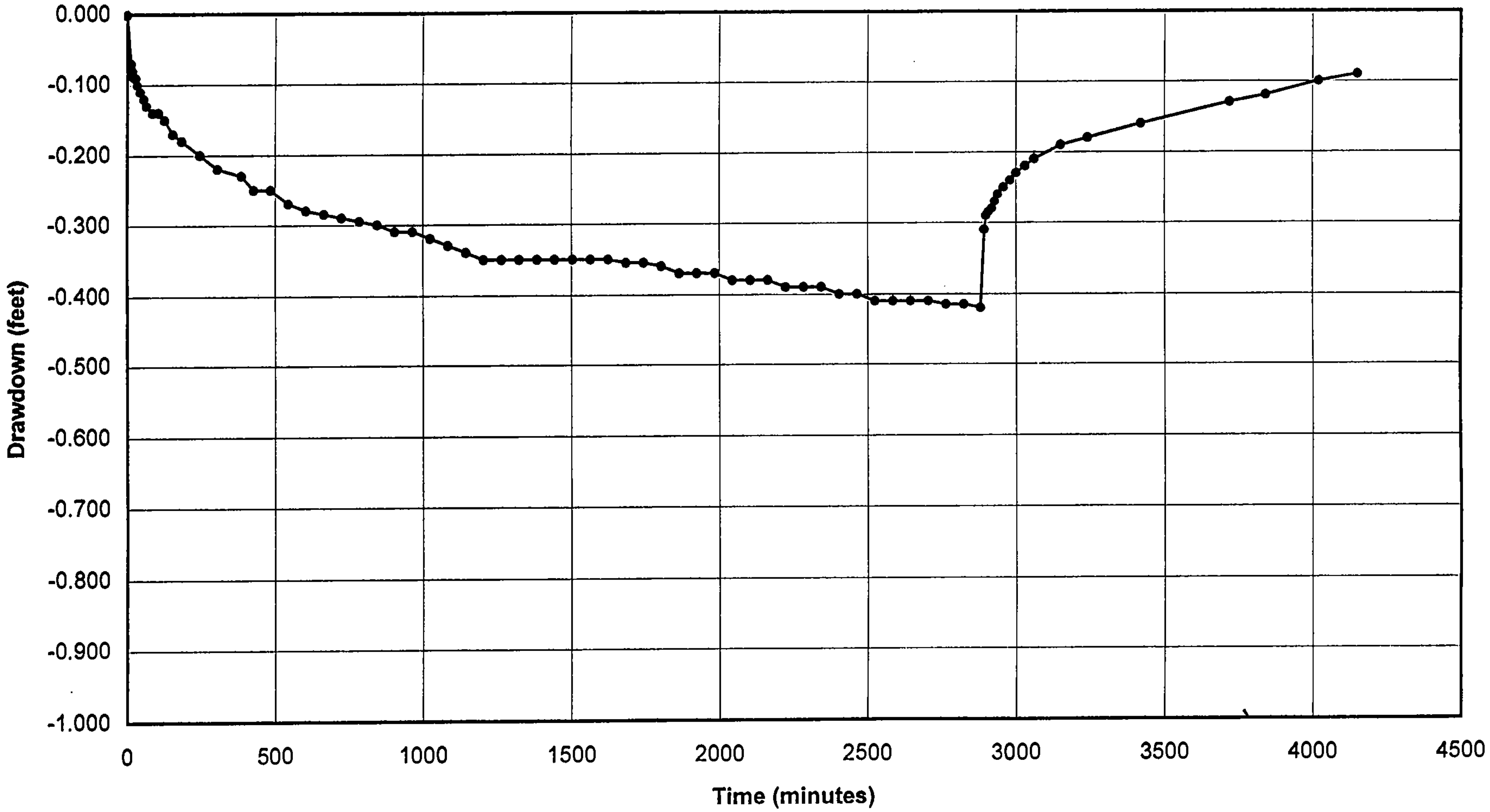
Date	24 Hour Clock Time	Elapsed Time Since Test Started (minutes)	Depth to Water (feet)	Drawdown (feet)	Pumping Rate (gpm)	Remarks
9/14/98	1500	0	19.420	0.001	0	Static WL
	1513	13	19.490	0.070	45	
	1517	17	19.500	0.080	45	
	1522	22	19.510	0.090	45	
	1528	28	19.510	0.090	45	
	1533	33	19.520	0.100	45	
	1543	43	19.530	0.110	45	
	1555	55	19.540	0.120	45	
	1604	64	19.550	0.130	45	
	1625	85	19.560	0.140	45	
	1645	105	19.560	0.140	45	
	1705	125	19.570	0.150	45	
	1734	154	19.590	0.170	45	
	1804	184	19.600	0.180	45	
	1905	245	19.620	0.200	45	
	2005	305	19.640	0.220	45	
	2125	385	19.650	0.230	45	
	2207	427	19.670	0.250	45	
	2304	484	19.670	0.250	45	
9/15/98	0004	544	19.690	0.270	45	
	0104	604	19.700	0.280	45	
	0204	664	19.705	0.285	45	
	0304	724	19.710	0.290	45	
	0404	784	19.715	0.295	45	
	0504	844	19.720	0.300	45	
	0604	904	19.730	0.310	45	
	0704	964	19.730	0.310	45	
	0804	1024	19.740	0.320	45	
	0904	1084	19.750	0.330	45	
	1004	1144	19.760	0.340	45	
	1104	1204	19.770	0.350	45	
	1204	1264	19.770	0.350	45	
	1304	1324	19.770	0.350	45	
	1404	1384	19.770	0.350	45	
	1504	1444	19.770	0.350	45	
	1604	1504	19.770	0.350	45	
	1704	1564	19.770	0.350	45	
	1804	1624	19.770	0.350	45	
	1904	1684	19.775	0.355	45	
	2004	1744	19.775	0.355	45	
	2104	1804	19.780	0.360	45	
	2204	1864	19.790	0.370	45	
	2304	1924	19.790	0.370	45	
9/16/98	0004	1984	19.790	0.370	45	
	0104	2044	19.800	0.380	45	
	0204	2104	19.800	0.380	45	
	0304	2164	19.800	0.380	45	
	0404	2224	19.810	0.390	45	
	0504	2284	19.810	0.390	45	
	0604	2344	19.810	0.390	45	
	0704	2404	19.820	0.400	45	
	0804	2464	19.820	0.400	45	
	0904	2524	19.830	0.410	45	
	1004	2584	19.830	0.410	45	
	1104	2644	19.830	0.410	45	
	1204	2704	19.830	0.410	45	
	1304	2764	19.835	0.415	45	
	1404	2824	19.835	0.415	45	
	1500	2880	19.840	0.420	45	Pump Off

Recovery Data for Observation Well PC-18
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

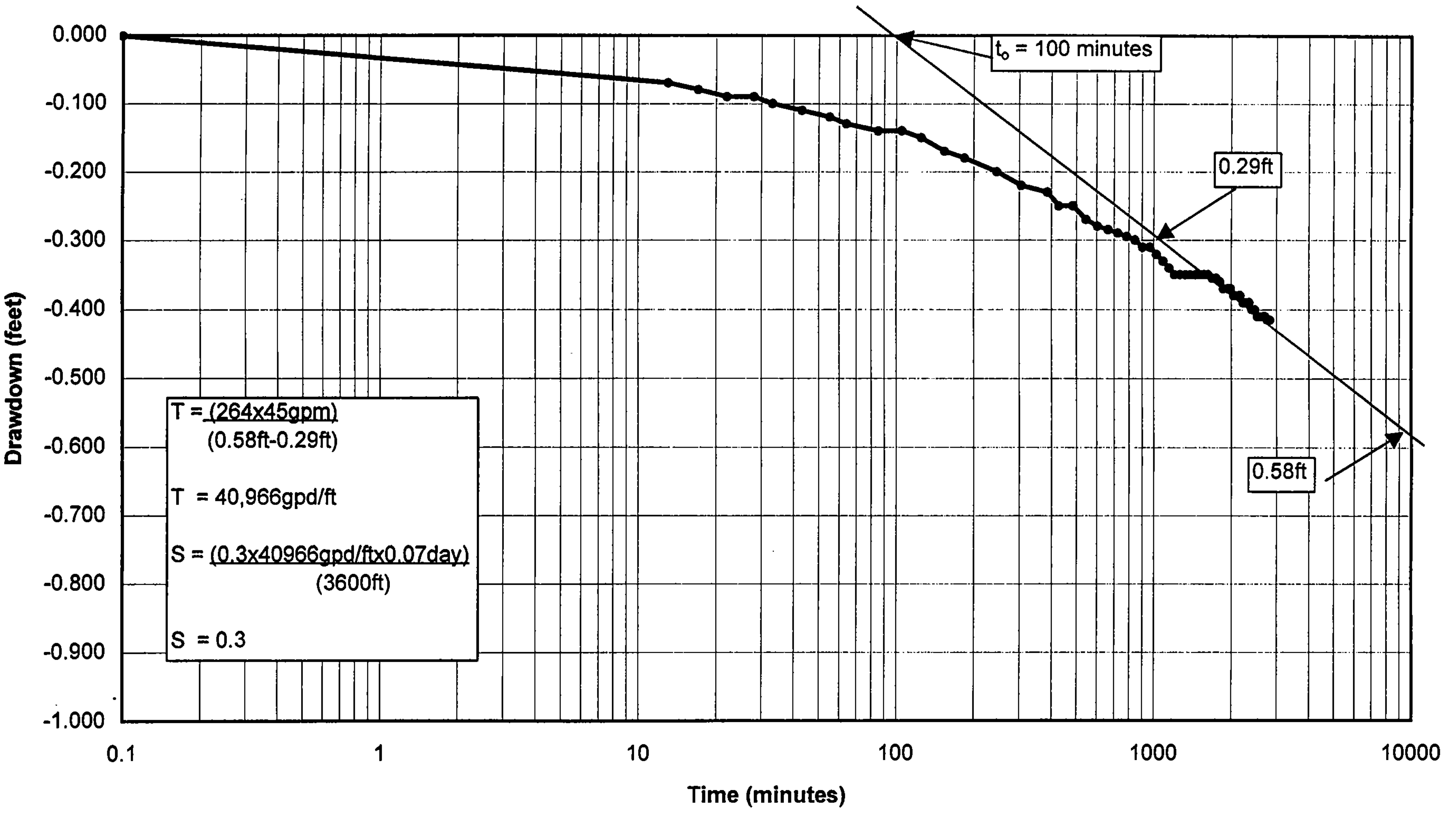
Pre-Test Water Level: 19.42 feet below top of casing
Pumping Rate: 45gpm

Date	24 Hour Clock Time	Time Since Pump Test Started (t, minutes)	Time Since Pump Stopped (t', minutes)	Ratio t/t'	Depth to Water (feet)	Residual Drawdown (s', feet)	Remarks
9/16/98	1500	2880	0.0	288000.0	19.840	0.420	Pump Off
	1513	2893	13.0	222.5	19.730	0.310	Recovery
	1519	2899	19.0	152.6	19.710	0.290	
	1527	2907	27.0	107.7	19.705	0.285	
	1538	2918	38.0	76.8	19.700	0.280	
	1548	2928	48.0	61.0	19.690	0.270	
	1558	2938	58.0	50.7	19.680	0.260	
	1618	2958	78.0	37.9	19.670	0.250	
	1640	2980	100.0	29.8	19.660	0.240	
	1700	3000	120.0	25.0	19.650	0.230	
	1730	3030	150.0	20.2	19.640	0.220	
	1800	3060	180.0	17.0	19.630	0.210	
	1930	3150	270.0	11.7	19.610	0.190	
	2100	3240	360.0	9.0	19.600	0.180	
9/17/98	2400	3420	540.0	6.3	19.580	0.160	
	0500	3720	840.0	4.4	19.550	0.130	
	0700	3840	960.0	4.0	19.540	0.120	
	1000	4020	1140.0	3.3	19.520	0.100	
	1210	4150	1270.0	3.0	19.510	0.090	End of Test

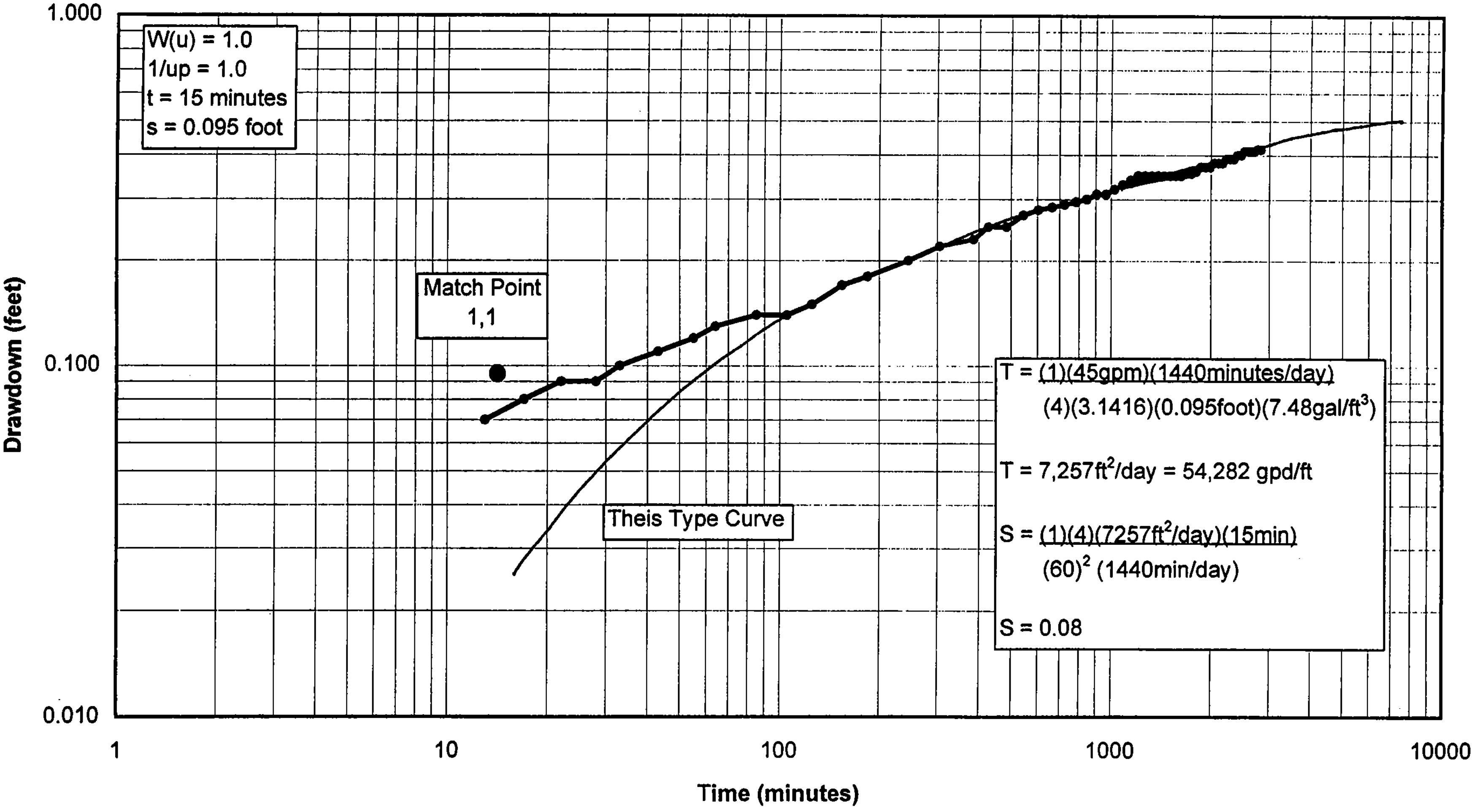
ARITHMETIC PLOT OF DRAWDOWN AND RECOVERY DATA
FOR OBSERVATION WELL PC-18
CONSTANT DISCHARGE TEST OF HENDERSON MONITOR WELL PC-70
Date of Test: September 14-17, 1998



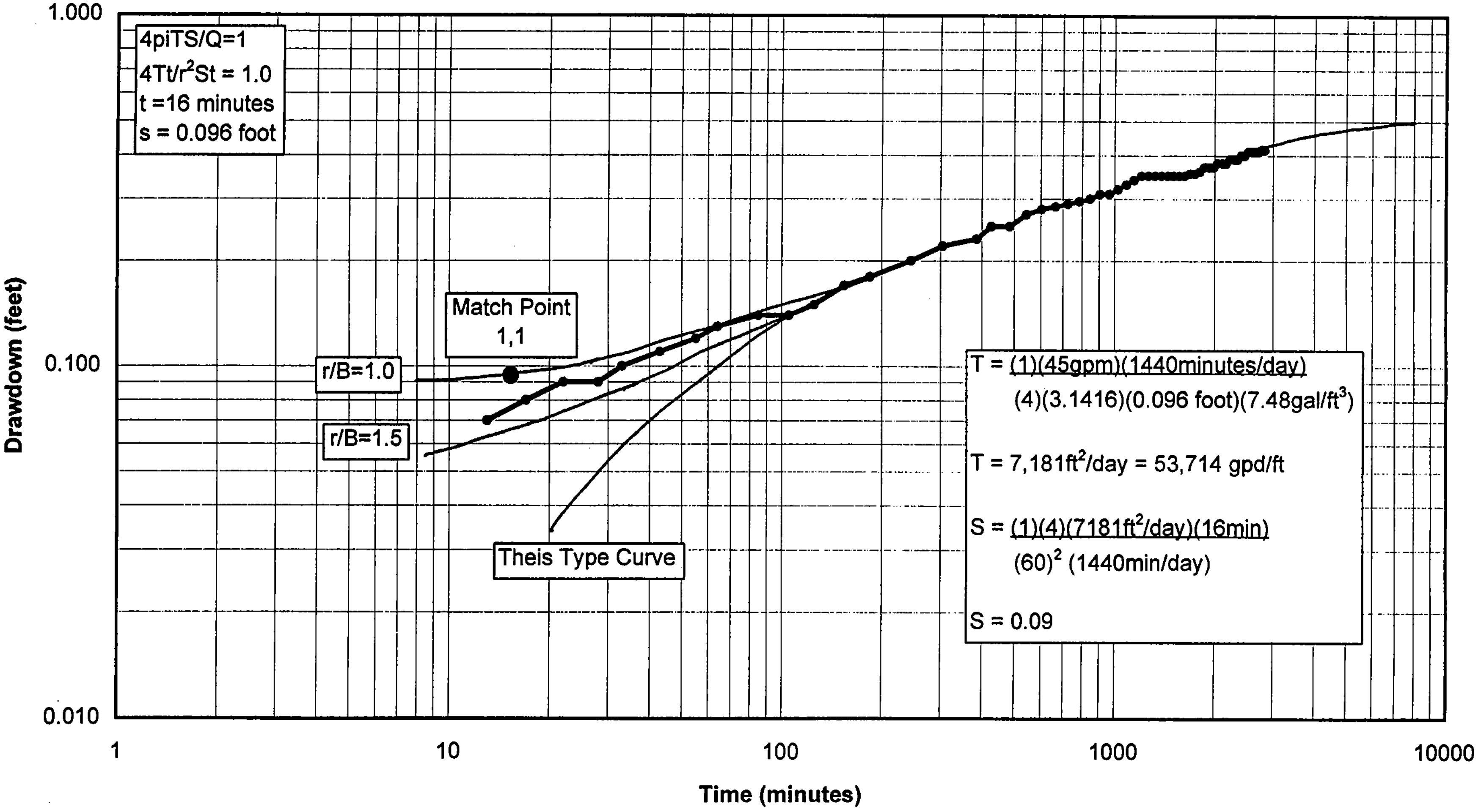
JACOBS SEMI-LOG ANALYSIS OF TIME vs DRAWDOWN
FOR OBSERVATION WELL PC-18
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



THEIS TYPE-CURVE ANALYSIS
LOG-LOG PLOT OF TIME vs DRAWDOWN FOR OBSERVATION WELL PC-18
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



BOULTON DELAYED DRAINAGE ANALYSIS
LOG-LOG PLOT OF TIME vs DRAWDOWN FOR OBSERVATION WELL PC-18
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



