# MARINE CORPS AIR STATION EL TORO
# EL TORO, CALIFORNIA
## INSTALLATION RESTORATION PROGRAM
## PHASE I REMEDIAL INVESTIGATION
### DRAFT TECHNICAL MEMORANDUM
### 7 May 1993

### VOLUME IV

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# APPENDIX F

# AQUIFER TEST ANALYSIS

# TABLE OF CONTENTS

Page

LIST OF ACRONYMS . . . . . iv
LIST OF VARIABLES . . . . . v
F.1. INTRODUCTION . . . . . F-1
F.1.1 Background . . . . . F-1
F.1.2 Purpose . . . . . F-2
F.1.3 Scope . . . . . F-2
F.1.4 Setting . . . . . F-3
F.1.4.1 Geology . . . . . F-3
F.1.4.2 Hydrogeology . . . . . F-4
F.1.5 Previous Work . . . . . F-4
F.1.6 Appendix Organization . . . . . F-5
F.2.0 SUMMARY OF RESULTS . . . . . F-5
F.3.0 FIELD METHODS . . . . . F-6
F.3.1 Water-Level and Barometric Pressure Measurements . . . . . F-6
F.3.2 Water-Level Monitoring . . . . . F-7
F.3.3 Pumping Tests . . . . . F-8
F.3.4 Slug Tests . . . . . F-9
F.3.5 Decontamination Procedures . . . . . F-10
F.4.0 ANALYSIS METHODS . . . . . F-11
F.4.1 Barometric Efficiency Calculation . . . . . F-11
F.4.2 Pumping Test Analysis . . . . . F-13
F.4.2.1 Cooper-Jacob Method . . . . . F-13
F.4.2.2 Agarwal, Al-Hussainy, and Ramey Method . . . . . F-15
F.4.2.3 Theis Recovery Method . . . . . F-16
F.4.2.4 Hantush Method . . . . . F-17
F.4.3 Slug Test Analysis . . . . . F-19
F.4.3.1 Cooper, Bredehoeft, and Papadopulos Method . . . . F-19
F.4.3.2 Bouwer and Rice Method . . . . . F-20

F.5.0 DISCUSSION OF RESULTS . . . . . F-23
F.5.1 Water-Level Monitoring . . . . . F-24

## TABLE OF CONTENTS (Continued)

Page

F.5.1.1 Barometric Efficiency . . . . . ~~F-24~~ F-23
F.5.1.2 Hydraulic Response to Pumping of Area Wells . . . . ~~F-25~~ F-24
F.5.2 Pumping Test Analysis . . . . . F-25
F.5.2.1 Cooper-Jacob Method . . . . . F-26
F.5.2.2 Hantush Method . . . . . ~~F-27~~ F-26
F.5.3 Slug Test Analysis . . . . . ~~F-27~~ F-26
F.5.3.1 Cooper, Bredehoeft, and Papadopulos Method . . . . ~~F-28~~ F-27
F.5.3.2 Bouwer and Rice Method . . . . . F-28
F.6. REFERENCES . . . . . ~~F-30~~ F-31

Attachment 1 Example of Barometric Efficiency Calculation
Attachment 2 Example of Pumping Test Analysis, Pumping (Cooper-Jacob Method)
Attachment 3 Example of Pumping Test Analysis, Recovery (Theis Method)
Attachment 4 Example of Well Bore Storage Calculation (Agarwal, Al-Hussainy, and Ramey Method)
Attachment 5 Example of Pumping Test Analysis (Hantush Method)
Attachment 6 Example of a Slug Test Analysis (Cooper, Bredehoeft, and Papadopulos Method)
Attachment 7 Example of a Slug Test Analysis (Bouwer and Rice Method)
Attachment 8 Data Plots for Pumping Tests
Attachment 9 Data Plots for Slug Tests

## TABLES

F-1 Summary of Monitoring Wells . . . . . F-33
F-2 Summary of Aquifer Parameters . . . . . F-35
F-3 Monitoring Well Construction Summary . . . . . F-39
F-4 Available Water-Level Monitoring Hydrographs . . . . . F-43
F-5 Pumping Tests Performed . . . . . F-45

## TABLE OF CONTENTS (Continued)

Page

F-6 Pumping Rates and Pumping Duration . . . . . F-47
F-7 Data Logger Data Collection Frequency (in minutes) . . . . . F-49
F-8 Slug Tests Performed . . . . . F-51
F-9 Aquifer Test Analysis Methods . . . . . F-53
F-10 Barometric Efficiency Estimates . . . . . F-55
F-11 Pumping Test Results . . . . . F-59
F-12 Slug Test Results . . . . . F-63

FIGURES

F-1 MCAS El Toro Site Location Map . . . . . F-67
F-2 Monitoring Well Location Map . . . . . F-69
F-3 Clark (1967) Method for Estimating Barometric Efficiency: Plot of Sum of Change in Water Levels (feet) versus Sum of Change in Barometric Pressure (feet) . . . . . F-71
F-4 Cooper-Jacob (1946) Method for Estimating Transmissivity: Semilogarithmic Plot of Drawdown (feet) versus Time (min) . . . . . F-73
F-5 Agarwal, Al-Hussainy, and Ramey (1970) Method for Estimating Critical Time: Plot of Drawdown (feet) versus Time (min) . . . . . F-75
F-6 Theis (1935) Recovery Method for Estimating Transmissivity: Semilogarithmic Plot of Residual Drawdown (feet) versus Time Ratio t/t' . . . . . F-77
F-7 Hantush (1960) Method: Family of Type Curves $H(u,\beta)$ versus 1/u, for Various Values of $\beta$ (After Lohman, 1979) . . . . . F-79
F-8 Cooper, Bredehoeft, and Papadopulos (1967) Method: Family of Type Curves $F(\alpha,\beta')$ versus $\beta'$ for Different Values of $\alpha$ (after Kruseman and DeRidder, 1991) . . . . . F-81
F-9 Bouwer and Rice (1976) Method: Partially Penetrating Well Configuration (after Kruseman and DeRidder, 1991) . . . . . F-83
F-10 Bouwer and Rice (1976) Method: Curves Showing the Relation Between the Dimensionless Parameters A, B, C, and $L/r_b$ (after Kruseman and DeRidder, 1991) . . . . . F-85

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# ACRONYMS

| | |
|---|---|
| AQTESOLV | Aquifer Test Solver |
| bgs | Below Ground Surface |
| gpm | gallons per minute |
| JMM | James M. Montgomery Engineers, Inc. |
| MCAS | Marine Corps Air Station |
| NPL | National Priorities List |
| OCWD | Orange County Water District |
| OU | Operable Unit |
| psia | pounds per square inch - atmosphere |
| psig | pounds per square inch - gauge |
| PVC | polyvinyl chloride |
| RI/FS | Remedial Investigation/Feasibility Study |
| TM | Technical Memorandum |
| TSP | trisodium phosphate |
| VOC | volatile organic compound |

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# VARIABLES

| | |
|---|---|
| $\alpha$ | Dimensionless storage coefficient in Cooper, Bredehoeft, and Papadopulos Method |
| $\beta$ | Leakage factor of overlying confining unit |
| $\beta'$ | Dimensionless time in Cooper, Bredehoeft, and Papadopulos Method |
| $\gamma$ | Specific weight of water |
| A,B,C | Dimensionless parameters in Bouwer and Rice Method |
| b | Saturated thickness of aquifer |
| b' | Saturated thickness of overlying confining unit |
| b'' | Saturated thickness of underlying confining unit |
| $B_e$ | Barometric efficiency |
| $C_w$ | Well bore storage coefficient |
| $F(\alpha,\beta')$ | Dimensionless drawdown in Cooper, Bredehoeft, and Papadopulos Method |
| h | Head of water level in monitoring well |
| $H(u,\beta)$ | Dimensionless drawdown in Hantush Method |
| K | Horizontal hydraulic conductivity |
| K' | Vertical hydraulic conductivity of overlying confining unit |
| K'' | Vertical hydraulic conductivity of underlying confining unit |
| L | Length of casing through which water flows into the well |
| n | porosity |
| $p_A$ | Barometric pressure |
| Q | Volumetric flow rate or discharge rate |
| r | Radial distance from pumped well |
| $r_b$ | Radial distance from well center to undisturbed aquifer |
| $r_c$ | Casing radius |
| $r_e$ | Effective radius |
| $R_e$ | Radial distance over which the difference in water level is dissipated in the aquifer to some insignificant level |
| $r_{ws}$ | Radius of well storage |
| s | Drawdown |
| s' | Residual drawdown |
| S | Storage coefficient |
| S' | Storage coefficient of overlying confining layer |

## VARIABLES (continued)

| | |
|---|---|
| S'' | Storage coefficient of underlying confining layer |
| $S_s$ | Specific storage of main aquifer |
| $S_s'$ | Specific storage of overlying confining layer |
| $S_s''$ | Specific storage of underlying confining layer |
| t | Time since pumping started |
| t' | Time since pumping stopped |
| $t_c$ | Critical time for well bore storage effects |
| T | Transmissivity |
| u,u',y | Variables of integration |
| V | Volume of slug |
| W(u) | Well function of u |
| W(u') | Well function of u' |

# Appendix F
# AQUIFER TEST ANALYSIS

## F.1 Introduction

This document presents the aquifer tests performed for Phase I of the Remedial Investigation (RI) conducted for the Marine Corps Air Station (MCAS) El Toro, California. The contents of this document are an appendix to the MCAS El Toro Phase I RI Technical Memorandum (TM).

MCAS El Toro (Station) is located in southern California in Orange County, about eight miles southeast of the City of Santa Ana (Figure F-1). The Station was placed on the National Priorities List (NPL) because of the presence of trichloroethylene and other volatile organic compound (VOC) contamination in the groundwater at the Station boundary, and in wells to the west of the Station in the City of Irvine.

### F.1.1 Background

There are 22 sites designated for study under the MCAS El Toro RI/Feasibility Study (FS). The sites are divided into three operable units (OUs), designated as OU-1, OU-2, and OU-3. OU-1 (Site 18) includes the regional VOC investigation, which was conducted both on- and off-Station. OU-2 consists of the potential source areas for the regional VOC investigation and includes Sites 2, 3, 5, 10, and 17. OU-3 includes the remaining 16 sites.

Sixty-six single-point and 10 multidepth wells were installed during Phase I. The single-point wells are screened in the shallowest saturated permeable zone. The multidepth wells are screened in the shallowest as well as the deeper permeable zones. Six of the 10 multidepth wells are cluster wells, and the remaining four are multiport single borehole wells. The number of discrete zones screened for each multidepth well ranges from two to six. Table F-1 summarizes these wells according to their type and approximate depth for each OU. Figure F-2 shows the locations of the wells.

### F.1.2 Purpose

The purpose of the MCAS El Toro RI aquifer tests was to evaluate aquifer parameters to adequately characterize the site to confirm and to refine the current understanding and conceptual hydrogeologic model of the site. The aquifer parameters and conceptual hydrogeologic model will be used to perform the following functions:

- Conduct a contaminant transport analysis.
- Perform a baseline risk assessment.
- Evaluate remedial alternatives.

The contaminant transport analysis and baseline risk assessment are described elsewhere in the MCAS El Toro Phase I RI TM. The remedial alternatives evaluation is presented in a separate document.

### F.1.3 Scope

The scope of the aquifer tests consisted of conducting both pumping and slug tests, and analyzing the resulting test data for 62 of the monitoring wells installed during Phase I. The scope also included supporting two long-term pumping tests conducted by the Orange County Water District (OCWD). The criteria for selecting the 62 wells for testing was:

- The tests were representative of various geographic areas and depths.
- Where practical, wells with useful observation wells were given preference over wells without useful observation wells.

The aquifer tests consisted of the following five tasks:

- Continuous long-term (e.g., 1 to 7 days) water-level monitoring at select wells located throughout the Station.
- Single- and multiple-well, short-term pumping tests for 31 wells, with pumping lasting from 40 to 265 minutes.

- Short-term (e.g., generally overnight, immediately before and after pumping) water-level monitoring at pumped wells.
- Multiple-well long-term pumping tests for three wells (one MCAS El Toro and two OCWD wells), with pumping lasting approximately 27 to 30 hours.
- Slug tests for 31 wells that are completed in zones of relatively low permeability zones.

Hydrographs of the continuous long-term water-level monitoring data were plotted to determine the hydraulic response to pumping of area water supply wells. Water-level monitoring data were also analyzed, using Clark (1967) to determine well barometric efficiency. Test analysis methods used for pumping tests were Cooper-Jacob (1946), Theis Recovery (1935) and Hantush (1960). Analysis methods used for slug tests were Cooper, Bredehoeft, and Papadopulos (1967) and Bouwer and Rice (1976). The pumping tests and slug tests were analyzed with the aid of the computer software package AQTESOLV. All long-term pumping tests were analyzed by manual-type curve-fitting methods. Selected short-term pumping and slug test analysis results were checked by manual methods.

In addition to collecting aquifer test data during the pumping tests, groundwater was sampled chemical analysis. Temperature, pH, and electrical conductivity were monitored during pumping. These results are discussed elsewhere in the TM (not in this appendix).

### F.1.4 Setting

This section briefly describes the regional and site geology and hydrogeology of the Station. A detailed description is provided in Section 1.3 of the TM.

#### F.1.4.1 Geology

MCAS El Toro lies on quaternary deposits in the western portion of the Tustin Plain (Singer, 1973). These deposits form a heterogeneous mixture of silts and clays with interbedded sands and fine gravels that is up to 500 feet thick.

### F.1.4.2 Hydrogeology

In the Station area, aquifers are thin and discontinuous, and separated by thicker sequences of fine-grained materials (Banks, 1984). The aquifers tend to be composed of lenticular clayey and silty sands and fine gravels within a complex mixture of sandy clays and sandy silts. The groundwater may be considered to flow in a single large-scale heterogeneous system (Herndon and Reilly, 1989).

The groundwater system beneath the Station was thought to be in an unconfined (forebay) area. A confined (pressure) area lies in the central portion of the basin to the west of the Station. The boundary of the forebay and pressure areas varies seasonally (Banks, 1984). Regional flow has been to the west and northwest since the 1940s, and is controlled locally by area pumping (Herndon and Reilly, 1989).

Information gathered during drilling shows the depth to groundwater is the shallowest in the foothills, where it is about 45 to 60 feet below ground surface (bgs). Groundwater is first encountered at a depth greater than 200 feet bgs to the northern and eastern portions of the Station, and decreases towards the west and southwest. Flow direction is to the northwest at a gradient of approximately 0.008. Current thinking tends to include the Station in the pressure area.

## F.1.5 Previous Work

Analysis of aquifer tests performed in monitoring wells installed on and near the Station resulted in hydraulic conductivity estimates that range from 2.2 to 36 feet per day (ft/day). A value of 30 ft/day was determined from a 72-hour aquifer test (James M. Montgomery Engineers, Inc. [JMM], 1990). A 72-hour test performed by OCWD in the basin west of the Station provided data that indicate that the hydraulic conductivity is 21 ft/day. The linear groundwater velocity was estimated to range from 0.7 to 4 ft/day (Herndon and Reilly, 1989).

### F.1.6 Appendix Organization

Major findings of the aquifer tests are summarized and discussed in Section 2.0. Field methods employed are described in Section 3.0. Methods used to analyze the aquifer test data are presented in Section 4.0. Results of analyzing the water-level monitoring, pumping tests, and slug tests are presented with discussion in Section 5.0. References are listed in Works Cited, Section 6.0. Examples of calculations for the different analysis methods are in Attachments 1 to 7. Data plots for pumping tests and slug tests are in Attachments 8 and 9, respectively.

## F2 Summary of Results

Results of the long-term water-level monitoring program and aquifer tests indicate water levels in the majority of wells monitored were affected significantly by barometric pressure changes.

The heterogeneity of the aquifer is evident from observations of core samples obtained during drilling. Consistent with previous findings, the water-bearing units tend to consist of lenticular clayey and silty sands and some gravels contained within a complex mixture of sandy clays and sandy silts. More than 25 percent of the short-term tests were aborted due to excessive drawdown, and large drawdowns were observed in others.

Pumping tests and slug tests performed generated hydraulic conductivity estimates that range from 0.2 to 65 ft/day in the shallow wells, and from 0.01 to 57 ft/day in the deeper wells. The values obtained for the wells are comparable to, but have a larger range than, previous tests conducted by OCWD and JMM.

Three storage coefficients were estimated from the tests: 0.013 for shallow groundwater (at Wells 5D/5E), and 0.00078 (at Wells 5B/RW-2) and 0.00063 (at Wells IDP1/103) for deeper groundwater.

The test results also suggest that the fine-grained, confining units are leaky. A leakage factor of 0.1 was estimated for the lone shallow-zone test (Wells 5D/5E), and leakage

factors of 0.1 and 0.05 were found at the two tests of deeper zones (Wells 5B/RW-2 and Wells IDP1/103, respectively). The results of the aquifer test analyses are summarized in Table F-2 attached and described in greater detail in Subsection F.5.

Hydraulic response to pumping of area water supply wells was observed. Observation of vertical transmission of pressure changes between screened zones in the cluster wells was complicated by area pumping. It was difficult to separate drawdown caused by area pumping versus that induced by pumping in a screen depth below the wells monitored within a cluster well.

## F.3 Field Methods

The field methods used to collect the data from long-term water-level monitoring and from pumping and slug tests are presented in this section. Table F-3 summarizes the monitoring well construction on a well-by-well basis for the aquifer tests.

### F.3.1 Water-Level and Barometric Pressure Measurements

Water-level measurements for the long-term water-level monitoring, pumping and slug tests were obtained primarily with pressure transducers placed below the water table in individual monitoring wells. The transducers were connected to multichannel electronic data loggers that collected water-level measurements at specified intervals. The transducer-collected data were periodically checked manually with hand-held electric water level indicators. Barometric pressure measurements were collected during the aquifer tests using a vented barometric pressure transducer, also connected to the electronic data logger. The barometer was placed inside a cooler, which was kept partially open, to maintain relatively constant temperature and moisture conditions.

Twelve In-Situ brand vented pressure transducers were used: seven were 10-pounds-per-square-inch gauge (psig), four were 20-psig, and one was 100-psig. Six Hermit brand data loggers were used: four 2- and one 8-channel. The 10-psig pressure transducers were used primarily to measure water levels for long-term monitoring, and in wells with small (less than 20 foot) anticipated drawdowns.

The 20-psig and 100-psig pressure transducers were used to measure water levels with greater anticipated drawdowns: between 20 and 40 feet for the 20-psig pressure transducers, and between 45 and 200 feet for the 100-psig pressure transducer. The barometric pressure transducer was a 16-psia (atmosphere) In-Situ brand transducer.

The water-level pressure transducers were placed within sounding tubes of wells that were pumped to minimize turbulence effects of the water during pumping. Sounding tubes were not used for observation wells, or for wells that were slug-tested. The sounding tubes consisted of 1-inch diameter open-ended polyvinyl chloride (PVC) tubes. They were set as close to the top of the pump as possible, generally less than 1 foot from top of pump. In turn, the pumps were set as close as possible to the bottom of the screen interval to maximize available drawdown during pumping. For the slug-tested wells, the pressure transducers were set about 20 feet below the static water level, and weighed down with stainless steel rods to minimize disturbance of the pressure transducers as the slug was withdrawn from the wells.

### F.3.2 Water-Level Monitoring

Long-term water-level monitoring data were collected for several wells as part of the background monitoring program. Monitoring durations ranged from one to seven days.

Water-level monitoring was also conducted immediately before the start, and following recovery of pumping tests. These monitoring periods were shorter, generally less than one day. Table F-4 lists the wells for which hydrographs have been prepared. The data logger readings for the pressure transducers were collected at 5 to 15 minute intervals.

### F.3.3 Pumping Tests

The pumping tests consisted of both single-well and multiple-well tests. For a given well selected for pumping, the closest wells were monitored. Typically, a

pressure transducer was placed in the pumping and observation wells, if available, at least 12 hours before pumping and water-level data were collected. Depending on the testing schedule, the barometric pressure was also measured during the same time period. Table F-5 summarizes the wells for which pumping tests were performed. After pumping, with durations which ranged from 40 to 265 minutes, the pressure transducer was left in the well until recovery was complete. In some instances, the pressure transducer was left for an additional one to several days to collect long-term water-level monitoring data.

Although the closest wells were monitored, 30 of the 32 pumping tests were essentially single-well tests due to the relatively short pumping durations and large distances between the pumping and potential observation wells. Only one piezometer, Well 5E, was drilled specifically as an observation well to support a long-term pumping test conducted at Well 5D. One other piezometer, Well 103, was drilled to support testing of two extraction wells by the OCWD. These two OCWD tests, Wells IDP1 and IDP2, are not included in the total count of 32 tests.

The planned pumping duration for the short-term tests was 240 minutes. Prior to pumping, well development data were reviewed to estimate the proper discharge rate so as to provide sufficient but not excessive drawdown in the pumping well. Depending on the testing schedule, an attempt was made to perform brief trial tests before the actual pumping tests to determine an optimal pumping rate. Actual testing was conducted only after the water level has recovered to within 5 percent of undisturbed conditions. However, it was necessary to shorten the pumping duration for about 25 percent of the wells due to excessive drawdown beyond that anticipated.

Pumping rates for the pumping tests ranged from about 1 gallon per minute (gpm) to about 40 gpm. Typically, the pumping rates fluctuated from 1 to 10 percent during pumping as a result of declining water level in the pumping well. An attempt was made to stabilize the pumping rate within the first few minutes of the pumping test. The discharge rate was kept as constant as practical thereafter by either adjusting a discharge gate valve, or slightly varying the frequency of a

variable-frequency pump (if used) for the remainder of the test. An effort was made to minimize these corrections.

Grundfos brand pumps were used for the aquifer tests. Pump selection was based on discharge rates and the lift required. The average pumping rates and pumping duration for each test are listed in Table F-6. The discharge rates were determined by observing the time required either to totalize a known volume using an in-line flowmeter (Fill-Rite or Neptune brands), or to fill a container of known volume (5 gallons), or both. Generally, discharge rates were recorded, at a minimum, every 10 minutes for the first 60 minutes of pumping, and every 15 minutes thereafter. Average pumping rates were determined by dividing the total volume discharged as recorded by the flowmeter over the duration of pumping.

The data logger readings for the pressure transducers were collected at a linear rate of 5-to 15-minute intervals before pumping. At the start of pumping and recovery, the readings were collected at a logarithmic rate for very short time intervals. As pumping and recovery proceeded, the readings were collected at progressively longer intervals. Table F-7 lists these time intervals for the Hermit SE 1000C (2-channel) and SE 2000 (8-channel) data loggers.

During pumping, the on-site hydrogeologist plotted the drawdown (logarithmic scale) as function of time (linear scale) on semilogarithmic graph paper. Transmissivity values were estimated as the pumping test proceeded.

### F.3.4 Slug Tests

Generally, two consecutive slug tests were performed on wells that were completed in relatively fine-grained (low-hydraulic-conductivity) zones. Exceptions to the rule occurred as a result of various schedule constraints. Table F-8 summarizes the wells in which slug tests were performed. The slug tests were conducted by instantaneously withdrawing a slug from the well and measuring the recovery. The testing procedure was as follows:

- Set a 10-psig pressure transducer in the well and allow the water level to reach essentially undisturbed conditions.
- Measure the water level.
- Lower a 10-foot long stainless steel 3-inch-diameter top-entry bailer (slug).
- Allow the water level to reach within a minimum of 10 percent of undisturbed conditions.
- Raise slug from the well with a pump hoist rig.
- Measure water level until a minimum of 90 percent recovery has occurred.
- Repeat above steps for the second slug test.

The pressure transducers were set about 20 feet below the undisturbed water level of the well. Similar to the pumping tests, water-level readings were collected at very short time intervals at the beginning of the test, and as recovery proceeded the readings were collected at progressively longer intervals (Table F-7).

### F.3.5 Decontamination Procedures

All downhole equipment used during aquifer testing was decontaminated. Such equipment included hand-held water level indicators, pressure transducers and extension cables. The bailers and lifting cables (used for slug testing), and the downhole pumps, discharge pipes, sounding tubes, and electrical wiring (used for pumping tests) were decontaminated as well. The majority of the pumping tests were performed with nondedicated pumps that were moved from well to well, while some of the pumping tests were performed with dedicated Grundfos brand groundwater sampling pumps. Before the nondedicated pumps and appurtenances were placed downhole, they were decontaminated as follows:

- Rinse the pump and appurtenances with a high-pressure hot-water washer.
- Flush the inside of the pump first with a solution of trisodium phosphate (TSP) or Alconox water, then with fresh water.
- Flush the pump appurtenances with a solution of TSP or Alconox water, then with fresh water.

The remaining equipment was decontaminated as follows:

- Wash equipment with a disposable soap-impregnated cloth.
- Rinse with fresh water.
- Rinse with distilled water.

## F.4 Analysis Methods

Analysis methods were selected to evaluate the aquifer test data. The Clark Method (1967) was selected to quantify the relationship of changes in atmospheric pressure to water level fluctuations in wells. Since most of the pumping tests were single-well tests, the Cooper-Jacob Method (1946) was selected to analyze data from the pumping well. Additionally, the Theis Recovery Method (1935) was selected to analyze recovery data from the same wells. The time interval during which well bore storage affects the data was estimated using the Agarwal, Al-Hussainy, and Ramey Method (1970). Evidence of leaky conditions as observed in the successful multiple-well tests indicated the use of the Hantush Method (1960) because of the unconsolidated nature of the confining layer. As for slug tests, the Cooper, Bredehoeft, and Papadopulos Method (1967) was selected for confined and leaky aquifers. The Bouwer and Rice Method (1976) (updated in Bouwer [1989]) was selected as the analysis method for unconfined aquifers, although it is also considered a useful analysis method for confined slug tests.

Table F-9 summarizes the aquifer parameters obtained from the respective analyses.

### F.4.1 Barometric Efficiency Calculation

As described by Clark (1967), the ratio of change in the water level in a well to the change in atmospheric pressure that produces it is defined as the barometric efficiency. Fluctuations of the water level caused by changes in atmospheric pressure may obscure other fluctuations over time that are of interest. Such effects are of special interest when evaluating pumping tests or long-term water-level fluctuations. In some cases, atmospheric pressure changes in the short term

may not significantly impact water-level changes. The barometric pressure may be assumed constant when evaluating slug test results.

As illustrated in the following equation, the barometric efficiency is defined as the change in the water level in the well to the change in barometric pressure over a given time period:

$$B_e = \frac{\gamma \Delta h}{\Delta P_A} \quad (1)$$

where

$B_e$ Barometric efficiency

$\gamma$ Specific weight of water [$M/L^3$]

$\Delta h$ Change in head or water level in well [L]

$\Delta P_A$ Change in barometric pressure [$M/L^2$]

The specific gravity of water is equal to unity.

Assuming that 100 percent of the fluctuations in water level in a monitoring well result from atmospheric pressure changes, the barometric efficiency of a monitoring well may be calculated as follows:

- Collect barometric pressure and water-level measurements at the same time. If a barometric pressure is collected at a different time, linearly interpolate the water level to estimate it for the time at which the barometric pressure was collected.
- Calculate the incremental changes in barometric pressure ($\Delta BP$) and the incremental changes in the water level ($\Delta WL$) by subtracting the respective WL or BP collected at a particular time ($t_n$) from the value collected at the previous time ($t_{n-1}$).
- Sum the respective absolute values of the incremental $\Delta WL$ ($\Delta WL_{t(1)} + \ldots + \Delta WL_{t(n-1)} + \Delta WL_{t(n)}$) and $\Delta BP$ ($\Delta BP_{t(1)} + \ldots + \Delta BP_{t(n-1)} + \Delta BP_{t(n)}$) to form the increasing series $\Sigma\Delta BP$ ($\Sigma\Delta BP_{t(1)} + \ldots + \Sigma\Delta BP_{t(n-1)} + \Sigma\Delta BP_{t(n)}$) and $\Sigma\Delta WL$ ($\Sigma\Delta WL_{t(1)} + \ldots + \Sigma\Delta WL_{t(n-1)} + \Sigma\Delta WL_{t(n)}$), respectively.
- Plot the increasing series $\Sigma\Delta BP$ versus the increasing series $\Sigma\Delta WL$. The slope of a straight line fit through these points is the barometric efficiency:

Barometric efficiency (percent) = $(\Sigma\Delta WL/\Sigma\Delta BP) \times 100$

When calculating the barometric efficiency in this manner, a straight line is fit through only those data that appear to be affected by barometric pressure. If recovery data is being used, for example, the slope of the line ($\Sigma\Delta WL$ divided by $\Sigma\Delta BP$) will be much greater than the actual barometric efficiency, because the water level is also changing as a result of pumping.

## F.4.2 Pumping Test Analysis

### F.4.2.1 Cooper-Jacob Method

For nonsteady-state radial flow without vertical movement, Theis (1935) noticed that the discharge of a well is equivalent to the rate of decline of head multiplied by the storativity, summed over the area of recharge. He developed a solution to the following equation:

$$s = \frac{Q}{4\pi T}\int_{u}^{\infty}\frac{e^{-u}du}{u} \qquad (2)$$

Where

| | |
|---|---|
| s | Drawdown [L] |
| Q | Discharge rate [$L^3/T$] |
| T | Transmissivity [$L^2/T$] |
| u | Variable of integration |

The solution to the equation assumes the following:

- The aquifer is homogeneous, is isotropic, and has a uniform thickness over the area influenced by the test.
- The aquifer has infinite areal extent (practically its boundaries are beyond the significant effects of the well in the time considered).
- The discharging well penetrates the entire thickness of the aquifer.

- The well has an infinitesimal diameter (of no practical significance for periods of pumping longer than a few minutes).
- The water removed from storage is discharged instantaneously with decline in head.
- Before pumping, the piezometric surface is horizontal over the area influenced by the test.

The solution to Equation 2 can be given by the infinite series as follows:

$$s = \frac{Q}{4\pi T}\left[-0.577216 - \ln u + u - \frac{u^2}{2 \cdot 2!} + \frac{u^3}{3 \cdot 3!} - \ldots\right] \quad (3)$$

where

$$u = \frac{r^2 S}{4Tt} \quad (4)$$

and

| | |
|---|---|
| r | Distance between the observation well and the pumping well [L] |
| S | Aquifer storativity [dimensionless] |
| *t* | Time since pumping began at a constant discharge [T] |

The value of the series is commonly expressed as the well function of u, or W(u). Carrying this nomenclature forward, for given values of u and W(u), T may be determined from:

$$T = \frac{Q}{4\pi s} W(u) \quad (5)$$

and S may be determined by rewriting Equation 4:

$$S = \frac{4Tut}{r^2} \quad (6)$$

At long pumping times the value of u becomes successively smaller. The Cooper-Jacob semi-logarithmic straight-line method of analysis takes advantage of the fact that, for values of u $\leq$ 0.01, only the first two terms are significant. The rest of the

infinite series beyond *ln* u is negligible. By noting that the term *ln* u = 2.3 log u, Equation 5 can be simplified to:

$$s = \frac{2.3Q}{4\pi T} \log \left(\frac{2.25Tt}{S\,r^2}\right) \tag{7}$$

The value of the log term can be obtained by plotting the drawdown as a function of logarithmic time (Figure F-4). Taking advantage of this and rearranging Equation 7, the aquifer transmissivity can be calculated as follows:

$$T = \frac{2.3Q}{4\pi \Delta s} \tag{8}$$

where $\Delta s$ is the change in drawdown over one log cycle. In plotting the data for the straight-line solution, S can be estimated by extending the line until it intersects the line of zero drawdown. The equation is as follows:

$$S = 2.25T\left(\frac{t}{r^2}\right) \qquad \textit{(at the point of zero drawdown)} \tag{9}$$

It is important to apply the rule that $u \leq 0.01$ for the approximation. By examining Equation 3, u becomes small at large t and small r, since S and T are constants. From a practical standpoint, this means fitting the straight line to later time data.

### F.4.2.2 Agarwal, Al-Hussainy, and Ramey Method

The method suggested by Agarwal, Al-Hussainy, and Ramey (1970) is based on the analysis presented by Papadopulos and Cooper (1967) for well bore storage corrections of aquifer test data from large-diameter wells or low-permeability formations. The first 30 to 60 seconds of drawdown versus time data are plotted on an arithmetic scale, and a straight line is fit to the initial data. The slope of the line is calculated and set equal to the discharge rate divided by $C_W$, a coefficient that describes the amount of water per foot of casing derived under well bore storage conditions. From the type curves in Papadopulos and Cooper (1967), a criterion for determining the minimum time for applicability of the Cooper-Jacob method can be established. This critical time is given below:

$$t_c = \frac{100\ C_w}{4\pi T} \tag{10}$$

where

$t_c$ Critical time [T]

$C_w$ Coefficient equal to discharge, Q, divided by slope of line as described above [$L^3$/L]

Figure F-5 presents an example of straight-line fit on a plot of water level versus time data. The transmissivity of the aquifer at the well is then calculated from the Cooper-Jacob semilogarithmic plot using only that portion of the data that was collected later than the critical time calculated. The T value used in Equation 10 is a first approximation obtained for all of the data.

### F.4.2.3 Theis Recovery Method

The recovery test data can be analyzed in similar fashion (Figure F-6). Theis (1935) showed that the residual drawdown can be given as:

$$s' = \frac{Q}{4\pi T}[W(u) - W(u')] \tag{11}$$

where

s' Residual drawdown [L]

u' Variable of integration for recovery

W(u') Well function of u'

and

$$u' = \frac{r^2 S}{4Tt'} \tag{12}$$

where t' [T] is the time since pumping stopped or recovery began. Once again, for sufficiently small values of u and u', small r and large t', the two well functions in Equation 11 can be approximated by the first two terms of the infinite series and written as follows:

$$s' = \frac{2.3Q}{4\pi T} \log \left(\frac{t}{t'}\right) \tag{13}$$

By noting the $\Delta s'$ per log cycle of t/t', the transmissivity becomes:

$$T = \frac{2.3Q}{4\pi \Delta s'} \tag{14}$$

No comparable value of S can be determined by the recovery method.

### F.4.2.4 Hantush Method

Hantush and Jacob (1955) developed an equation for nonsteady radial flow in an infinite leaky confined aquifer to consider an aquifer overlain by a confining bed of low permeability. Hantush (1960) presented a modification of the theory of leaky confined aquifers to consider the storage of water in the confining beds. His equations are as follows:

$$s = \frac{Q}{4\pi T} H(u,\beta) \tag{15}$$

where

$$H(u,\beta) = \int_u^\infty \frac{e^{-y}}{y} \, erfc \left(\frac{\beta/\sqrt{u}}{\sqrt{y(y-u)}}\right) dy \tag{16}$$

and u is defined previously in Equation 4, and y is the variable of integration. As simplified from Hantush (1960),

$$\beta = \frac{r}{4b} \left(\frac{\sqrt{K'S_s'}}{KS_s} + \frac{\sqrt{K''S_s''}}{KS_s}\right) \tag{17}$$

where

| | |
|---|---|
| K | Hydraulic conductivity of main aquifer [L/T] |
| K' | Hydraulic conductivity of overlying confining layer [L/T] |
| K" | Hydraulic conductivity of underlying confining layer [L/T] |
| $S=bS_S$ | Storage coefficient of the main aquifer |
| $S'=b'S_S'$ | Storage coefficient of the overlying confining layers |

| | |
|---|---|
| $S''=b''S_s''$ | Storage coefficient of the underlying confining layer |
| $S_s$ | Specific storage (storage coefficient per vertical unit of thickness b) of the main aquifer [1/L] |
| $S_s'$ | Specific storage (storage coefficient per vertical unit of thickness b') of the overlying aquifer [1/L] |
| $S_s''$ | Specific storage (storage coefficient per vertical unit of thickness b") of the underlying aquifer [1/L] |

We can derive

$$S = 4T \frac{(t/r^2)}{(1/u)} \tag{18}$$

As K' and K'' (and ß) approach zero, H(u,ß) approaches W(u), and Equation 15 becomes the Theis equation. Type curves of 1/u versus H(u,ß), such as those shown in Figure F-7, were prepared by McClelland (1961) and found in Lohman (1979). Time-drawdown and time-recovery data can be plotted and superposed on these logarithmic-type curves of 1/u versus H(u,ß) for various values of ß. The value of ß for the curve chosen is noted. For arbitrary but convenient values of 1/u=1 and H(u,ß)=1, the corresponding values of s and t are read, and substituted into Equations 15 and 18 to calculate T and S, respectively.

### F.4.3 Slug Test Analysis

Data were analyzed using the Cooper, Bredehoeft, and Papadopulos Method and the Bouwer and Rice Method. Both methods assume that water level in the well returns to its undisturbed level exponentially, neglecting inertial effects, or turbulence. The time-drawdown data were corrected to eliminate the erratic head changes that typically occurred in the first 5-15 seconds of the tests. The elapsed time associated with the maximum drawdown was subtracted from all times, giving the maximum drawdown a time of zero.

#### F.4.3.1 Cooper, Bredehoeft and Papadopulos Method

The Cooper, Bredehoeft, and Papadopulos Method is a curve-fitting method derived for fully penetrating wells in confined aquifers. After the initial change in water level inside the well, groundwater flows to the well in a nonsteady state. Cooper and others used a heat flow analogy to relate the change in head to transmissivity, storage, and well geometry.

When the slug is pulled out of the well, the instantaneous change in water level, $h_b$ [L], is related to the volume of the slug:

$$h_b = \frac{V}{\pi r_{ws}^2} \tag{19}$$

where

$V$ = Volume of slug [$L^3$]

$r_{ws}$ = Radius of well storage (casing or effective radius) [L].

The rise of water level in the well is defined by:

$$h_t = h_o \, F(\alpha,\beta) \tag{20}$$

where

$h_t$ = Change in water level (drawdown) in the well at time $t>t_o$ [L]

$h_o$ = Initial change in water level (maximum drawdown) at time $t_o=0$ [L]

$F(\alpha,\beta')$ = Dimensionless drawdown

$\beta'$ = Dimensionless time

and

$$T = \frac{\beta' r_{ws}^2}{t} \tag{21}$$

where $r_b$ [L] is the radial distance from well center to undisturbed aquifer. For each value of $\alpha$, a curve relates $F(\alpha,\beta')$ to $\beta'$. A set of type curves is presented in

$$S = \frac{\alpha r_{ws}^2}{r_b^2} \tag{22}$$

Figure F-8.

Time-drawdown data can be plotted on a semilogarithmic graph, with the ratio of $h/h_o$ on the arithmetic axis and with time on the logarithmic axis. The data plot is overlain with the set of type curves, and the best-fitting type curve is selected by keeping the ß' and t axes coinciding and moving the plots horizontally. The value of $\alpha$ for the curve chosen is noted. For an arbitrary but convenient value of ß'=1, the corresponding value of t is read from the time axis of the data plot, and is substituted into Equation 21 to calculate T. Finally, S can be computed from Equation 22.

### F.4.3.2 Bouwer and Rice Method

The Bouwer and Rice (1976) method was developed for fully and partially penetrating wells in unconfined and confined aquifers. The method is based on a version of the Theis equation, which describes steady-state flow to a well after a sudden lowering of the head in the well:

$$Q = 2\pi\ KL \frac{h}{\ln\ (R_e/r_b)} \tag{23}$$

where

| | | |
|---|---|---|
| L | = | Length of casing through which water flows into the well [L] |
| $R_e$ | = | Radial distance over which the difference in water level, h, is dissipated in the aquifer to some insignificant (negligible) level [L] |
| $r_b$ | = | Radial distance from well center to undisturbed aquifer (borehole radius) [L] |

The Theis equation describes steady-state groundwater flow, and hence is valid only for the first part of a slug test, when water is flowing into the well relatively unaffected by changes in the saturated screen length, or by the exponential decrease of the hydraulic gradient toward the well. Negligible drawdown of the

water table in the aquifer around the well is assumed to occur, as the Theis equation requires aquifer thickness to be uniform around the well. Similarly, the negligible drawdown condition is also implicitly required by horizontal flow to the well, that is, no vertical flow is assumed to exist between the water table and the screen.

After removal of the slug, the subsequent rise in water level is described by:

$$\frac{dh}{dt} = \frac{-Q}{\pi r_{ws}^2} \tag{24}$$

where $r_{ws}$ is the radius of the well, either the unscreened casing radius ($r_c$) where head is rising, or the effective radius ($r_e$), which takes into account well bore storage often as represented by the porosity of the filter pack. Bouwer (1989) accounted for the well bore storage and defined the effective radius as:

$$r_e = \left[r_c^2 + n(r_b^2 - r_c^2)\right]^{0.5} \tag{25}$$

where n is porosity of the filter pack. Combining Equations 24 and 25, integrating, and solving for K gives:

$$K = \frac{r_{ws}^2 \ln (R_e/r_b)}{2L} \frac{1}{t} \ln \frac{h_o}{h_t} \tag{26}$$

where $h_o$ is the water level at time = 0, and $h_t$ is the water level at time t. All of the parameters in Equation 26, except $R_e$, are known in advance of analysis, and are depicted in Figure F-9. The well shown in the figure is partially penetrating, and the water table is above the screen and filter pack. For a fully penetrating well, b equals H. This second configuration reflects assumptions made for the RI analyses. The reason is discussed further in Section F.5.3.

Bouwer and Rice determined values of $R_e$ using an electrical resistance network analog, with different values of $r_b$, L, b, and H. The base of the aquifer was represented as a nonconducting boundary, and the water table as a constant plane source of current. The electrical analog could also be considered as a confined system, with the plane source representing an impermeable or semi-

permeable aquifer boundary. They derived the following empirical equations, which relate $R_e$ to the geometry and boundary conditions of the electrical analog:

(For partially penetrating wells),

$$\ln \frac{R_e}{r_b} = \left[ \frac{1.1}{\ln (H/r_b)} + \frac{A + B \ln [(b-H)/r_b]}{L/r_b} \right]^{-1} \quad (27)$$

(For fully penetrating wells),

$$\ln \frac{R_e}{r_b} = \left[ \frac{1.1}{\ln (H/r_b)} + \frac{C}{L/r_b} \right]^{-1} \quad (28)$$

where A, B, and C are dimensionless parameters.

Empirical curves relating the constants A, B, and C to the ratio $L/r_b$, as derived by the electrical analog work, are shown in Figure F-10. With the ratio $L/r_b$ known in advance, the applicable constant(s) can be determined from the curves, and the value of $R_e$ can be computed from either Equations 27 or 28. A straight line can be drawn on a plot of drawdown $h_t$ (logarithmic axis) versus time t (arithmetic axis). Hydraulic conductivity is calculated using Equation 26 with arbitrary t and $h_t$ values read from the straight line drawn.

## F.5. Discussion of Results

A discussion of well construction is provided here as a preamble to the discussion of aquifer test analysis results. Some of the wells that were drilled at the Station, especially in the early stages of the field investigation, were screened partially in silt and clay layers. A combination of factors contributed to this: (1) groundwater beneath the Station was found to be actually under confined rather than unconfined conditions, (2) the uncertainty during drilling in finding the first groundwater versus the first coarse-grained zone, and (3) strict adherence to well construction specifications.

Before the start of the field investigation at the Station, the site was believed to be situated in the forebay (unconfined) area and not in the pressure (confined) area. The

well construction specifications called for placement of the screen in the shallowest permeable (coarse-grained) zone, even if that did not coincide with the first occurrence of groundwater. The specifications also called for extending the screen to 5 feet above the top of the shallowest permeable zone to allow for seasonal variations of the water table assuming unconfined aquifer conditions. However, field implementation of such specifications in a complex heterogeneous system found beneath the Station was not an easy task.

As drilling proceeded and increasing evidence supported observations that the aquifer system beneath the Station may be confined, greater scrutiny was given to placing the well screen adjacent to only coarse-grained zones. The requirement of 5 foot of screen above the water table was relaxed to maximize screen length in the permeable zone. Interpretation of aquifer test data in these wells should take into account the well construction.

### F.5.1 Water-Level Monitoring

#### F.5.1.1 Barometric Efficiency

Table F-10 presents the results of barometric efficiency calculations for wells drilled during the RI. A sample calculation is presented in Attachment 1.

The barometric efficiency estimates range from 0.09 to 1.9. The results fall into fairly narrow ranges: three estimates are greater than 1.3; seventeen estimates cluster closely around 1.0; seventeen estimates cluster closely around 0.5; twelve estimates cluster around 0.3; and four estimates are below 0.25. In wells with greater than 1.0 estimates of barometric efficiency, one unit of change in barometric pressure results in greater than one unit of change in water level. This appears paradoxical.

A possible cause focuses on the water level and barometric pressure transducers used. In-Situ, Inc., manufacturer of the pressure transducers and the data loggers, was contacted to ascertain if the instruments were functioning properly. An effort was made to determine if improper operation of the instruments may be

a cause. Field data downloaded from the data loggers were reviewed to determine if the pressure transducer constants were entered incorrectly by field crew. No systematic problems were discovered.

The Station is too far from the ocean to be under the influence of tidal effects. External loading effects, such as planes landing and railroad trains passing, are not reasonable causes. A review of field data did not show water levels in wells located near the runways or the railroad tracks to be affected differently when compared with other wells.

A possible physical explanation may be found in Weeks (1979). Inspection of the hydrographs and barographs plotted together indicates that a phase lag and/or frequency mismatch may occur. Weeks (1979) hypothesized that barometric pressure changes are transmitted instantaneously down the well, but are delayed in the unsaturated zone due to the thick overburden. In other words, soil gas pressure (movement of air into or out of the unsaturated zone) may be decreasing in response to the previous decline in barometric pressure at the same time barometric pressure is rising. Therefore, because water level change is due to soil gas pressure at the water table (delayed response) and the barometric pressure at land surface (instantaneous transmission), it may exceed the barometric pressure change alone. With the mechanism described by Weeks operating, one gets various combinations of barometric efficiencies that can add up to over 1.0.

The field data were not analyzed using the method suggested by Weeks (1979).

#### F.5.1.2 Hydraulic Response to Pumping of Area Wells

From the background monitoring program, response to pumping in the vicinity of the Station was observed. Area groundwater withdrawal is associated with water supply wells. In the vicinity of the Station, pumping is believed to occur at depth to the north, west, and south of the Station. Pumping to the east of the Station is also suspected although response to it was not observed directly from monitoring. The difference in screen depths of area water supply wells (all at greater depths) and most of the monitoring wells drilled (mostly shallow) during the RI partially

hampers such direct observation. An on-Station pumping well is known to exist at the west end of the main east-west runway; its pumping appeared to affect the deeper screened units of Well Clusters 3 and 4 located in the southwest quadrant of the Station.

### F.5.2 Pumping Test Analysis

Table F-11 presents the results for the pumping tests conducted for the RI. Preferred results, summarized in Table F-2, are highlighted in bold. In general, for the single-well tests, the estimates obtained using the recovery data were chosen. Fluctuations in discharge rates and well losses were variables of concern during pumping but not during recovery. Other factors, such as critical time estimates and whether check valves were functioning properly, were considered. Sample calculations of the time to end of significant well bore storage effects and pumping test analysis methods are presented in Attachments 2 to 5. Data plots of all the pumping test analyses are in Attachment 8.

Water-level measurements collected during the short-term pumping tests were not corrected for barometric pressure effects because the barometric-induced water level fluctuations were small in comparison with changes caused by pumping. Although unnecessary, the lone exceptions are corrections to the data collected in Well RW-2, an observation well for pumping Well 5B. Field data for all wells were reviewed to confirm that the barometric effects on water-level changes were negligible.

For the long-term pumping test conducted at Well 5D, the water levels for the pumping well, and the piezometer (Well 5E) were corrected for barometric effects. The correction is necessary because of smaller changes in drawdown at later stages of pumping. Fluctuations of water level caused by barometric pressure effects may be more significant. The test data in Well 103 collected in support of OCWD's pumping test at Well IDP1 were not corrected for barometric effects because atmospheric data were not available.

Hydraulic conductivity values were calculated from transmissivity values estimated from the analyses by assuming a saturated thickness. In some cases, the static water level was within the screened interval of the monitoring wells, while in others the static water level was above the screened interval. The monitoring well screened interval depths and the depths to static water level are listed in Table F-3 (Subsection F.3). For the former case, the saturated thickness was assumed to consist of the saturated screen length. For the latter case, the saturated thickness was assumed to consist of the entire well screen, generally 20 or 40 feet. The K values for some wells may be greater than those estimated because, as discussed above, the effective saturated thickness in some wells may be less than either the saturated screen length or the well screen.

#### F.5.2.1 Cooper-Jacob Method

For the majority of the wells tested, the pumping well is also the observation well. If the $u \leq 0.01$ rule were applied in the strictest sense, the criterion can be achieved at relatively small time t because the radial distance r for these wells is small, say the radius of the well bore. However, storativity estimates based on drawdown data are not expected to be valid for the pumping well because the r value is difficult to estimate. Therefore, estimates of u values to determine the validity of the Cooper-Jacob approximation is generally not done for the pumping well data.

#### F.5.2.2 Hantush Method

Due to the unconsolidated nature of the confining layers, the Hantush Method is used to analyze the multiple-well test data. The Hantush-Jacob Method, which assumes no storage in the confining layers, is used generally only when very stiff aquitards are present.

### F.5.3 Slug Test Analysis

Table F-12 presents the results for the slug tests conducted for the RI. As with the pumping tests, the preferred results (summarized in Table F-2) are highlighted

in bold. In all cases, estimates resulting from the first test were chosen. Results from the Bouwer and Rice analysis were chosen if the test data did not fit the Cooper, Bredehoeft, and Papadopulos type of curves well, and/or if the "double-straight-line" effect was observed. Otherwise, the estimates from both slug test analysis methods were averaged. Field factors were considered in the selection process. Sample calculations for both analysis methods are presented in Attachments 6 and 7. The data plots for the slug tests are in Attachment 9.

The slug test data were analyzed using both the Cooper, Bredehoeft, and Papadopulos Method, and the Bouwer and Rice Method for two reasons. First, the findings suggest that the aquifer beneath the main part of the Station may be confined. Therefore, a method such as Cooper, Bredehoeft, and Papadopulos is appropriate. A more flexible method such as Bouwer and Rice, which has been found to be useful for both unconfined and confined conditions, is also used.

Slug test results are representative of a relatively small portion of the aquifer in comparison with pumping tests. The time-drawdown data are usually influenced by well construction and degree of well development. Both analysis methods must be carefully applied to yield parameter values that represent the formation rather than the filter pack, or other aspects of the well bore. The larger the slug volume and the longer the screen, the larger the sample of aquifer material tested.

Poor development of several wells of Cluster Wells 1 and 2 deserves consideration. All boreholes of the two cluster wells were drilled using the mud rotary technique. Results of the slug tests for Wells 1A, 1B, 2A, 2C, and 2D should be considered while noting the difficulty of properly developing the wells.

#### F.5.3.1 Cooper, Bredehoeft, and Papadopulos Method

The analysis method considers the effects of well bore storage, a definite advantage. However, field data may or may not have the S-shape required for the type curve matching. Even in wells believed to be confined, early data tend to deviate from the S-shape. Additionally, although a storage coefficient is estimated using this method, the type curves are similar in shape and a unique match may

be difficult to make. The storage coefficient is very sensitive to the curve-fitting process, whereas the sensitivity of the transmissivity value to the curve-fitting is much smaller.

### F.5.3.2 Bouwer and Rice Method

All slug tests analyzed using the Bouwer and Rice method were assumed to be fully penetrating because the aquifer thickness was not known. The sensitivity of hydraulic conductivity (K) to aquifer thickness (b) was assessed for 20 percent of the slug-tested wells. In all cases, the K values estimated for the fully penetrating configuration were no more than 25 percent greater than K values estimated for the partially penetrating configuration, with b (100 feet and greater) being much greater than the column of water above the bottom of the well screen (H). Thus, only Equation 28 (Subsection F.4.3.2) was used. The base of the aquifer was not a focus of the field investigation, and therefore is assumed to be at the bottom of the screen for the analyses.

The screen length, L, is set as either the full screen length in the case where static water level is above the top of the screen, or the saturated screen length where static water level was below the top of the screen. The radius of well screen was either the radius of the casing where the static water level was above the top of the filter pack, or the effective radius where the static water level was below the top of the filter pack. As required by well construction specifications, the filter pack extended above the top of the screen.

The test data usually do not show a simple straight line on the semilogarithmic plot. Early data may be attributed to inertial effects. A "double straight-line" effect is often observed as early data in unconfined wells exhibit a straight line of steeper slope than later data. This rapid recovery in the early part of the test is attributed to drainage of water from the filter pack and the developed zone. After this initial drainage of the higher hydraulic conductivity zone around the well screen, water level rises more slowly as groundwater from the formation begins to flow to the well.

At late time, the steady-state flow assumption used is no longer valid. As the test progresses, the flow rate into the well decreases, and the drawdown data deviate from the straight line for large t. Hence, the drawdown data that occur between the early rapid rise and the late slowing rise represent the correct data to fit the straight line.

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**Table F-1**
**Summary of Monitoring Wells**
**MCAS El Toro Phase I RI Technical Memorandum**

| Well Type | Depth Range (feet) | Number of Wells | | |
|---|---|---|---|---|
| | | OU-1 | OU-2 | OU-3 |
| Single-Point | 70 - 290[a] | 12 | 16 | 38 |
| Multidepth | 135 - 490 | 10 | -- | -- |
| Cluster | | 6 (25[b]) | -- | -- |
| Multiport | | 4 (20[b]) | -- | -- |

[a] One well, a piezometer, is screened to 495 ft.
[b] Total number of screened zones.

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**Table F-2**
**Summary of Aquifer Parameters**
**MCAS El Toro Phase I RI Technical Memorandum**



| Site No. | Well No. | Test Analysis Method (a) | Test Type (b) | Transmissivity (ft*ft/day) | Hydraulic Conductivity (ft/day) | Storage Coefficient (c) | Leakage Factor |
|---|---|---|---|---|---|---|---|
| **Operable Unit (OU)-1** | | | | | | | |
| 18 | 1B | B&R / CBP | S | 4.6 | 0.23 | 4 E-04 | |
| | 1E | B&R | S | 22 | 2.0 | | |
| | 2A | B&R / CBP | S | 0.15 | 0.01 | 5 E-04 | |
| | 2C | B&R | S | 3.7 | 0.19 | | |
| | 2D | Th: Recovery | P | 0.57 | 0.03 | | |
| | 2D | B&R | S | 0.28 | 0.01 | | |
| | 2E | C-J: Pumping | P | 28 | 0.69 | | |
| | 3A | Th: Recovery | P | 900 | 45.0 | | |
| | 3B | Th: Recovery | P | 1080 | 53.9 | | |
| | 3E | CBP | S | 9.0 | 0.22 | 2 E-06 | |
| | 4A | C-J: Pumping | P | 350 | 17.3 | | |
| | 4B | C-J: Pumping | P | 190 | 9.5 | | |
| | 5A | B&R | S | 0.18 | 0.01 | | |
| | 5B | Th: Recovery | P | 250 | 12.4 | | |
| | 5B/RW-2 | H: Pumping | P | 396 | 9.9 | 7.8 E-04 | 0.1 |
| | 5C | C-J: Pumping | P | 1260 | 63.0 | | |
| | 5D | Th: Recovery | P | 1230 | 28.5 | | |
| | 5D/5E | H: Pumping | P | 1250 | 27.8 | 1.3 E-02 | 0.1 |
| | 12 | Th: Recovery | P | 0.42 | 0.01 | | |
| | 14 | C-J: Pumping | P | 170 | 4.3 | | |
| | 15 | Th: Recovery | P | 0.61 | 0.02 | | |
| | 16 | C-J: Pumping | P | 400 | 11.4 | | |
| | 17 | Th: Recovery | P | 290 | 7.3 | | |
| | 18 | Th: Recovery | P | 47 | 1.2 | | |
| | 19C | Th: Recovery | P | 250 | 12.5 | | |
| | 19D | C-J: Pumping | P | 3480 | 174 | | |
| | 19E | B&R / CBP | S | 9.0 | 0.22 | 5 E-03 | |
| | 22 | Th: Recovery | P | 230 | 5.8 | | |
| | 24 | B&R / CBP | S | 43 | 2.2 | 1 E-03 | |
| | 101 | C-J: Pumping | P | 190 | 4.7 | | |
| | IDP1 | C-J: Pumping | P | 4170 | 34.8 | | |
| | IDP1/103 | H: Pumping | P | 5680 | 56.8 | 6.3 E-04 | 0.05 |
| **Operable Unit (OU)-2** | | | | | | | |
| 2 | 25 | B&R | S | 91 | 4.7 | | |
| | 59 | B&R | S | 35 | 1.7 | | |
| | 60 | B&R / CBP | S | 14 | 0.52 | 2 E-04 | |
| | 61 | B&R / CBP | S | 7.6 | 0.38 | 9 E-05 | |
| 3 | 26 | C-J: Pumping | P | 390 | 10.3 | | |
| | 39 | C-J: Pumping | P | 55 | 1.9 | | |
| | 63 | Th: Recovery | P | 160 | 4.0 | | |
| | 64 | CBP | S | 120 | 3.0 | 8 E-07 | |
| | 65A | B&R | S | 230 | 6.5 | | |
| 5 | 67 | Th: Recovery | P | 1670 | 44.1 | | |
| | 68 | B&R / CBP | S | 68 | 3.4 | 8 E-05 | |
| 10 | 77 | Th: Recovery | P | 1690 | 42.4 | | |

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**Table F-2**
**Summary of Aquifer Parameters**
**MCAS El Toro Phase I RI Technical Memorandum**



| Site No. | Well No. | Test Analysis Method (a) | Test Type (b) | Transmissivity (ft*ft/day) | Hydraulic Conductivity (ft/day) | Storage Coefficient (c) | Leakage Factor |
|---|---|---|---|---|---|---|---|
| **Operable Unit (OU)-3** | | | | | | | |
| 1 | 57 | B&R | S | 24 | 1.2 | | |
| 4 | 66 | Th: Recovery | P | 450 | 11.3 | | |
| 6 | 69 | B&R / CBP | S | 44 | 1.1 | 2 E-04 | |
| 7 | 70 | B&R / CBP | S | 100 | 2.7 | 1 E-05 | |
| | 72 | Th: Recovery | P | 320 | 8.1 | | |
| | 91 | B&R | S | 170 | 4.3 | | |
| | 100 | B&R | S | 80 | 2.0 | | |
| 8 | 29 | B&R / CBP | S | 7.2 | 0.18 | 6 E-08 | |
| | 73 | B&R | S | 570 | 14.3 | | |
| | 74 | Th: Recovery | P | 920 | 23.1 | | |
| 9 | 75 | Th: Recovery | P | 2280 | 65.1 | | |
| 12 | 31 | C-J: Pumping | P | 170 | 4.3 | | |
| | 48 | B&R / CBP | S | 380 | 9.7 | 1 E-05 | |
| 13 | 32 | B&R / CBP | S | 47 | 1.1 | 8 E-05 | |
| | 78 | Th: Recovery | P | 690 | 21.4 | | |
| 15 | 51 | B&R | S | 20 | 0.52 | | |
| 16 | 33 | B&R | S | 1.1 | 0.03 | | |
| | 52 | B&R / CBP | S | 28 | 0.69 | 3 E-03 | |
| 19 | 54 | B&R | S | 26 | 0.86 | | |
| | 85 | B&R | S | 13 | 0.37 | | |
| 20 | 88 | B&R | S | 11 | 0.29 | | |
| 21 | 56 | Th: Recovery | P | 720 | 19.6 | | |
| 22 | 47 | C-J: Pumping | P | 260 | 7.1 | | |

Note: Differences with transmissivity, hydraulic conductivity, and storage coefficient values listed in Tables F-11 and F-12 are due to use of different significant figures.

(a) Test Analysis Method

B&R: Bouwer and Rice (1976), and Bouwer (1989)
CBP: Cooper, Bredehoeft and Papadopulos (1967)
C-J: Cooper-Jacob (1946)
H: Hantush (1960)
Th: Theis - Recovery (1935)

(b) Test Type

S: Slug test
P: Pumping test

(c) All storage coefficients calculated for slug test results used the Cooper, Bredehoeft and Papadopulos method. The values are sensitive to the curve-fitting process and are only order of magnitude estimates.