4piTS/Q=1
$4Tt/r^2St = 1.0$
t =16 minutes
s = 0.096 foot

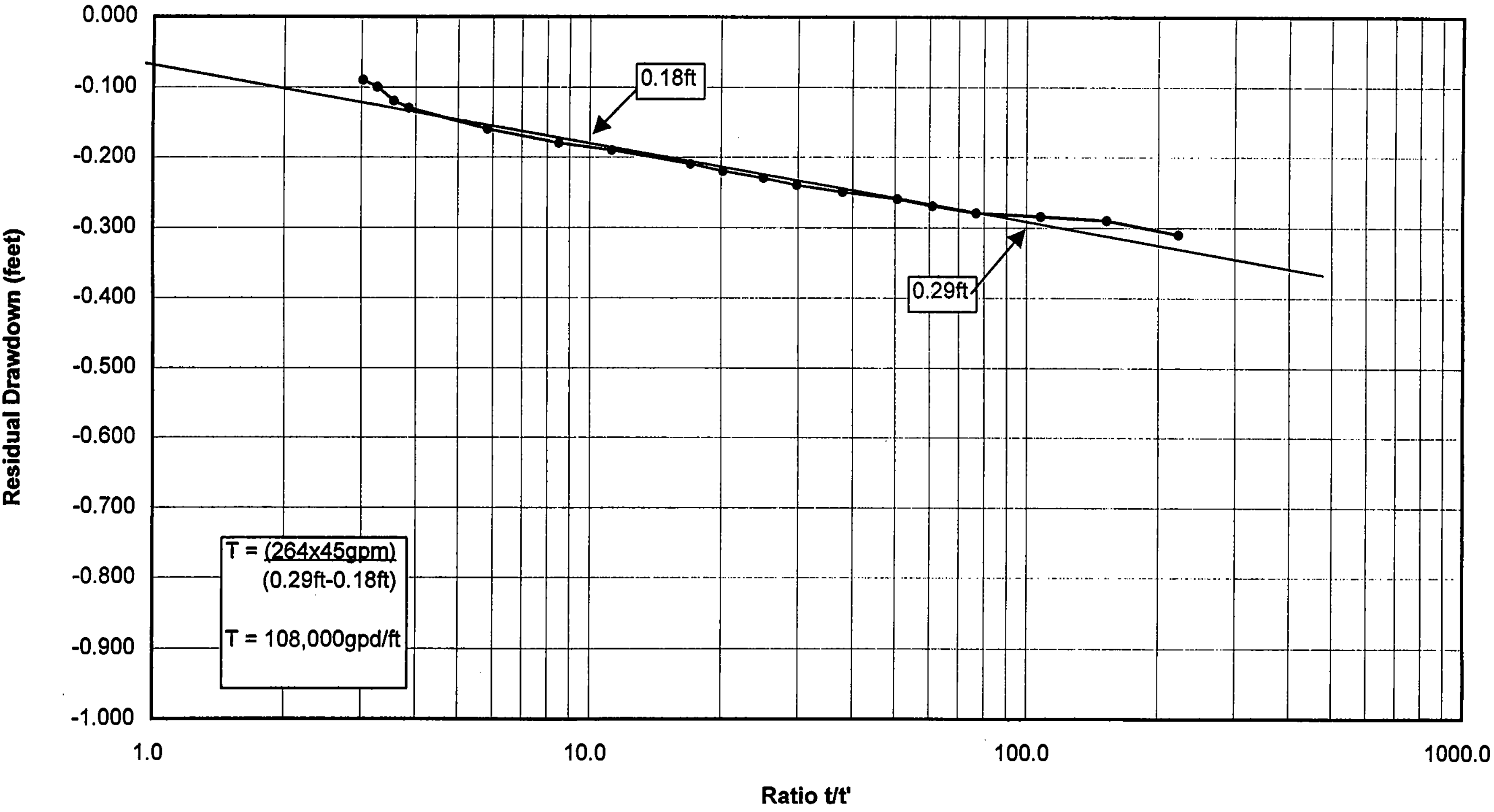
$$T = \frac{(1)(45gpm)(1440minutes/day)}{(4)(3.1416)(0.096\ foot)(7.48gal/ft^3)}$$

$T = 7,181ft^2/day = 53,714$ gpd/ft

$$S = \frac{(1)(4)(7181ft^2/day)(16min)}{(60)^2\ (1440min/day)}$$

S = 0.09

JACOBS SEMI-LOG ANALYSIS OF t/t' vs RESIDUAL DRAWDOWN DATA
FOR OBSERVATION WELL PC-18
CONSTANT DISCHARGE RECOVERY TEST OF HENDERSON TEST WELL PC-70
Date of Recovery Test: September 16-17, 1998



$$T = \frac{(264 \mathrm{x} 45 \mathrm{gpm})}{(0.29 \mathrm{ft} - 0.18 \mathrm{ft})}$$

T = 108,000gpd/ft

CALCULATION OF AQUIFER COEFFICIENTS FOR OBSERVATION WELL PC-18
CONSTANT DISCHARGE PUMPING TEST
OF PITTMAN LATERAL TEST WELL PC-70

Jacobs Semi-Log Straight-Line Analysis of Drawdown Data

Transmissivity = 40,966 gallons per day per foot
Permeability = 1,241 gallons per day per square foot
(40,966/33 feet of saturation)
Hydraulic Conductivity = 166 feet per day (1241/7.48gallons per cubic foot)
Storage Coefficient = 0.03

Theis Log-Log Type Curve Match Analysis of Drawdown Data

Transmissivity = 54,282 gallons per day per foot
Permeability = 1,645 gallons per day per square foot
(54282/33 feet of saturation)
Hydraulic Conductivity = 220 feet per day (1645/7.48gallons per cubic foot)
Storage Coefficient = 0.08

Boulton Log-Log Delayed Drainage Curve Match Analysis of Drawdown Data

Transmissivity = 53,714 gallons per day per foot
Permeability = 1,628 gallons per day per square foot
(53714/33 feet of saturation)
Hydraulic Conductivity = 218 feet per day (1628/7.48gallons per cubic foot)
Storage Coefficient = 0.09

Jacobs Semi-Log Straight-Line Analysis of Recovery Data

Transmissivity = 108,000 gallons per day per foot
Permeability = 3,273 gallons per day per square foot
(108000/33 feet of saturation)
Hydraulic Conductivity = 438 feet per day (3273/7.48gallons per cubic foot)

ADDENDUM G

Tabulations and Graphs of Drawdown and Recovery Data and Calculations of Aquifer Coefficients for Test Well PC-55

Drawdown Data For Observation Well PC-55
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

Pre-Test Water Level: 17.87 feet top of casing
Pumping Rate: 45gpm

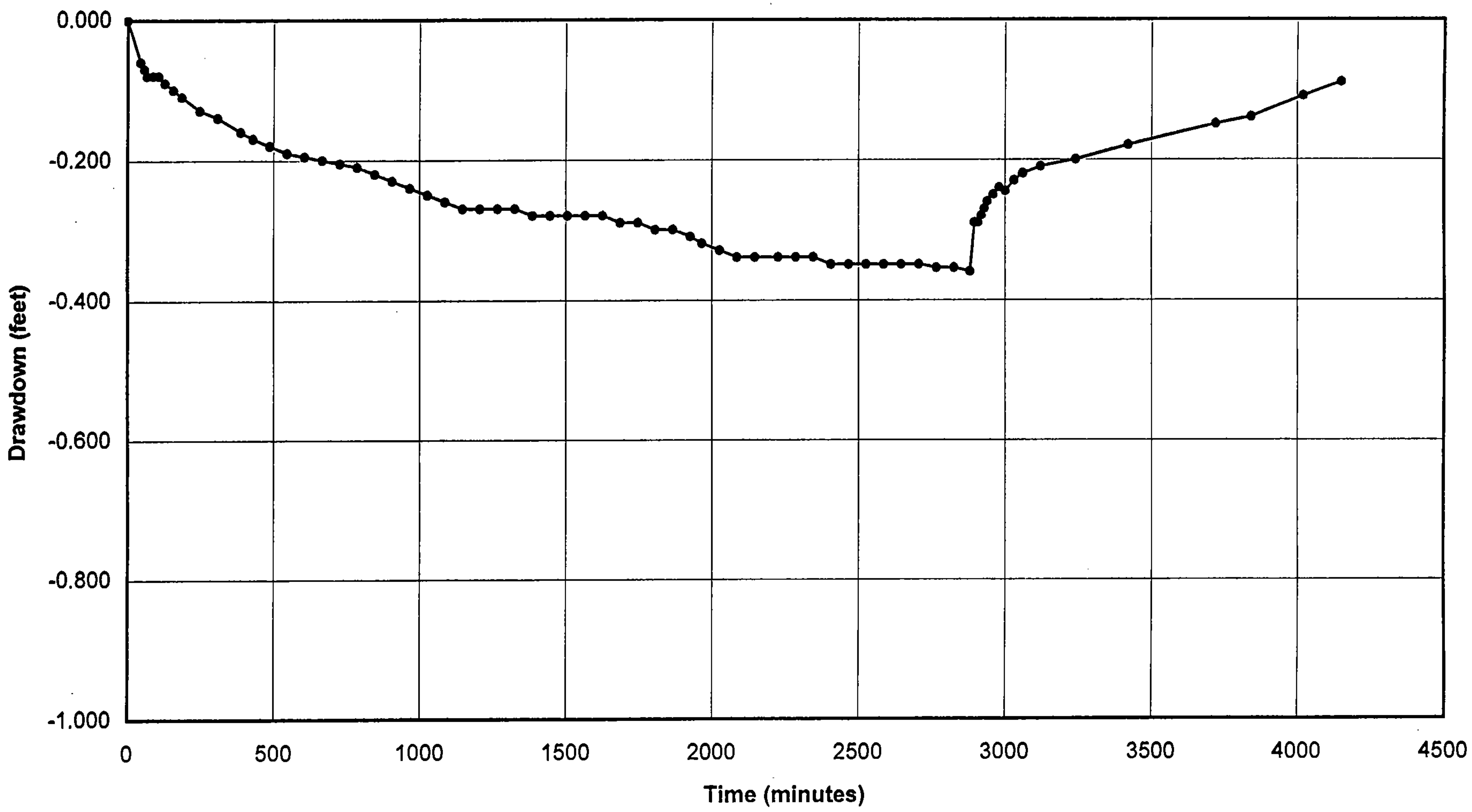
Date	24 Hour Clock Time	Elapsed Time Since Test Started (minutes)	Depth to Water (feet)	Drawdown (feet)	Pumping Rate (gpm)	Remarks
9/14/98	1500	0	17.870	0.000	0	Static WL
	1544	44	17.930	0.060	45	
	1557	57	17.940	0.070	45	
	1606	66	17.950	0.080	45	
	1626	86	17.950	0.080	45	
	1646	106	17.950	0.080	45	
	1707	127	17.960	0.090	45	
	1736	156	17.970	0.100	45	
	1806	186	17.980	0.110	45	
	1907	247	18.000	0.130	45	
	2008	308	18.010	0.140	45	
	2127	387	18.030	0.160	45	
	2209	429	18.040	0.170	45	
	2307	487	18.050	0.180	45	
9/15/98	0006	546	18.060	0.190	45	
	0106	606	18.065	0.195	45	
	0206	666	18.070	0.200	45	
	0306	726	18.075	0.205	45	
	0406	786	18.080	0.210	45	
	0506	846	18.090	0.220	45	
	0606	906	18.100	0.230	45	
	0706	966	18.110	0.240	45	
	0806	1026	18.120	0.250	45	
	0906	1086	18.130	0.260	45	
	1006	1146	18.140	0.270	45	
	1106	1206	18.140	0.270	45	
	1206	1266	18.140	0.270	45	
	1306	1326	18.140	0.270	45	
	1406	1386	18.150	0.280	45	
	1506	1446	18.150	0.280	45	
	1606	1506	18.150	0.280	45	
	1706	1566	18.150	0.280	45	
	1806	1626	18.150	0.280	45	
	1906	1686	18.160	0.290	45	
	2006	1746	18.160	0.290	45	
	2106	1806	18.170	0.300	45	
	2206	1866	18.170	0.300	45	
	2306	1926	18.180	0.310	45	
9/16/98	0006	1966	18.190	0.320	45	
	0106	2026	18.200	0.330	45	
	0206	2086	18.210	0.340	45	
	0306	2164	18.210	0.340	45	
	0406	2226	18.210	0.340	45	
	0506	2286	18.210	0.340	45	
	0606	2346	18.210	0.340	45	
	0706	2406	18.220	0.350	45	
	0806	2466	18.220	0.350	45	
	0906	2526	18.220	0.350	45	
	1006	2586	18.220	0.350	45	
	1106	2646	18.220	0.350	45	
	1206	2706	18.220	0.350	45	
	1306	2766	18.225	0.355	45	
	1406	2826	18.225	0.355	45	
	1500	2880	18.230	0.360	45	Pump Off

Recovery Data for Observation Well PC-55
Constant Discharge Test of Henderson Well PC-70
Kerr-McGee Henderson Facility, Henderson, NV
Test Date: September 14-17, 1998

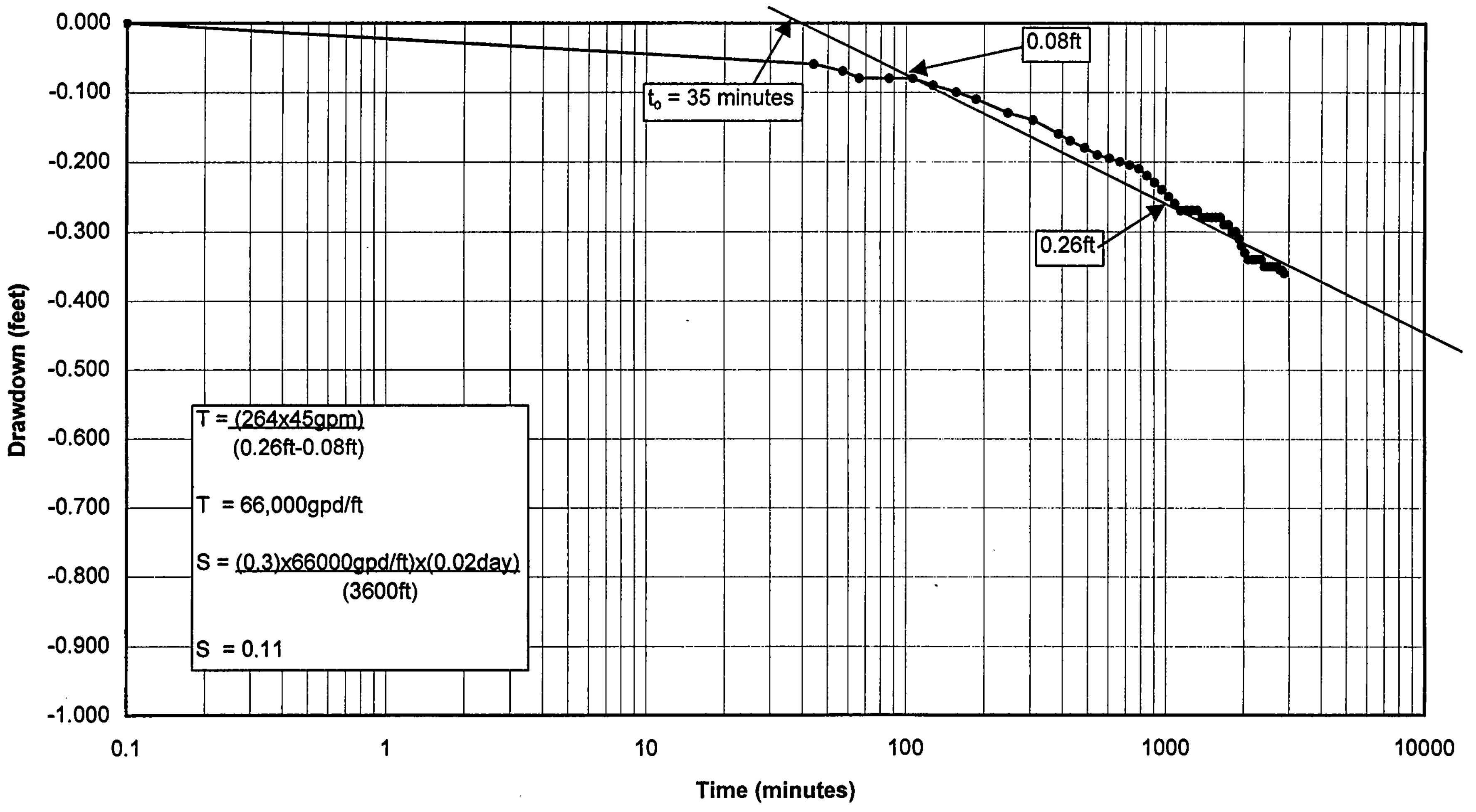
Pre-Test Water Level: 17.87 feet below top of casing
Pumping Rate: 45gpm

Date	24 Hour Clock Time	Time Since Pump Test Started (t, minutes)	Time Since Pump Stopped (t', minutes)	Ratio t/t'	Depth to Water (feet)	Residual Drawdown (s', feet)	Remarks
9/16/98	1500	2880	0.0	288000.0	18.230	0.360	Pump Off
	1515	2895	15.0	193.0	18.160	0.290	Recovery
	1522	2902	22.0	131.9	18.160	0.290	
	1528	2908	28.0	103.9	18.160	0.290	
	1539	2919	39.0	74.8	18.150	0.280	
	1549	2929	49.0	59.8	18.140	0.270	
	1559	2939	59.0	49.8	18.130	0.260	
	1619	2959	79.0	37.5	18.120	0.250	
	1640	2980	100.0	29.8	18.110	0.240	
	1700	3000	120.0	25.0	18.115	0.245	
	1730	3030	150.0	20.2	18.100	0.230	
	1800	3060	180.0	17.0	18.090	0.220	
	1930	3120	240.0	13.0	18.080	0.210	
	2100	3240	360.0	9.0	18.070	0.200	
9/17/98	2400	3420	540.0	6.3	18.050	0.180	
	0500	3720	840.0	4.4	18.020	0.150	
	0700	3840	960.0	4.0	18.010	0.140	
	1000	4020	1140.0	3.5	17.980	0.110	
	1210	4150	1270.0	3.3	17.960	0.090	End of Test

ARITHMETIC PLOT OF DRAWDOWN AND RECOVERY DATA
FOR OBSERVATION WELL PC-55
CONSTANT DISCHARGE TEST OF HENDERSON MONITOR WELL PC-70
Date of Test: September 14-17, 1998



JACOBS SEMI-LOG ANALYSIS OF TIME vs DRAWDOWN
FOR OBSERVATION WELL PC-55
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



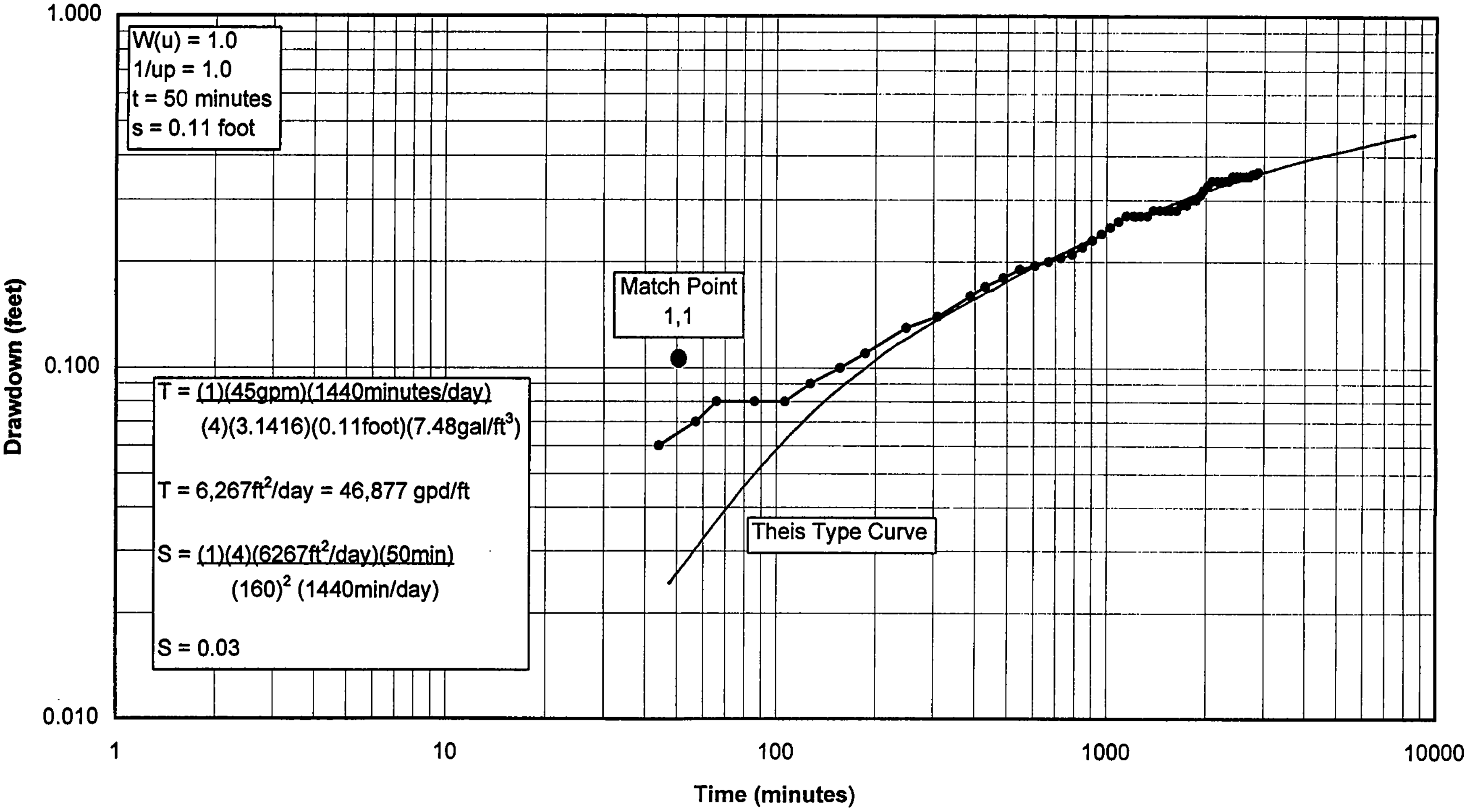
$T = \frac{(264x45gpm)}{(0.26ft-0.08ft)}$

T = 66,000gpd/ft

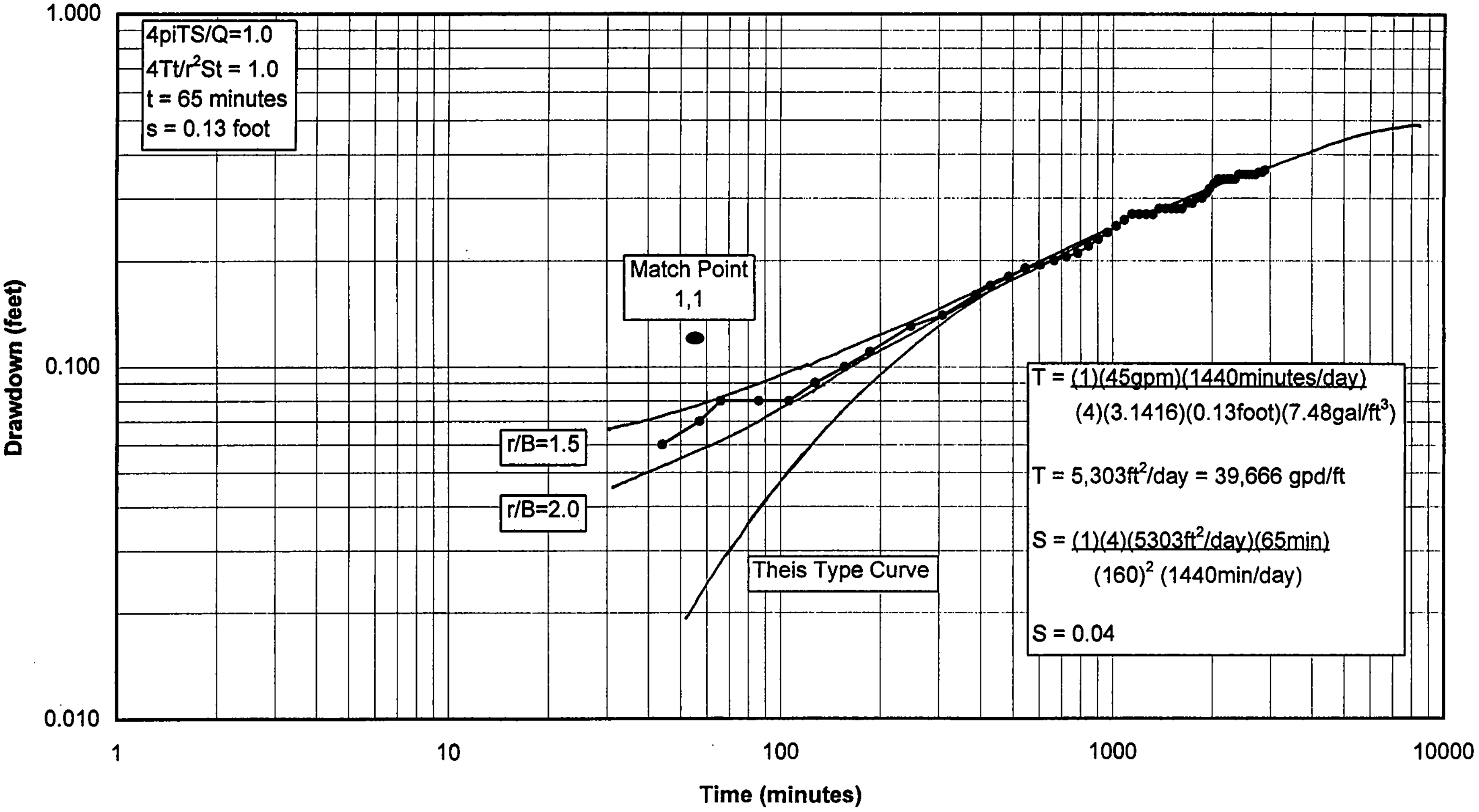
$S = \frac{(0.3)x66000gpd/ft)x(0.02day)}{(3600ft)}$

S = 0.11

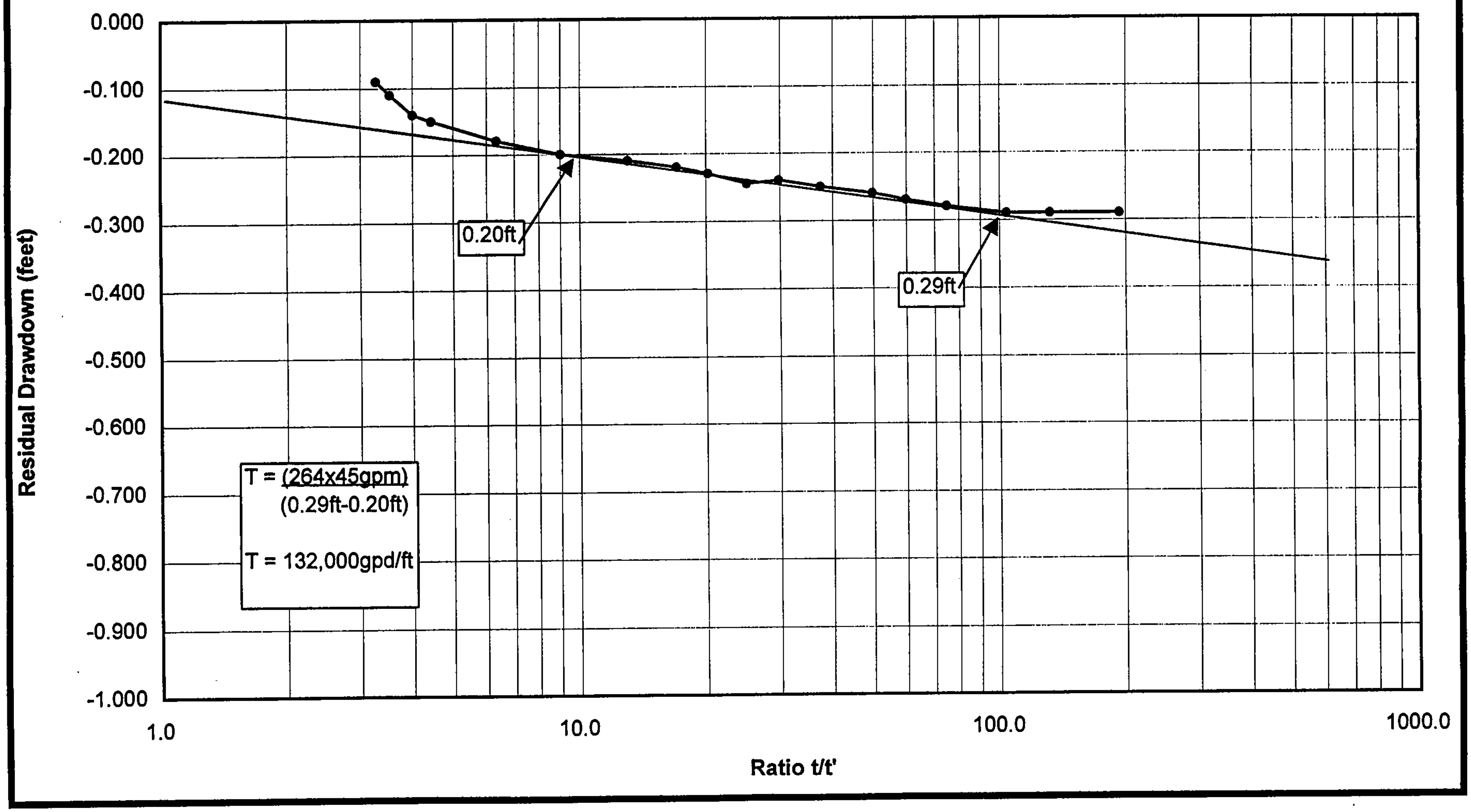
THEIS TYPE-CURVE ANALYSIS
LOG-LOG PLOT OF TIME vs DRAWDOWN FOR OBSERVATION WELL PC-55
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



BOULTON DELAYED DRAINAGE ANALYSIS
LOG-LOG PLOT OF TIME vs DRAWDOWN FOR OBSERVATION WELL PC-55
CONSTANT DISCHARGE PUMPING TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



JACOBS SEMI-LOG ANALYSIS OF t/t' vs RESIDUAL DRAWDOWN DATA
FOR OBSERVATION WELL PC-55
CONSTANT DISCHARGE RECOVERY TEST OF HENDERSON TEST WELL PC-70
Date of Recovery Test: September 16-17, 1998



$$T = \frac{(264 \times 45\text{gpm})}{(0.29\text{ft} - 0.20\text{ft})}$$

T = 132,000gpd/ft

CALCULATION OF AQUIFER COEFFICIENTS FOR OBSERVATION WELL PC-55
CONSTANT DISCHARGE PUMPING TEST
OF PITTMAN LATERAL TEST WELL PC-70

Jacobs Semi-Log Straight-Line Analysis of Drawdown Data

Transmissivity = 66,000 gallons per day per foot
Permeability = 1,748 gallons per day per square foot
(66,000/33 feet of saturation)
Hydraulic Conductivity = 239 feet per day (1748/7.48gallons per cubic foot)
Storage Coefficient = 0.11

Theis Log-Log Type Curve Match Analysis of Drawdown Data

Transmissivity = 46,877 gallons per day per foot
Permeability = 1,267 gallons per day per square foot
(46877/37 feet of saturation)
Hydraulic Conductivity = 169 feet per day (1287/7.48gallons per cubic foot)
Storage Coefficient = 0.03

Boulton Log-Log Delayed Drainage Curve Match Analysis of Drawdown Data

Transmissivity = 39,666 gallons per day per foot
Permeability = 1,072 gallons per day per square foot
(39666/37 feet of saturation)
Hydraulic Conductivity = 143 feet per day (1072/7.48gallons per cubic foot)
Storage Coefficient = 0.04

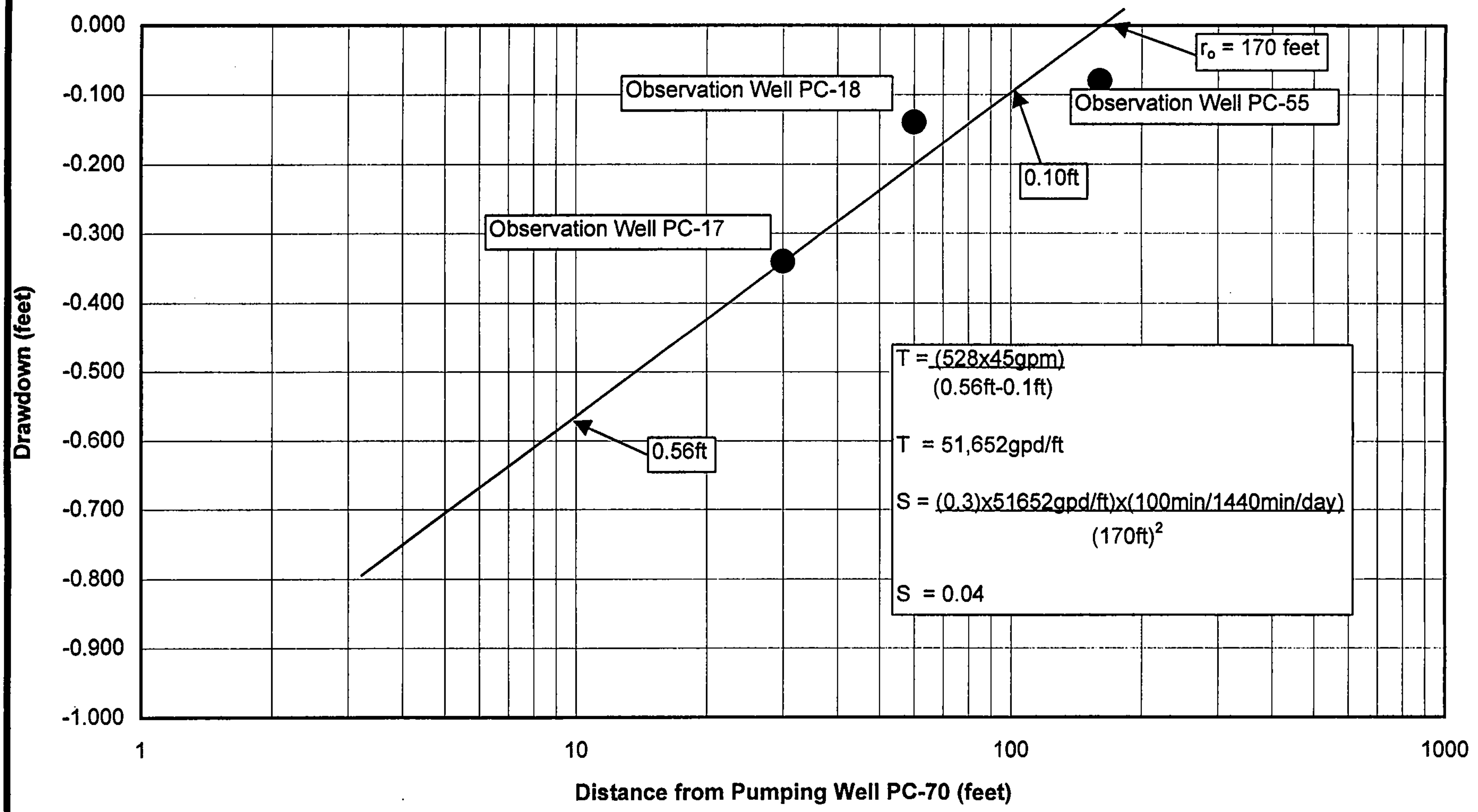
Jacobs Semi-Log Straight-Line Analysis of Recovery Data

Transmissivity = 132,000 gallons per day per foot
Permeability = 3,568 gallons per day per square foot
(132000/37 feet of saturation)
Hydraulic Conductivity = 477 feet per day (3568/7.48gallons per cubic foot)

ADDENDUM H

Graphs of Distance-Drawdown Analyses and Calculations of Corresponding Aquifer Coefficients

DISTANCE-DRAWDOWN ANALYSIS OF DRAWDOWN DATA
AFTER 100 MINUTES OF PUMPING
CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



$$T = \frac{(528x45gpm)}{(0.56ft-0.1ft)}$$

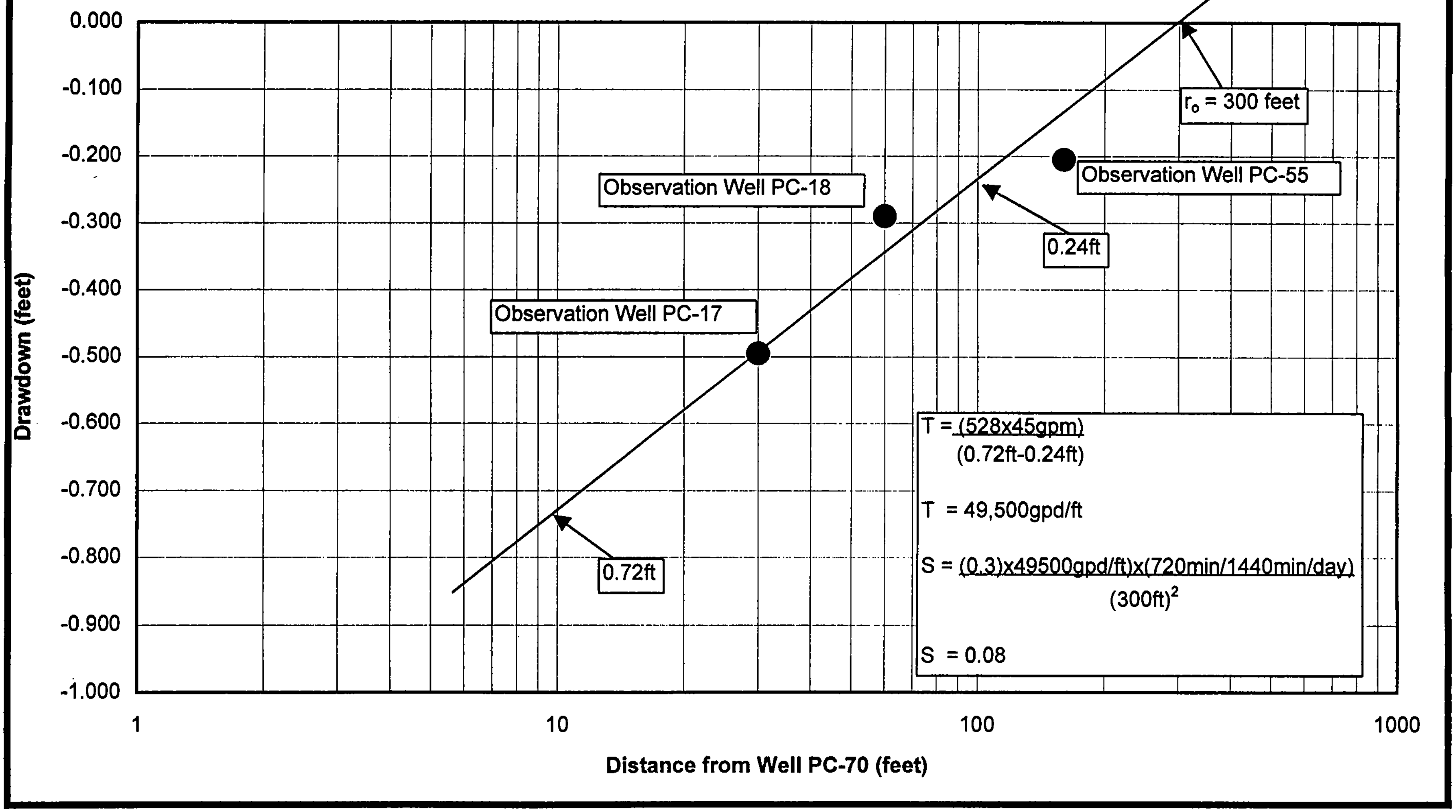
$$T = 51,652gpd/ft$$

$$S = \frac{(0.3)x51652gpd/ft)x(100min/1440min/day)}{(170ft)^2}$$

$$S = 0.04$$

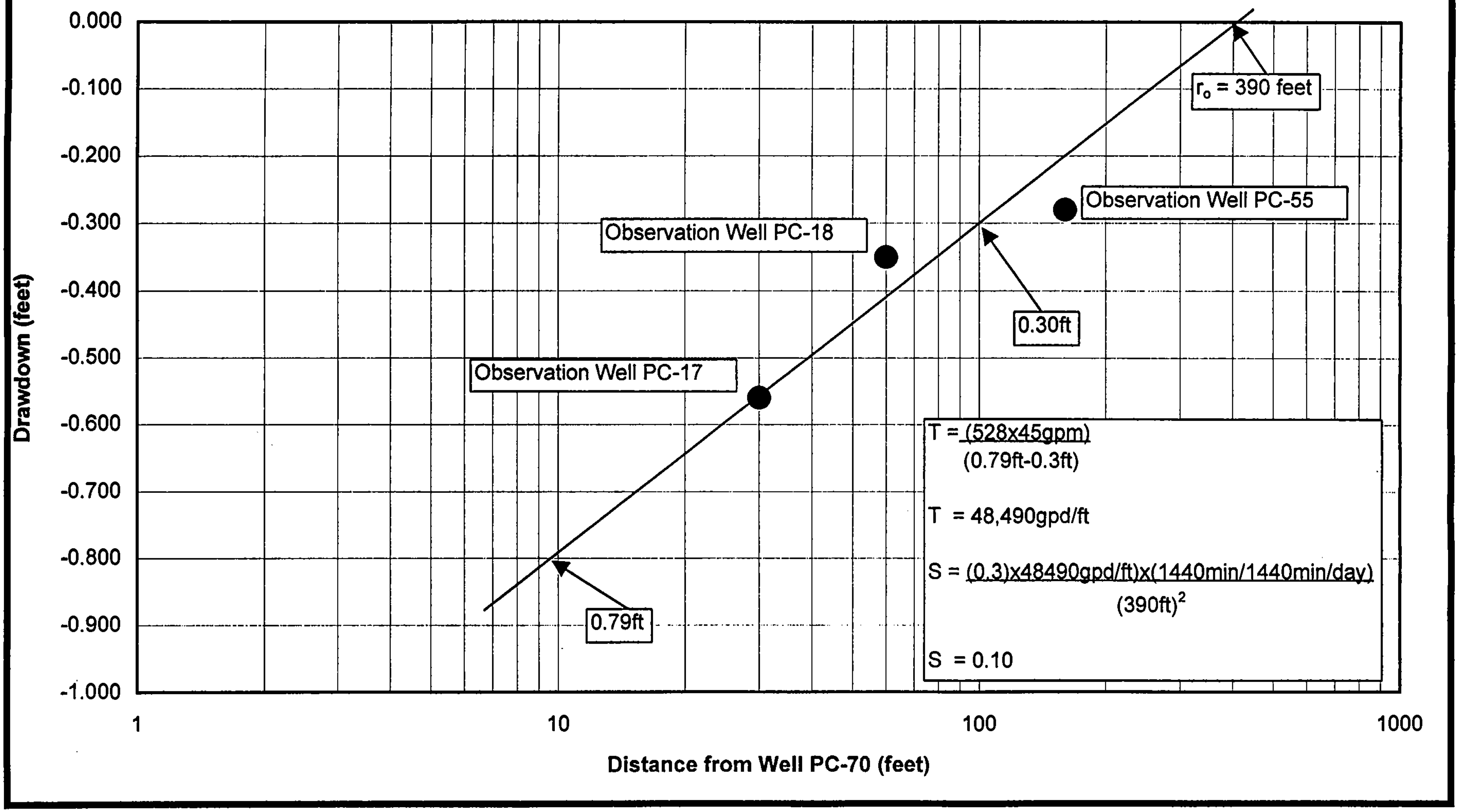
DISTANCE-DRAWDOWN ANALYSIS OF DRAWDOWN DATA AFTER 720 MINUTES (12 HOURS) OF PUMPING CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70