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**Table F-3**
**Monitoring Well Construction Summary**
**MCAS El Toro Phase I RI Technical Memorandum** Sheet 1 of 2

| Well No. | Site No. | Depth to Water During Test | Ground Surface Elevation (feet) | Screened Interval Depth (feet) | | Screened Interval Elevation (feet) | | Well Dia. (in.) |
|---|---|---|---|---|---|---|---|---|
| | | | | From | To | From | To | |
| 1A | 18 | 231 | 393 | 466 | 486 | -73 | -93 | 5 |
| 1B | | 198 | 393 | 396 | 416 | -3 | -23 | 5 |
| 1E | | 214 | 391 | 205 | 225 | 186 | 166 | 4 |
| 2A | 18 | 175 | 391 | 462 | 482 | -71 | -91 | 5 |
| 2C | | 175 | 391 | 358 | 378 | 33 | 13 | 5 |
| 2D | | 176 | 391 | 294 | 314 | 97 | 77 | 5 |
| 2E | | 180 | 391 | 198 | 233 | 193 | 158 | 5 |
| 3A | 18 | 125 | 280 | 370 | 390 | -90 | -110 | 5 |
| 3B | | 117 | 280 | 280 | 300 | 0 | -20 | 5 |
| 3E | | 112 | 279 | 124 | 164 | 155 | 115 | 4 |
| 4A | 18 | 102 | 243 | 286 | 306 | -43 | -63 | 5 |
| 4B | | 88 | 243 | 190 | 210 | 53 | 33 | 4 |
| 5A | 18 | 96 | 270 | 462 | 482 | -192 | -212 | 5 |
| 5B | | 95 | 274 | 321 | 341 | -47 | -67 | 5 |
| 5C | | 90 | 270 | 225 | 245 | 45 | 25 | 5 |
| 5D | | 89 | 271 | 83 | 133 | 188 | 138 | 6 |
| 5E | | 85 | 270 | 80 | 130 | 190 | 140 | 2 |
| 12 | 18 | 165 | 305 | 165 | 205 | 140 | 100 | 4 |
| 14 | 18 | 73 | 268 | 75 | 115 | 193 | 153 | 4 |
| 15 | 18 | 175 | 320 | 175 | 215 | 145 | 105 | 4 |
| 16 | 18 | 228 | 376 | 223 | 263 | 153 | 113 | 5 |
| 17 | 18 | 147 | 376 | 215 | 255 | 161 | 121 | 5 |
| 18 | 18 | 139 | 276 | 140 | 180 | 136 | 96 | 4 |
| 19C | 18 | 111 | 232 | 257 | 277 | -25 | -45 | 5 |
| 19D | | 100 | 232 | 150 | 170 | 82 | 62 | 5 |
| 19E | | 97 | 232 | 98 | 138 | 134 | 94 | 4 |
| 22 | 18 | 246 | 426 | 247 | 287 | 179 | 139 | 5 |
| 24 | 18 | 47 | 617 | 51 | 71 | 566 | 546 | 4 |
| 25 | 2 | 56 | 546 | 55 | 75 | 491 | 471 | 4 |
| 26 | 3 | 232 | 419 | 230 | 270 | 189 | 149 | 5 |
| 29 | 8 | 92 | 273 | 95 | 135 | 178 | 138 | 4 |
| 31 | 12 | 102 | 256 | 105 | 145 | 151 | 111 | 4 |
| 32 | 13 | 142 | 285 | 144 | 184 | 141 | 101 | 4 |
| 33 | 16 | 182 | 337 | 180 | 220 | 157 | 117 | 4 |
| 39 | 3 | 241 | 419 | 230 | 270 | 189 | 149 | 5 |
| 47 | 22 | 120 | 277 | 116 | 156 | 161 | 121 | 4 |
| 48 | 12 | 96 | 247 | 95 | 135 | 152 | 112 | 4 |
| 51 | 15 | 127 | 270 | 125 | 165 | 145 | 105 | 4 |
| 52 | 16 | 182 | 333 | 182 | 222 | 151 | 111 | 4 |
| 54 | 19 | 149 | 332 | 141 | 181 | 191 | 151 | 4 |
| 56 | 21 | 95 | 256 | 92 | 132 | 164 | 124 | 4 |
| 57 | 1 | 62 | 630 | 63 | 83 | 567 | 547 | 4 |

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**Table F-3**
**Monitoring Well Construction Summary**
**MCAS El Toro Phase I RI Technical Memorandum** **Sheet 2 of 2**

| Well No. | Site No. | Depth to Water During Test | Ground Surface Elevation (feet) | Screened Interval Depth (feet) | | Screened Interval Elevation (feet) | | Well Dia. (in.) |
|---|---|---|---|---|---|---|---|---|
| | | | | From | To | From | To | |
| 59 | 2 | 68 | 506 | 69 | 89 | 437 | 417 | 4 |
| 60 | 2 | 71 | 499 | 80 | 100 | 419 | 399 | 4 |
| 61 | 2 | 60 | 514 | 80 | 100 | 434 | 414 | 4 |
| 63 | 3 | 224 | 403 | 235 | 275 | 168 | 128 | 5 |
| 64 | 3 | 243 | 419 | 245 | 285 | 174 | 134 | 5 |
| 65A | 3 | 233 | 409 | 230 | 270 | 179 | 139 | 5 |
| 66 | 4 | 224 | 401 | 250 | 290 | 151 | 111 | 5 |
| 67 | 5 | 189 | 428 | 187 | 227 | 241 | 201 | 5 |
| 68 | 5 | 185 | 417 | 190 | 210 | 227 | 207 | 5 |
| 69 | 6 | 142 | 324 | 150 | 190 | 174 | 134 | 4 |
| 70 | 7 | 128 | 294 | 125 | 165 | 169 | 129 | 4 |
| 72 | 7 | 108 | 277 | 110 | 150 | 167 | 127 | 4 |
| 73 | 8 | 88 | 264 | 90 | 130 | 174 | 134 | 4 |
| 74 | 8 | 90 | 264 | 90 | 130 | 174 | 134 | 4 |
| 75 | 9 | 119 | 270 | 114 | 154 | 156 | 116 | 4 |
| 77 | 10 | 109 | 272 | 130 | 170 | 142 | 102 | 4 |
| 78 | 13 | 135 | 276 | 127 | 167 | 149 | 109 | 4 |
| 85 | 19 | 148 | 329 | 143 | 183 | 186 | 146 | 4 |
| 88 | 20 | 188 | 332 | 185 | 225 | 147 | 107 | 4 |
| 91 | 7 | 109 | 274 | 110 | 150 | 164 | 124 | 4 |
| 100 | 7 | 109 | 287 | 131 | 171 | 156 | 116 | 4 |
| 101 | 18 | 86 | 230 | 90 | 130 | 140 | 100 | 4 |
| 103 | 18 | 122 | 252 | 395 | 495 | -143 | -243 | 4 |

*Note:*

During testing, the depth to water is measured from a measuring point elevation.
It may differ from final ground surface elevation set after well completion.
The difference is generally within 0.5 ft.

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**Table F-4**
**Available Water-Level Monitoring Hydrographs**
**MCAS El Toro Phase I RI Technical Memorandum**

| Well No. | Site No. | Well No. | Site No. |
|---|---|---|---|
| 1A | 18 | 19D | 18 |
| 1C | 18 | 19E | 18 |
| 1D | 18 | 22 | 18 |
| 1E | 18 | 26 | 3 |
| 2A | 18 | 27 | 5 |
| 2C | 18 | 31 | 12 |
| 2D | 18 | 33 | 16 |
| 2E | 18 | 37 | 21 |
| 3A | 18 | 39 | 3 |
| 3B | 18 | 40 | 4 |
| 3C | 18 | 41 | 5 |
| 3E | 18 | 45 | 9 |
| 4A | 18 | 48 | 12 |
| 4B | 18 | 50 | 14 |
| 5A | 18 | 56 | 21 |
| 5B | 18 | 66 | 4 |
| 5C | 18 | 67 | 5 |
| 5D | 18 | 72 | 7 |
| 5E | 18 | 74 | 8 |
| 14 | 18 | 75 | 9 |
| 16 | 18 | 90 | 21 |
| 17 | 18 | 101 | 18 |
| 18 | 18 | PS-4 | 18 |
| 19A | 18 | PS-6 | 18 |
| 19B | 18 | RW-2 | 18 |
| 19C | 18 | | |

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**Table F-5**
**Pumping Tests Performed**
**MCAS El Toro Phase I RI Technical Memorandum**

| Site No. | Pumping Well No. | Observation Well No. |
|---|---|---|
| **Operable Unit (OU) - 1:** | | |
| 18 | 2D | 2D |
| | 2E | 2E |
| | 3A | 3A |
| | 3B | 3B |
| | 4A | 4A |
| | 4B | 4B |
| | 5B | 5B |
| | | RW-2 |
| | 5C | 5C |
| | 5D | 5D |
| | | 5E |
| | 12 | 12 |
| | 14 | 14 |
| | 15 | 15 |
| | 16 | 16 |
| | 17 | 17 |
| | 18 | 18 |
| | 19C | 19C |
| | 19D | 19D |
| | 22 | 22 |
| | 101 | 101 |
| | IDP1 | IDP1 |
| | | 103 |
| **Operable Unit (OU) - 2:** | | |
| 3 | 26 | 26 |
| | 39 | 39 |
| | 63 | 63 |
| 5 | 67 | 67 |
| 10 | 77 | 77 |
| **Operable Unit (OU) - 3:** | | |
| 4 | 66 | 66 |
| 7 | 72 | 72 |
| 8 | 74 | 74 |
| 9 | 75 | 75 |
| 12 | 31 | 31 |
| 13 | 78 | 78 |
| 21 | 56 | 56 |
| 22 | 47 | 47 |

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**Table F-6**
**Pumping Rates, and Pumping Duration**
**MCAS El Toro Phase I RI Technical Memorandum**

| Well No. | Site No. | Average Pumping Rate (gpm) | Pumping Duration (minutes) |
|---|---|---|---|
| 2D | 18 | 1.3 | 74 |
| 2E | 18 | 4.1 | 265 |
| 3A | 18 | 18 | 265 |
| 3B | 18 | 18.7 | 241 |
| 4A | 18 | 5.5 | 241 |
| 4B | 18 | 36.5 | 203 |
| 5B | 18 | 23.8 | 240 |
| 5C | 18 | 19.3 | 190 |
| 5D (1) | 18 | 20.4 | 1611 |
| 5D (2) | 18 | 35 | 124 |
| 12 (1) | 18 | 1.4 | 40 |
| 12 (2) | 18 | 0.8 | 66 |
| 14 | 18 | 8.3 | 241 |
| 15 | 18 | 0.7 | 140 |
| 16 | 18 | 17 | 240 |
| 17 | 18 | 18 | 260 |
| 18 | 18 | 1.6 | 242 |
| 19C | 18 | 10.6 | 242 |
| 19D | 18 | 38 | 161 |
| 22 | 18 | 12 | 240 |
| 26 | 3 | 9.0 | 240 |
| 31 | 12 | 8.6 | 201 |
| 39 | 3 | 3.7 | 244 |
| 47 | 22 | 20 | 240 |
| 56 | 21 | 16 | 96 |
| 63 | 3 | 11.7 | 152 |
| 66 | 4 | 39 | 200 |
| 67 | 5 | 16.8 | 240 |
| 72 (1) | 7 | 19 | 48 |
| 72 (2) | 7 | 13.5 | 155 |
| 74 | 8 | 12 | 240 |
| 75 | 9 | 19 | 240 |
| 77 | 10 | 18.2 | 240 |
| 78 | 13 | 4.6 | 214 |
| 101 | 18 | 27 | 240 |
| IDP1 | 18 | 1188 | 1769 |

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**Table F-7**
**Data Logger Data Collection Frequency**
**(minutes)**
**MCAS El Toro Phase I RI Technical Memorandum**

| SE 1000C | | | SE 2000 | | |
|---|---|---|---|---|---|
| Time Range | | Data Collection Frequency | Time Range | | Data Collection Frequency |
| From | To | | From | To | |
| 0 | 0.0333 | 0.0033 | 0 | 0.0833 | 0.0083 |
| 0.0333 | 0.333 | 0.0167 | 0.0833 | 0.500 | 0.0167 |
| 0.333 | 2 | 0.0833 | 0.500 | 2 | 0.0833 |
| 2 | 10 | 0.5 | 2 | 10 | 0.5 |
| 10 | 100 | 2 | 10 | 100 | 2 |
| 100 | 1000 | 10 | 100 | 1000 | 10 |
| 1000 | -- | 15[a] | 1000 | -- | 15[a] |

[a] Frequency set by operator.

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**Table F-8**
**Slug Tests Performed**
**MCAS El Toro Phase I RI Technical Memorandum**

| Site No. | Well No. | Number of Tests |
|---|---|---|
| **Operable Unit (OU) - 1** | | |
| 18 | 1B | 2 |
| | 1E | 2 |
| | 2A | 1 |
| | 2C | 1 |
| | 2D | 2 |
| | 3E | 2 |
| | 5A | 1 |
| | 19E | 2 |
| | 24 | 2 |
| **Operable Unit (OU) - 2** | | |
| 2 | 25 | 2 |
| | 59 | 2 |
| | 60 | 2 |
| | 61 | 2 |
| 3 | 64 | 2 |
| | 65A | 2 |
| 5 | 68 | 2 |
| **Operable Unit (OU) - 3** | | |
| 1 | 57 | 2 |
| 6 | 69 | 2 |
| 7 | 70 | 2 |
| | 91 | 2 |
| | 100 | 1 |
| 8 | 29 | 2 |
| | 73 | 2 |
| 12 | 48 | 2 |
| 13 | 32 | 2 |
| 15 | 51 | 2 |
| 16 | 33 | 2 |
| | 52 | 2 |
| 19 | 54 | 2 |
| | 85 | 2 |
| 20 | 88 | 2 |

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**Table F-9**
**Aquifer Test Analysis Methods**
**MCAS El Toro Phase I RI Technical Memorandum**

| Element | Test Analysis Method | | Parameter |
|---|---|---|---|
| Water-Level Monitoring | Clark (1967) | | $B_e$ |
| Time of Significant Well Bore Storage | Agarwal, Al-Hussainy, Ramey (1967) | | $t_c$ |
| Pumping Tests | Cooper-Jacob (1946) | Single-Well | $T, K^*$ |
| | | Multiple-Well | $T, K^*, S$ |
| | Theis Recovery (1935) | Single-Well | $T, K^*$ |
| | | Multiple-Well | $T, K^*$ |
| | Hantush (1960) | Single-Well | Not applicable |
| | | Multiple-Well | $T, K^*, S, \beta$ |
| Slug Tests | Cooper, Bredehoeft, and Papadopulos (1967) | | $T, K^*, S$ |
| | Bouwer and Rice (1976) and Bouwer (1989) | | $T^*, K, h_o$ |

$B_e$ Barometric efficiency
$t_c$ Critical time
$T$ Transmissivity
$K$ Hydraulic conductivity
$S$ Storage coefficient
$K^*$ $K = T/b$, where b is the saturated thickness
$T^*$ $T = K(b)$, where b is as defined above
$\beta$ Leakage factor
$h_o$ Initial drawdown

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**Table F-10**
**Barometric Efficiency Estimates**
**MCAS El Toro Phase I RI Technical Memorandum**



| Well No. | Site No. | Barometric Efficiency |
|---|---|---|
| 1C | 18 | 0.41 |
| 1D | 18 | 0.95 |
| 1E | 18 | 0.33 |
| 2A | 18 | 0.09 |
| 2C | 18 | 0.22 |
| 2D | 18 | 0.15 |
| 2E | 18 | 0.49 |
| 3A | 18 | 0.89 |
| 3B | 18 | 0.74 |
| 3C | 18 | 1.00 |
| 3E | 18 | 0.53 |
| 5A | 18 | 0.42/0.35/0.57 |
| 5B | 18 | 0.28/0.28/0.28 |
| 5C | 18 | 0.48/0.27/0.26 |
| 5D | 18 | 0.35/0.19 |
| 5E | 18 | 0.57/0.48 |
| 18 | 18 | 0.37/0.34 |
| 19D | 18 | 0.46 |
| 19E | 18 | 0.97 |
| 22 | 18 | 1.18 |
| 26 | 3 | 0.96 |
| 27 | 5 | 0.96 |
| 31 | 12 | 1.00 |
| 33 | 16 | 0.61 |
| 37 | 21 | 0.48 |
| 39 | 3 | 1.13 |
| 40 | 4 | 1.18 |
| 41 | 5 | 1.90 |
| 48 | 12 | 0.99 |
| 50 | 14 | 0.34 |
| 56 | 21 | 0.45 |
| 66 | 4 | 1.37 |
| 67 | 5 | 1.13 |
| 72 | 7 | 0.52 |
| 75 | 9 | 0.95 |

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**Table F-10**
**Barometric Efficiency Estimates**
**MCAS El Toro Phase I RI Technical Memorandum**



| Well No. | Site No. | Barometric Efficiency |
|---|---|---|
| 90 | 21 | 0.92/0.52 |
| 101 | 18 | 0.47 |
| PS-4 | 18 | 1.30/0.85/1.16 |
| PS-6 | 18 | 0.98 |
| RW-2 | 18 | 0.55/0.54/0.36 |

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## Table F-11
## Pumping Test Results
## MCAS El Toro Phase I RI Technical Memorandum



| Site No. | Pumping Well No. | Obs. Well No. | Input Parameters: Pumping Rate (gpm) | Input Parameters: Saturated Thickness (feet) | Input Parameters: Test (a) Analysis Method | Test Results: Pumping: Transmissivity (ft2/day) | Pumping: Transmissivity (gpd/ft) | Pumping: Hydraulic Conductivity (ft/day) | Pumping: Hydraulic Conductivity (cm/s) | Pumping: Storage Coefficient | Pumping: Leakage Factor | Pumping: Data Fit (min) | Recovery: Transmissivity (ft2/day) | Recovery: Transmissivity (gpd/ft) | Recovery: Hydraulic Conductivity (ft/day) | Recovery: Hydraulic Conductivity (cm/s) | Recovery: Data Fit (t/t') | Critical Time tc (min) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operable Unit (OU) -1:** | | | | | | | | | | | | | | | | | | | |
| 18 | 2D | 2D | 1.3 | 20 | C-J/Th | 0.6 | 1.7 | 0.03 | 1.0E-05 | -- | -- | 10-70 | 1.7 | 13 | 0.1 | 3.05E-05 | 4-2 | 322 | Poor development; T, K not of formation. |
| | 2E | 2E | 4.1 | 40 | C-J/Th | 27.7 | 216.9 | 0.7 | 2.4E-04 | -- | -- | 40-100 | 216.9 | 1623 | 5.4 | 1.91E-03 | 30-2 | 28 | Recovery suspect: no check valve. |
| | | | -- | -- | C-J | 10.3 | 77 | 0.3 | 9.1E-05 | -- | -- | 100-260 | -- | -- | -- | -- | -- | -- | |
| | 3A | 3A | 18 | 20 | C-J/Th | 705.5 | 5278 | 35.3 | 1.2E-02 | -- | -- | 2-260 | 899.9 | 6733 | 45.0 | 1.59E-02 | 20-3 | 5 | |
| | 3B | 3B | 18.7 | 20 | C-J/Th | 239.9 | 1795 | 12.0 | 4.2E-03 | -- | -- | 20-240 | 1078.3 | 8068 | 53.9 | 1.90E-02 | 30-3 | 3 | |
| | 4A | 4A | 5.5 | 20 | C-J/Th | 346.8 | 2595 | 17.3 | 6.1E-03 | -- | -- | 10-100 | 510.9 | 3823 | 25.5 | 9.01E-03 | 40-10 | 2 | Recovery suspect: no check valve. |
| | | | -- | -- | C-J | 140.0 | 1048 | 7.0 | 2.5E-03 | -- | -- | 100-240 | -- | -- | -- | -- | -- | -- | Pumping observed nearby by end of test. |
| | 4B | 4B | 36.5 | 20 | C-J/Th | 189.6 | 1419 | 9.5 | 3.3E-03 | -- | -- | 20-200 | 150.5 | 1126 | 7.5 | 2.65E-03 | 10-2 | 6 | Recovery: no check valve but beyond effects. |
| | 5B | 5B | 23.8 | 20 | C-J/Th | 223.1 | 1669 | 11.2 | 3.9E-03 | -- | -- | 20-100 | 248.3 | 1858 | 12.4 | 4.38E-03 | 20-2 | 6 | |
| | | RW-2 | -- | 40 | H | 396.3 | 2965 | 9.9 | 3.5E-03 | 7.8E-04 | 0.1 | 3-240 | -- | -- | -- | -- | -- | -- | Existing RW-2 as observation well. |
| | 5C | 5C | 19.3 | 20 | C-J/Th | 1236.7 | 9253 | 61.8 | 2.2E-02 | -- | -- | 10-200 | 1259.3 | 9422 | 63.0 | 2.22E-02 | 30-3 | 0.6 | |
| | 5D | 5D | 20.4 | 44 | C-J/Th | 143.1 | 1071 | 3.3 | 1.1E-03 | -- | -- | 20-200 | 1296.0 | 9697 | 29.5 | 1.04E-02 | 100-2 | 45 | Long-term test : earlier pumping data. |
| | | | 20.4 | -- | C-J/Th | 72.3 | 541 | 1.6 | 5.8E-04 | -- | -- | 400-1000 | 23.3 | 174 | 0.5 | 1.86E-04 | 1500-250 | -- | Long-term test : later pumping data. |
| | | | 35 | -- | C-J/Th | 79.4 | 594 | 1.8 | 6.4E-04 | -- | -- | 30-80 | 1209.3 | 9048 | 27.5 | 9.70E-03 | 10-2 | 85 | Shorter test at too high Q; results not reliable. |
| | | 5E | 20.4 | 45 | H | 1249.8 | 9351 | 27.8 | 9.8E-03 | 1.3E-02 | 0.1 | 20-1300 | -- | -- | -- | -- | -- | -- | Long-term test: obs. well 5E. |
| | 12 | 12 | 1.4 | 40 | C-J/Th | 0.9 | 7 | 0.02 | 8.3E-06 | -- | -- | 20-40 | 0.4 | 3 | 0.01 | 3.75E-06 | 2-1 | 305 | T,K not of formation: tc > pumping time |
| | | | 0.8 | -- | C-J | 0.6 | 5 | 0.02 | 5.7E-06 | -- | -- | 30-70 | -- | -- | -- | -- | -- | 268 | T,K not of formation: tc > pumping time |
| | 14 | 14 | 8.3 | 40 | C-J/Th | 171.8 | 1285 | 4.3 | 1.5E-03 | -- | -- | 10-70 | 2276.6 | 17035 | 56.9 | 2.01E-02 | 80-3 | 1.2 | Pumping observed nearby after 70 min. |
| | 15 | 15 | 0.7 | 40 | C-J/Th | 0.7 | 5 | 0.02 | 6.3E-06 | -- | -- | 60-120 | 0.6 | 5 | 0.02 | 5.36E-06 | 4-2 | 196 | T,K not of formation: tc > pumping time |
| | 16 | 16 | 17 | 35 | C-J/Th | 400.2 | 2994 | 11.4 | 4.0E-03 | -- | -- | 10-100 | 662.3 | 4955 | 18.9 | 6.68E-03 | 30-4 | 5 | Pumping observed nearby. |
| | 17 | 17 | 18 | 40 | C-J/Th | 190.1 | 1422 | 4.8 | 1.7E-03 | -- | -- | 20-200 | 291.0 | 2178 | 7.3 | 2.57E-03 | 40-2 | 4 | Some problems with discharge hose. |
| | 18 | 18 | 1.6 | 40 | C-J/Th | 11.1 | 83 | 0.3 | 9.8E-05 | | | 100-240 | 47.4 | 354 | 1.2 | 4.18E-04 | 4-2 | 29 | Sampling activity affected discharge. |
| | 19C | 19C | 10.6 | 20 | C-J/Th | 274.2 | 2051 | 13.7 | 4.8E-03 | -- | -- | 100-180 | 251.0 | 1878 | 12.5 | 4.43E-03 | 10-2 | 1.4 | Did not have large enough pump; "low" Q. |
| | 19D | 19D | 38 | 20 | C-J/Th | 3481.9 | 26053 | 174.1 | 6.1E-02 | -- | -- | 1-140 | 3029.8 | 22670 | 151.5 | 5.34E-02 | 50-2 | 0.7 | Recovery suspect: no check valve. |
| | 22 | 22 | 12 | 40 | C-J/Th | 112.3 | 840 | 2.8 | 9.9E-04 | -- | -- | 10-240 | 231.8 | 1735 | 5.8 | 2.04E-03 | 20-2 | 9 | |
| | 101 | 101 | 27 | 40 | C-J/Th | 186.3 | 1394 | 4.7 | 1.6E-03 | -- | -- | 3-30 | 595.2 | 4453 | 14.9 | 5.25E-03 | 100-2 | 7 | Other pumping nearby possible. |
| | | | -- | -- | C-J | 104.4 | 781 | 2.6 | 9.2E-04 | -- | -- | 100-240 | -- | -- | -- | -- | -- | -- | |
| | IDP1 | IDP1 | 1188 | 120 | C-J | 4174.6 | 31235 | 34.8 | 1.2E-02 | -- | -- | 5-200 | -- | -- | -- | -- | -- | -- | OCWD extraction well. Effective saturated |
| | | 103 | -- | 100 | H | 6782.4 | 50748 | 56.5 | 2.0E-02 | 6.3E-04 | 0.05 | 100-1700 | -- | -- | -- | -- | -- | -- | thickness 120 ft ,with spinner logging. |
| **Operable Unit (OU) -2:** | | | | | | | | | | | | | | | | | | | |
| 3 | 26 | 26 | 9 | 38 | C-J/Th | 392.8 | 2939 | 10.3 | 3.6E-03 | -- | -- | 10-240 | 421.3 | 3153 | 11.1 | 3.91E-03 | 20-2 | 21 | Recovery: fit after "slug" from no check valve. |
| | 39 | 39 | 3.7 | 29 | C-J/Th | 55.5 | 415 | 1.9 | 6.7E-04 | -- | -- | 40-80 | 64.3 | 481 | 2.2 | 7.83E-04 | 20-2 | 11 | Recovery: fit after "slug" from no check valve. |
| | 63 | 63 | 11.7 | 40 | C-J/Th | 66.8 | 500 | 1.7 | 5.9E-04 | -- | -- | 5-50 | 159.6 | 1194 | 4.0 | 1.41E-03 | 15-2 | 12 | |
| | | | -- | -- | C-J | 11.4 | 86 | 0.3 | 1.0E-04 | -- | -- | 40-90 | -- | -- | -- | -- | -- | -- | |
| 5 | 67 | 67 | 16.8 | 38 | C-J/Th | 1591.2 | 11906 | 41.9 | 1.5E-02 | -- | -- | 5-100 | 1674.7 | 12531 | 44.1 | 1.55E-02 | 20-2 | 3 | |
| 10 | 77 | 77 | 18.2 | 40 | C-J/Th | 381.6 | 2855 | 9.5 | 3.4E-03 | -- | -- | 10-180 | 1694.9 | 12682 | 42.4 | 1.49E-02 | 70-2 | 4 | |

PAGE NUMBER F-60

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**Table F-11**
**Pumping Test Results**
**MCAS El Toro Phase I RI Technical Memorandum**



| Site No. | Pumping Well No. | Obs. Well No. | Input Parameters: Pumping Rate (gpm) | Input Parameters: Saturated Thickness (feet) | Input Parameters: Test (a) Analysis Method | Test Results: Pumping: Transmissivity (ft2/day) | Test Results: Pumping: Transmissivity (gpd/ft) | Test Results: Pumping: Hydraulic Conductivity (ft/day) | Test Results: Pumping: Hydraulic Conductivity (cm/s) | Test Results: Pumping: Storage Coefficient | Test Results: Pumping: Leakage Factor | Test Results: Pumping: Data Fit (min) | Test Results: Recovery: Transmissivity (ft2/day) | Test Results: Recovery: Transmissivity (gpd/ft) | Test Results: Recovery: Hydraulic Conductivity (ft/day) | Test Results: Recovery: Hydraulic Conductivity (cm/s) | Test Results: Recovery: Data Fit (t/t') | Critical Time tc (min) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operable Unit (OU) -3:** | | | | | | | | | | | | | | | | | | | |
| 4 | 66 | 66 | 39 | 40 | C-J/Th | 254.3 | 1903 | 6.4 | 2.2E-03 | -- | -- | 6-60 | 451.4 | 3378 | 11.3 | 3.98E-03 | 30-2 | 17 | |
| | | | -- | -- | C-J | 97.3 | 728 | 2.4 | 8.6E-04 | -- | -- | 80-200 | -- | -- | -- | -- | -- | -- | |
| 7 | 72 | 72 | 19 | 40 | C-J/Th | 48.8 | 365 | 1.2 | 4.3E-04 | -- | -- | 10-30 | 324.0 | 2424 | 8.1 | 2.86E-03 | 10-2 | 12 | |
| | | | 13.5 | -- | C-J/Th | 62.6 | 469 | 1.6 | 5.5E-04 | -- | -- | 15-70 | 310.9 | 2326 | 7.8 | 2.74E-03 | 20-2 | 18 | |
| 8 | 74 | 74 | 12 | 40 | C-J/Th | 318.5 | 2383 | 8.0 | 2.8E-03 | -- | -- | 20-240 | 922.8 | 6904 | 23.1 | 8.14E-03 | 40-4 | 8 | |
| 9 | 75 | 75 | 19 | 35 | C-J/Th | 162.9 | 1219 | 4.7 | 1.6E-03 | -- | -- | 80-240 | 2279.5 | 17056 | 65.1 | 2.30E-02 | 50-4 | 9 | |
| 12 | 31 | 31 | 8.6 | 40 | C-J/Th | 171.2 | 1281 | 4.3 | 1.5E-03 | -- | -- | 10-200 | 341.4 | 2555 | 8.5 | 3.01E-03 | 70-5 | 1.5 | Recovery: fit after "slug" from no check valve. |
| 13 | 78 | 78 | 4.6 | 32 | Th | -- | -- | -- | -- | -- | -- | -- | 685.3 | 5128 | 21.4 | 7.56E-03 | 10-2 | -- | Pumping data not useable: large fluctuations. |
| 21 | 56 | 56 | 16 | 37 | C-J/Th | 68.6 | 514 | 1.9 | 6.5E-04 | -- | -- | 10-240 | 724.2 | 5419 | 19.6 | 6.91E-03 | 10-2 | 24 | |
| 22 | 47 | 47 | 20 | 36 | C-J | 257.3 | 1925 | 7.1 | 2.5E-03 | -- | -- | 6-240 | -- | -- | -- | -- | -- | -- | Early time electronic data lost. |

(a) Test Analysis Methods
- C-J: Cooper-Jacob (1946)
- H: Hantush (1960)
- Th: Theis - Recovery (1935)