Date of Test: September 14-17, 1998



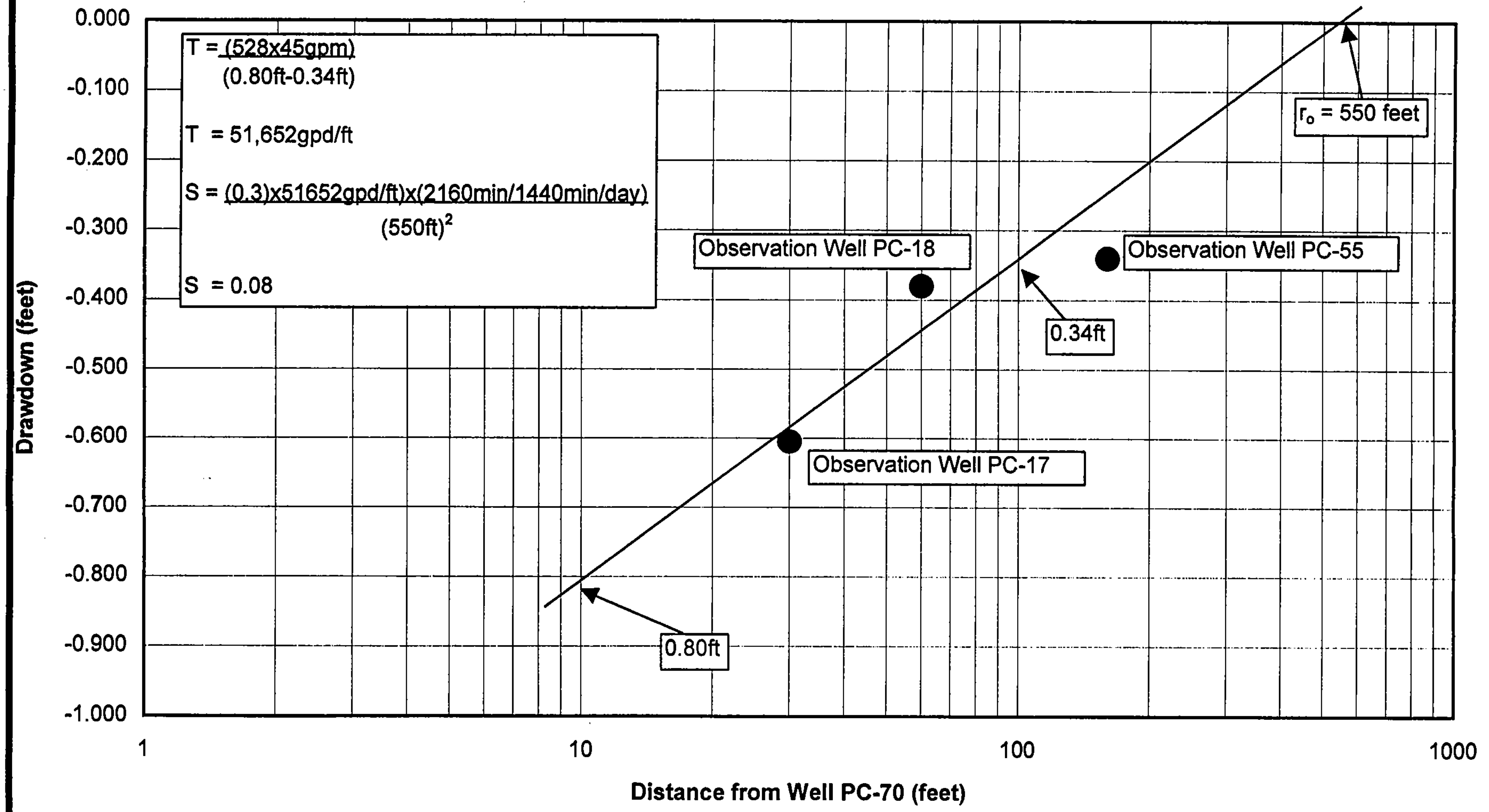
DISTANCE-DRAWDOWN ANALYSIS OF DRAWDOWN DATA AFTER 1440 MINUTES (24 HOURS) OF PUMPING CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70

Date of Test: September 14-17, 1998



DISTANCE-DRAWDOWN ANALYSIS OF DRAWDOWN DATA AFTER 2160 MINUTES (36 HOURS) OF PUMPING CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70

Date of Test: September 14-17, 1998



$$T = \frac{(528x45gpm)}{(0.80ft-0.34ft)}$$

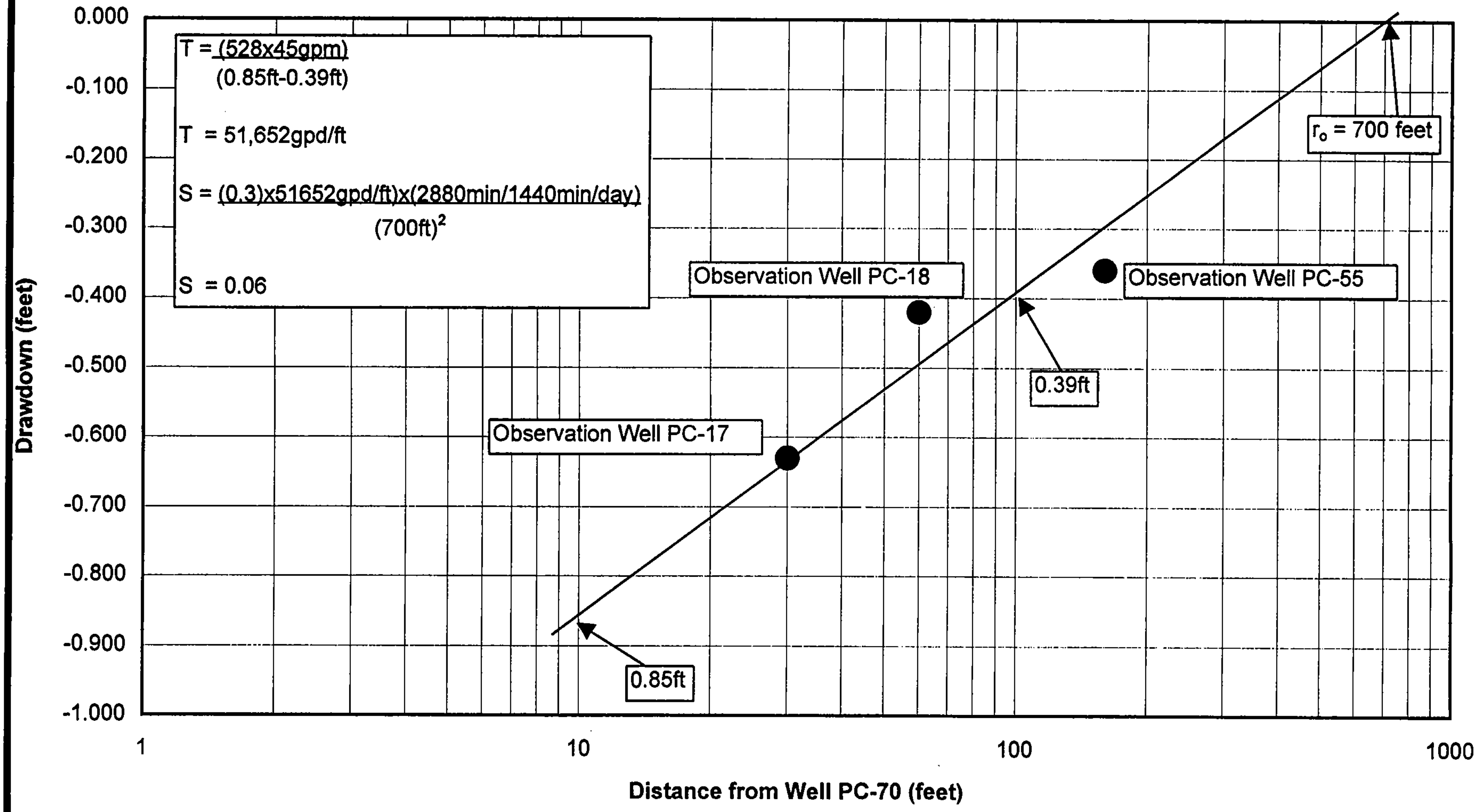
$T = 51,652gpd/ft$

$$S = \frac{(0.3)x51652gpd/ft)x(2160min/1440min/day)}{(550ft)^2}$$

$S = 0.08$

DISTANCE-DRAWDOWN ANALYSIS OF DRAWDOWN DATA AFTER 2880 MINUTES (48 HOURS) OF PUMPING CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70

Date of Test: September 14-17, 1998



$$T = \frac{(528 \times 45gpm)}{(0.85ft - 0.39ft)}$$

$$T = 51{,}652gpd/ft$$

$$S = \frac{(0.3) \times 51652gpd/ft) \times (2880min/1440min/day)}{(700ft)^2}$$

$$S = 0.06$$

CALCULATION OF AQUIFER COEFFICIENTS FROM DISTANCE DRAWDOWN DATA CONSTANT DISCHARGE PUMPING TEST OF PITTMAN LATERAL TEST WELL PC-70

Jacobs Semi-Log Straight-Line Analysis of Distance-Drawdown Data at 100 Minutes

Transmissivity = 51,652 gallons per day per foot
Permeability = 1,519 gallons per day per square foot
(51652/34 feet of average saturation)
Hydraulic Conductivity = 203 feet per day (1519/7.48gallons per cubic foot)
Storage Coefficient = 0.04

Jacobs Semi-Log Straight-Line Analysis of Distance-Drawdown Data at 720 Minutes

Transmissivity = 49,500 gallons per day per foot
Permeability = 1,456 gallons per day per square foot
(49500/34 feet of average saturation)
Hydraulic Conductivity = 195 feet per day (1456/7.48gallons per cubic foot)
Storage Coefficient = 0.08

Jacobs Semi-Log Straight-Line Analysis of Distance-Drawdown Data at 1440 Minutes

Transmissivity = 48,490 gallons per day per foot
Permeability = 1,426 gallons per day per square foot
(48490/34 feet of average saturation)
Hydraulic Conductivity = 191 feet per day (1426/7.48gallons per cubic foot)
Storage Coefficient = 0.10

Jacobs Semi-Log Straight-Line Analysis of Distance-Drawdown Data at 2160 Minutes

Transmissivity = 51,652 gallons per day per foot
Permeability = 1,519 gallons per day per square foot
(51,652/34 feet of average saturation)
Hydraulic Conductivity = 203 feet per day (1519/7.48gallons per cubic foot)
Storage Coefficient = 0.08

CALCULATION OF AQUIFER COEFFICIENTS FROM DISTANCE DRAWDOWN DATA CONSTANT DISCHARGE PUMPING TEST OF PITTMAN LATERAL TEST WELL PC-70

(continued)

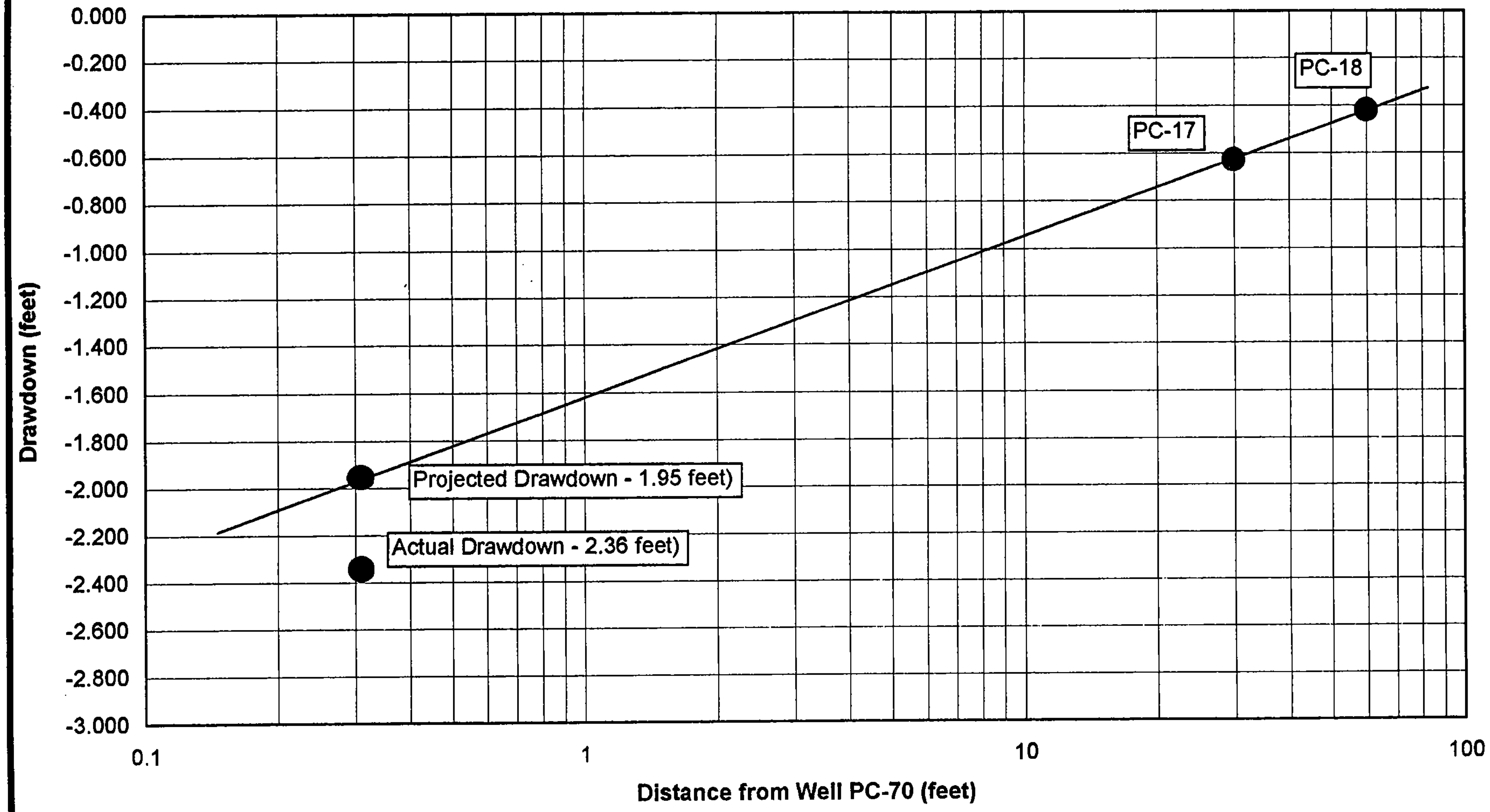
Jacobs Semi-Log Straight-Line Analysis of Distance-Drawdown Data at 2880 Minutes

Transmissivity = 51,652 gallons per day per foot
Permeability = 1,519 gallons per day per square foot
(51,652/34 feet of average saturation)
Hydraulic Conductivity = 203 feet per day (1519/7.48gallons per cubic foot)
Storage Coefficient = 0.08

ADDENDUM I

Projection of Well Efficiency for Test Well PC-70

SEMI-LOG PLOT OF DISTANCE-DRAWDOWN AT WELLS PC-17 AND PC-18
PROJECTING THE EFFICIENCY OF TEST WELL PC-70 AT 48 HOURS
CONSTANT DISCHARGE TEST OF HENDERSON TEST WELL PC-70
Date of Test: September 14-17, 1998



Attachment 2

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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ILLUSTRATIONS

CONTENTS – continued

Figure

CONTENTS – continued

Figure

APPENDICES

Appendix

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

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.

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

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 nonequilibrium 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.

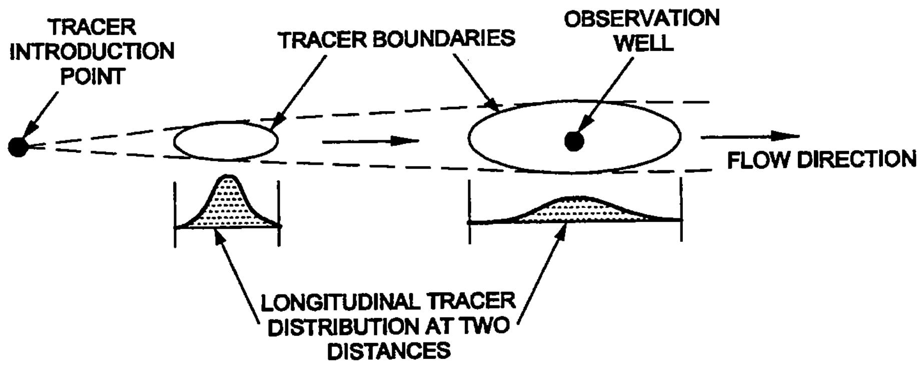
SUMMARY OF PUMPING TEST RESULTS, SITE C: Analysis of pumping test results for **Site C** indicates that computed transmissivities range from 110,000 to 170,000 gpd/ft. Operative transmissivity is judged to be about 160,000 gpd/ft based on data obtained during the recovery period. Based on aquifer thickness 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 breakthrough 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.

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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

				..........BOREHOLE..........		........................CASING........................		
WELL IDENTIFIER	PIEZOMETER IDENTIFIER	DATE COMPLETED	ALTITUDE OF TOP OF CASING (feet, msl)[a]	BOREHOLE DIAMETER (inches)	BOREHOLE DEPTH (feet)	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 [illegible] COMMON CONSTITUENTS AND ROUTINE PARAMETERS FOR WATER SAMPLES OBTAINED BETWEEN PITTMAN LATERAL AND SEEP AREA
KERR–McGEE CHEMICAL LLC, HENDERSON, NEVADA

	…..SAMPLE IDENTIFIER…..			…..COMMON CONSTITUENTS^a (milligrams per liter)…..													…..ROUTINE PARAMETERS…..				
																		ELECTRICAL CONDUCTANCE ..(µmho/cm)^c..		…..pH…..	
SAMPLE SOURCE	FIELD	LAB	DATE SAMPLED	Ca	Mg	Na	K	HCO_3	Cl	SO_4	NO_3	F	Br	B	Alk	TDS	TEMP^b	FIELD	LAB	FIELD	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

								……………..FIELD PARAMETERS……………..		
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]	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

		COOPER-JACOB SEMI-LOGARITHMIC GRAPHICAL METHOD		THEIS SEMI-LOGARITHMIC RECOVERY GRAPHICAL METHOD		
PUMPED WELL IDENTIFIER	OBSERVATION WELL IDENTIFIER	TRANSMISSIVITY (gpd/ft)[a]	STORAGE COEFFICIENT[b]	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

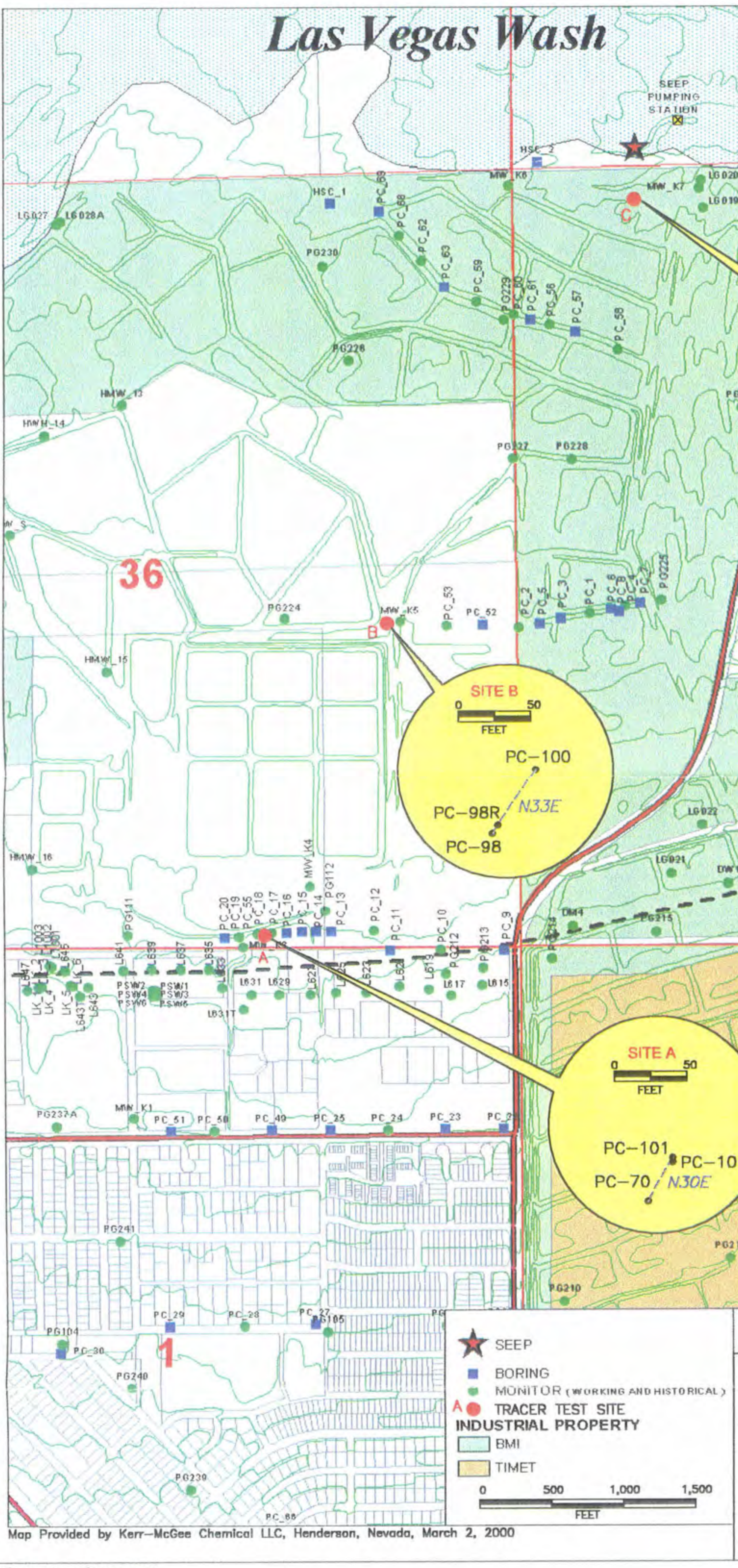
--- = Reliable value could not be determined

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

KERR-McGEE CHEMICAL LLC
HENDERSON, NEVADA

CLARK COUNTY, NEVADA

LOCATION MAP

ERROL L. MONTGOMERY & ASSOCIATES, INC. 2000
CONSULTANTS IN HYDROGEOLOGY
TUCSON, ARIZONA

FIGURE 1

448.01\FIG1-locmap\27Sept2000

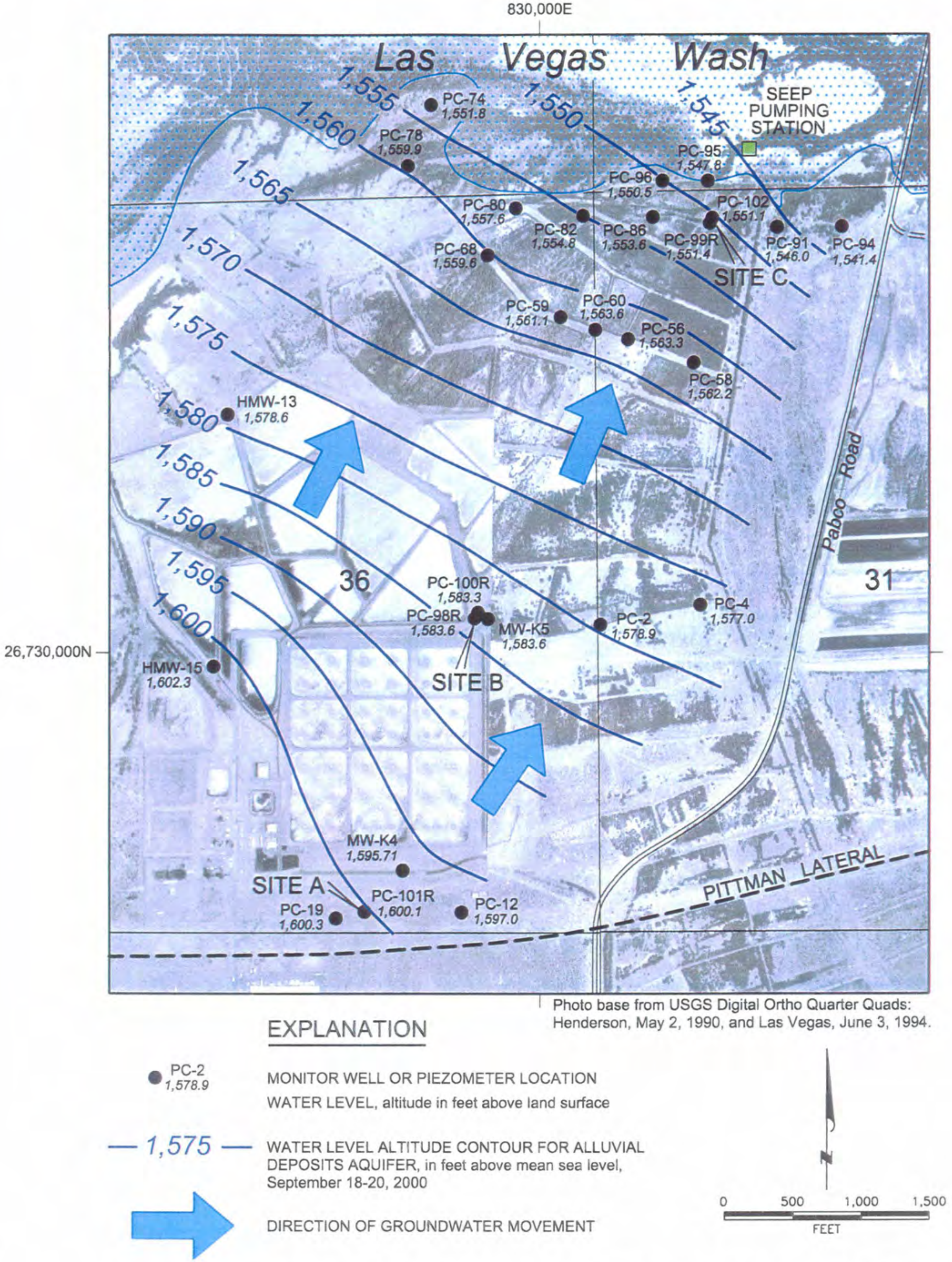


Photo base from USGS Digital Ortho Quarter Quads: Henderson, May 2, 1990, and Las Vegas, June 3, 1994.

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

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ERROL L. MONTGOMERY & ASSOCIATES, INC.

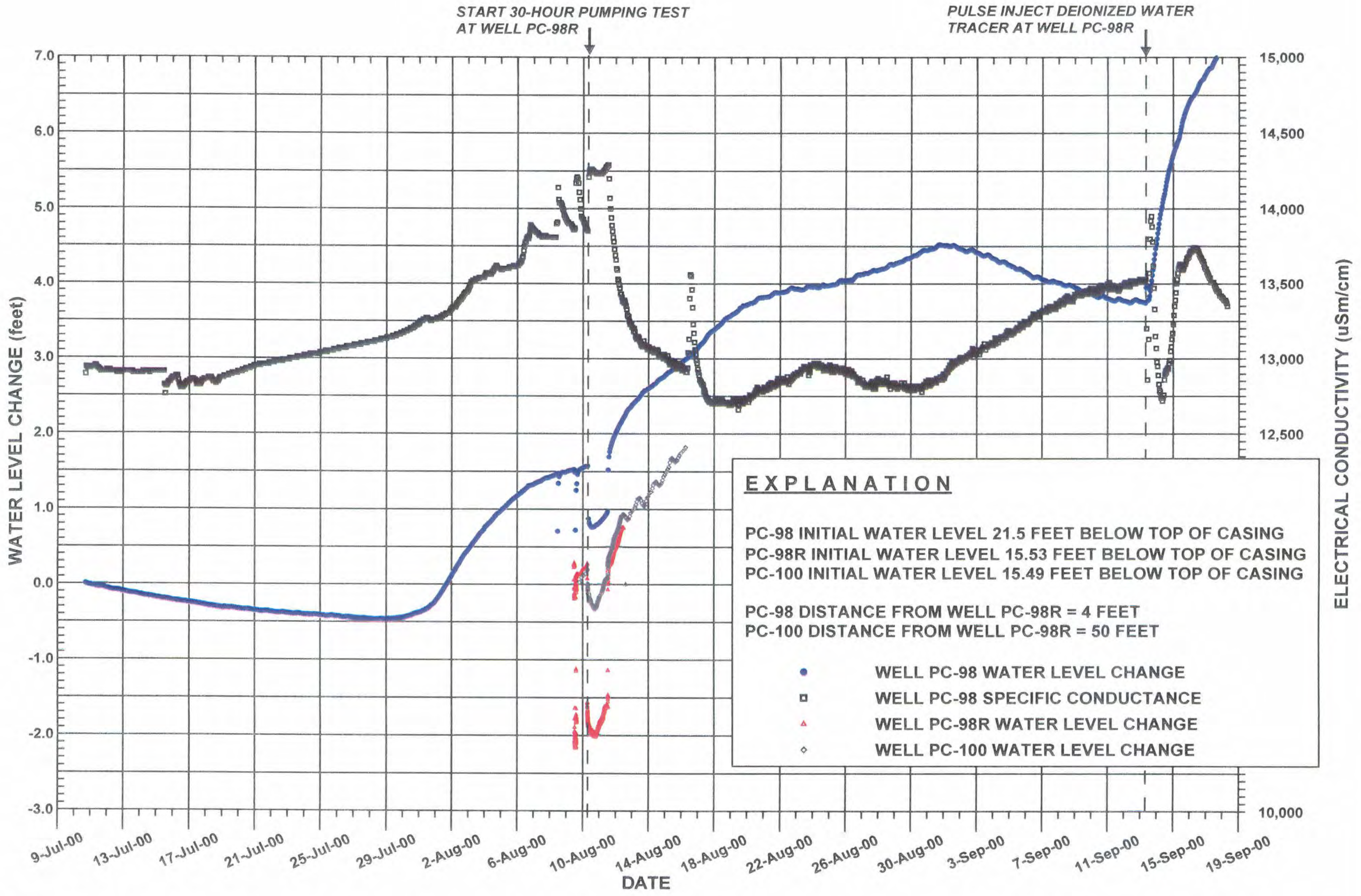


FIGURE 3. BASELINE HYDROGRAPH OF WATER LEVEL AND SPECIFIC CONDUCTANCE HYDROGRAPH FOR WELL PC-98, WATER LEVEL FOR WELL PC-98R, AND WATER LEVEL FOR PIEZOMETER PC-100, SITE B

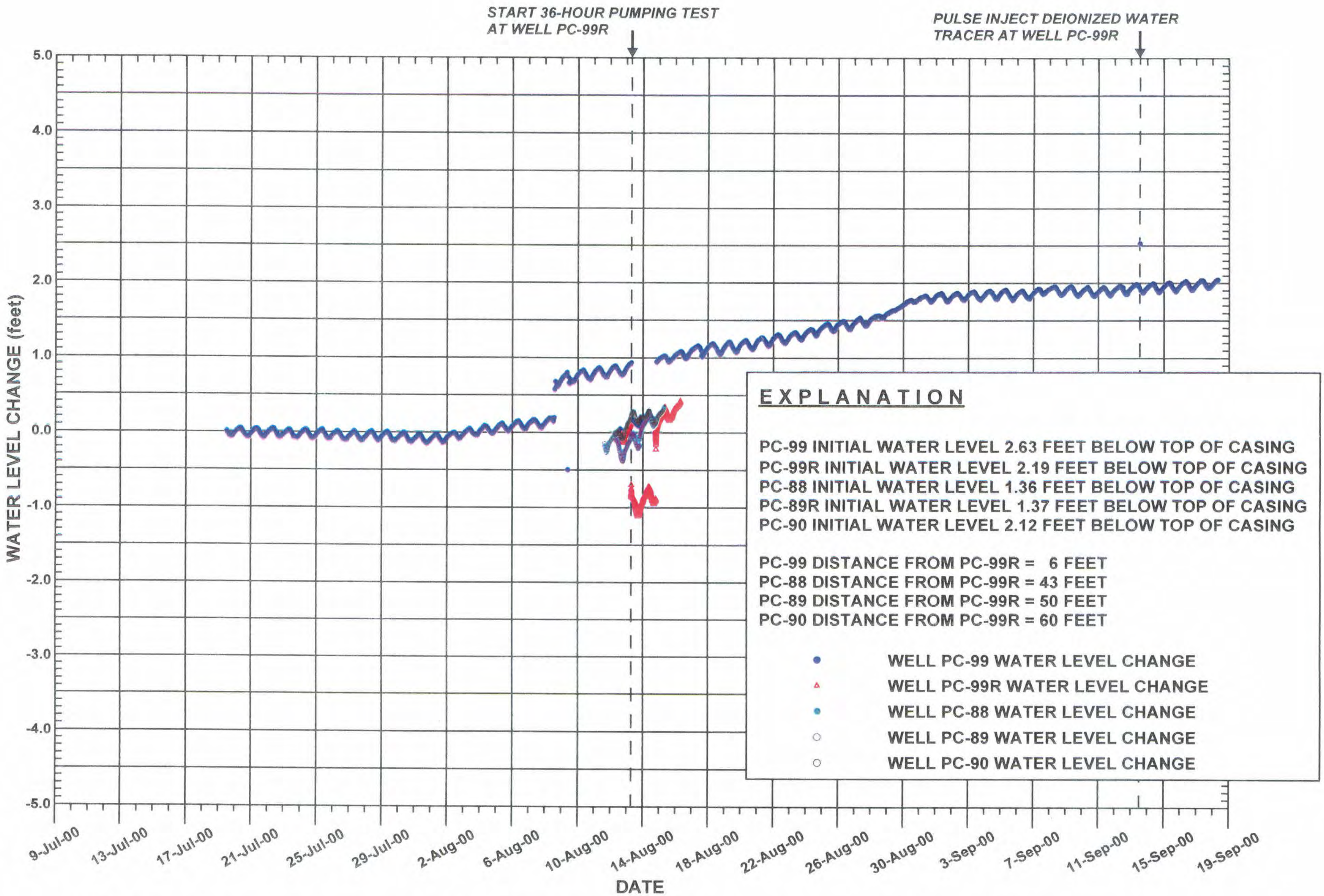


FIGURE 4. BASELINE HYDROGRAPH OF WATER LEVEL FOR WELLS PC-99 AND PC-99R, AND PIEZOMETERS PC-88, PC-89, AND PC-90, SITE C

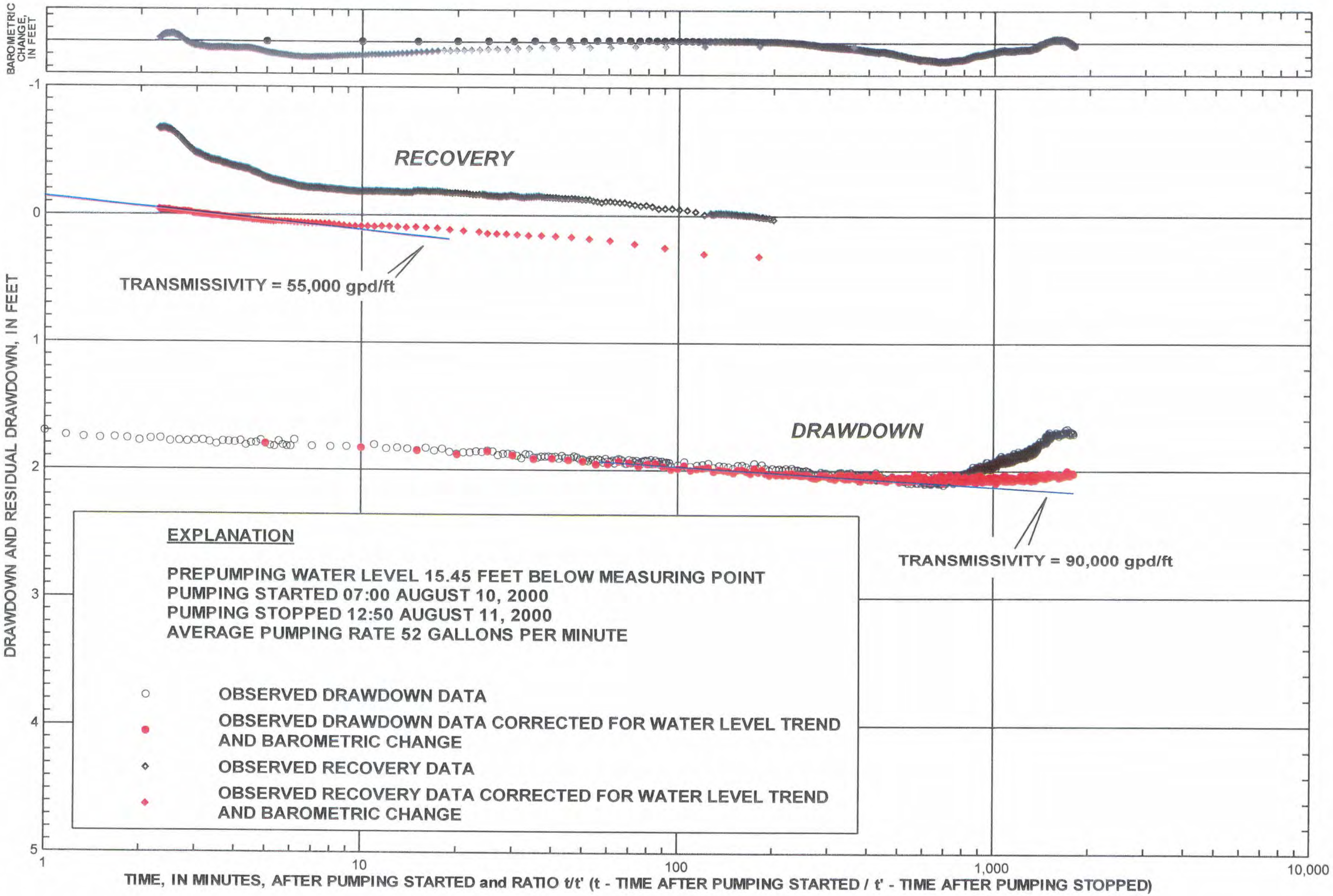


FIGURE 5. DRAWDOWN AND RECOVERY GRAPH FOR PUMPED WELL PC-98R DURING CONSTANT-DISCHARGE PUMPING TEST (SITE B)

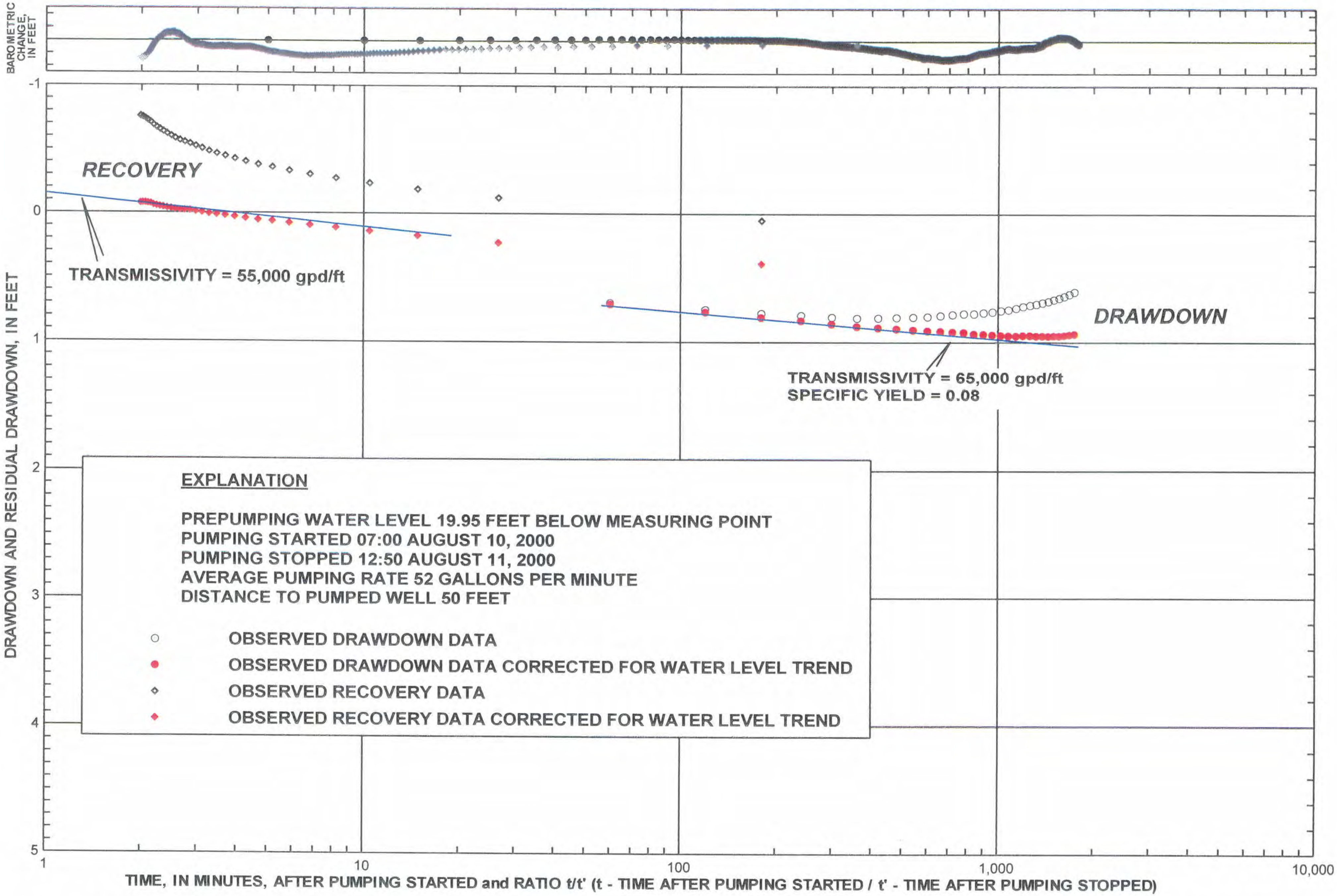


FIGURE 6. DRAWDOWN AND RECOVERY GRAPH FOR OBSERVATION WELL PC-98 DURING CONSTANT-DISCHARGE PUMPING TEST AT WELL PC-98R (SITE B)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

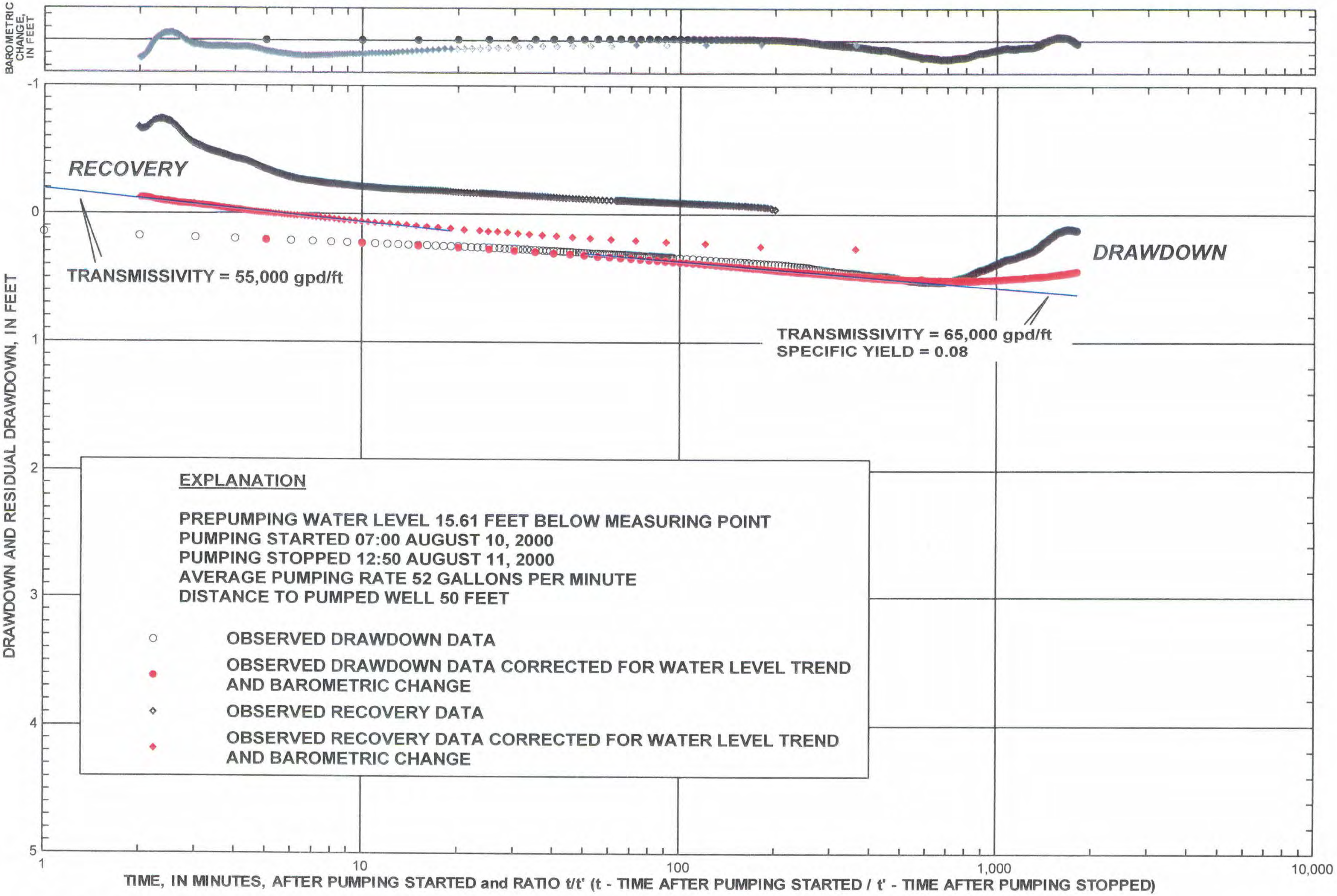


FIGURE 7. DRAWDOWN AND RECOVERY GRAPH FOR PIEZOMETER PC-100 DURING CONSTANT-RATE PUMPING TEST AT WELL PC-98R (SITE B)