PAGE NUMBER F-62

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## Table F-12
## Slug Test Results
## MCAS El Toro Phase I RI Technical Memorandum



| Site No. | Well No. | Test Test No. | Analysis Input Parameters: Initial Drawdown y(0) (feet) | Casing or Effective Radius (r) (feet) | Borehole Radius (r) (feet) | Saturated Aquifer Thickness (b) (feet) | Screen Length (L) (feet) | Water Column Height (H) (feet) | Head Change within Gravel Pack (y/n) | Value of b or H used in Analysis (feet) | Test Results: Bouwer and Rice (1976) Method: Initial Drawdown h(0) (feet) | Hydraulic Conductivity (K) (ft/min) | Hydraulic Conductivity (K) (ft/day) | Hydraulic Conductivity (K) (cm/sec) | Cooper, Bredehoeft and Papadopulos (1967) Method: Trans-missivity (T) (ft*ft/min) | Hydraulic Conductivity (K) (ft/min) | Hydraulic Conductivity (K) (ft/day) | Hydraulic Conductivity (K) (cm/sec) | Storage Coefficient (S) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operable Unit (OU)-1** | | | | | | | | | | | | | | | | | | | | |
| 18 | 1B | 1 | 2.718 | 0.2083 | 0.5417 | 201 | 20 | 201 | n | 25 | **2.56** | **1.5 E-04** | **0.22** | **7.6 E-05** | **3.4 E-03** | **1.7 E-04** | **0.24** | **8.6 E-05** | **4 E-04** | |
| | | 2 | 2.694 | 0.2083 | 0.5417 | 201 | 20 | 201 | n | 25 | 2.56 | 1.7 E-04 | 0.24 | 8.6 E-05 | 4.2 E-03 | 2.1 E-04 | 0.30 | 1.1 E-04 | 2 E-04 | |
| | 1E | 1 | 2.644 | 0.2872 | 0.4583 | 10.8 | 10.8 | 10.8 | y | 10.8 | **1.34** | **1.5 E-03** | **2.09** | **7.4 E-04** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.919 | 0.2872 | 0.4583 | 10.8 | 10.8 | 10.8 | y | 10.8 | 1.45 | 1.9 E-03 | 2.71 | 9.6 E-04 | -- | -- | -- | -- | -- | "double straight line" effect. |
| | 2A | 1 | 2.847 | 0.2083 | 0.5417 | 307 | 20 | 307 | n | 25 | **2.75** | **5.7 E-06** | **0.01** | **2.9 E-06** | **9.1 E-05** | **4.6 E-06** | **0.01** | **2.3 E-06** | **5 E-04** | Poor development; results unreliable |
| | 2C | 1 | 2.6 | 0.2083 | 0.5417 | 203 | 20 | 203 | n | 25 | **2.61** | **1.3 E-04** | **0.19** | **6.6 E-05** | 6.7 E-03 | 3.4 E-04 | 0.48 | 1.7 E-04 | 6 E-08 | |
| | 2D | 1 | 2.951 | 0.2083 | 0.5417 | 138 | 20 | 138 | n | 25 | **2.73** | **9.6 E-06** | **0.01** | **4.9 E-06** | 1.6 E-04 | 8.0 E-06 | 0.01 | 4.1 E-06 | 7 E-04 | |
| | | 2 | 2.975 | 0.2083 | 0.5417 | 138 | 20 | 138 | n | 25 | 2.78 | 1.0 E-05 | 0.01 | 5.1 E-06 | 1.4 E-04 | 7.0 E-06 | 0.01 | 3.6 E-06 | 9 E-04 | |
| | 3E | 1 | 3.429 | 0.1667 | 0.4583 | 52 | 40 | 52 | n | 52 | 3.28 | 8.9 E-05 | 0.13 | 4.5 E-05 | **6.0 E-03** | **1.5 E-04** | **0.22** | **7.6 E-05** | **2 E-06** | |
| | | 2 | 3.415 | 0.1667 | 0.4583 | 52 | 40 | 52 | n | 52 | 3.29 | 8.9 E-05 | 0.13 | 4.5 E-05 | 6.5 E-03 | 1.6 E-04 | 0.23 | 8.3 E-05 | 2 E-06 | |
| | 5A | 1 | 2.885 | 0.2083 | 0.5417 | 385 | 20 | 385 | n | 25 | **2.88** | **6.1 E-06** | **0.01** | **3.1 E-06** | 4.6 E-05 | 2.3 E-06 | 0.003 | 1.2 E-06 | 1 E-03 | Poor development; results unreliable |
| | 19E | 1 | 2.95 | 0.2872 | 0.4583 | 40.7 | 40 | 40.7 | y | 40.7 | **2.65** | **1.7 E-04** | **0.24** | **8.6 E-05** | **5.2 E-03** | **1.3 E-04** | **0.19** | **6.6 E-05** | **5 E-03** | |
| | | 2 | 2.937 | 0.2872 | 0.4583 | 40.7 | 40 | 40.7 | y | 40.7 | 2.58 | 1.7 E-04 | 0.24 | 8.6 E-05 | 6.0 E-03 | 1.5 E-04 | 0.22 | 7.6 E-05 | 4 E-03 | |
| | 24 | 1 | 3.368 | 0.2872 | 0.4583 | 22.8 | 20 | 22.8 | y | 22.8 | **3.04** | **1.3 E-03** | **1.87** | **6.6 E-04** | **3.4 E-02** | **1.7 E-03** | **2.45** | **8.6 E-04** | **1 E-03** | |
| | | 2 | 3.891 | 0.2872 | 0.4583 | 22.8 | 20 | 22.8 | y | 22.8 | 3.09 | 1.5 E-03 | 2.16 | 7.6 E-04 | 4.3 E-02 | 2.2 E-03 | 3.10 | 1.1 E-03 | 2 E-04 | |
| **Operable Unit (OU)-2** | | | | | | | | | | | | | | | | | | | | |
| 2 | 25 | 1 | 2.83 | 0.2872 | 0.4583 | 19.2 | 19.2 | 19.2 | y | 19.2 | **1.46** | **3.3 E-03** | **4.72** | **1.7 E-03** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.979 | 0.2872 | 0.4583 | 19.2 | 19.2 | 19.2 | y | 19.2 | 1.36 | 3.2 E-03 | 4.61 | 1.6 E-03 | -- | -- | -- | -- | -- | "double straight line" effect |
| | 59 | 1 | 2.825 | 0.2872 | 0.4583 | 20.4 | 20 | 20.4 | y | 20.4 | **2.40** | **1.2 E-03** | **1.73** | **6.1 E-04** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.67 | 0.2872 | 0.4583 | 20.3 | 20 | 20.3 | y | 20.4 | 2.37 | 1.2 E-03 | 1.73 | 6.1 E-04 | -- | -- | -- | -- | -- | "double straight line" effect |
| | 60 | 1 | 3.915 | 0.1667 | 0.4583 | 26.3 | 20 | 26.3 | n | 26.3 | **3.72** | **3.2 E-04** | **0.46** | **1.6 E-04** | **8.1 E-03** | **4.1 E-04** | **0.58** | **2.1 E-04** | **2 E-04** | |
| | | 2 | 3.728 | 0.1667 | 0.4583 | 26.4 | 20 | 26.4 | n | 26.4 | 3.74 | 3.4 E-04 | 0.49 | 1.7 E-04 | 1.3 E-02 | 6.5 E-04 | 0.94 | 3.3 E-04 | 8 E-07 | |
| | 61 | 1 | 3.509 | 0.1667 | 0.4583 | 40 | 20 | 40 | n | 25 | **3.41** | **2.5 E-04** | **0.36** | **1.3 E-04** | **5.8 E-03** | **2.9 E-04** | **0.42** | **1.5 E-04** | **9 E-05** | |
| | | 2 | 3.469 | 0.1667 | 0.4583 | 40 | 20 | 40 | n | 40 | 3.38 | 2.6 E-04 | 0.37 | 1.3 E-04 | 5.6 E-03 | 2.8 E-04 | 0.40 | 1.4 E-04 | 8 E-05 | |
| 3 | 64 | 1 | 1.919 | 0.2872 | 0.4583 | 41.9 | 40 | 41.9 | y | 41.9 | 1.71 | 8.1 E-04 | 1.17 | 4.1 E-04 | **8.3 E-02** | **2.1 E-03** | **2.99** | **1.1 E-03** | **8 E-07** | |
| | | 2 | 1.846 | 0.2872 | 0.4583 | 41.8 | 40 | 41.8 | y | 41.8 | 1.65 | 8.4 E-04 | 1.21 | 4.3 E-04 | 8.1 E-02 | 2.0 E-03 | 2.92 | 1.0 E-03 | 1 E-06 | |
| | 65A | 1 | 1.955 | 0.3441 | 0.5417 | 35.6 | 35.6 | 35.6 | y | 35.6 | **1.84** | **4.5 E-03** | **6.48** | **2.3 E-03** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 1.86 | 0.3441 | 0.5417 | 35.6 | 35.6 | 35.6 | y | 35.6 | 1.78 | 4.8 E-03 | 6.96 | 2.5 E-03 | -- | -- | -- | -- | -- | "double straight line" effect |
| 5 | 68 | 1 | 2.139 | 0.2083 | 0.5417 | 22.3 | 20 | 22.3 | n | 22.3 | **1.98** | **1.8 E-03** | **2.59** | **9.1 E-04** | **5.9 E-02** | **3.0 E-03** | **4.25** | **1.5 E-03** | **8 E-05** | |
| | | 2 | 2.142 | 0.2083 | 0.5417 | 22.3 | 20 | 22.3 | n | 22.3 | 2.07 | 2.1 E-03 | 3.02 | 1.1 E-03 | 6.5 E-02 | 3.3 E-03 | 4.68 | 1.7 E-03 | 7 E-05 | |

PAGE NUMBER F-64

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## Table F-12
## Slug Test Results
## MCAS El Toro Phase I RI Technical Memorandum



| Site No. | Well No. | Test Test No. | Analysis Input Parameters: Initial Drawdown y(0) (feet) | Casing or Effective Radius (r) (feet) | Borehole Radius (r) (feet) | Saturated Aquifer Thickness (b) (feet) | Screen Length (L) (feet) | Water Column Height (H) (feet) | Head Change within Gravel Pack (y/n) | Value of b or H used in Analysis (feet) | Test Results: Bouwer and Rice (1976) Method: Initial Drawdown h(0) (feet) | Hydraulic Conductivity (K) (ft/min) | Hydraulic Conductivity (K) (ft/day) | Hydraulic Conductivity (K) (cm/sec) | Cooper, Bredehoeft and Papadopulos (1967) Method: Trans-missivity (T) (ft*ft/min) | Hydrualic Conductivity (K) (ft/min) | Hydrualic Conductivity (K) (ft/day) | Hydrualic Conductivity (K) (cm/sec) | Storage Coefficient (S) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Operable Unit (OU)-3** | | | | | | | | | | | | | | | | | | | | |
| 1 | 57 | 1 | 3.025 | 0.2872 | 0.4583 | 23.5 | 20 | 23.5 | y | 23.5 | **2.76** | **8.5 E-04** | **1.22** | **4.3 E-04** | 8.8 E-03 | 4.4 E-04 | 0.63 | 2.2 E-04 | 1 E-02 | |
| | | 2 | 2.96 | 0.2872 | 0.4583 | 23.4 | 20 | 23.4 | y | 23.4 | 2.70 | 7.7 E-04 | 1.11 | 3.9 E-04 | 8.4 E-03 | 4.2 E-04 | 0.60 | 2.1 E-04 | 2 E-02 | |
| 6 | 69 | 1 | 3.534 | 1.667 | 0.4583 | 50.3 | 40 | 50.3 | n | 50.3 | **3.34** | **7.5 E-04** | **1.08** | **3.8 E-04** | **3.1 E-02** | **7.8 E-04** | **1.12** | **3.9 E-04** | **2 E-04** | |
| | | 2 | 3.501 | 1.667 | 0.4583 | 50.3 | 40 | 50.3 | n | 50.3 | 3.46 | 8.2 E-04 | 1.18 | 4.2 E-04 | 5.5 E-03 | 1.4 E-04 | 0.20 | 7.0 E-05 | 2 E-06 | |
| 7 | 70 | 1 | 2.826 | 2.872 | 0.4583 | 37.4 | 37.4 | 37.4 | y | 37.4 | **2.67** | **1.3 E-03** | **1.92** | **6.8 E-04** | **9.4 E-02** | **2.5 E-03** | **3.62** | **1.3 E-03** | **1 E-05** | |
| | | 2 | 4.044 | 2.872 | 0.4583 | 37.5 | 37.5 | 37.5 | y | 37.5 | 2.87 | 1.4 E-03 | 2.03 | 7.2 E-04 | 3.6 E-02 | 9.6 E-04 | 1.38 | 4.9 E-04 | 5 E-02 | |
| | 91 | 1 | 2.916 | 2.872 | 0.4583 | 42.3 | 40 | 42.3 | y | 42.3 | **2.83** | **3.0 E-03** | **4.32** | **1.5 E-03** | 5.6 E-01 | 1.4 E-02 | 20.16 | 7.1 E-03 | 1 E-13 | |
| | | 2 | 3.092 | 2.872 | 0.4583 | 42.3 | 40 | 42.3 | y | 42.3 | 3.93 | 4.7 E-03 | 6.77 | 2.4 E-03 | 4.3 E-01 | 1.1 E-02 | 15.48 | 5.5 E-03 | 4 E-10 | |
| | 100 | 1 | 2.868 | 0.1667 | 0.4583 | 62 | 40 | 62 | n | 45 | **2.76** | **1.4 E-03** | **2.02** | **7.1 E-04** | 1.5 E-01 | 3.8 E-03 | 5.40 | 1.9 E-03 | 1 E-08 | |
| 8 | 29 | 1 | 3.266 | 0.1667 | 0.4583 | 43.6 | 40 | 43.6 | n | 43.6 | **3.24** | **7.4 E-05** | **0.11** | **3.8 E-05** | **6.9 E-03** | **1.7 E-04** | **0.25** | **8.8 E-05** | **6 E-08** | |
| | | 2 | 3.237 | 0.1667 | 0.4583 | 43.6 | 40 | 43.6 | n | 43.6 | 3.16 | 8.4 E-05 | 0.12 | 4.3 E-05 | 6.3 E-03 | 1.6 E-04 | 0.23 | 8.0 E-05 | 8 E-07 | |
| | 73 | 1 | 2.807 | 2.872 | 0.4583 | 41.7 | 40 | 41.7 | y | 41.7 | **2.94** | **9.9 E-03** | **14.26** | **5.0 E-03** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method |
| | | 2 | 3.054 | 2.872 | 0.4583 | 41.7 | 40 | 41.7 | y | 41.7 | 2.74 | 9.3 E-03 | 13.39 | 4.7 E-03 | -- | -- | -- | -- | -- | |
| 12 | 48 | 1 | 3.194 | 0.2872 | 0.4583 | 39.4 | 39.4 | 39.4 | y | 39.4 | **2.94** | **4.6 E-03** | **6.62** | **2.3 E-03** | **3.5 E-01** | **8.9 E-03** | **12.79** | **4.5 E-03** | **1 E-05** | |
| | | 2 | 2.931 | 0.2872 | 0.4583 | 39.4 | 39.5 | 39.5 | y | 39.5 | 2.93 | 4.8 E-03 | 6.94 | 2.4 E-03 | 6.0 E-01 | 1.5 E-02 | 21.87 | 7.7 E-03 | 9 E-09 | |
| 13 | 32 | 1 | 3.464 | 0.2872 | 0.4583 | 43.1 | 40 | 43.1 | y | 43.1 | **2.95** | **6.3 E-04** | **0.91** | **3.2 E-04** | **3.7 E-02** | **9.3 E-04** | **1.33** | **4.7 E-04** | **8 E-05** | |
| | | 2 | 2.925 | 0.2872 | 0.4583 | 43.1 | 40 | 43.1 | y | 43.1 | 2.80 | 7.2 E-04 | 1.04 | 3.7 E-04 | 6.2 E-02 | 1.6 E-03 | 2.23 | 7.9 E-04 | 1 E-06 | |
| 15 | 51 | 1 | 3.382 | 0.2872 | 0.4583 | 38.4 | 38.4 | 38.4 | y | 38.4 | **1.74** | **3.6 E-04** | **0.52** | **1.8 E-04** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.816 | 0.2872 | 0.4583 | 38.4 | 38.4 | 38.4 | y | 38.4 | 1.64 | 2.4 E-04 | 0.35 | 1.2 E-04 | -- | -- | -- | -- | -- | "double straight line" effect |
| 16 | 33 | 1 | 0.283 | 0.2872 | 0.4583 | 37.7 | 37.7 | 37.7 | y | 37.7 | **0.25** | **2.0 E-05** | **0.03** | **1.0 E-05** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method |
| | | 2 | 0.266 | 0.2872 | 0.4583 | 37.7 | 37.7 | 37.7 | y | 37.7 | 0.24 | 3.5 E-05 | 0.05 | 1.8 E-05 | -- | -- | -- | -- | -- | |
| | 52 | 1 | 2.669 | 0.2872 | 0.4583 | 40.6 | 40 | 40.6 | y | 40.6 | **2.41** | **5.1 E-04** | **0.73** | **2.6 E-04** | **1.8 E-02** | **4.5 E-04** | **0.65** | **2.3 E-04** | **3 E-03** | |
| | | 2 | 2.65 | 0.2872 | 0.4583 | 40.6 | 40 | 40.6 | y | 40.6 | 2.49 | 5.8 E-04 | 0.84 | 2.9 E-04 | 2.7 E-02 | 6.8 E-04 | 0.97 | 3.4 E-04 | 6 E-04 | |
| 19 | 54 | 1 | 3.253 | 0.2872 | 0.4583 | 30.7 | 30.7 | 30.7 | y | 30.7 | **1.08** | **6.0 E-04** | **0.86** | **3.0 E-04** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.346 | 0.2872 | 0.4583 | 30.6 | 30.6 | 30.6 | y | 30.7 | 1.07 | 7.8 E-04 | 1.12 | 4.0 E-04 | -- | -- | -- | -- | -- | "double straight line" effect |
| | 85 | 1 | 2.983 | 0.2872 | 0.4583 | 35.3 | 35.3 | 35.3 | y | 35.3 | **1.38** | **2.6 E-04** | **0.37** | **1.3 E-04** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.441 | 0.2872 | 0.4583 | 35.3 | 35.3 | 35.3 | y | 35.3 | 1.36 | 3.2 E-04 | 0.46 | 1.6 E-04 | -- | -- | -- | -- | -- | "double straight line" effect |
| 20 | 88 | 1 | 2.773 | 0.2872 | 0.4583 | 37.2 | 37.2 | 37.2 | y | 37.2 | **0.75** | **2.0 E-04** | **0.29** | **1.0 E-04** | -- | -- | -- | -- | -- | Poor fit to Cooper et al. method; exhibit |
| | | 2 | 2.876 | 0.2872 | 0.4583 | 37.2 | 37.2 | 37.2 | y | 37.2 | 0.74 | 2.2 E-04 | 0.32 | 1.1 E-04 | -- | -- | -- | -- | -- | "double straight line" effect |

Notes
1. Radius of casing is adjusted for head rising in gravel-packed part of well.
2. Radius of borehole is drilled radius.
3. Saturated aquifer thickness (b) is assumed to be equal to the height of the water column (H). For the Cooper, Bredehoeft and Papadopulos method, b is set equal to the screen length.
4. Height of water column (H) is assumed to be the height of static water level above the bottom of the screen, unless H>>L, in which case b and H are both set equal to (L + 5).
   Due to the natural logarithm term in the equation, H must be <= b.

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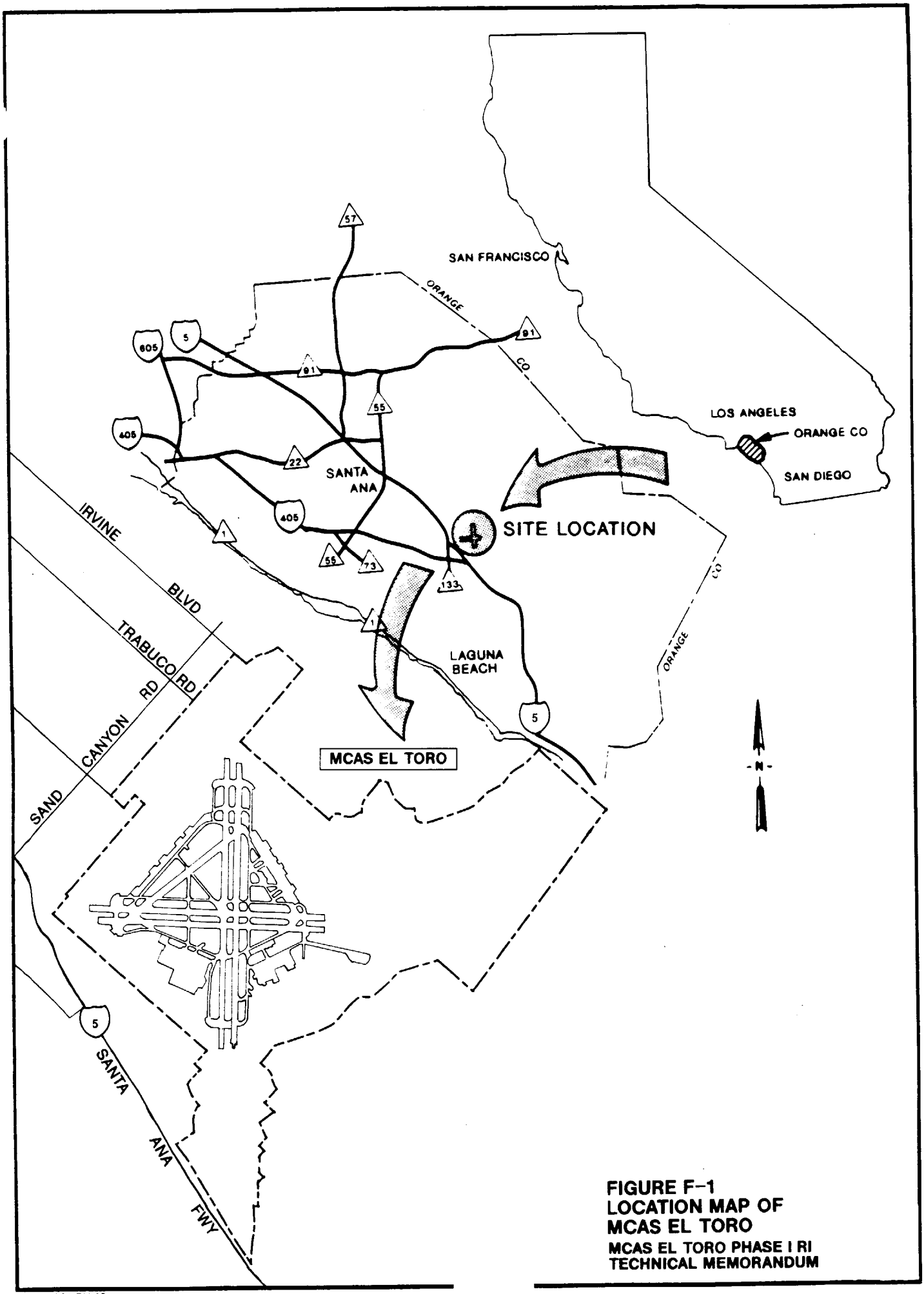


**FIGURE F-1**
**LOCATION MAP OF**
**MCAS EL TORO**
**MCAS EL TORO PHASE I RI**
**TECHNICAL MEMORANDUM**

SCO31981.RV.40

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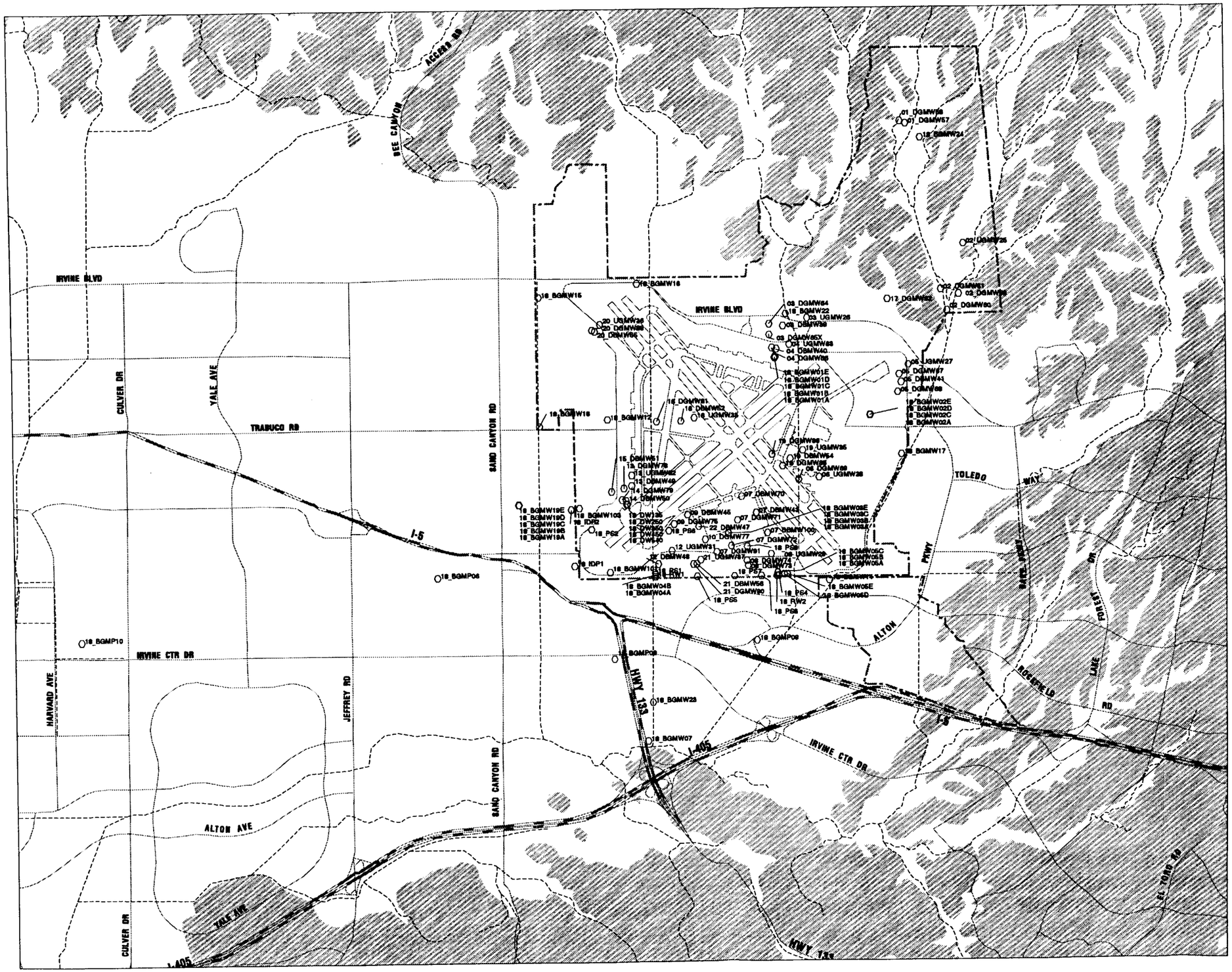


FEATURES:

- BEDROCK
- MONITORING WELL
- FREEWAY
- ROAD OR AIRFIELD
- MCAS EL TORO BOUNDARY
- WASH OR STREAM

0 2000 4000 6000
SCALE IN FEET

**FIGURE F-2**

**LOCATIONS OF WELLS MONITORED DURING PHASE I RI**

**MCAS EL TORO PHASE I RI TECHNICAL MEMORANDUM**

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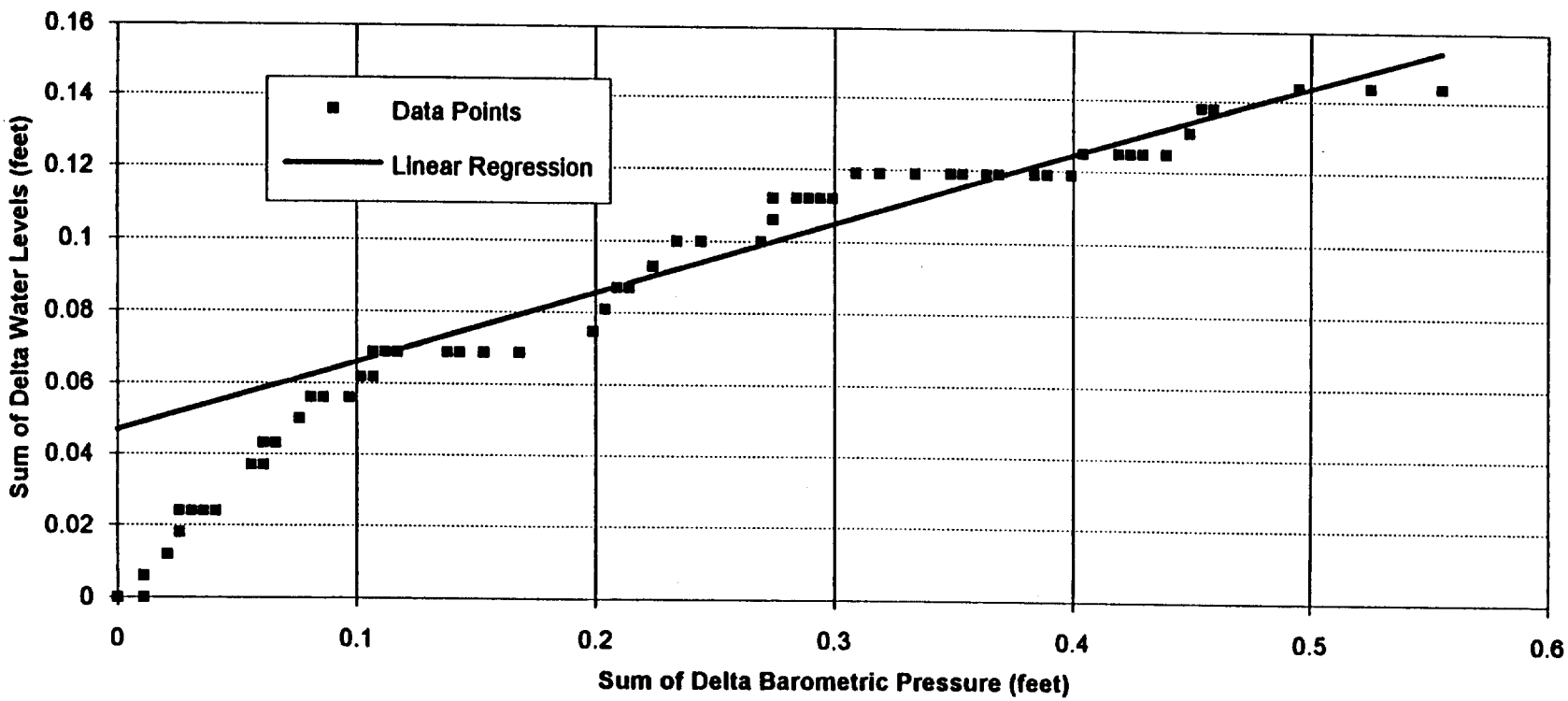


Figure F-3. Clark (1967) Method for Estimating Barometric Efficiency: Plot of Sum of Change in Water Levels (feet) versus Sum of Change in Barometric Pressure (feet).