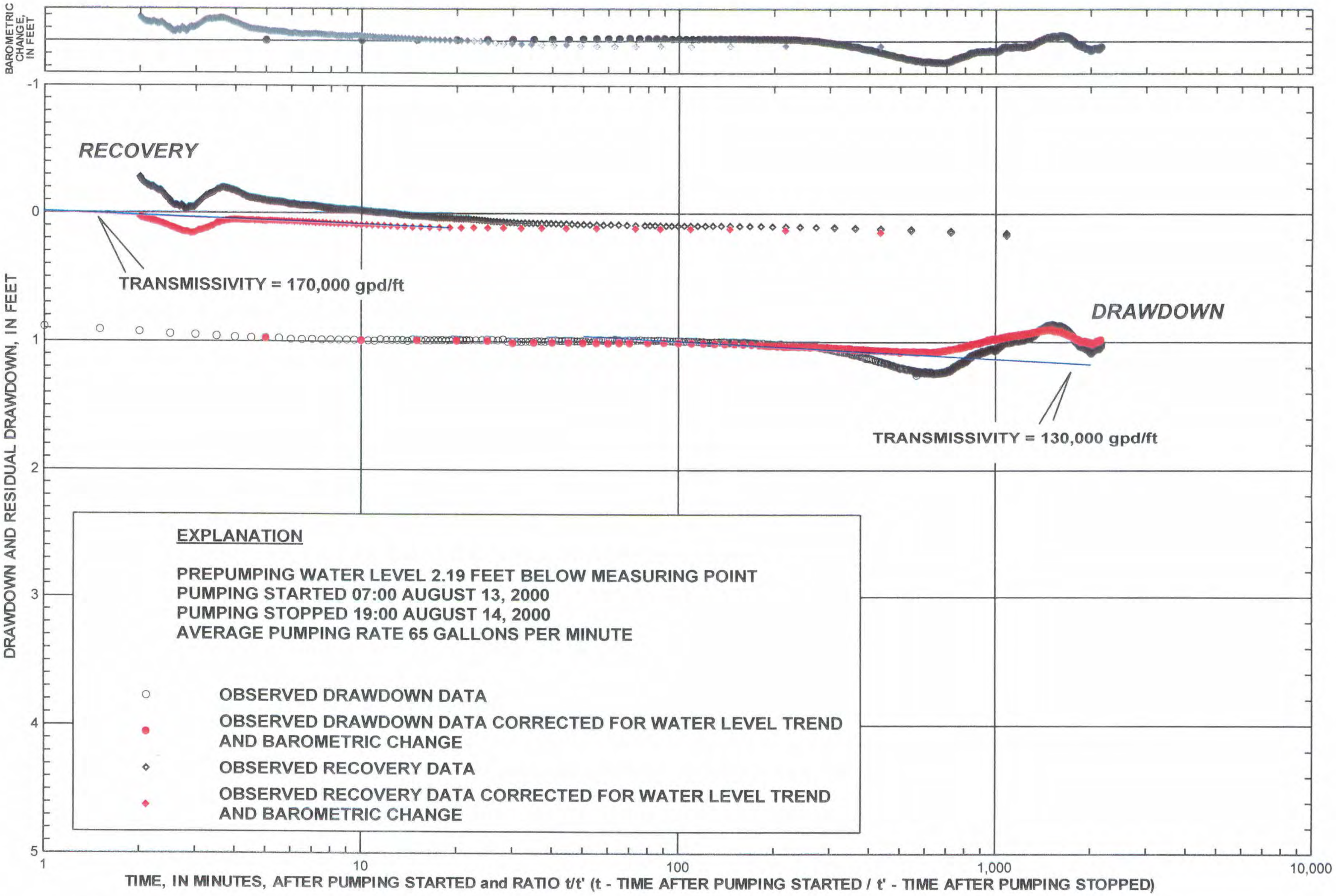


FIGURE 8. DRAWDOWN AND RECOVERY GRAPH FOR PUMPED WELL PC-99R DURING CONSTANT-DISCHARGE PUMPING TEST (SITE C)

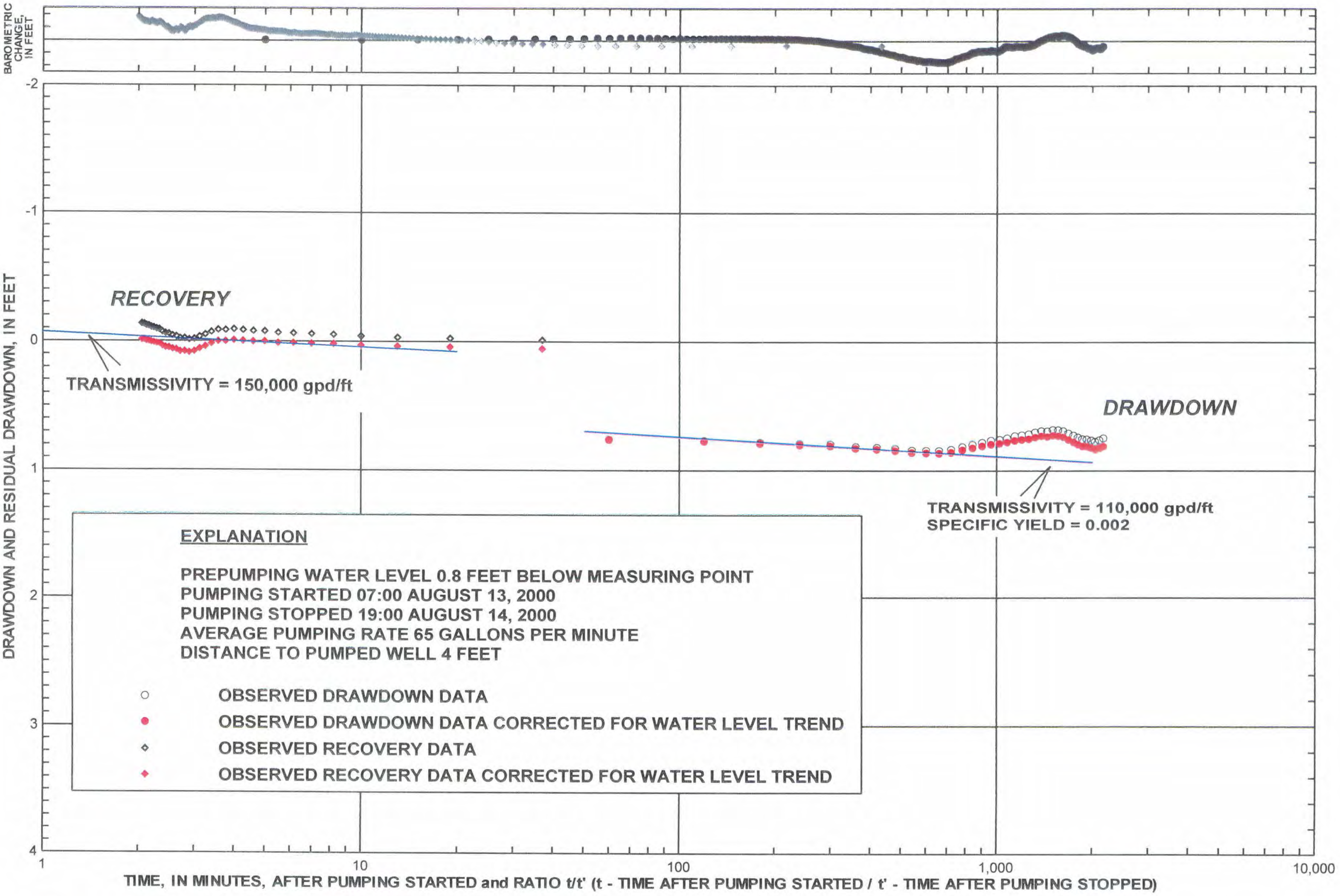


FIGURE 9. DRAWDOWN AND RECOVERY GRAPH FOR OBSERVATION WELL PC-99 DURING CONSTANT-DISCHARGE PUMPING TEST AT WELL PC-99R (SITE C)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

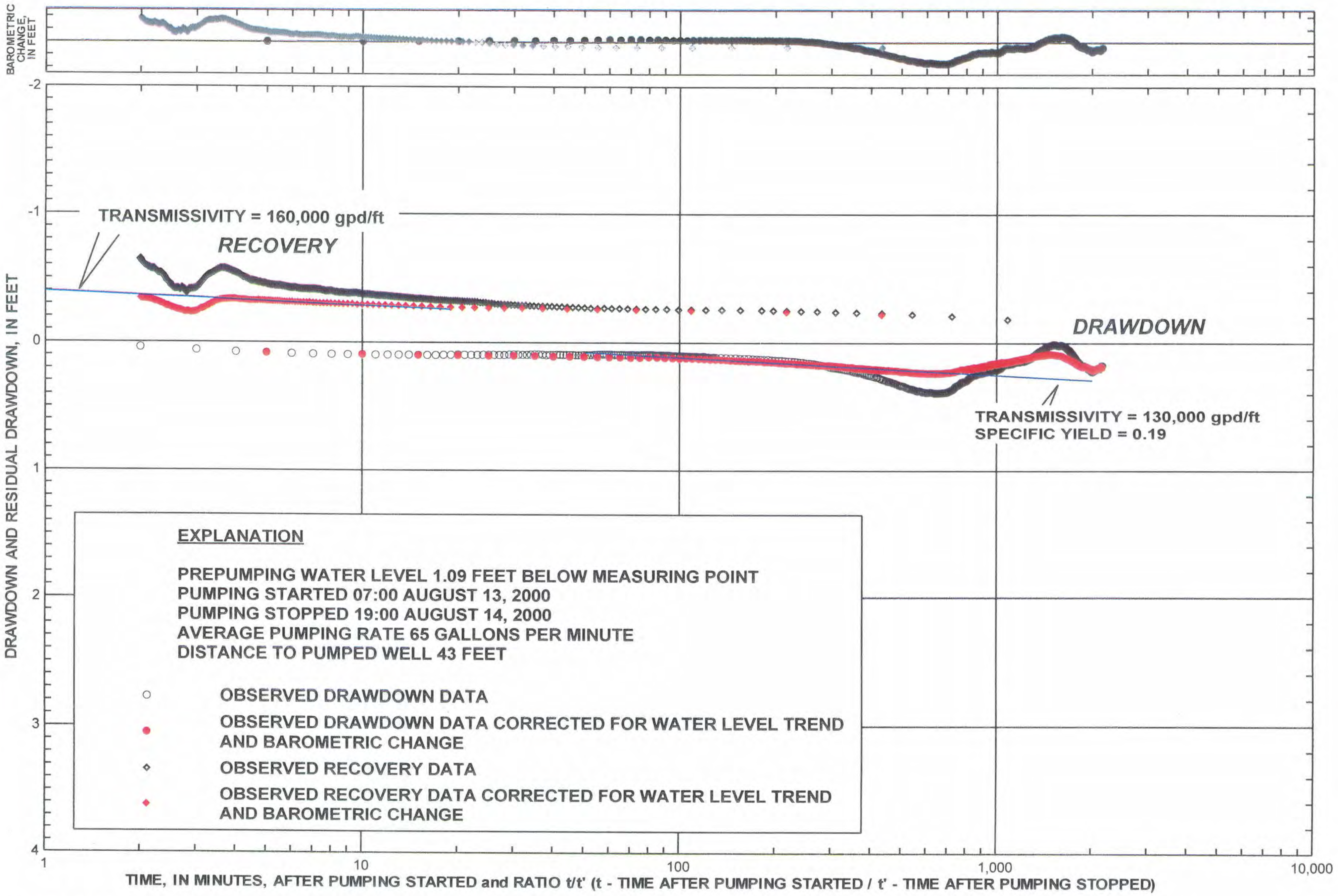


FIGURE 10. DRAWDOWN AND RECOVERY GRAPH FOR PIEZOMETER PC-88 DURING CONSTANT-DISCHARGE PUMPING TEST AT WELL PC-99R (SITE C)

ERROL L. MONTGOMERY & ASSOCIATES, INC.

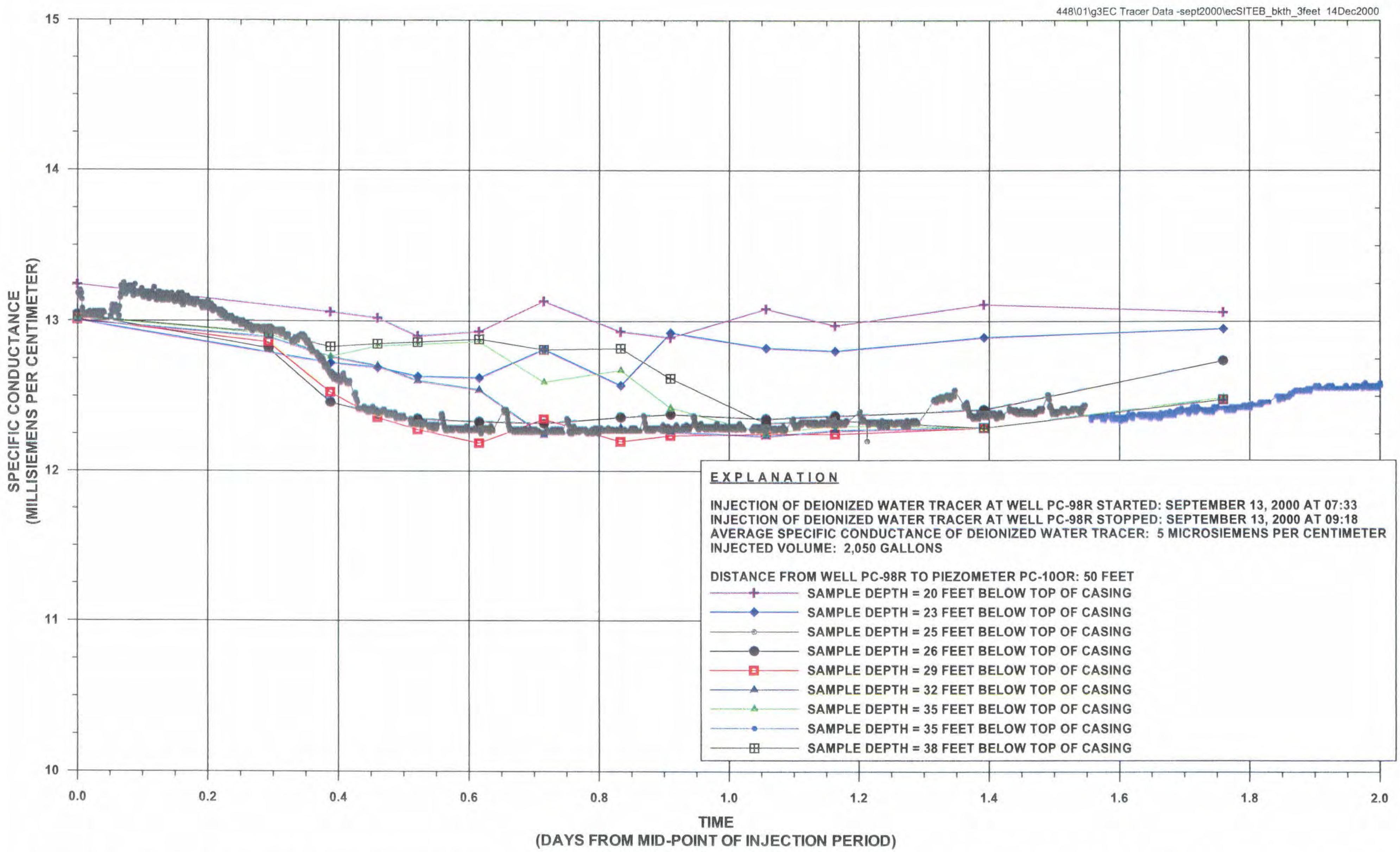


FIGURE 12. HYDROGRAPH OF SPECIFIC CONDUCTANCE OF GROUNDWATER AT PIEZOMETER PC-100R, SITE B DURING DEIONIZED WATER TRACER TEST

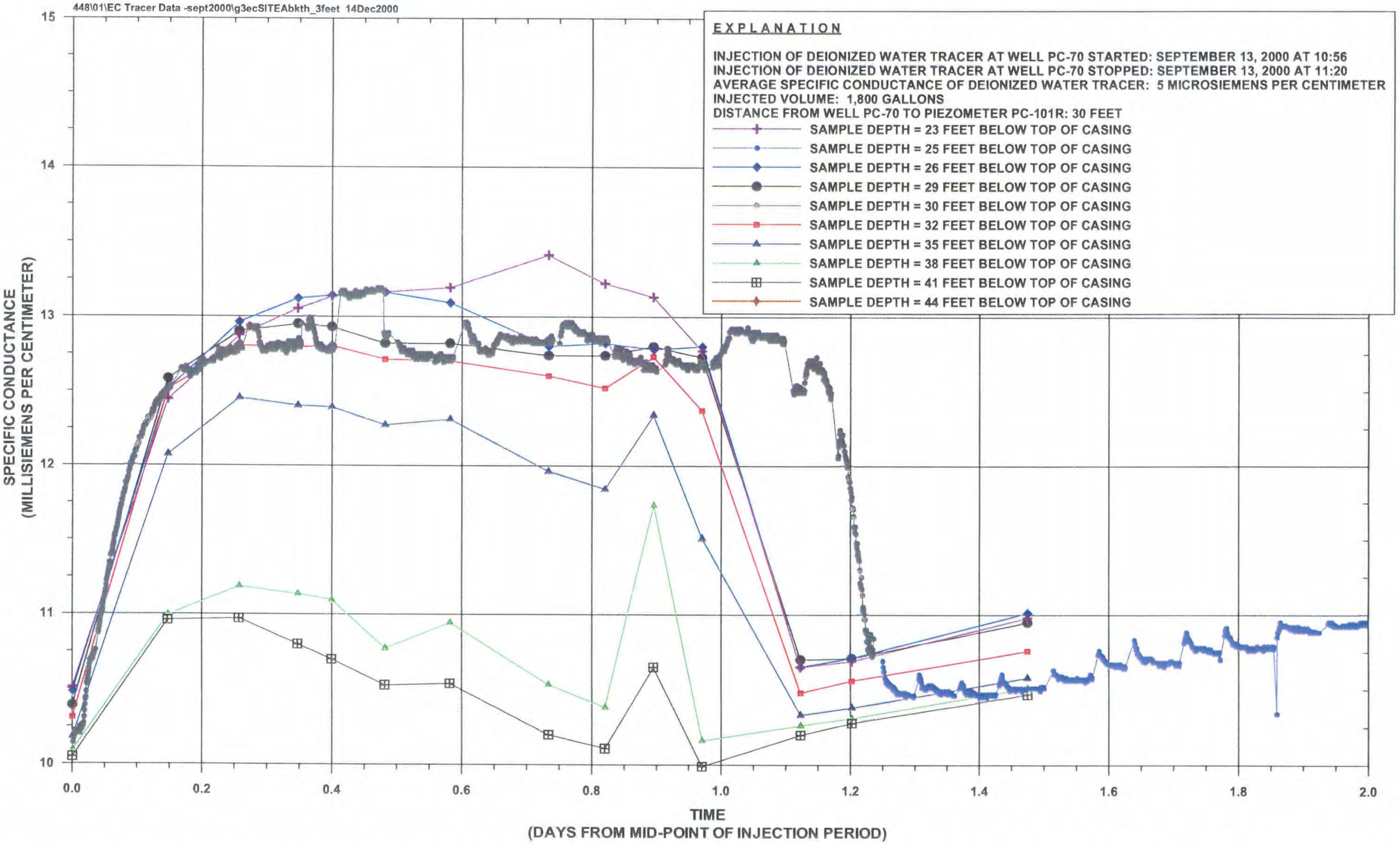


FIGURE 11. HYDROGRAPH OF SPECIFIC CONDUCTANCE OF GROUNDWATER AT <u>PIEZOMETER PC-101R, SITE A</u> DURING DEIONIZED WATER TRACER TEST

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

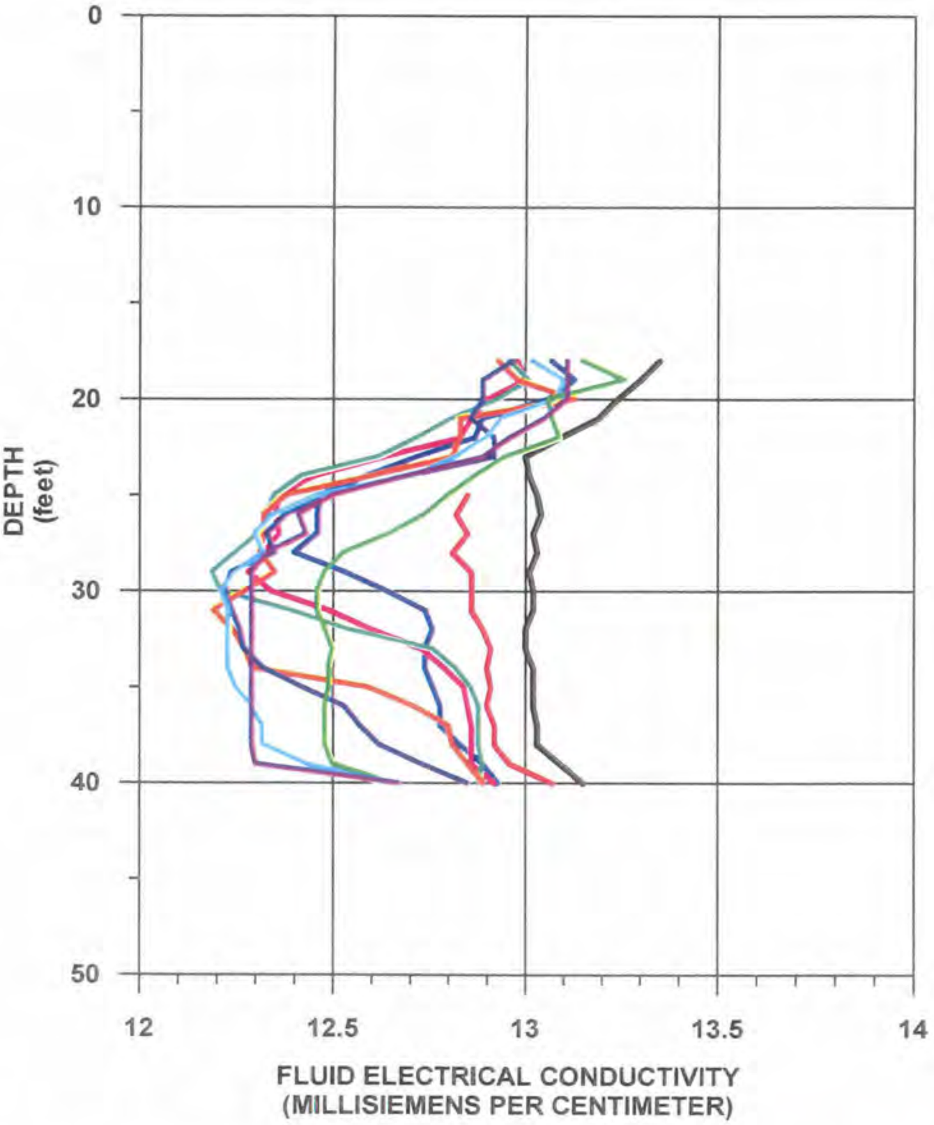


FIGURE 13. SPECIFIC CONDUCTANCE OF GROUNDWATER VERSUS DEPTH AT <u>PIEZOMETER PC-100R, SITE B</u> DURING DEIONIZED WATER TRACER TEST

ERROL L. MONTGOMERY & ASSOCIATES, INC.