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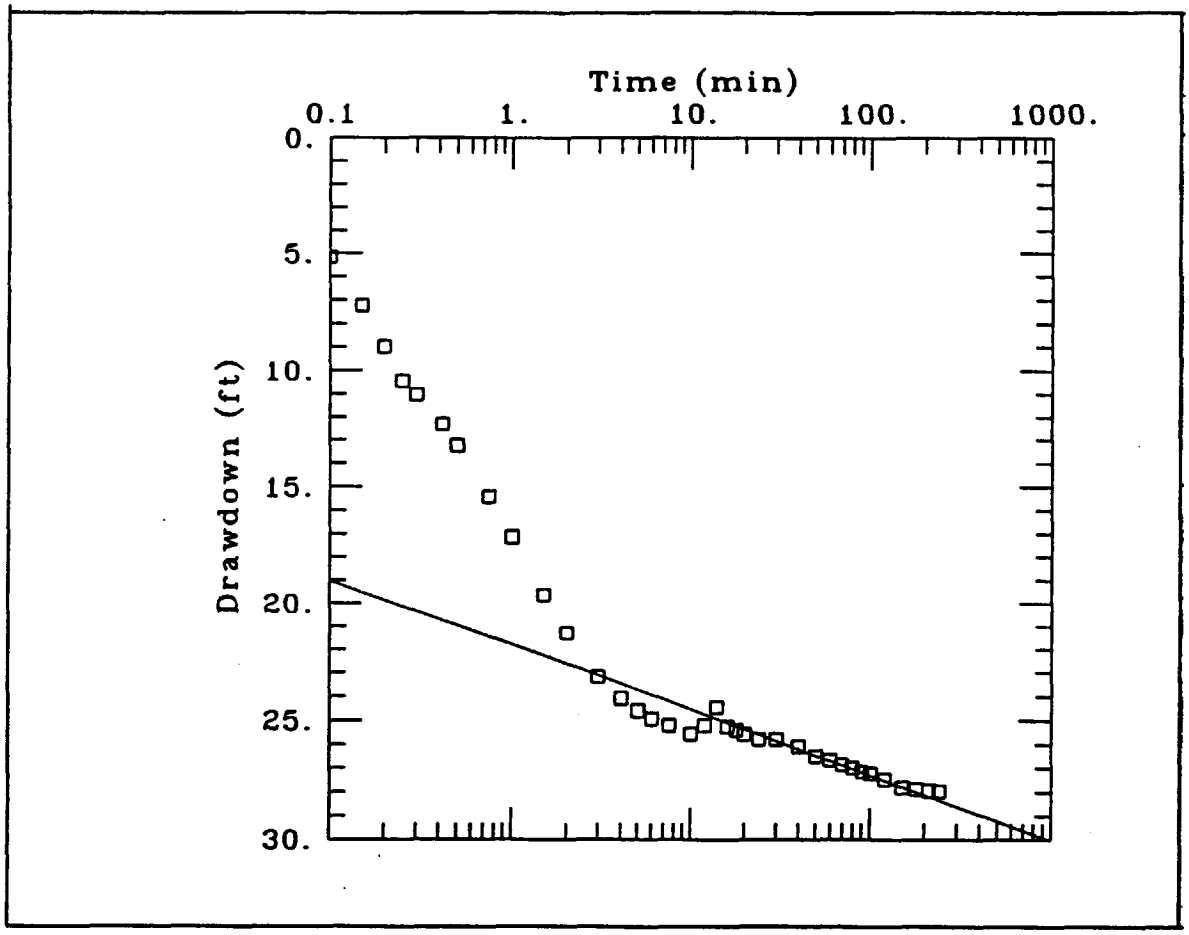


Figure F-4. Cooper-Jacob (1946) Method for Estimating Transmissivity: Semilogarithmic Plot of Drawdown (feet) versus Time (min).

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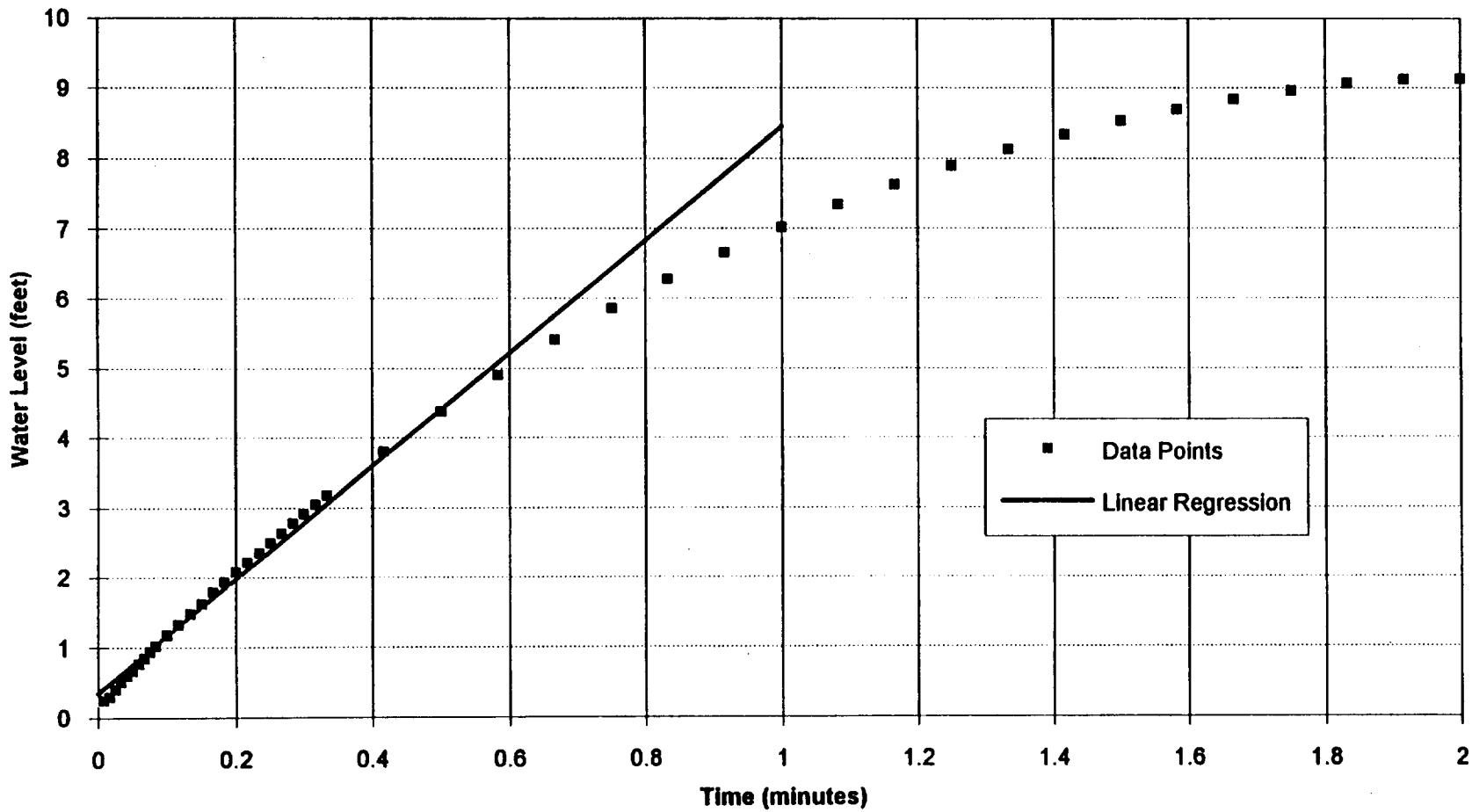


Figure F-5. Agarwal, Al-Hussainy and Ramey (1970) Method for Estimating Critical Time: Plot of Drawdown (feet) versus Time (min).

blank page

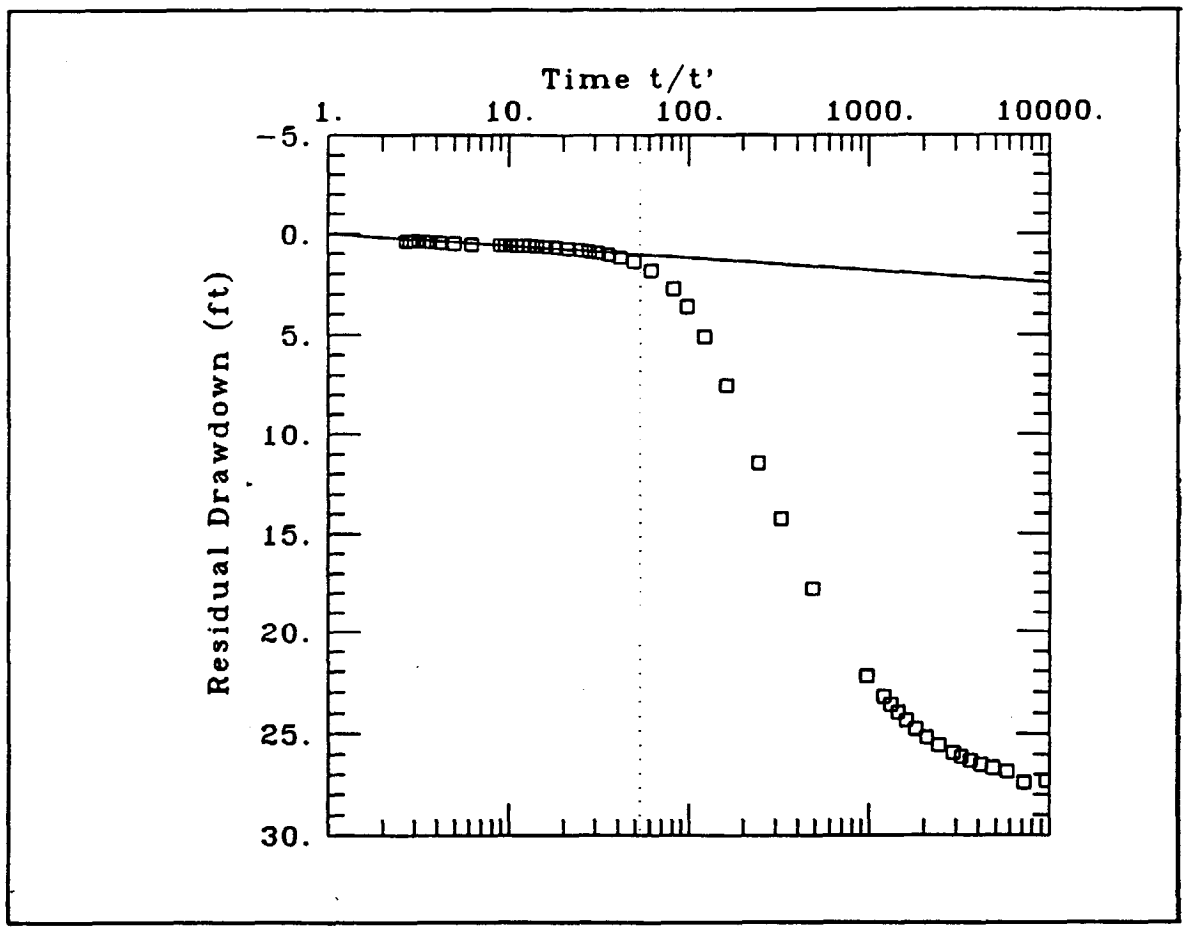


Figure F-6. Theis (1935) Recovery Method for Estimating Transmissivity: Semilogarithmic Plot of Residual Drawdown (feet) versus Time Ratio t/t'.

blank page

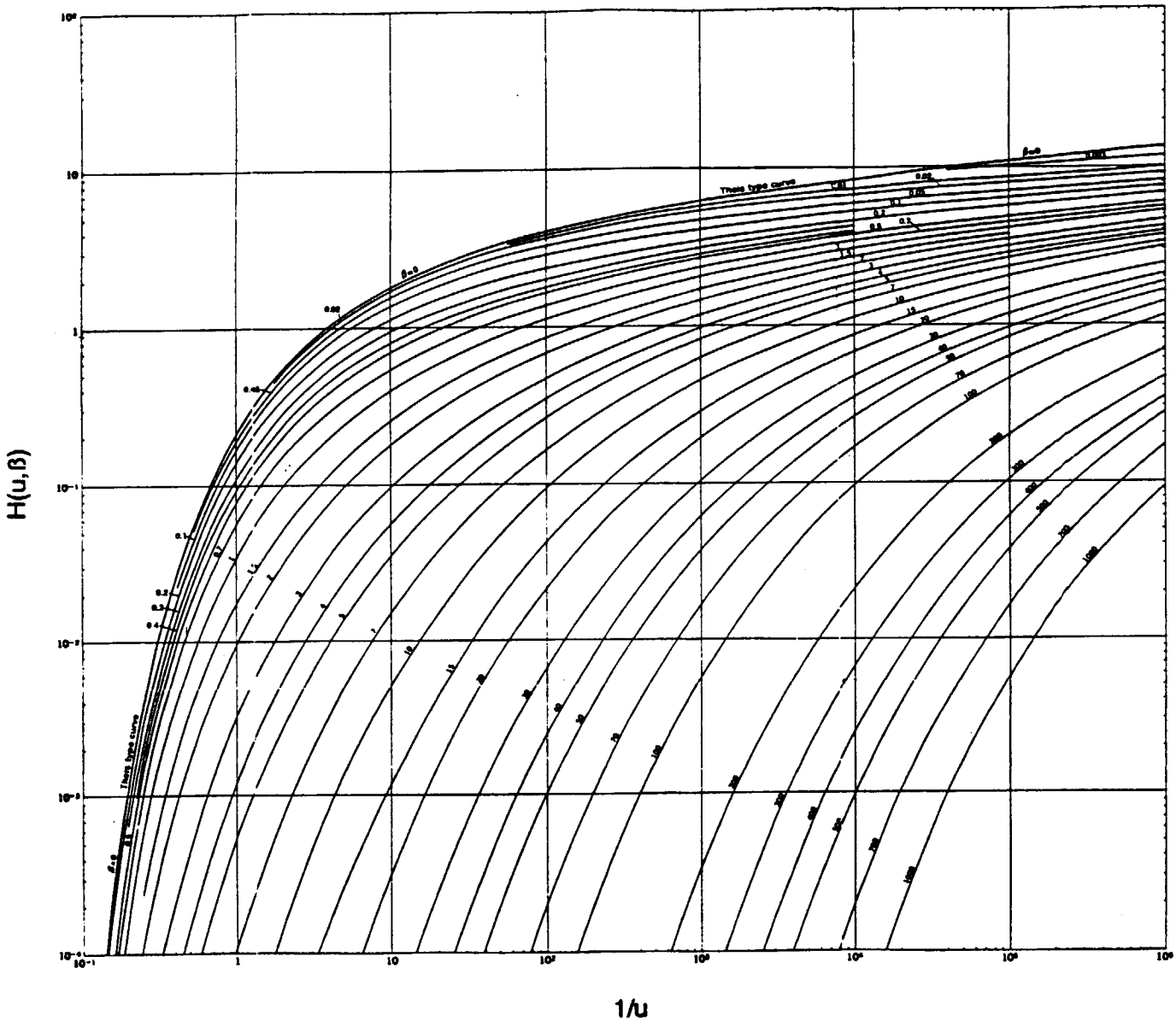


Figure F-7. Hantush (1960) Method: Family of Type Curves H(u,β) versus 1/u, for Various Values of β. (After Lohman, 1979)

blank page

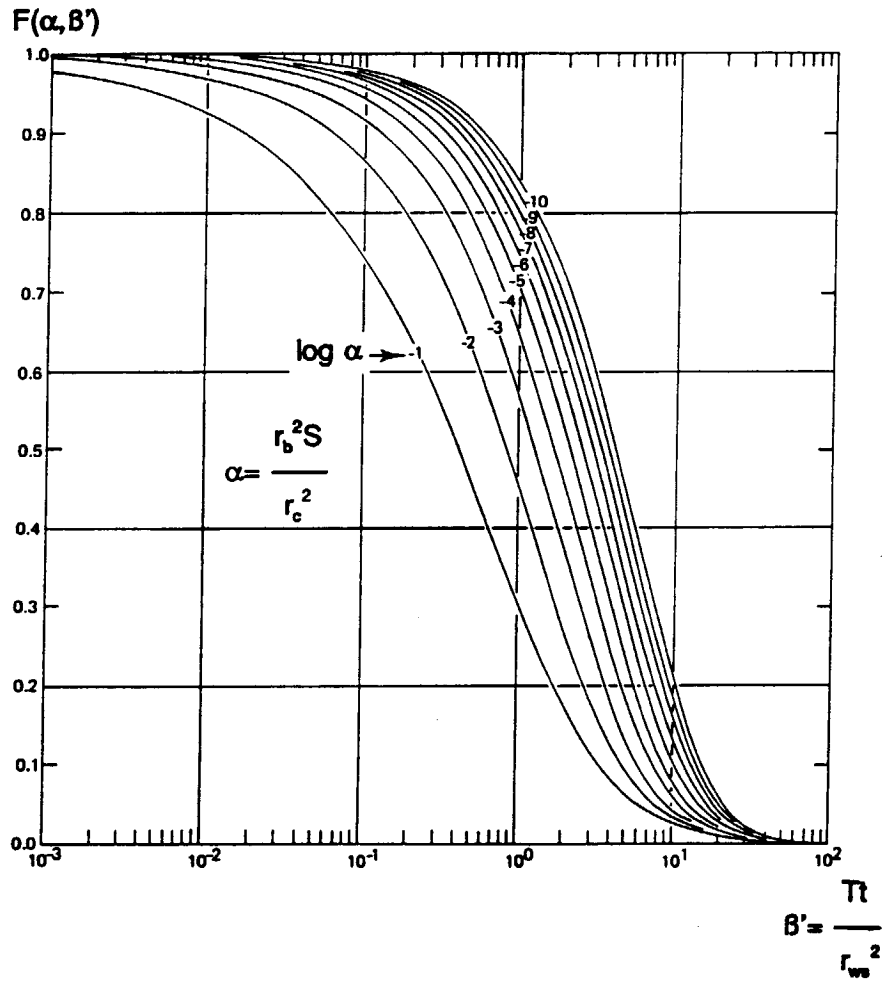


Figure F-8. Cooper, Bredehoeft and Papadopulos (1967) Method: Family of Type Curves F(α,β') versus β' for Different Values of α. (After Kruseman and DeRidder, 1991)

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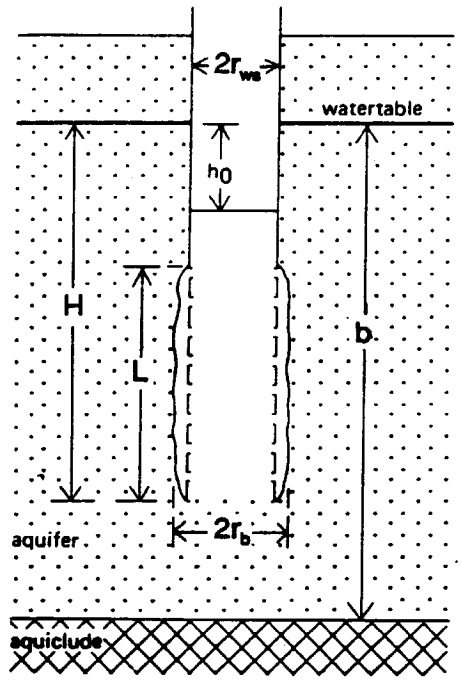


Figure F-9. Bouwer and Rice (1976) Method: Partially Penetrating Well Configuration. (After Kruseman and DeRidder, 1991)

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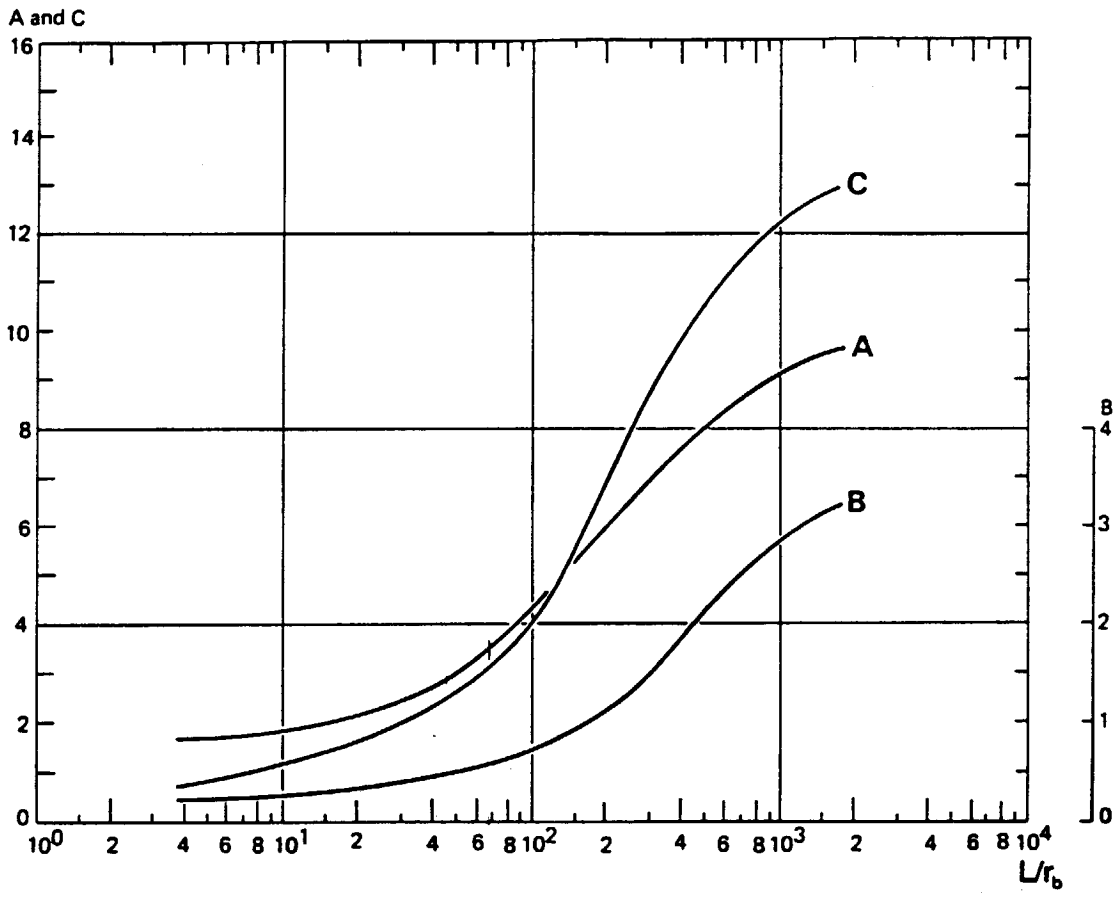


Figure F-10. Bouwer and Rice (1976) Method: Curves Showing the Relation Between the Dimensionless Parameters A, B, C, and $L/r_b$. (After Kruseman and DeRidder, 1991)

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# ATTACHMENT 1
# to Appendix F

## Example of Barometric Efficiency Calculation

# ATTACHMENT 1

## Example of Barometric Efficiency Calculation

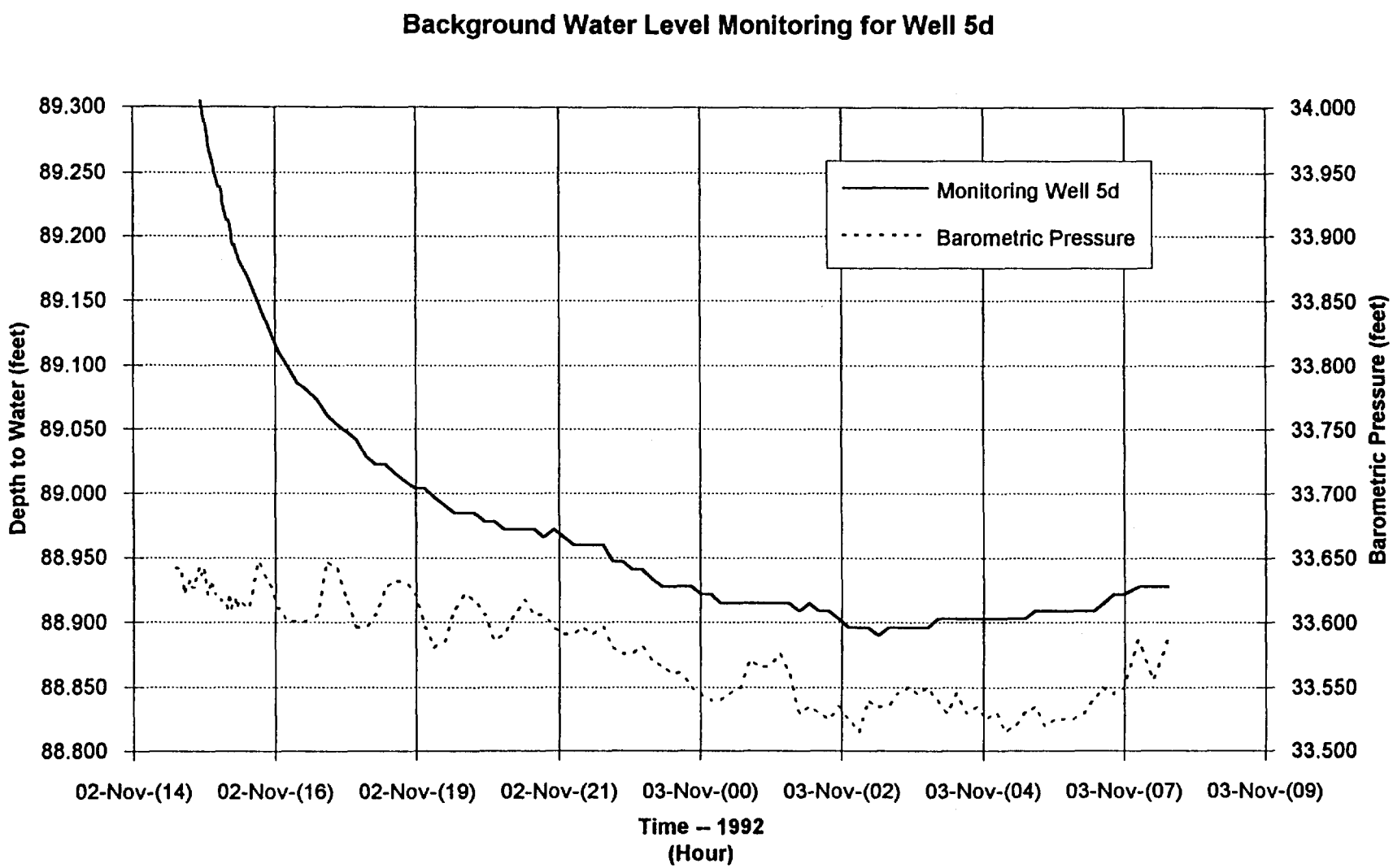
An example of a hydrograph/barograph data plot and calculation for Well 5D is presented below.

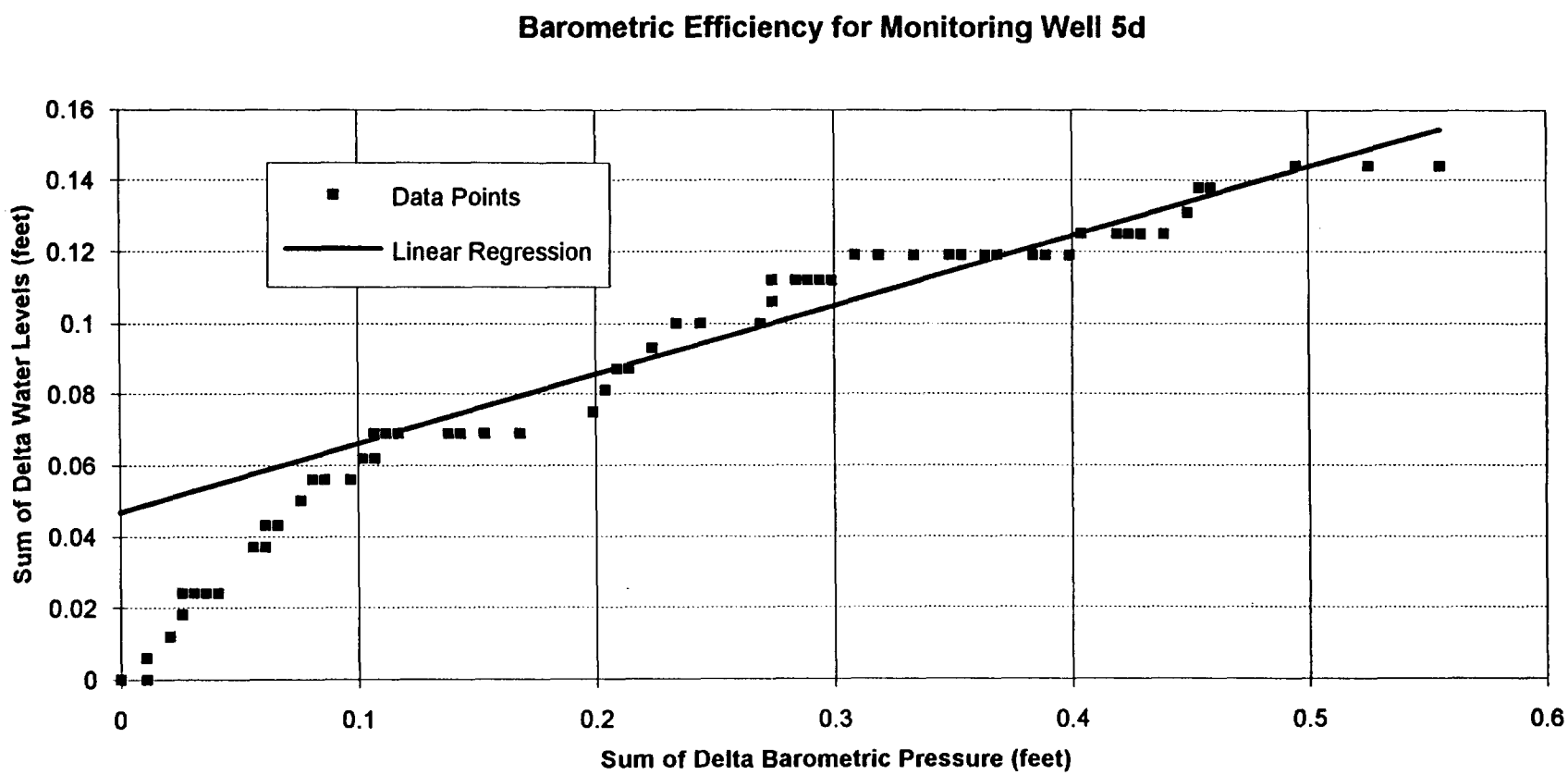
Refer to Section F.4.1 and Equation 1:

As implemented in EXCEL,

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **El Toro MCAS Barometric Efficiency Calculation** | | | | | | | | |
| **Well:** | **5d** | | | | | | | |
| slope (BE) = | 0.19 | | | | | | | |
| y-intercept | 0.05 | | | | | | | |
| n = | 47.00 | | n | x | y | | | |
| Sum(x) = | 14.27 | | 34 | 0 | 0.04681786 | | | |
| Sum(y) | 4.97 | | 80 | 0.555 | 0.15448734 | | | |
| Sum(xx)= | 5.05 | | | | | | | |
| Sum(xy)= | 1.65 | | | | | | | |

The barometric efficiency (slope of best-fit line) = 0.19.


Background Water Level Monitoring for Well 5d
Monitoring Well 5d
Barometric Pressure
Depth to Water (feet)
Barometric Pressure (feet)
89.300
89.250
89.200
89.150
89.100
89.050
89.000
88.950
88.900
88.850
88.800
34.000
33.950
33.900
33.850
33.800
33.750
33.700
33.650
33.600
33.550
33.500
02-Nov-(14)
02-Nov-(16)
02-Nov-(19)
02-Nov-(21)
03-Nov-(00)
03-Nov-(02)
03-Nov-(04)
03-Nov-(07)
03-Nov-(09)
Time -- 1992
(Hour)


Barometric Efficiency for Monitoring Well 5d
Data Points
Linear Regression
Sum of Delta Water Levels (feet)
Sum of Delta Barometric Pressure (feet)
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.1
0.2
0.3
0.4
0.5
0.6

# ATTACHMENT 2
## to Appendix F

## Example of Pumping Test Analysis, Pumping (Cooper-Jacob Method)

# ATTACHMENT 2

## Example of Pumping Test Analysis, Pumping, Cooper-Jacob Method

Data plots for wells analyzed using the Cooper-Jacob method are in Attachment 8. A sample calculation for Well 26 is presented below.

Refer to Subsection F.4.2.1, and Equation 8:

$Q = 9.0$ gpm
$s_{max} = 5.0$ ft
$t = 240$ min (total pumping time)

$\Delta s = 0.81$ ft for 1 log cycle t

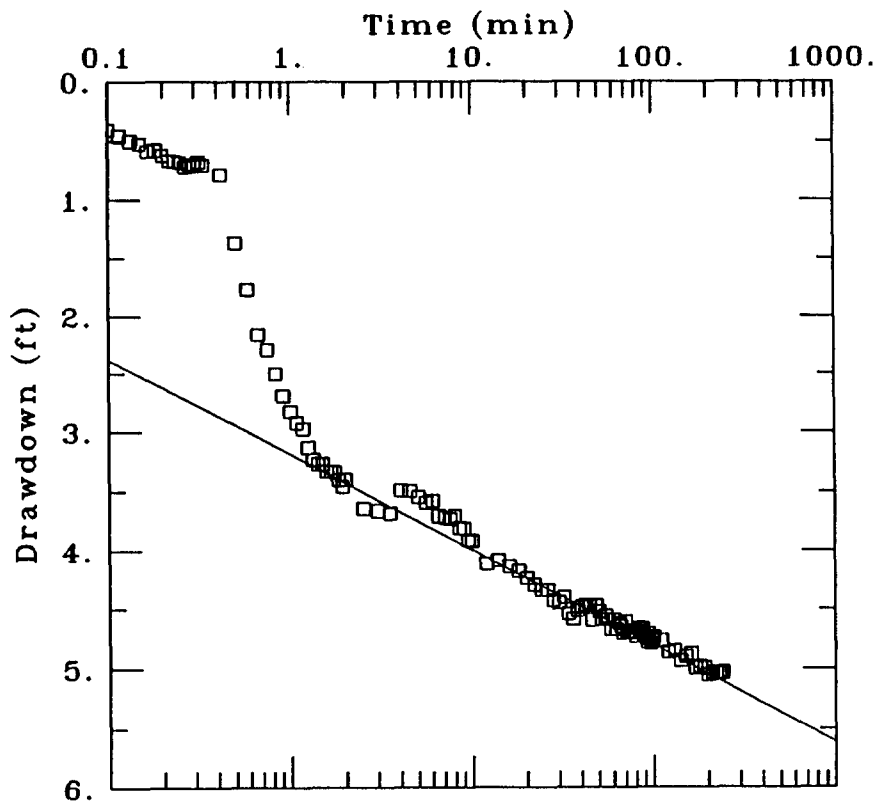
$$T = \frac{2.3\ (9.0\ \frac{gal}{min})\ (\frac{1\ ft^3}{7.48\ gal})\ (\frac{1440\ min}{1\ day})}{4\pi\ (0.81\ ft)}$$

$$= 391.5\ \frac{ft^2}{day}$$

Note: The difference in the T value calculated above and the T value shown in Table F-11 and the accompanying figure is due to different significant figures being used.

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 26: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL26\26P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 26

OBS. WELL:
Same

ESTIMATED PARAMETERS:
T = 0.2728 $ft^2$/min

TEST DATA:
Q = 1.203 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

# ATTACHMENT 3
# to Appendix F

## Example of Pumping Test Analysis, Recovery (Theis Method)

# ATTACHMENT 3

## Example of Pumping Test Analysis, Recovery, Theis Method

Data plots for wells analyzed using the Theis recovery method are in Attachment 8. A sample calculation for Well 26 is presented below.

Refer to Subsection F.4.2.3, and Equation 14:

$Q$ = 9.0 gpm
$s_{max}$ = 5.0 ft
$t$ = 240 min (total pumping time)

$\Delta s'$ = 0.75 ft for 1 log cycle (t/t')

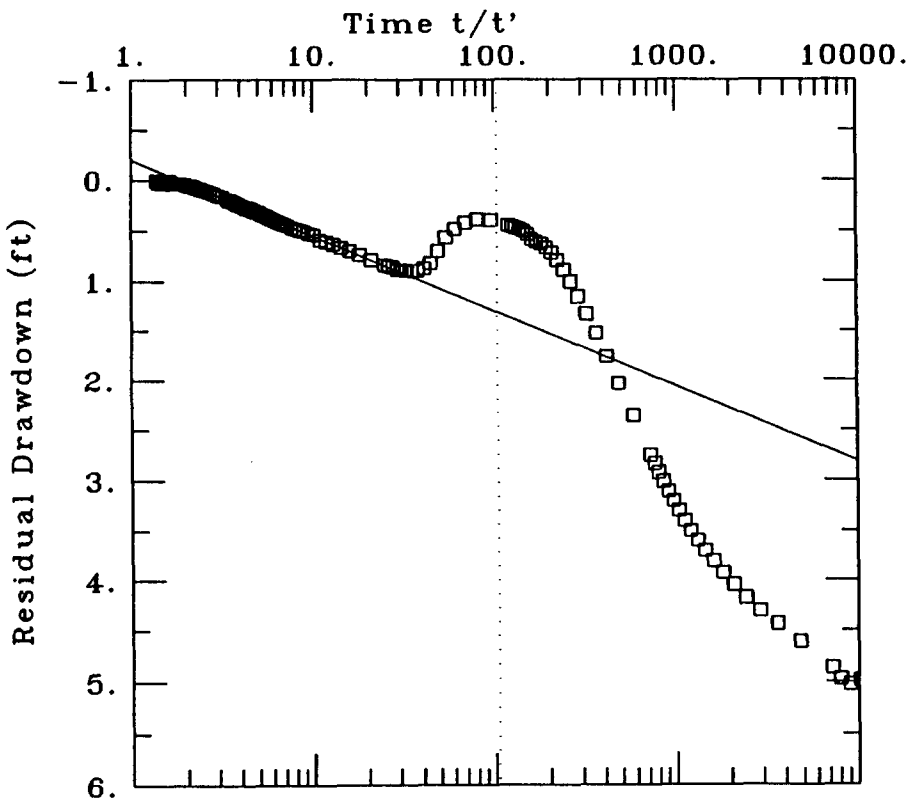
$$T = \frac{2.3\ (9.0\ \frac{gal}{min})\ (\frac{1\ ft^3}{7.48\ gal})\ (\frac{1440\ min}{1\ day})}{4\pi\ (0.75\ ft)}$$

$$= 422.8\ \frac{ft^2}{day}$$

Note: The difference in the T value calculated above and the T value shown in Table F-11 and the accompanying figure is due to different significant figures being used.

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 26: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL26\26R.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 26

OBS. WELL:
Same

ESTIMATED PARAMETERS:
T = 0.2926 $ft^2$/min

TEST DATA:
Q = 1.203 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

# ATTACHMENT 4
# to Appendix F

## Example of Well Bore Storage Calculation (Agarwal, Al-Hussainy, and Ramey Method)

# ATTACHMENT 4

## Example of Well Bore Storage Calculation, Agarwal, Al-Hussainy, and Ramey Method

An example of a well bore storage calculation to estimate the critical time, $t_c$, for Well 2E is presented below.

Refer to Subsection F.4.2.2 and Equation 10:

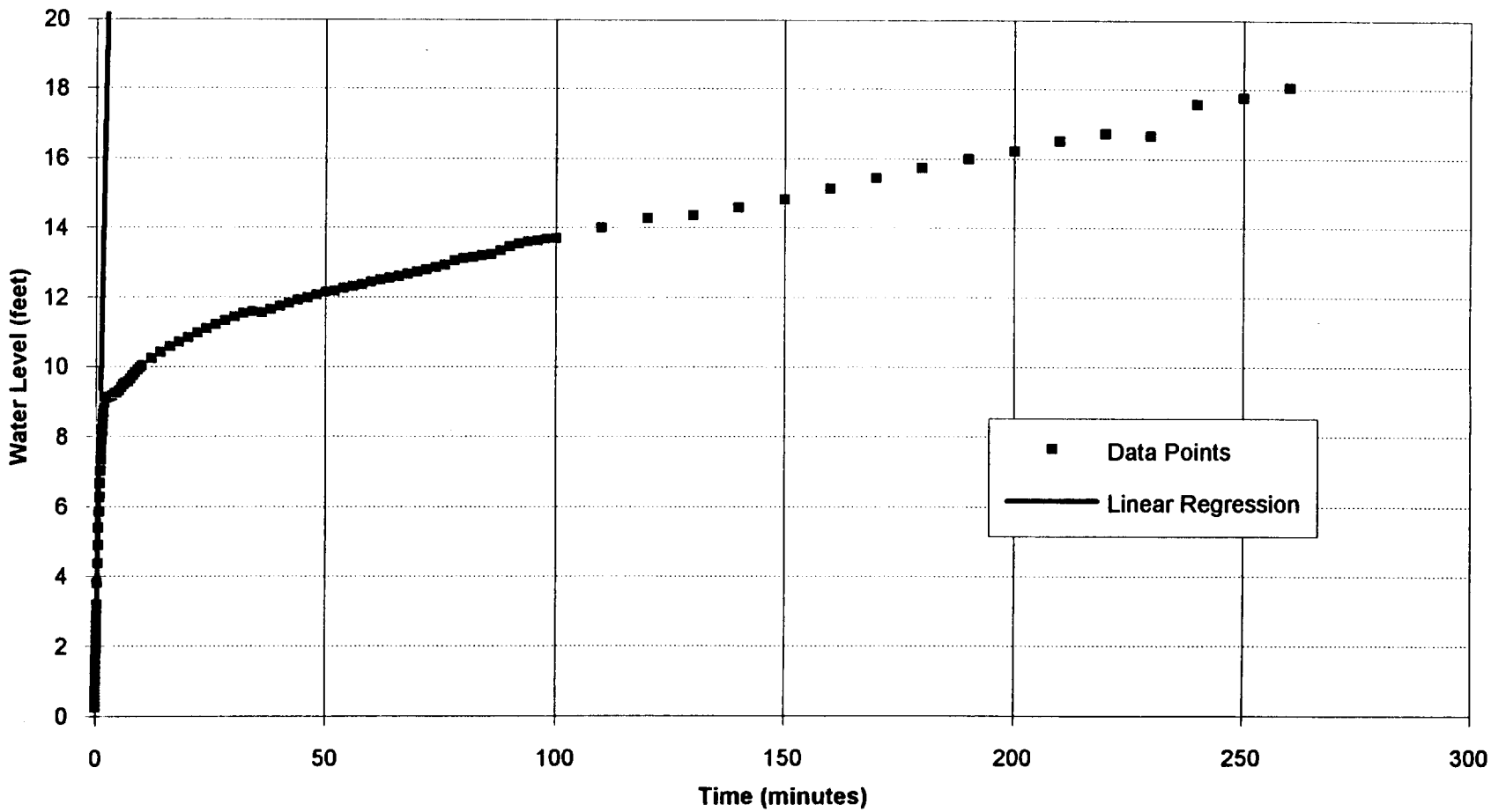
m = 8.10 ft/min (slope of best-fit line for the first 60 seconds)
Q = 4.1 gpm
T = 27.7 $ft^2$/day

$$C_w = \frac{Q}{m} = \frac{4.1\ gal/\text{min}}{8.10\ ft/\text{min}} = 0.5062\ gal/ft$$

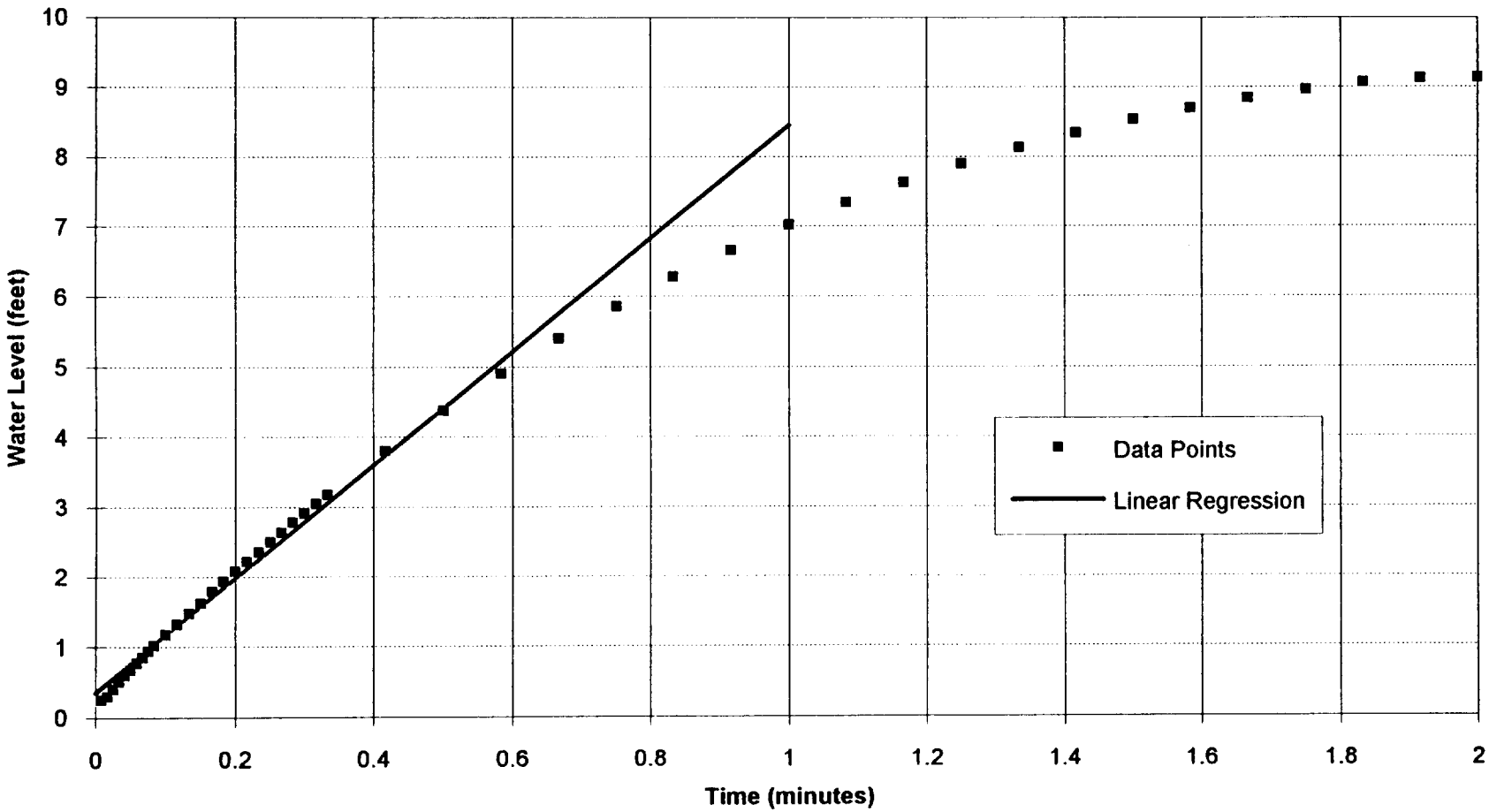
$$t_c = \frac{100\ C_w}{4\pi T} = \frac{(100)\ (0.5062\ \frac{gal}{ft})\ (\frac{1440\ \text{min}}{1\ day})\ (\frac{1\ ft^3}{7.48\ gal})}{4\pi\ (27.7\ \frac{ft^2}{day})} = 28.0\ \text{min}$$

Note: The slope of the best-fit line is calculated using a regression formula as implemented in Excel.

**Critical Time Calculation for Monitoring Well 2E**
**Agarwal, Al-Hussainy, and Ramey Method (1970)**



**Critical Time Calculation for Monitoring Well 2E**
**Agarwal, Al-Hussainy, and Ramey Method (1970)**



# ATTACHMENT 5
## to Appendix F

## Example of Pumping Test Analysis (Hantush Method)

## Attachment 5

## Example of a Pumping Test Analysis, Hantush Method

Data plots for wells analyzed using the Hantush method are in Attachment 8. A sample calculation for pumping well 5D and observation well 5E is presented below.

Refer to Subsection F.4.2.4, and Equations 15 and 18:

$Q = 20.4$ gpm
$s_{max} = 0.5$ ft
$r = 100.8$ ft

Match point: $H(u,\beta=0.7) = 1.0$
$1/u = 1.0$

Therefore, $s = 0.25$ ft
$t = 38$ min

$$T = \frac{(20.4\frac{gal}{min})\ (\frac{1\ ft^3}{7.48\ gal})\ (\frac{1440\ min}{1\ day})\ (1.0)}{4\ \pi\ (0.25\ ft)}$$

$$= 1{,}250\ ft^2/day$$

$$S = \frac{4\ (1{,}250\ \frac{ft^2}{day})\ (38\ min)\ (\frac{1\ day}{1440\ min})}{(100.8\ ft)^2}$$

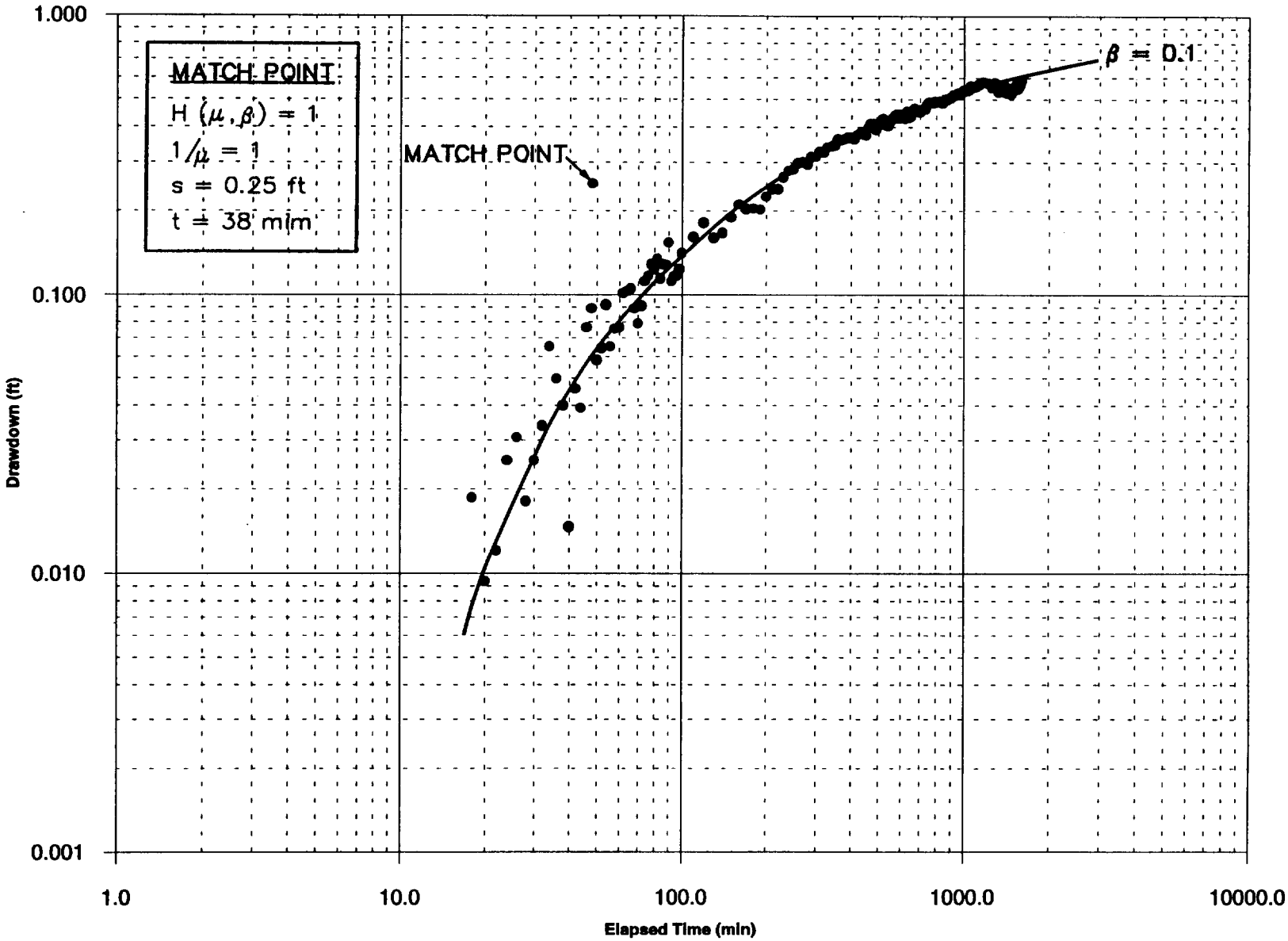
$$= 1.3\ x\ 10^{-2}$$

**MCAS EL TORO RI/FS PHASE I**
Project No.: **CTO #145**

**HANTUSH (WITH STORAGE)**

Client: **NAVY SOUTHWESTDIV**
Location: **MCAS EL TORO (SITE 18)**

Pumped Well: 5D Observation Well: 5E



# ATTACHMENT 6
# to Appendix F

## Example of Slug Test Analysis (Cooper, Bredehoeft, and Papadopulos Method

# ATTACHMENT 6

## Example of a Slug Test Analysis, Cooper, Bredehoeft, and Papadopulos Method

Data and data plots for wells analyzed using the Cooper, Bredehoeft, and Papadopulos Method are in Attachment 9. A sample calculation for Well 60 (Test No. 1) is presented below.

Refer to Subsection F.4.3.1, and Equations 21 and 22:

$r_b$ = 0.46 ft
$r_{ws}$ = 0.17 ft
b = 20 ft
$H_o$ = 3.92 ft

Match point: $\log \alpha = -3$
$\beta' = 1.0$ (see attached figure for data fit to type curves)

Therefore, t = 3.6 min

$$T = \frac{(1.0)\ (0.17\ ft)^2}{(3.6\ \text{min})} = 8.0 \times 10^{-3}\ ft^2/\text{min}$$

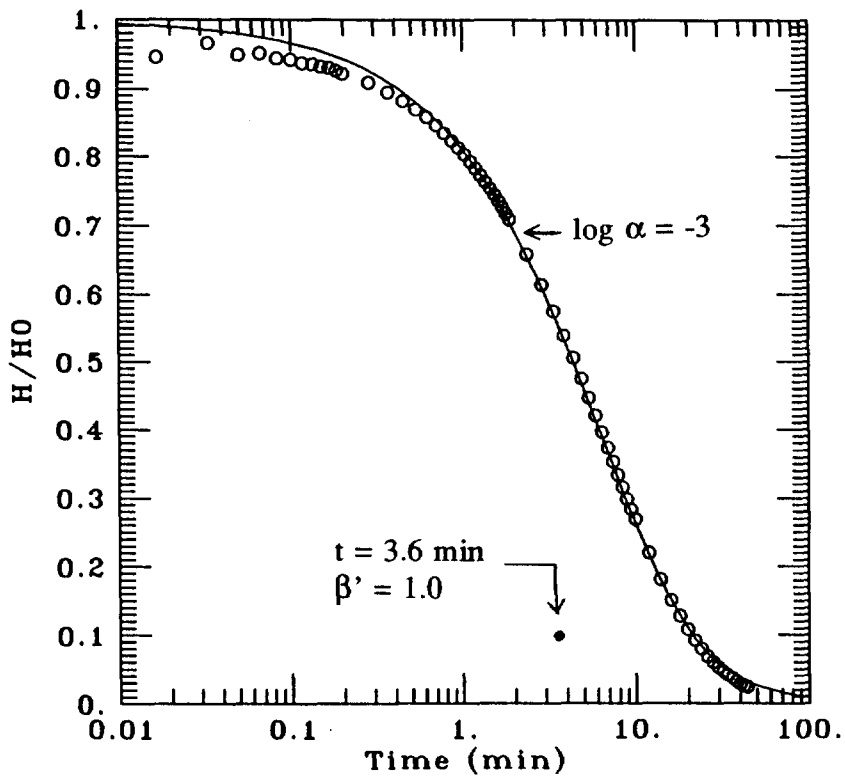
$$K = \frac{(8.0 \times 10^{-3}\ \frac{ft^2}{\text{min}})}{(20\ ft)} = 4 \times 10^{-4}\ ft/\text{min}$$

$$S = \frac{(10^{-3})\ (0.17\ ft)^2}{(0.46\ ft)^2} = 1.4 \times 10^{-4}$$

Note: The difference in the T, S values calculated above and the T, S values shown in Table F-12 and accompanying figure is due to different significant figures being used.

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 60 (TEST 1): COOPER ET AL. METHOD




DATA SET:
well60\60cbp1.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/22/92

TEST WELL:
Well 60 (Site 2)

ESTIMATED PARAMETERS:
T = 0.0081 $ft^2$/min
S = 0.0001611

TEST DATA:
H0 = 3.915 ft
rc = 0.1667 ft
rw = 0.4583 ft

# ATTACHMENT 7
# to Appendix F

## Example of Slug Test Analysis (Bouwer and Rice Method)

# ATTACHMENT 7

## Example of a Slug Test Analysis, Bouwer and Rice Method

Data plots for wells analyzed using the Bouwer and Rice Method are in Attachment 9. A sample calculation for Well 60 (Test No. 1) is presented below.

Refer to Subsection F.4.3.2, Equations 26 and 28, and Figure F-10:

$r_b$ = 0.46 ft
$r_{ws}$ = 0.17 ft
L = 20 ft
b = 26.3 ft
H = 26.3 ft
$h_o$ = 3.92 ft

Assume fully penetrating configuration, from Figure F-10, C = 2.8.