1\EC Tracer Data -sept2000\ECvDepthSiteB_deiTracer.GRF 31oct2000

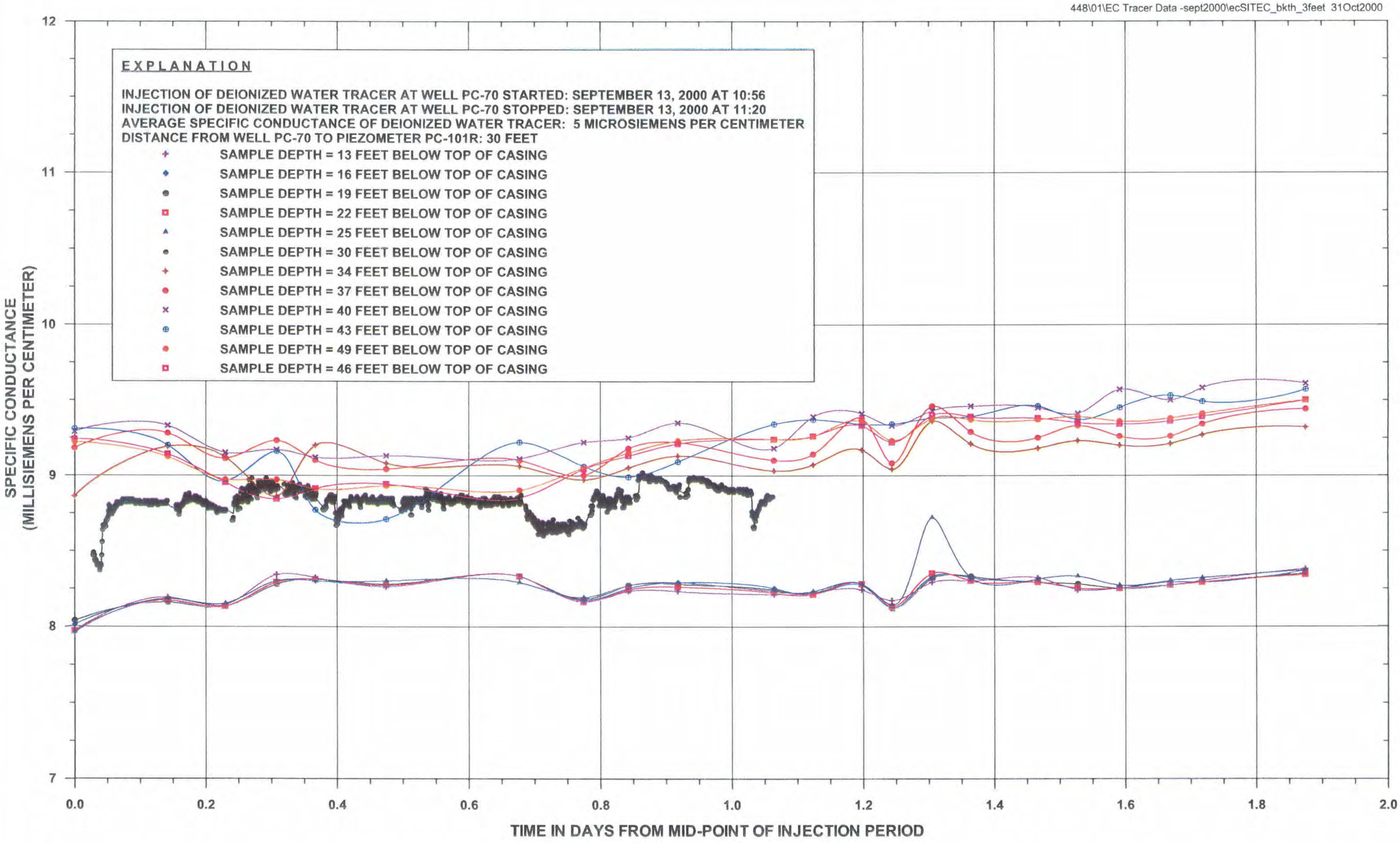


FIGURE 14. HYDROGRAPH OF SPECIFIC CONDUCTANCE OF GROUNDWATER AT PIEZOMETER PC-102, SITE C DURING DEIONIZED WATER TRACER TEST

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

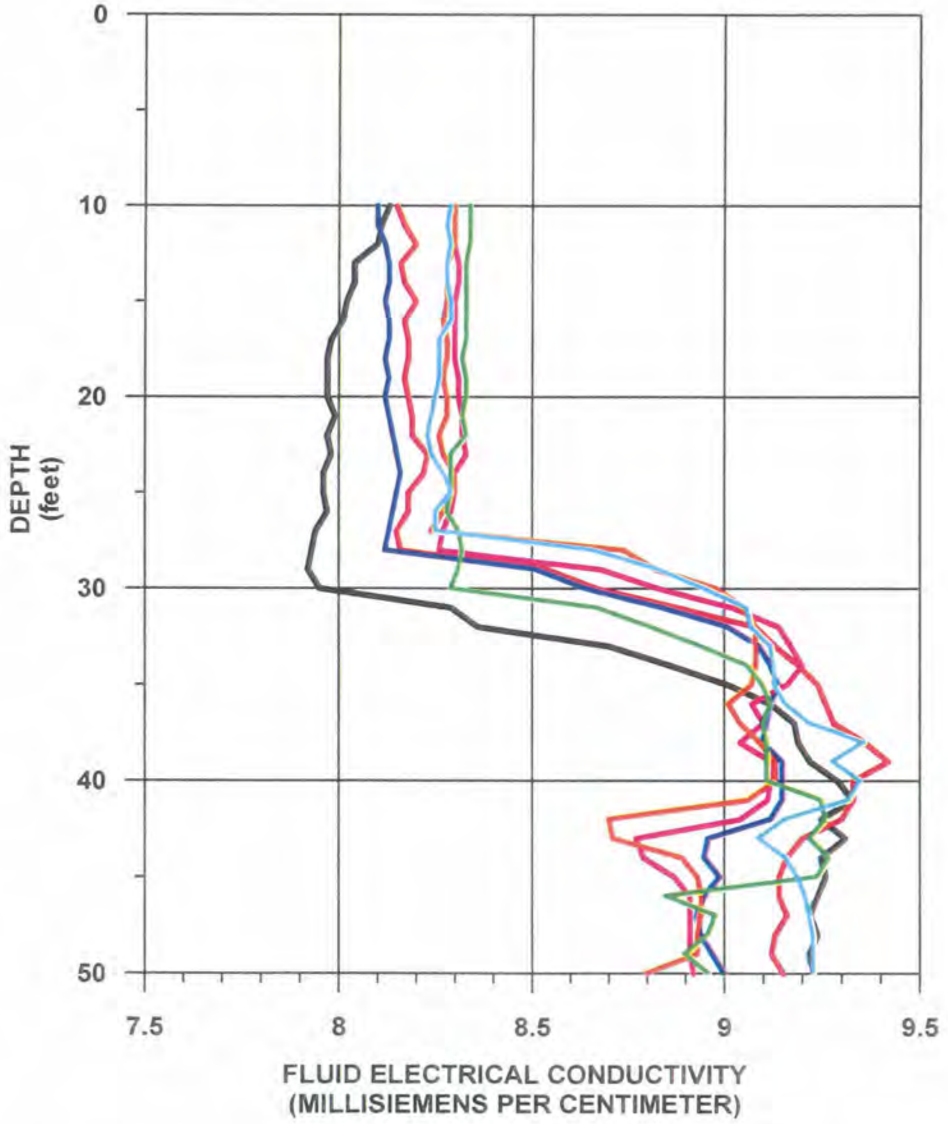


FIGURE 15. SPECIFIC CONDUCTANCE OF GROUNDWATER VERSUS DEPTH AT <u>PIEZOMETER PC-102, SITE C</u> DURING DEIONIZED WATER TRACER TEST

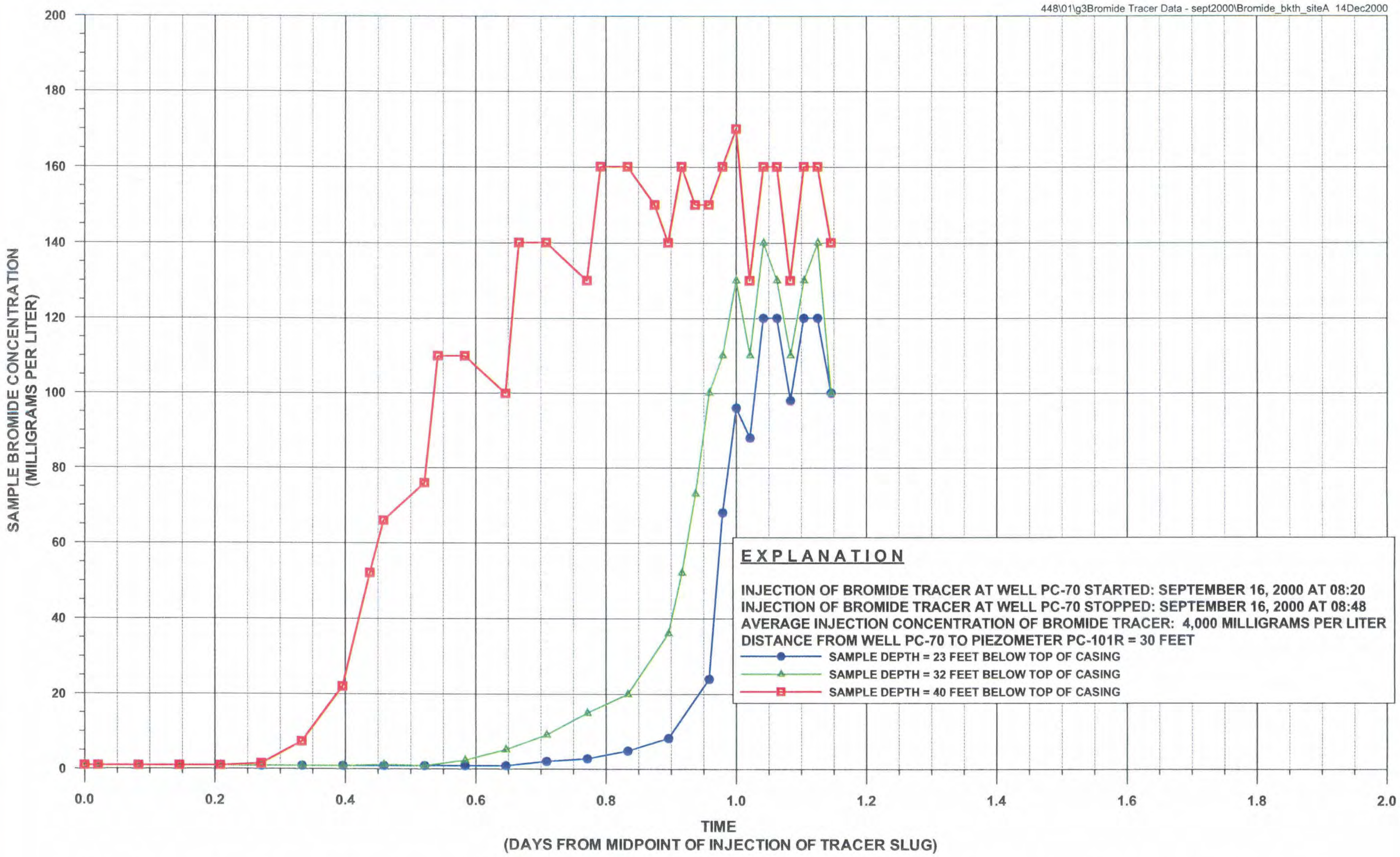
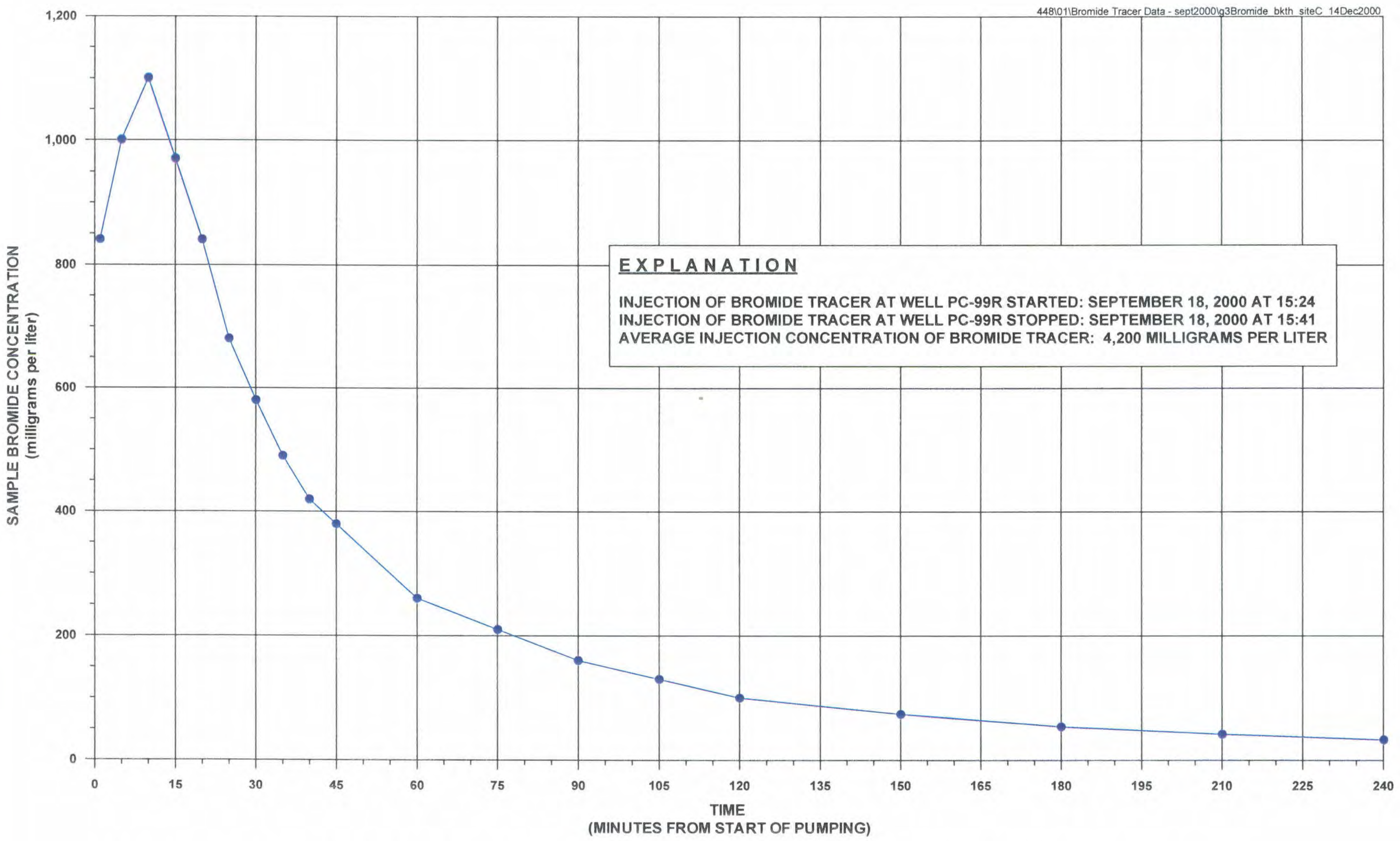


FIGURE 16. HYDROGRAPH OF BROMIDE BREAKTHROUGH DURING NATURAL GRADIENT TRACER TEST AT <u>PIEZOMETER PC-101R, SITE A</u>



EXPLANATION

INJECTION OF BROMIDE TRACER AT WELL PC-99R STARTED: SEPTEMBER 18, 2000 AT 15:24
INJECTION OF BROMIDE TRACER AT WELL PC-99R STOPPED: SEPTEMBER 18, 2000 AT 15:41
AVERAGE INJECTION CONCENTRATION OF BROMIDE TRACER: 4,200 MILLIGRAMS PER LITER

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

APPENDIX A

NEVADA DEPARTMENT OF ENVIRONMENTAL PROTECTION: AUTHORIZATION FOR TESTING

PETER G. MORROS. Director
ALLEN BIAGGI, *Administrator*
(775) 687-4670
) 687-4678

Administration
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

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

COPY

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

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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WILLIAM R. VICTOR, P.G.
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.

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.

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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 by R&D

Daniel S. Weber, P.G.
Project Hydrogeologist

Martin Barackman

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

UMMARY OF LABORATORY CHEMICAL RESULTS FOR COMM ONSTITUENTS AND ROUTINE PARAMETERS FOR WATER SAMPLES
OBTAINED BETWEEN PITTMA TERAL AND SEEP AREA
KERR–McGEE CHEMICAL LLC, HENDERSON, NEVADA

	.....SAMPLE IDENTIFIER.....			COMMON CONSTITUENTS[a] ......(milligrams per liter)......													......ROUTINE PARAMETERS......	ELECTRICAL CONDUCTANCE ...(μmho/cm)[c]...		.......pH......	
AMPLE OURCE	FIELD	LAB	DATE SAMPLED	Ca	Mg	Na	K	HCO_3	Cl	SO_4	NO_3	F	Br	B	Alk	TDS	TEMP[b]	FIELD	LAB	FIELD	LAB
EEP JMP	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
-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

OTE: 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.

ERROL L. MONTGOMERY & ASSOCIATES, INC.
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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:

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

rearranging

$$x\text{ lbs of }CaBr_2 =$$

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

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.