Best-fit line: $H_t$ = 0.1 ft
t = 23.5 min

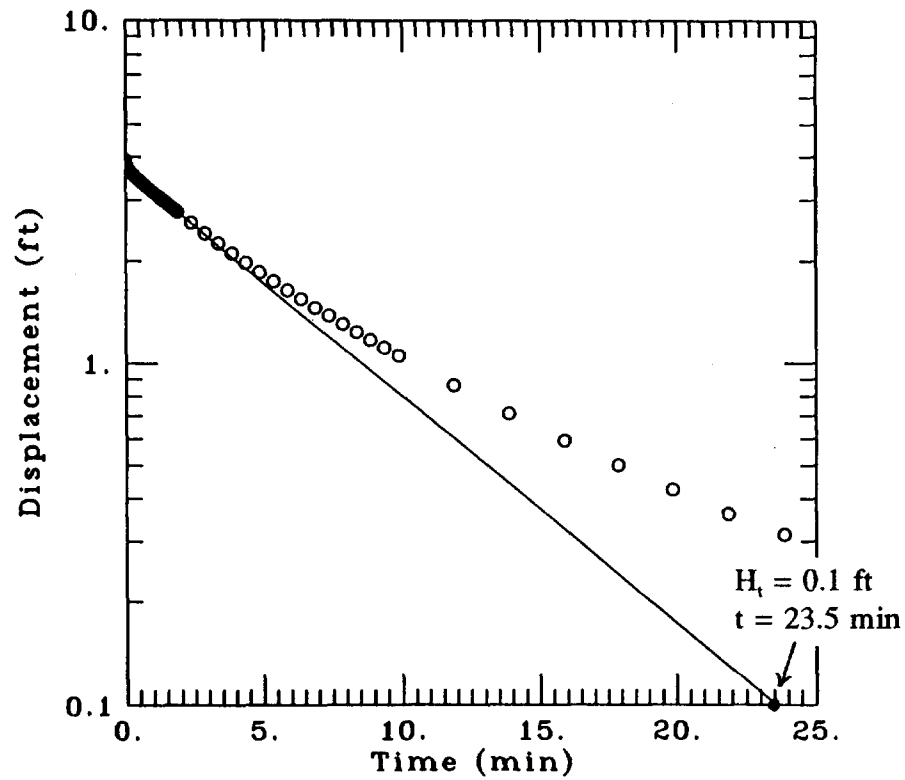
$$R_e = \exp\left[\left(\frac{1.1}{\ln(26.3\ ft\ /\ 0.46\ ft)} + \frac{2.8}{20\ ft\ /\ 0.46\ ft}\right)\right]^{-1} (0.46\ ft) = 9.0\ ft$$

$$K = (0.17\ ft)^2\ \frac{\ln(9.0\ ft\ /\ 0.46\ ft)}{2(20\ ft)}\ \left(\frac{1}{23.5\ \text{min}}\right) \ln\left(\frac{3.92\ ft}{0.1\ ft}\right)$$

$$= 3.35\ x\ 10^{-4}\ ft/\text{min}$$

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 60 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well60\60s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

TEST WELL:
Well 60 (Site 2)

ESTIMATED PARAMETERS:
K = 0.0003258 ft/min
y0 = 3.716 ft

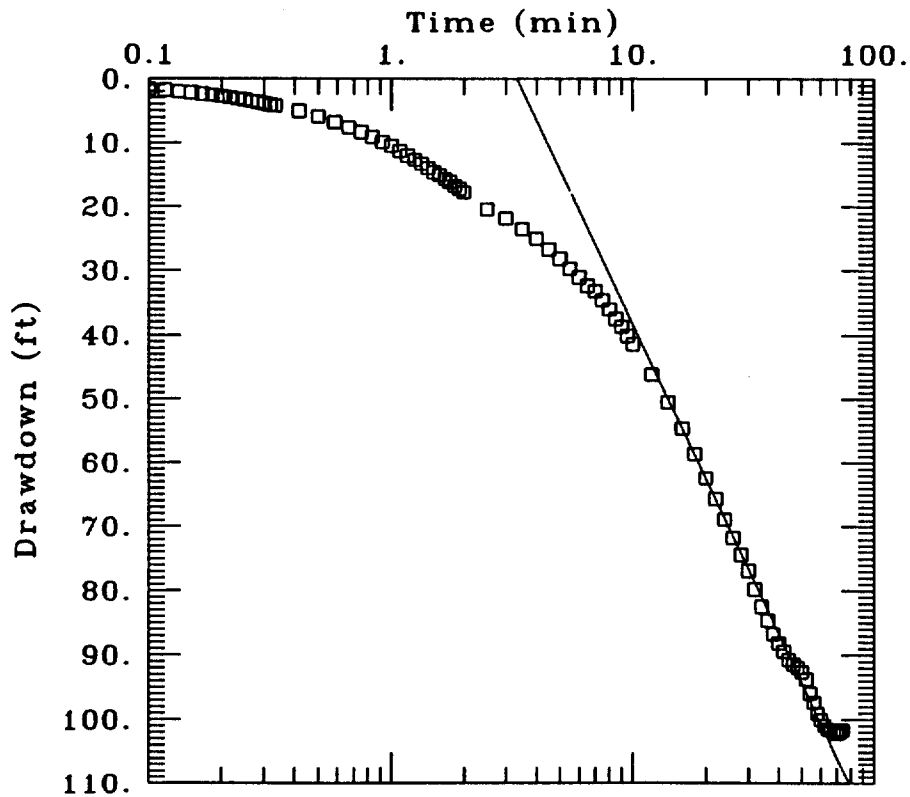
TEST DATA:
H0 = 3.915 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 20. ft
b = 26.3 ft
H = 26.3 ft

# ATTACHMENT 8
# to Appendix F

## Data Plots for Pumping Tests

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 2D: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL2D\2DP.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
21 August 1992

TEST WELL:
Well 2D

OBS. WELL:
Same

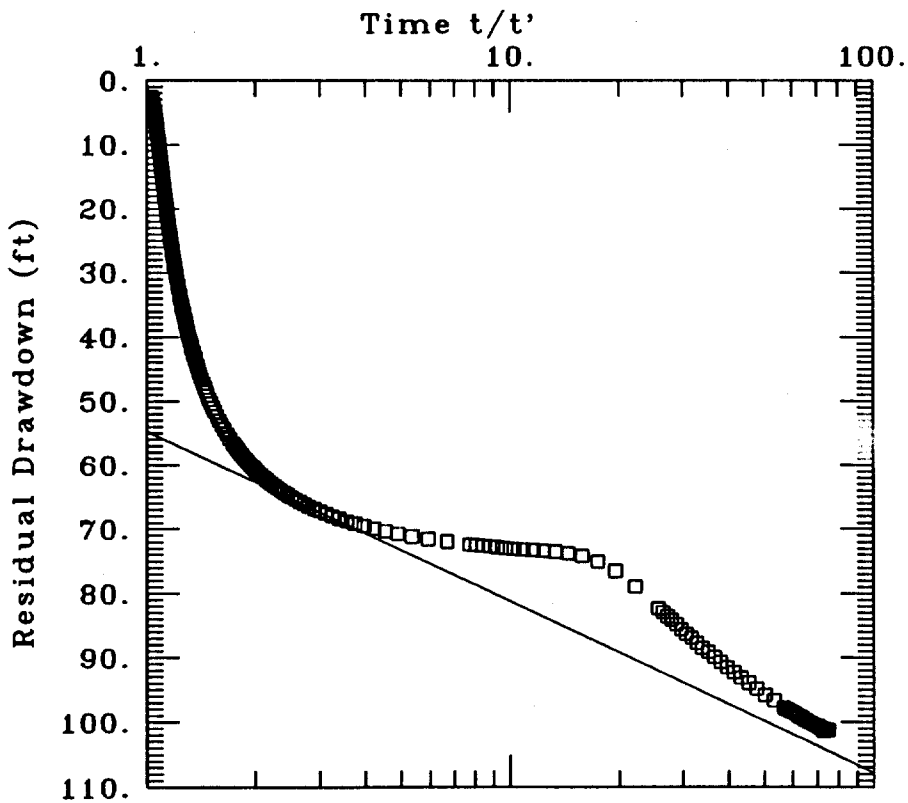
ESTIMATED PARAMETERS:
T = 0.0003974 $ft^2$/min

TEST DATA:
Q = 0.1737 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 2D: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL2D\2DR.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
21 August 1992

TEST WELL:
Well 2D

OBS. WELL:
Same

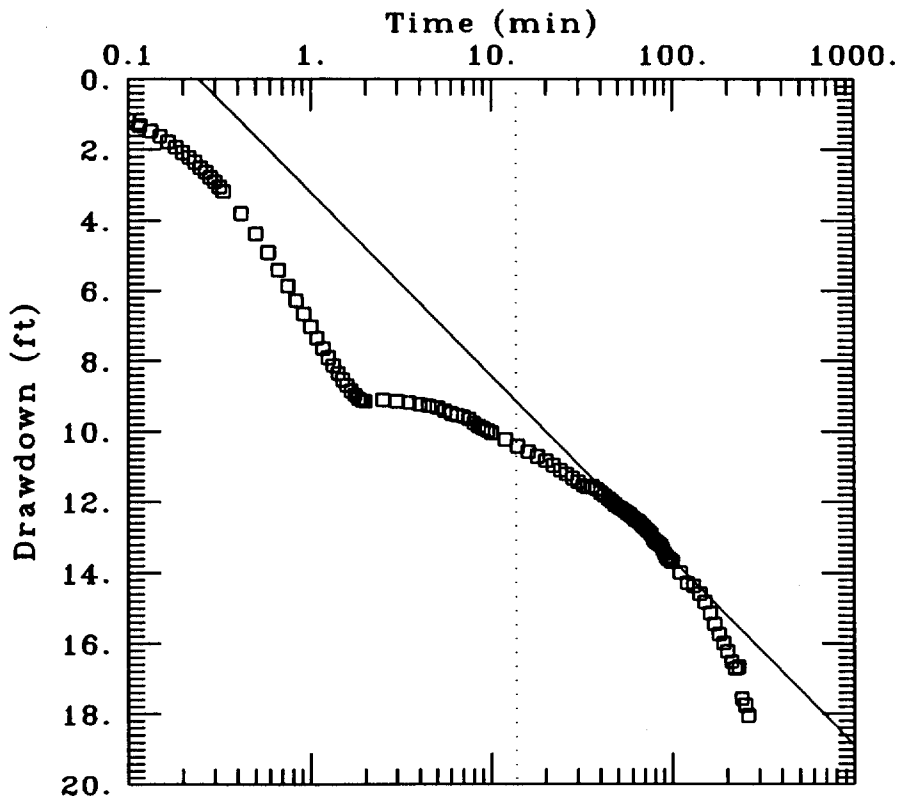
ESTIMATED PARAMETERS:
T = 0.0012 $ft^2$/min

TEST DATA:
Q = 0.1737 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 2E: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well2e\2ep.dat
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
21 September 1992

TEST WELL:
Well 2E

OBS. WELL:
Same

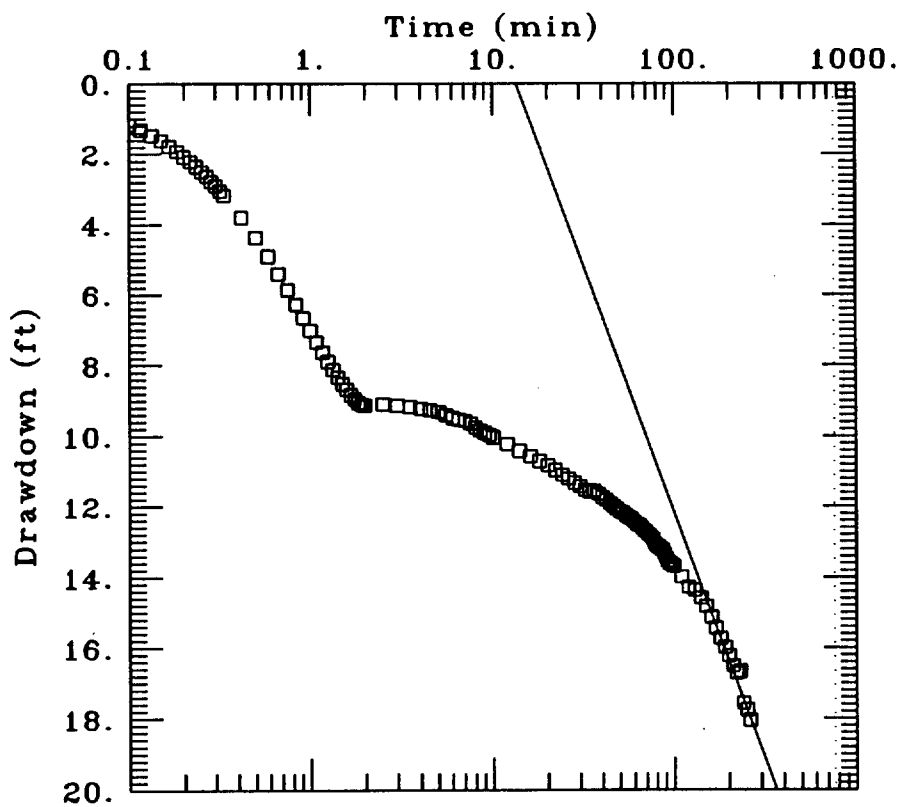
ESTIMATED PARAMETERS:
T = 0.01922 $ft^2$/min

TEST DATA:
Q = 0.548 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 2E: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well2e\2ep.dat
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
21 September 1992

TEST WELL:
Well 2E

OBS. WELL:
Same

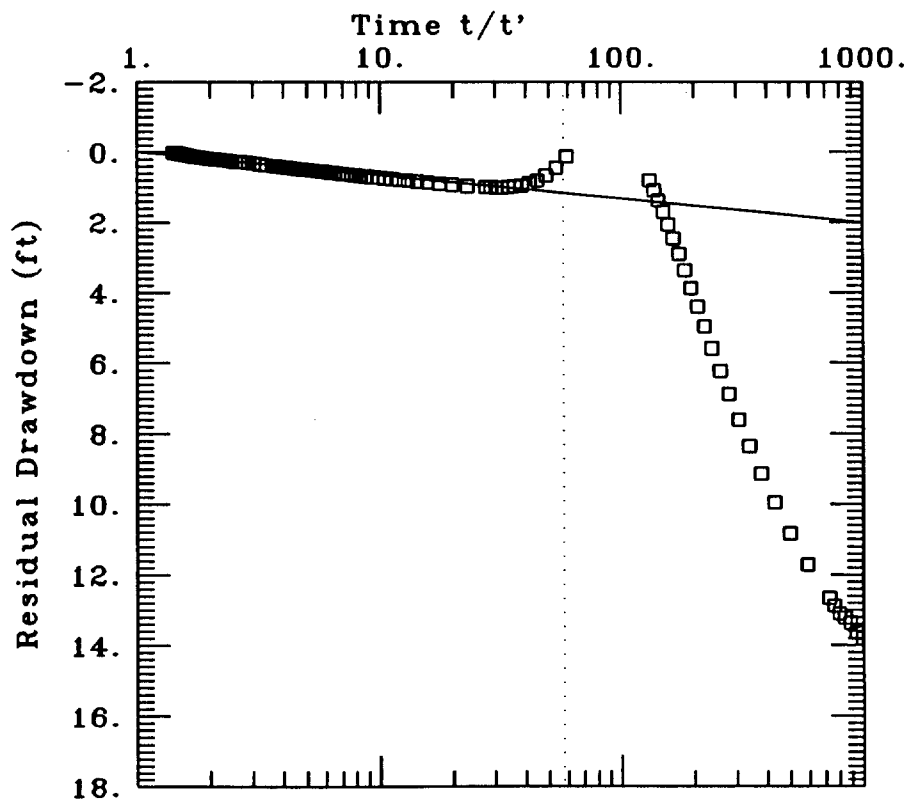
ESTIMATED PARAMETERS:
T = 0.007174 $ft^2$/min

TEST DATA:
Q = 0.548 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 2E: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL2E\2ER.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
21 September 1992

TEST WELL:
Well 2E

OBS. WELL:
Same

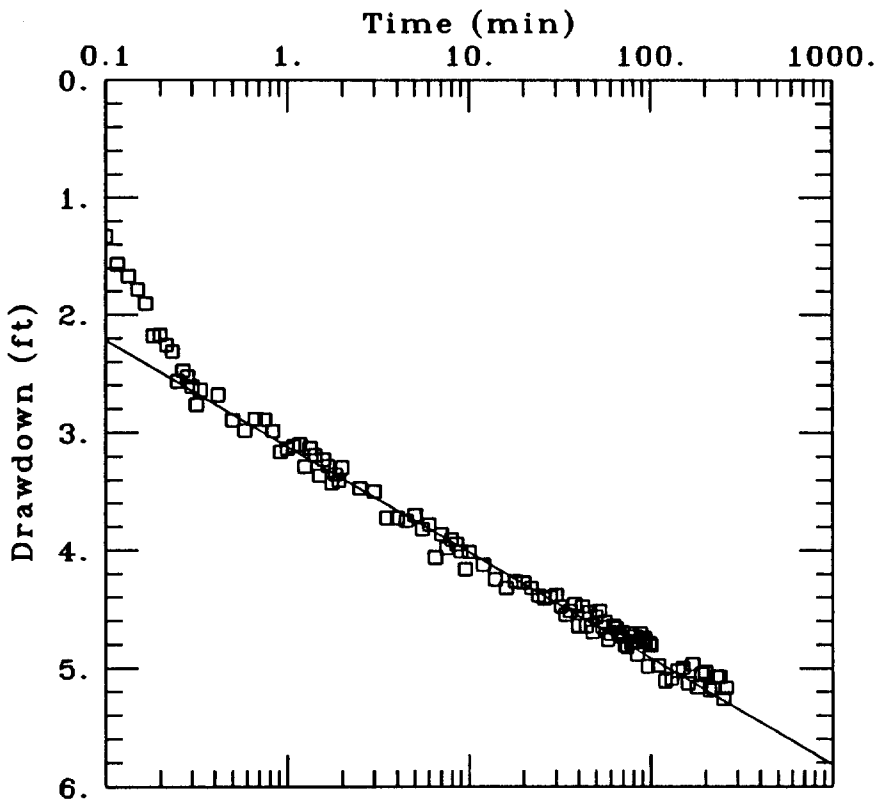
ESTIMATED PARAMETERS:
T = 0.1506 $ft^2$/min

TEST DATA:
Q = 0.548 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 3A: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well3a\3ap.dat
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 October 1992

TEST WELL:
Well 3A

OBS. WELL:
Same

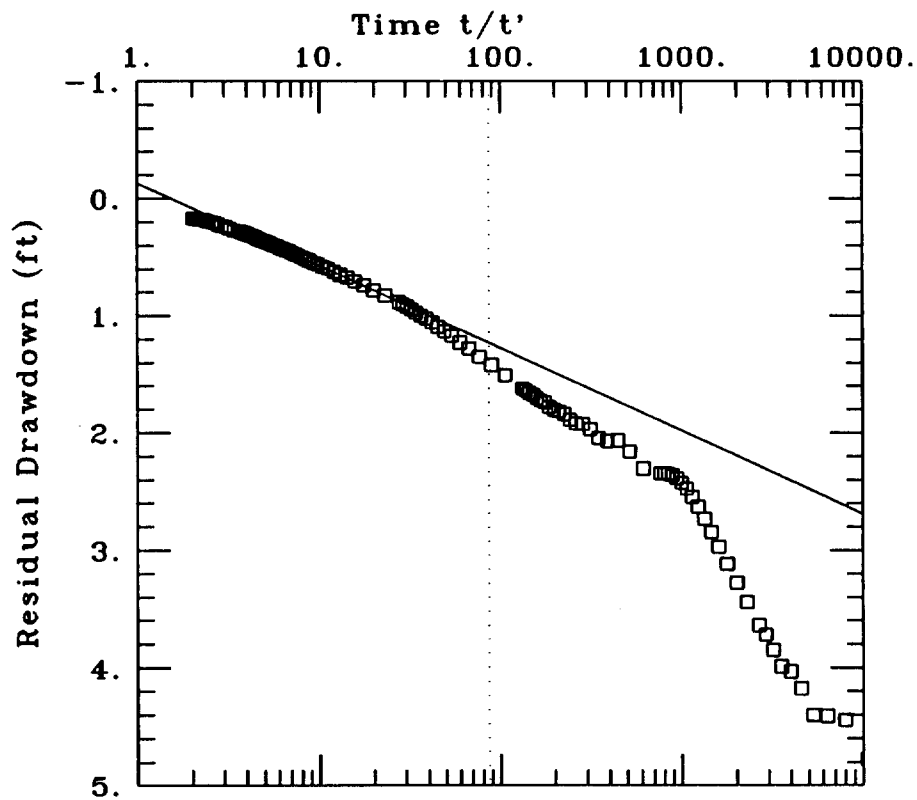
ESTIMATED PARAMETERS:
T = 0.4899 $ft^2$/min

TEST DATA:
Q = 2.406 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 3A: RECOVERY METHOD




DATA SET:
3ar.dat
02/20/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 October 1992

TEST WELL:
Well 3A

OBS. WELL:
Same

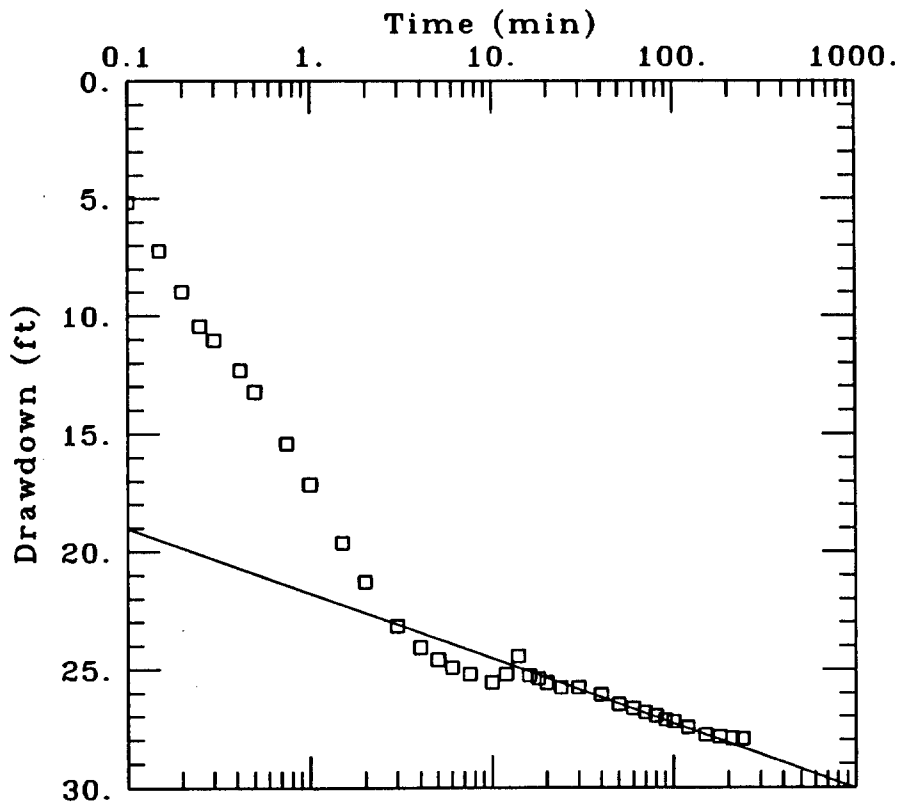
ESTIMATED PARAMETERS:
T = 0.6249 $ft^2$/min

TEST DATA:
Q = 2.406 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 3B: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL3B\3BP.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
28 October 1992

TEST WELL:
Well 3B

OBS. WELL:
Same

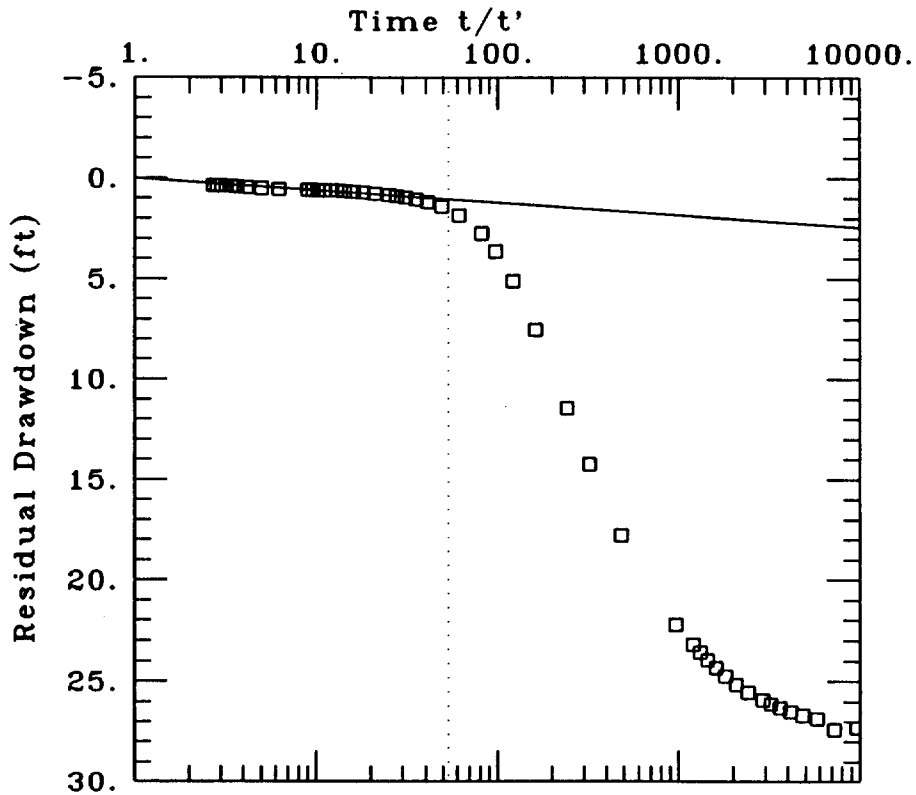
ESTIMATED PARAMETERS:
T = 0.1666 $ft^2$/min

TEST DATA:
Q = 2.499 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 3B: RECOVERY METHOD




DATA SET:
3br.dat
02/20/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
28 October 1992

TEST WELL:
Well 3B

OBS. WELL:
Same

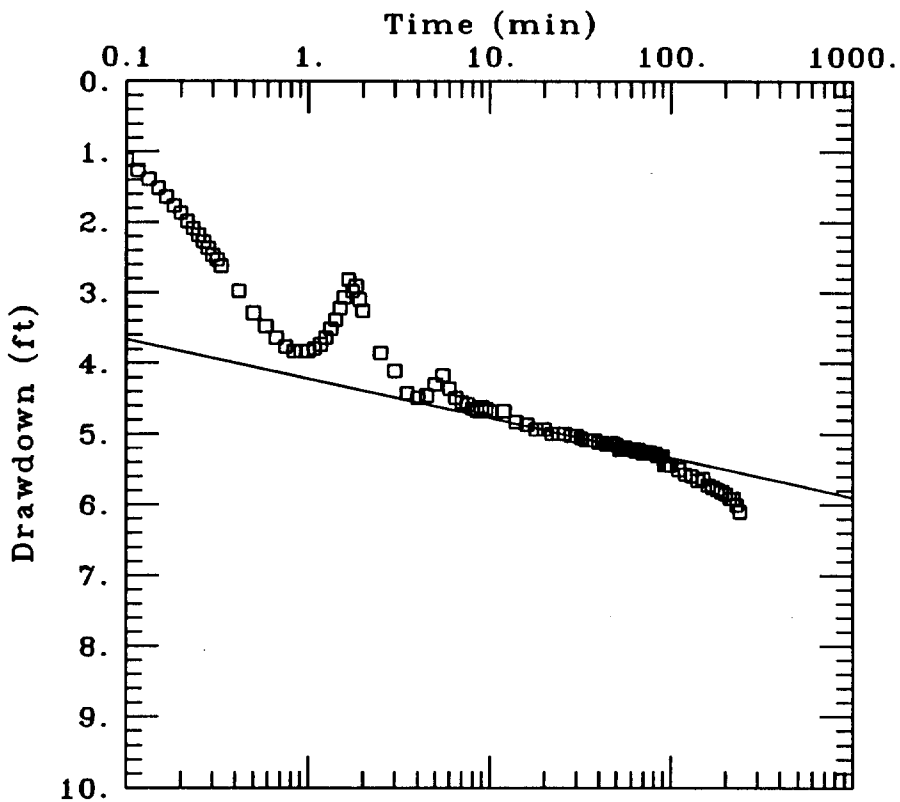
ESTIMATED PARAMETERS:
T = 0.7488 $ft^2$/min

TEST DATA:
Q = 2.499 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 4A: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well4a\4ap.dat
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 4A

OBS. WELL:
Same

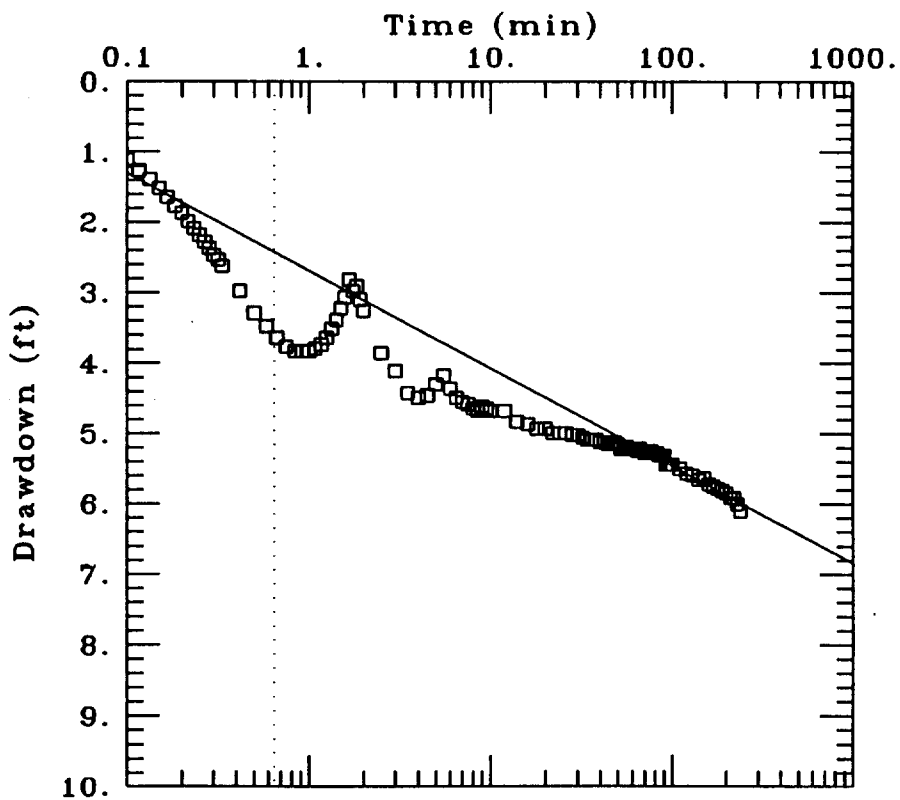
ESTIMATED PARAMETERS:
T = 0.2408 $ft^2$/min

TEST DATA:
Q = 0.7351 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 4A: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well4a\4ap.dat
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 4A

OBS. WELL:
Same

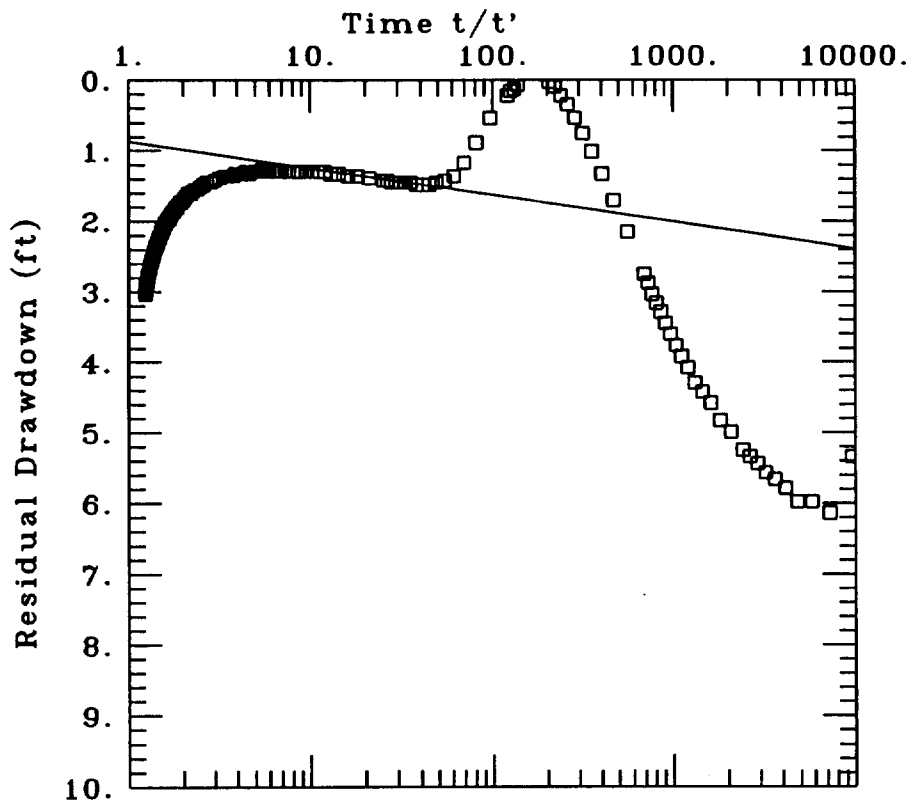
ESTIMATED PARAMETERS:
T = 0.09725 $ft^2$/min