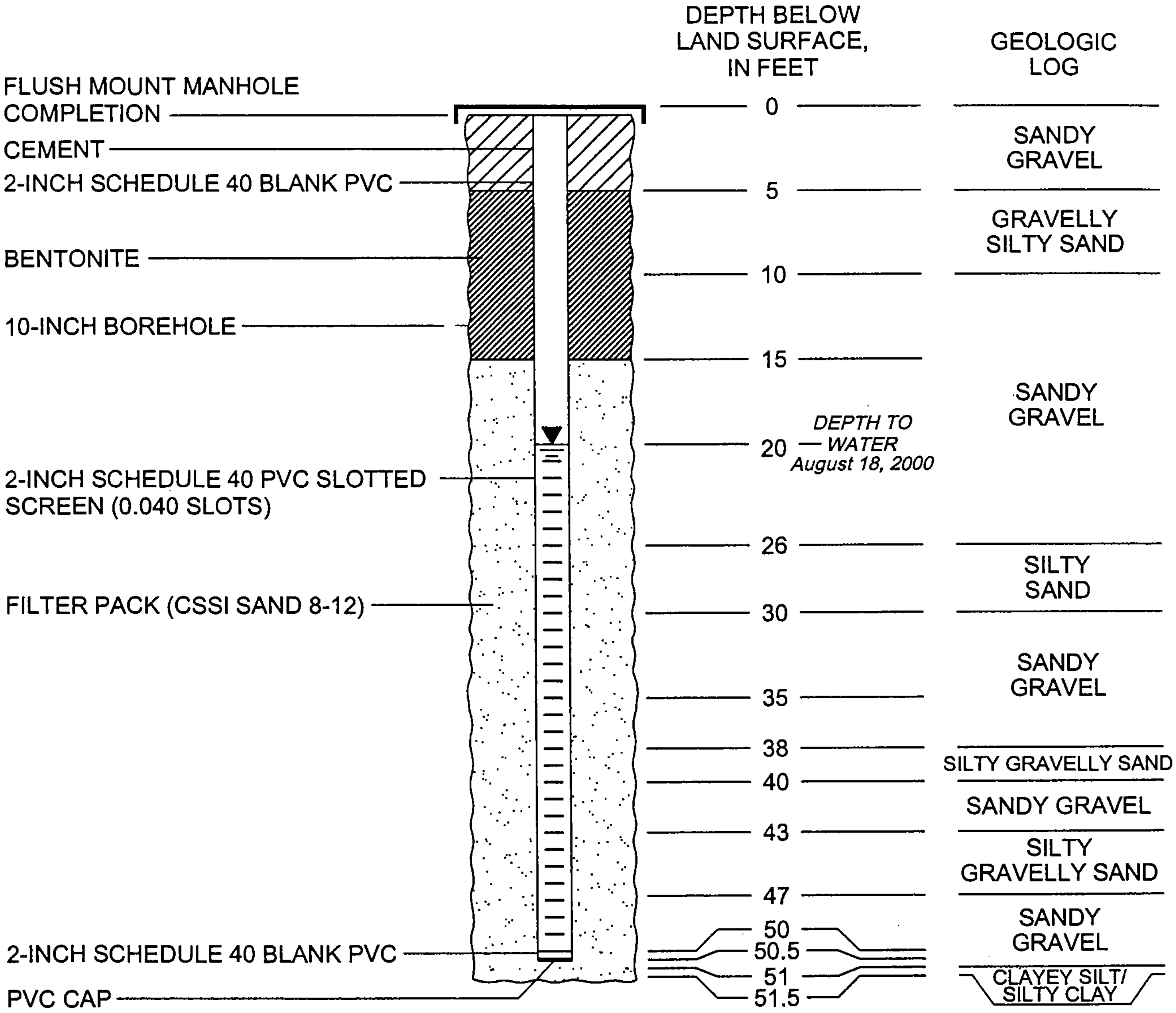
Daniel S. Weber, P.G.
Project Hydrogeologist

cc: Susan Crowley
Ed Krish
Bill Ganus

SENT VIA FACSIMILE

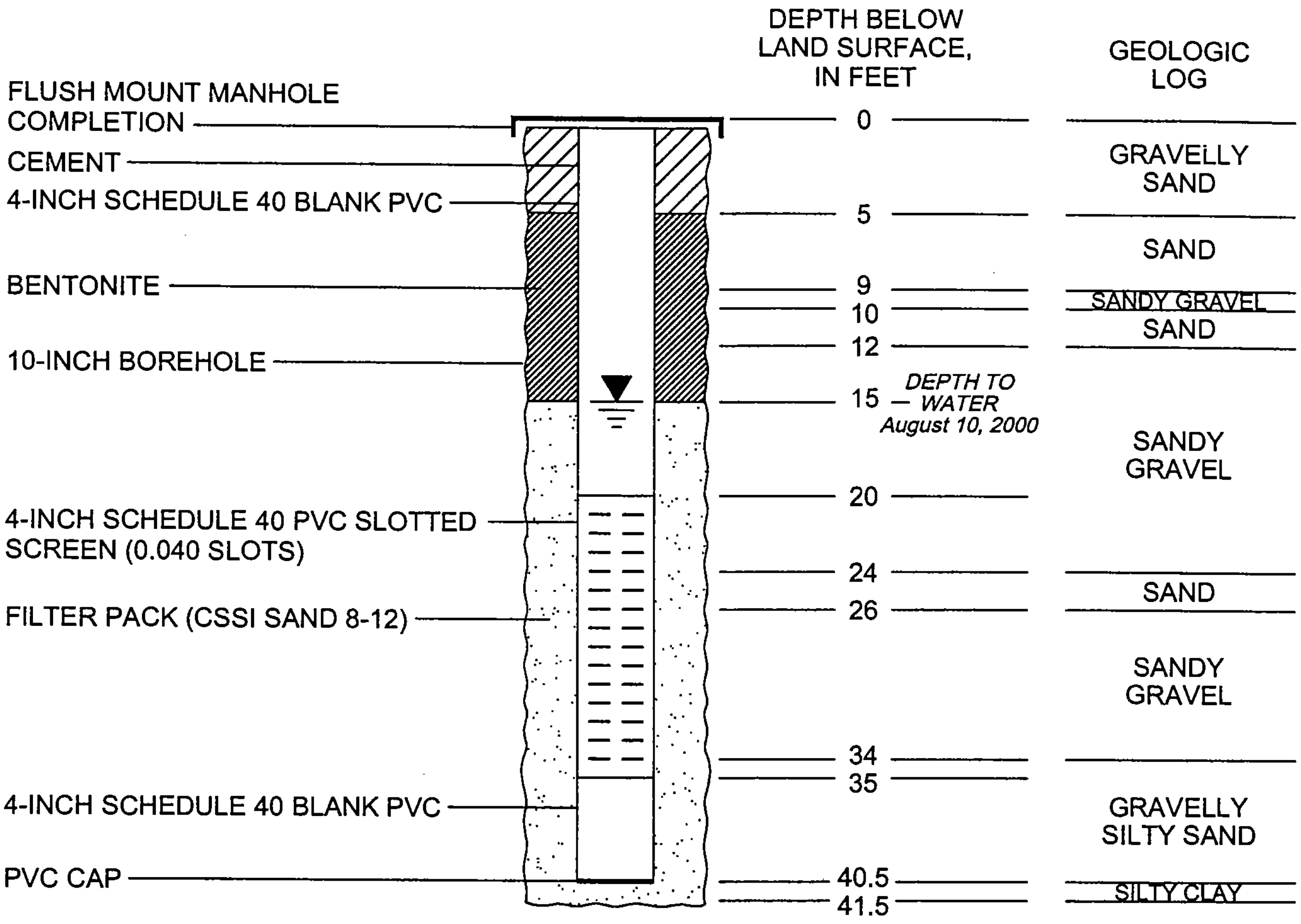
APPENDIX B

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



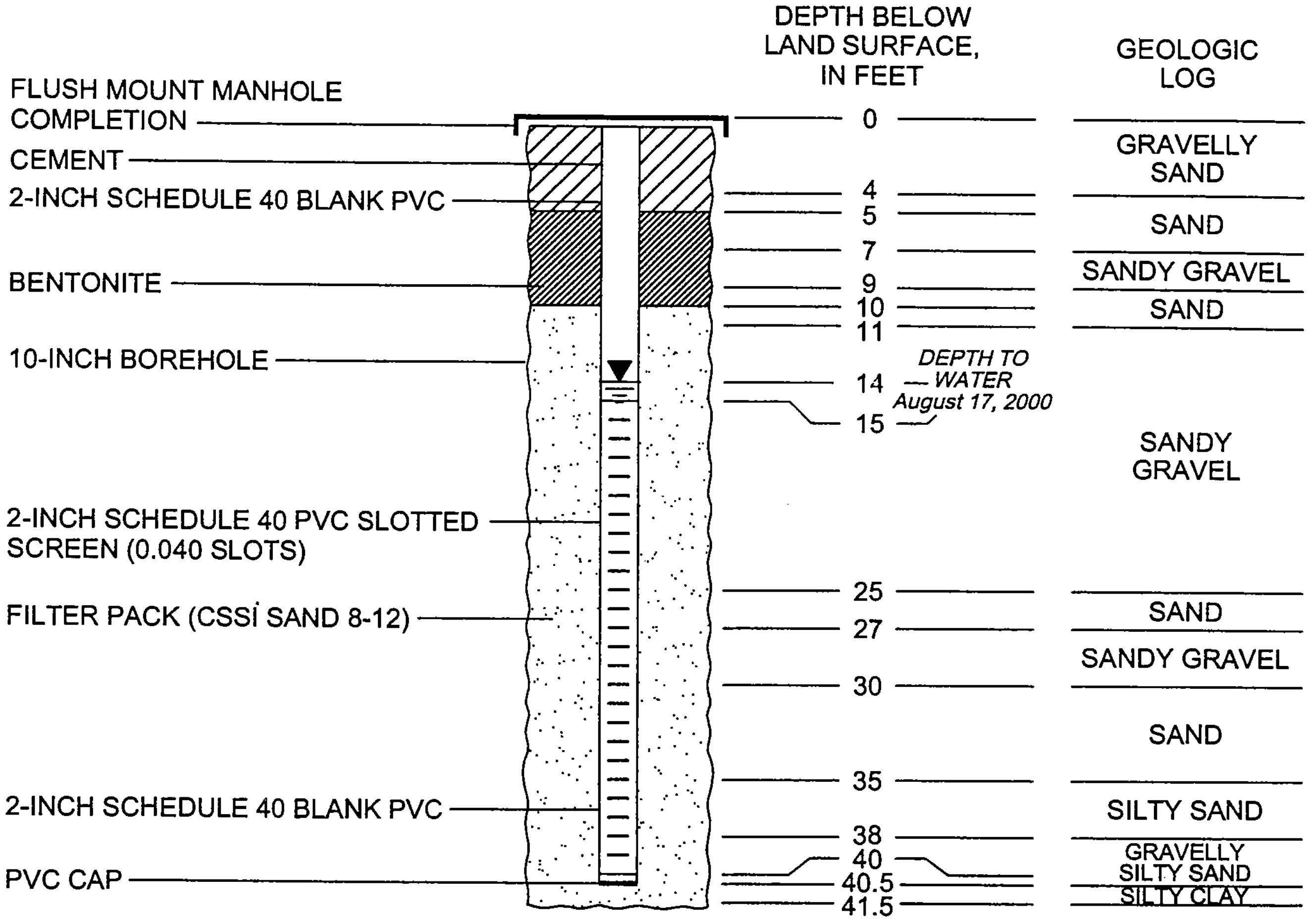
Data provided by Kerr-McGee

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



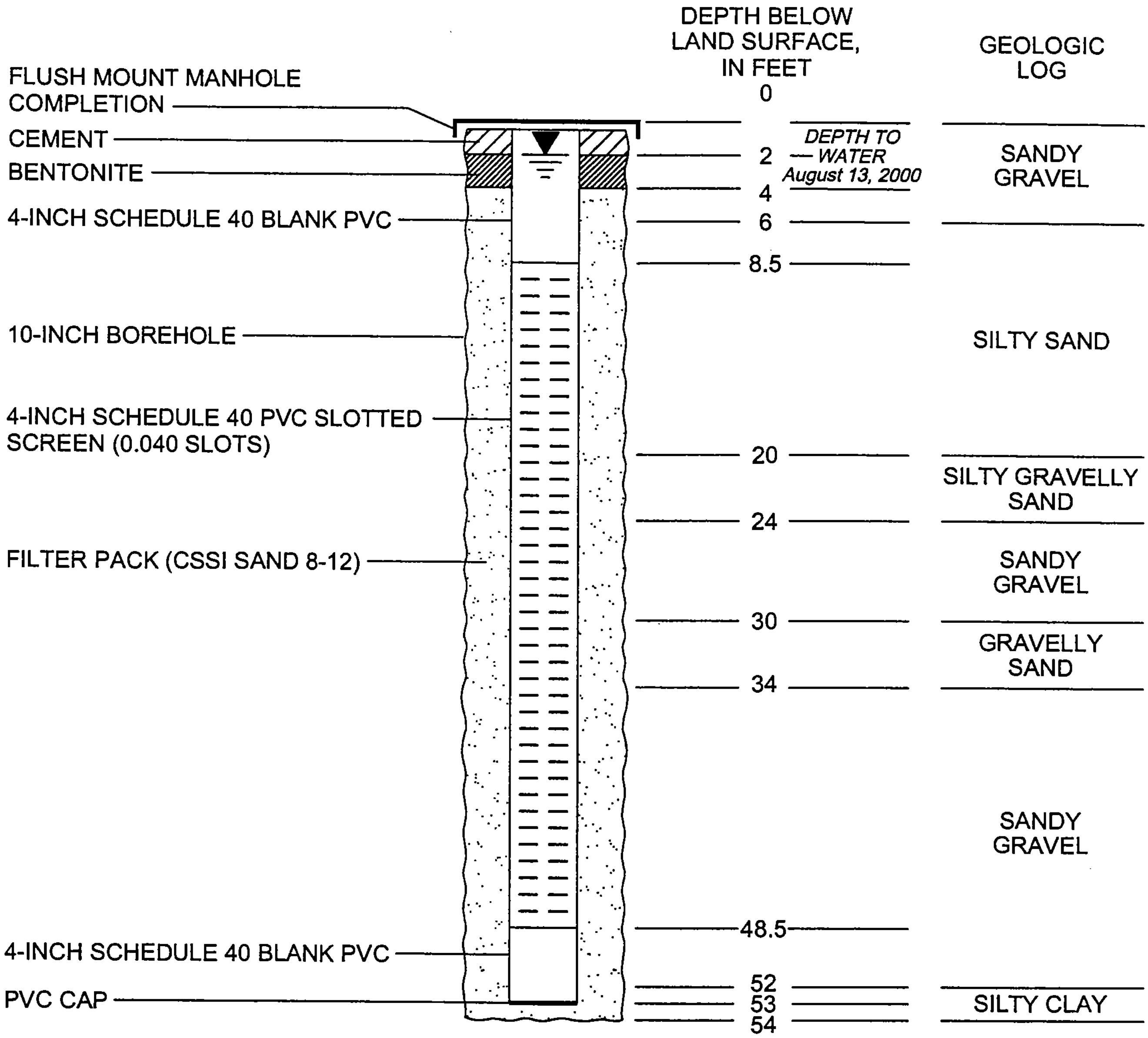
Data provided by Kerr-McGee

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



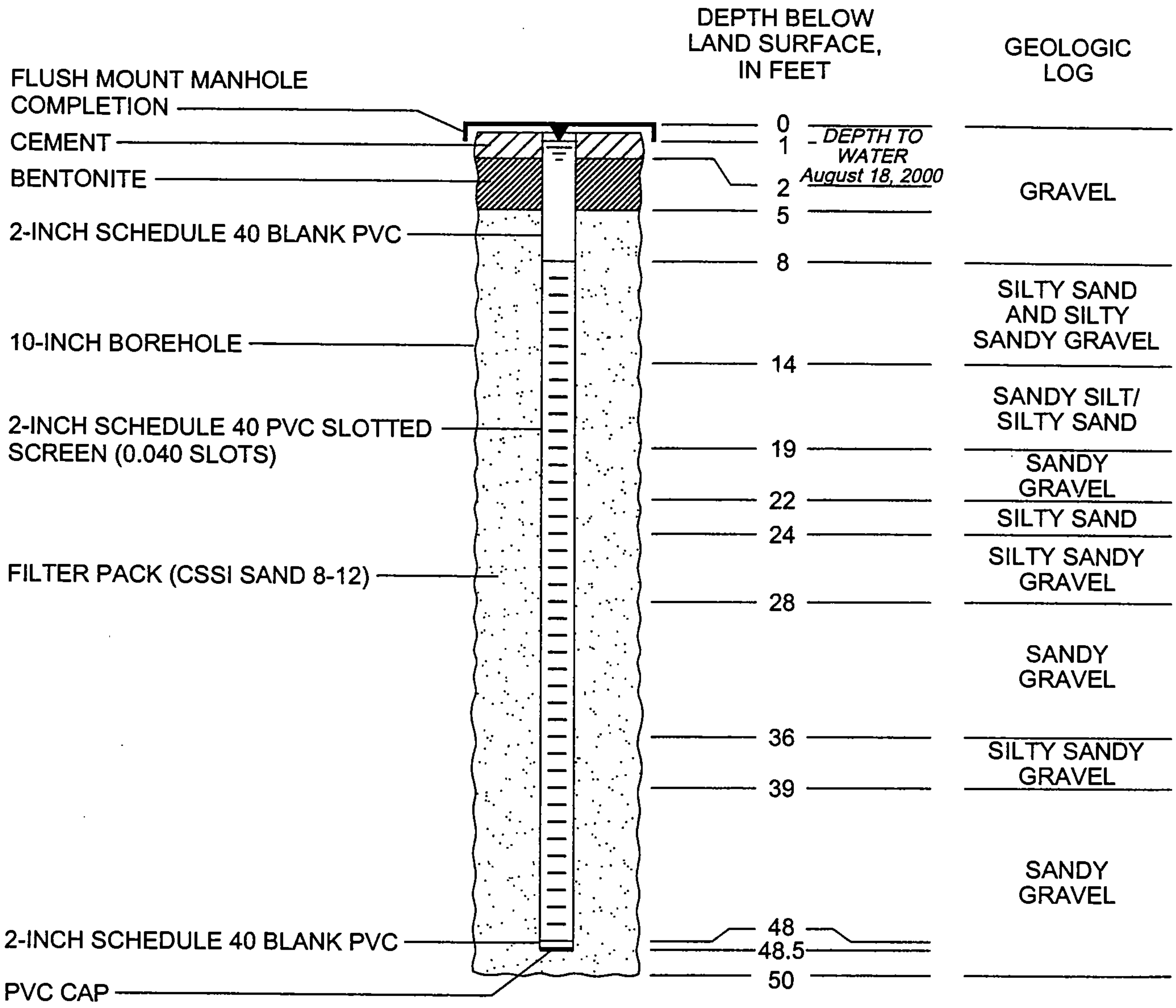
Data provided by Kerr-McGee

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



Data provided by Kerr-McGee

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



Data provided by Kerr-McGee

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

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

quifer 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 [illegible]iezometer 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 [illegible], 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
D - Not Detected

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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

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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
.F. - Dilution Factor
D - Not Detected

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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

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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
- Not Detected

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NEL LABORATORIES

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

CLIENT ID: **Bag 44 40 ft.**
DATE SAMPLED: 9/17/00
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

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

CLIENT ID: **Bag 44 32 ft.**
DATE SAMPLED: 9/17/00
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

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CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 43 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

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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
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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 43 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

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NEL LABORATORIES

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

CLIENT ID: **Bag 42 40 ft.**
DATE SAMPLED: 9/17/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 40 40 ft.**
DATE SAMPLED: 9/17/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 40 32 ft.**
?ROJECT 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
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 40 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

CLIENT ID: **Bag 38 40 ft.**
DATE SAMPLED: 9/17/00
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
.F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 34 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 34 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 34 23 ft.**
DATE SAMPLED: 9/17/00
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
.F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 32 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
.F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 31 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
.F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

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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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 22 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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
F. - Dilution Factor
) - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 22 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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
[illegible] - Dilution Factor
[illegible] - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 19 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 16 40 ft.**
DATE SAMPLED: 9/16/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 16 32 ft.**
DATE SAMPLED: 9/16/00
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
.F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 16 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

his report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 13 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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
This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 10 32 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 7 40 ft.**
ROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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
. - Dilution Factor
- Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 7 23 ft.**
DATE SAMPLED: 9/16/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
ROJECT 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
. - Dilution Factor
- Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

CLIENT ID: **Bag 4 23 ft.**
DATE SAMPLED: 9/16/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 1 40 ft.**
ROJECT ID:	Kerr McGee	DATE SAMPLED:	9/16/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 1 32 ft.**
DATE SAMPLED: 9/16/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 1 23 ft.**
DATE SAMPLED: 9/16/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

CLIENT ID: **Bag 47 23 ft.**
DATE SAMPLED: 9/17/00
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
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 47 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

his report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 48 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
- Not Detected
his report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
.F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 49 40 ft.**
ROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
ROJECT #:	448.01	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
. - Dilution Factor
- Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 50 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 50 32 ft.**
DATE SAMPLED: 9/17/00
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
- Not Detected
This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 50 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 51 23 ft.**
DATE SAMPLED: 9/17/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
ROJECT ID: Kerr McGee
ROJECT #: 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
- Dilution Factor
Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 52 32 ft.**
DATE SAMPLED: 9/17/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 52 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 53 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

CLIENT ID: **Bag 53 32 ft.**
DATE SAMPLED: 9/17/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT: Errol L. Montgomery & Associates, Inc.
PROJECT ID: Kerr McGee
PROJECT #: 448.01
CLIENT ID: **Bag 53 40 ft.**
DATE SAMPLED: 9/17/00
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
F. - Dilution Factor
- Not Detected

his report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 54 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

CLIENT ID: **Bag 54 32 ft.**
DATE SAMPLED: 9/17/00
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

This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 54 40 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Bag 55 23 ft.**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/17/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

CLIENT ID: **Bag 55 40 ft.**
DATE SAMPLED: 9/17/00
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
F. - Dilution Factor
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
This report shall not be reproduced except in full, without the written approval of the laboratory.

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

F. - Dilution Factor

- Not Detected

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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:	L0009267-69

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

is report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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.	CLIENT ID:	**Sample #44**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #43**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

his report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #41**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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
D - Not Detected

his report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #37**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

This report shall not be reproduced except in full, without the written approval of the laboratory.

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #34**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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
D - Not Detected

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

This report shall not be reproduced except in full, without the written approval of the laboratory.

NEL LABORATORIES

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

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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #25**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

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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

This report shall not be reproduced except in full, without the written approval of the laboratory.

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

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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

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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #13**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

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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

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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #9**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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
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CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #8**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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
.F. - Dilution Factor
) - Not Detected

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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

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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #6**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #5**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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

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CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #4**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
PROJECT #:	448.01	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
.F. - Dilution Factor
D - Not Detected

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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

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NEL LABORATORIES

CLIENT:	Errol L. Montgomery & Associates, Inc.	CLIENT ID:	**Sample #2**
PROJECT ID:	Kerr McGee	DATE SAMPLED:	9/18/00
ROJECT #:	448.01	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
Not Detected

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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

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