TEST DATA:
Q = 0.7351 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 4A: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL4A\4AR.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 4A

OBS. WELL:
Same

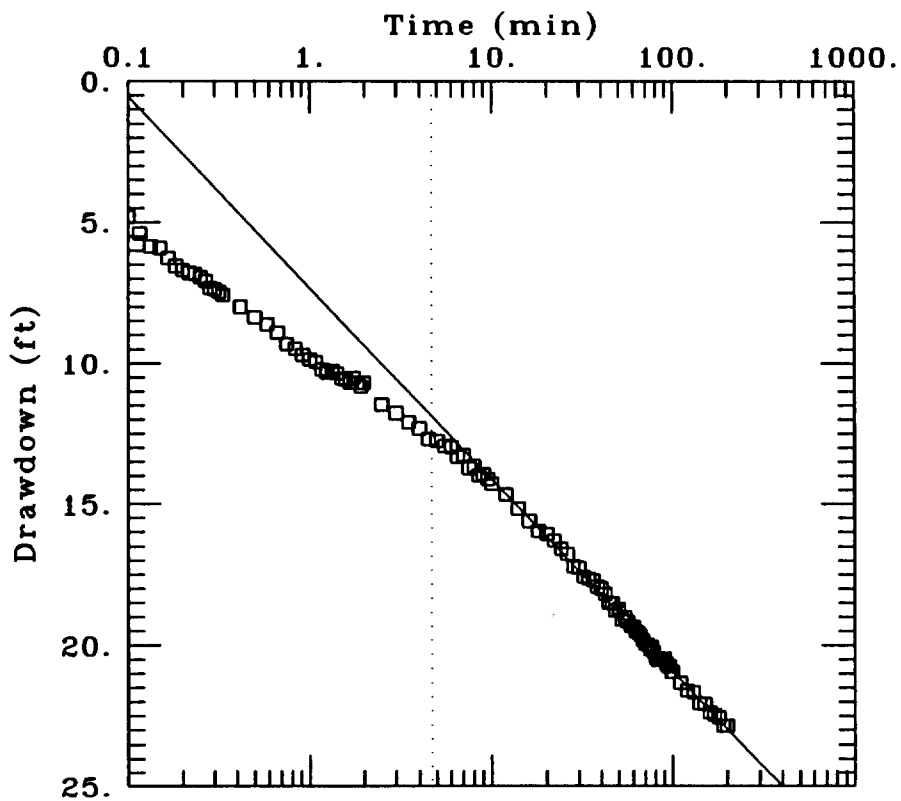
ESTIMATED PARAMETERS:
T = 0.3548 $ft^2$/min

TEST DATA:
Q = 0.7351 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 4B: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL4B\4BP.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 September 1992

TEST WELL:
Well 4B

OBS. WELL:
Same

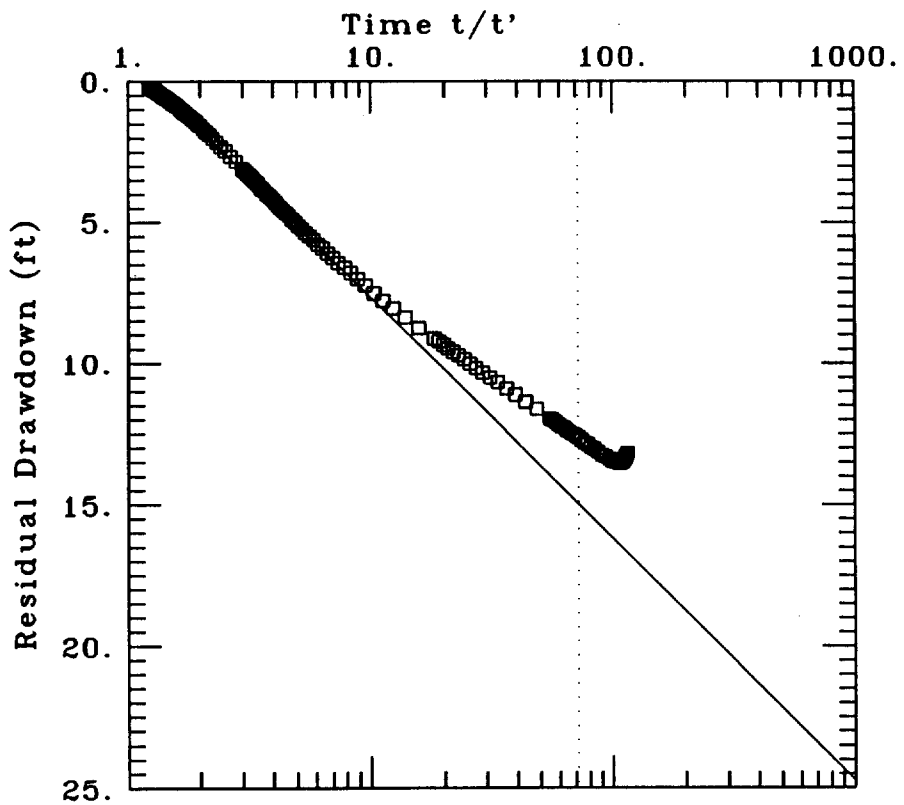
ESTIMATED PARAMETERS:
T = 0.1317 $ft^2$/min

TEST DATA:
Q = 4.878 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 4B: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL4B\4BR.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 September 1992

TEST WELL:
Well 4B

OBS. WELL:
Same

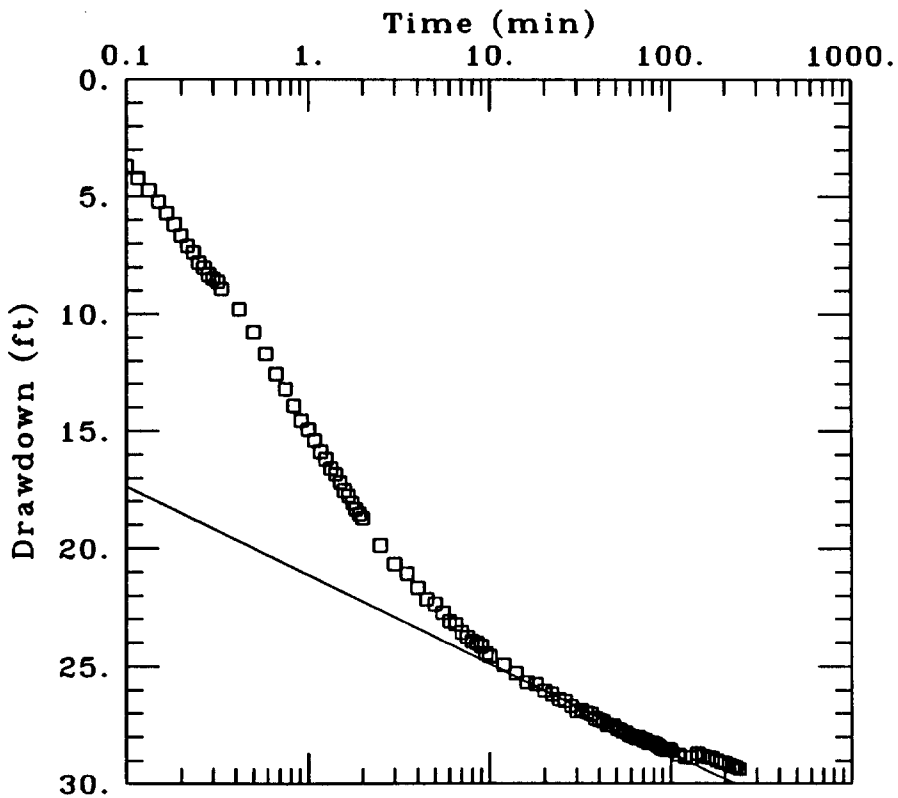
ESTIMATED PARAMETERS:
T = 0.1045 $ft^2$/min

TEST DATA:
Q = 4.878 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5B: COOPER-JACOB METHOD




DATA SET:
5bp.dat
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
11 November 1992

TEST WELL:
Well 5B

OBS. WELL:
Same

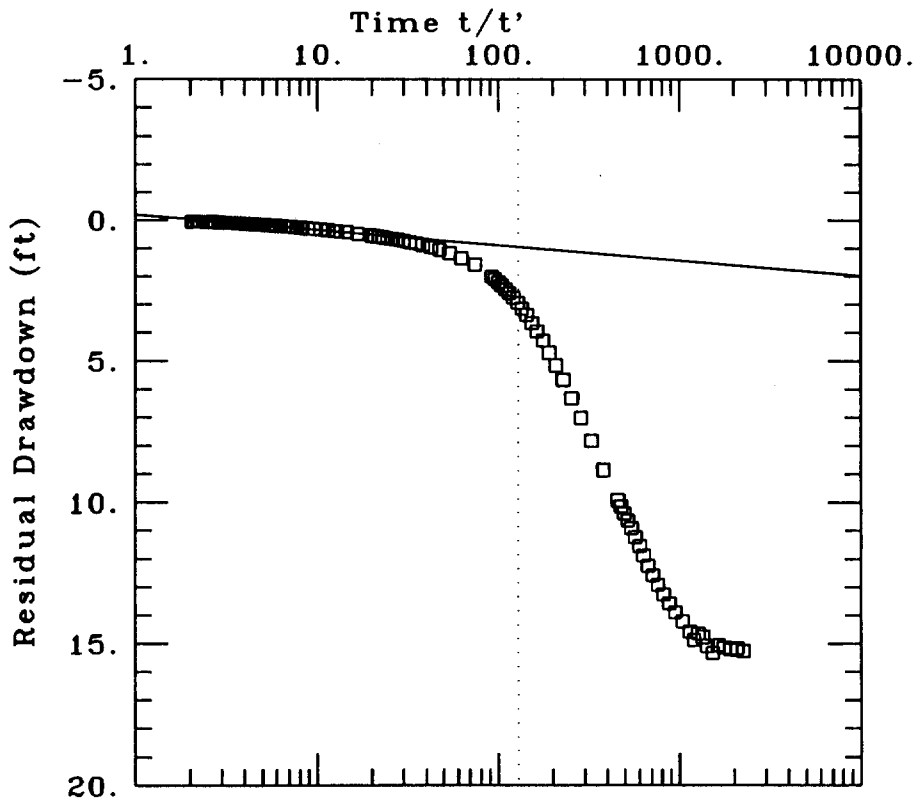
ESTIMATED PARAMETERS:
$T = 0.1549\ ft^2/min$

TEST DATA:
$Q = 3.181\ ft^3/min$

$rc = 0.2083\ ft$
$rw = 0.3441\ ft$

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5C: RECOVERY METHOD




DATA SET:
5CR.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
10 November 1992

TEST WELL:
Well 5C

OBS. WELL:
Same

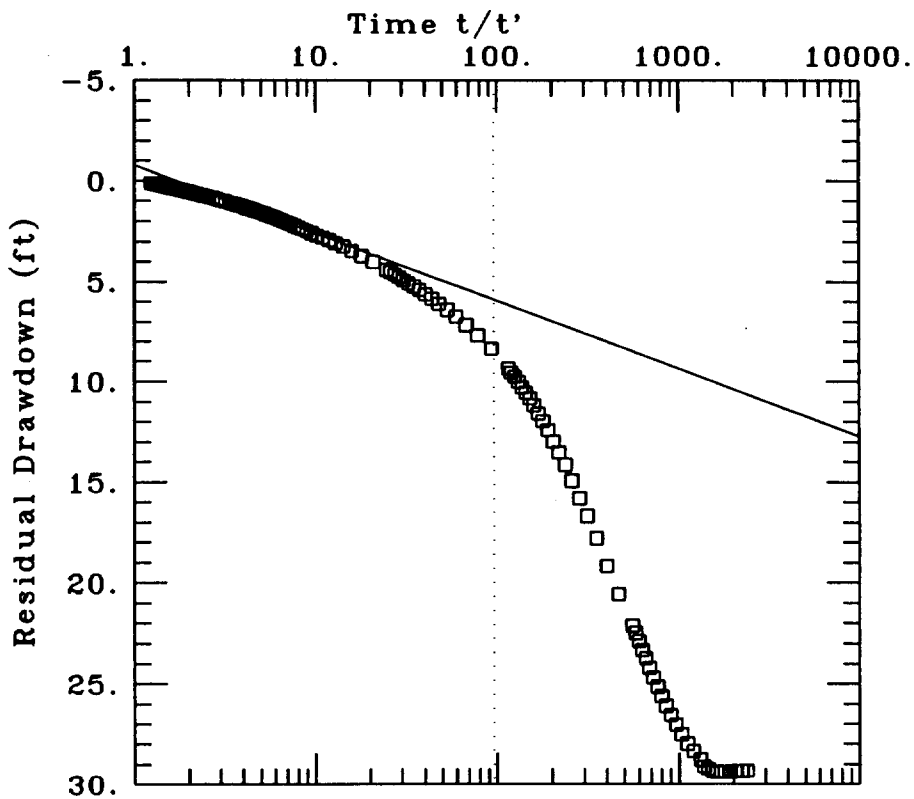
ESTIMATED PARAMETERS:
T = 0.8745 $ft^2$/min

TEST DATA:
Q = 2.579 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5B: RECOVERY METHOD




DATA SET:
5BR.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
11 November 1992

TEST WELL:
Well 5B

OBS. WELL:
Same

ESTIMATED PARAMETERS:
T = 0.1724 $ft^2$/min

TEST DATA:
Q = 3.181 $ft^3$/min

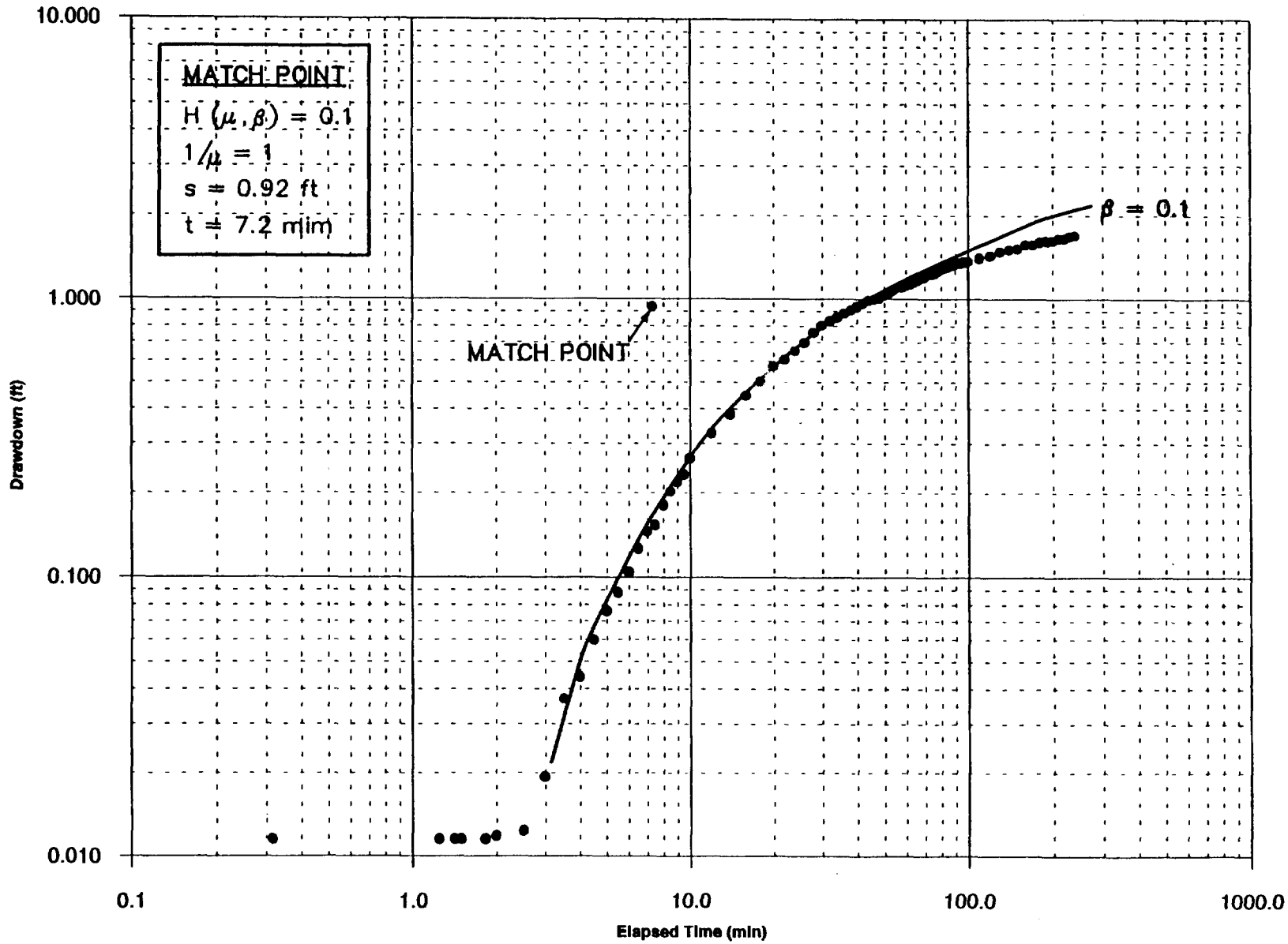
rc = 0.2083 ft
rw = 0.3441 ft

**MCAS EL TORO RI/FS PHASE I**
Project No.: **CTO #145**

**HANTUSH (WITH STORAGE)**

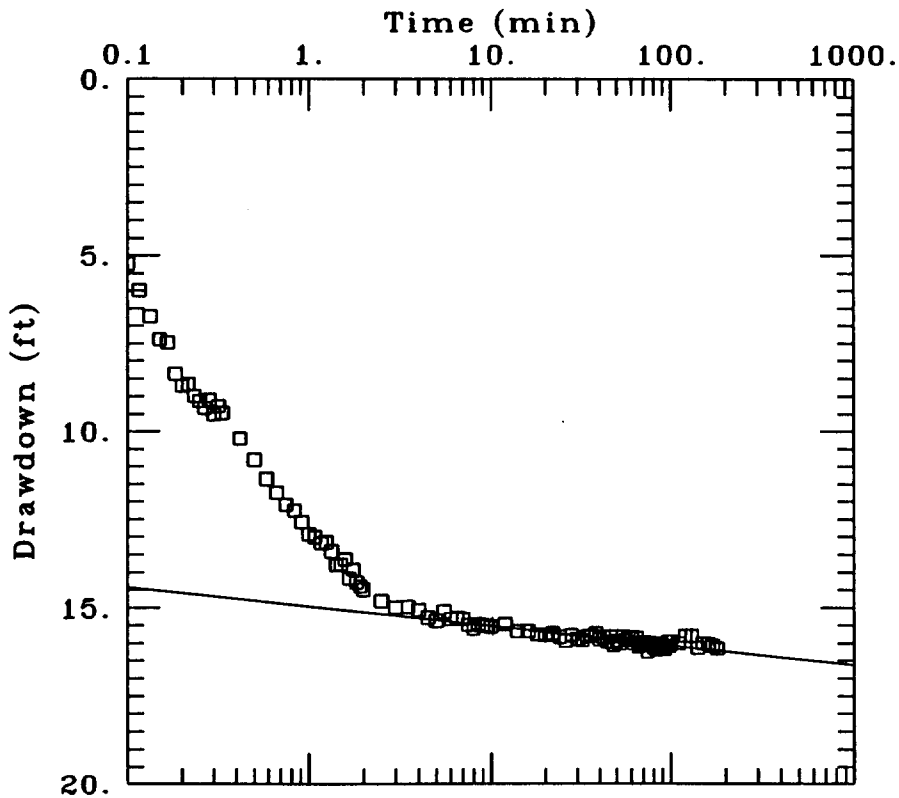
Client: **NAVY SOUTHWEST DIV**
Location: **MCAS EL TORO (SITE 1 8)**

Pumped Well: 5B  Observation Well: RW-2



| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5C: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL5C\5CP.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
10 November 1992

TEST WELL:
Well 5C

OBS. WELL:
Same

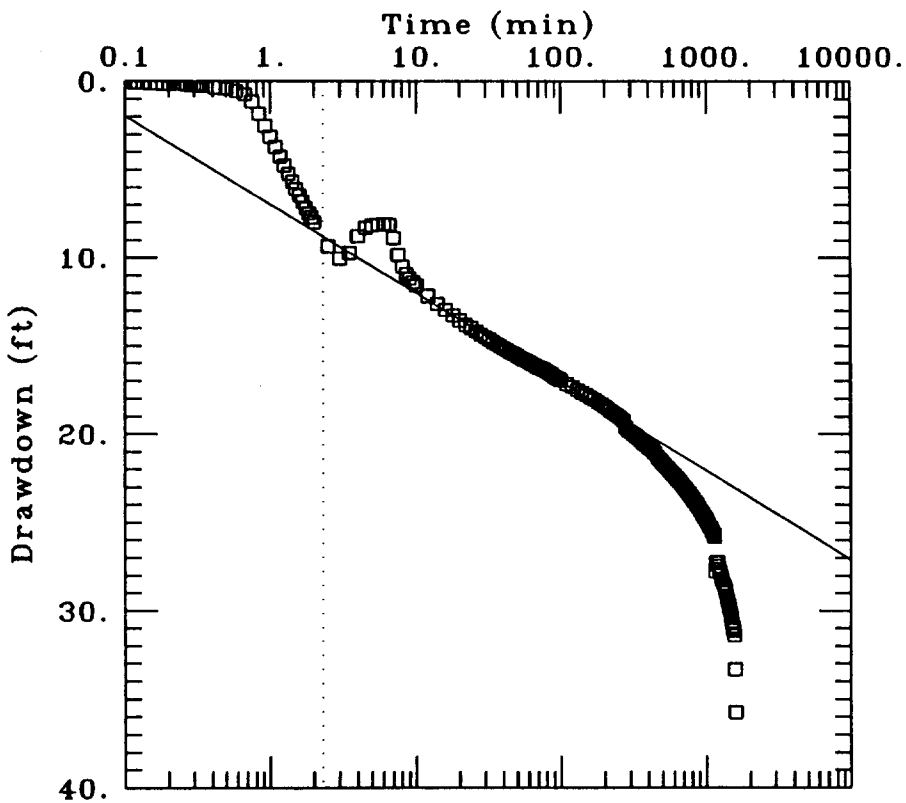
ESTIMATED PARAMETERS:
T = 0.8588 $ft^2$/min

TEST DATA:
Q = 2.579 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5D: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL5D\5DP.DAT
02/10/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
4 November 1992

TEST WELL:
Well 5D

OBS. WELL:
Same

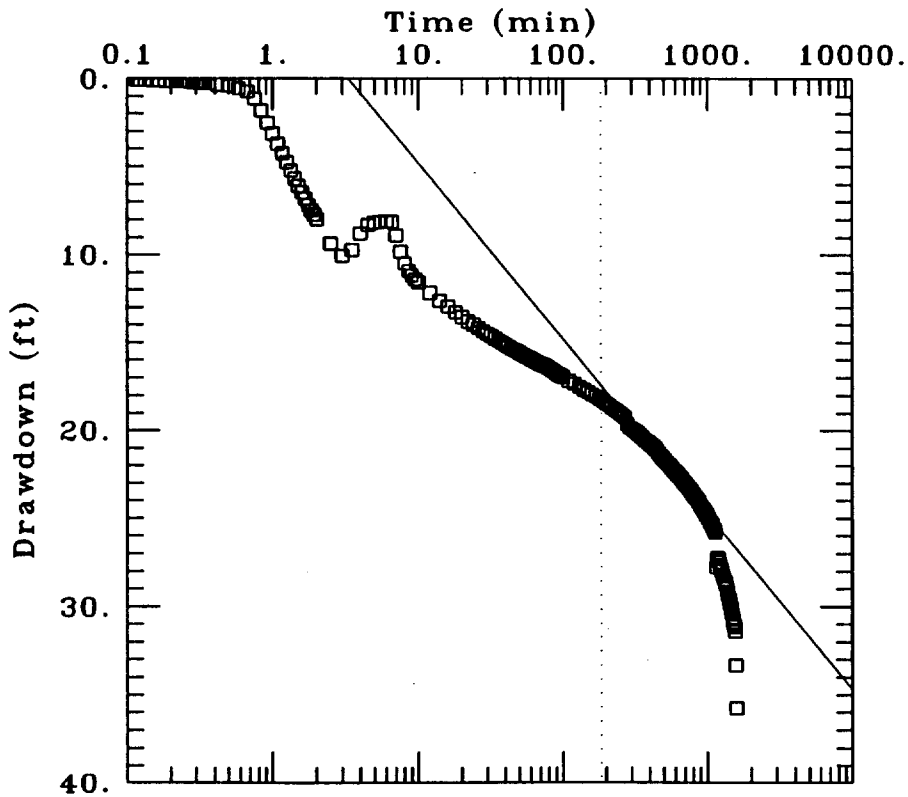
ESTIMATED PARAMETERS:
T = 0.09936 $ft^2$/min

TEST DATA:
Q = 2.726 $ft^3$/min

rc = 0.25 ft
rw = 0.363 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5D: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL5D\5DP.DAT
02/10/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
4 November 1992

TEST WELL:
Well 5D

OBS. WELL:
Same

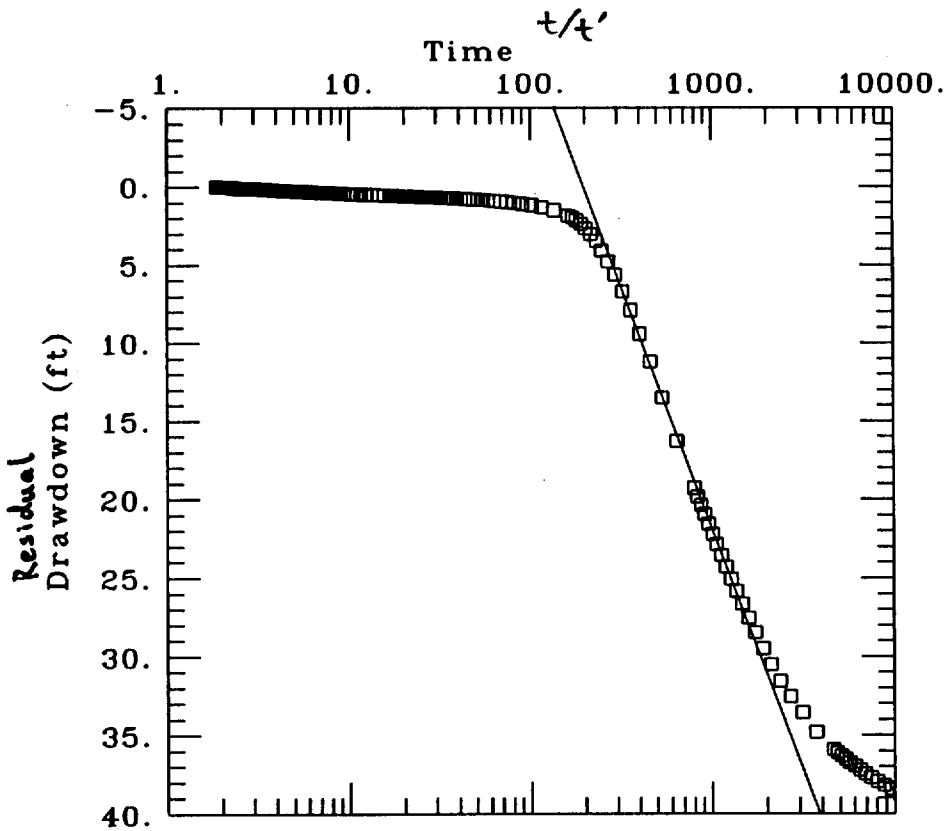
ESTIMATED PARAMETERS:
T = 0.05019 $ft^2$/min

TEST DATA:
Q = 2.726 $ft^3$/min

rc = 0.25 ft
rw = 0.363 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5D: RECOVERY METHOD




DATA SET:
c:\aqtest\well5d\5dr.dat
02/11/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
4 November 1992

TEST WELL:
Well 5D

OBS. WELL:
Same

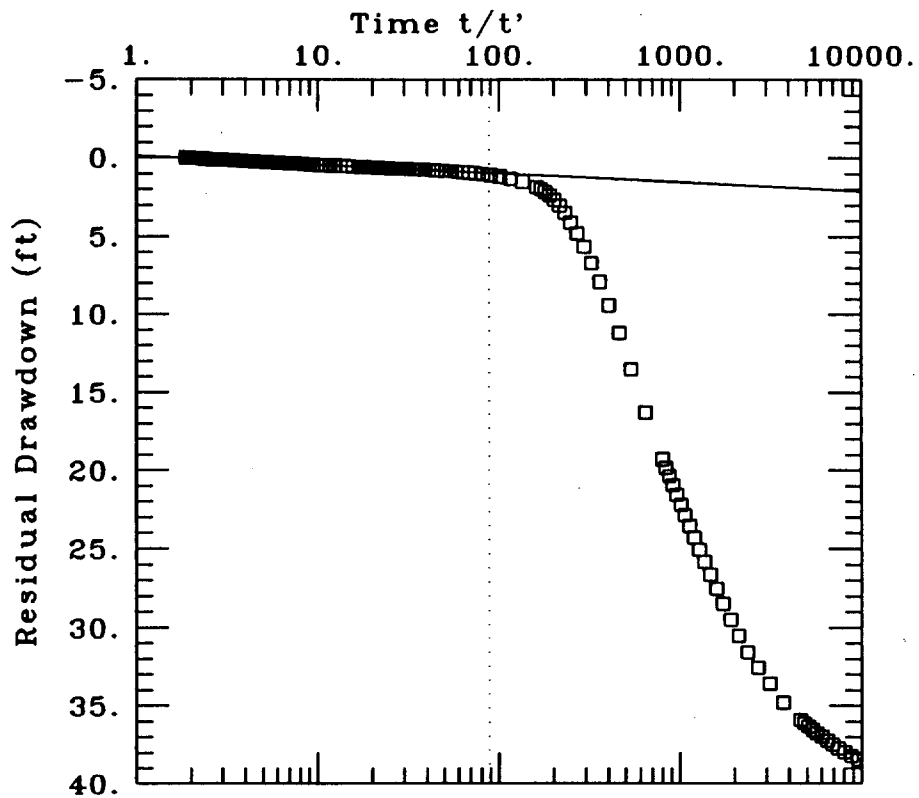
ESTIMATED PARAMETERS:
T = 0.01615 $ft^2$/min

TEST DATA:
Q = 2.726 $ft^3$/min

rc = 0.25 ft
rw = 0.363 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 5D: RECOVERY METHOD




DATA SET:
5DR.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
4 November 1992

TEST WELL:
Well 5D

OBS. WELL:
Same

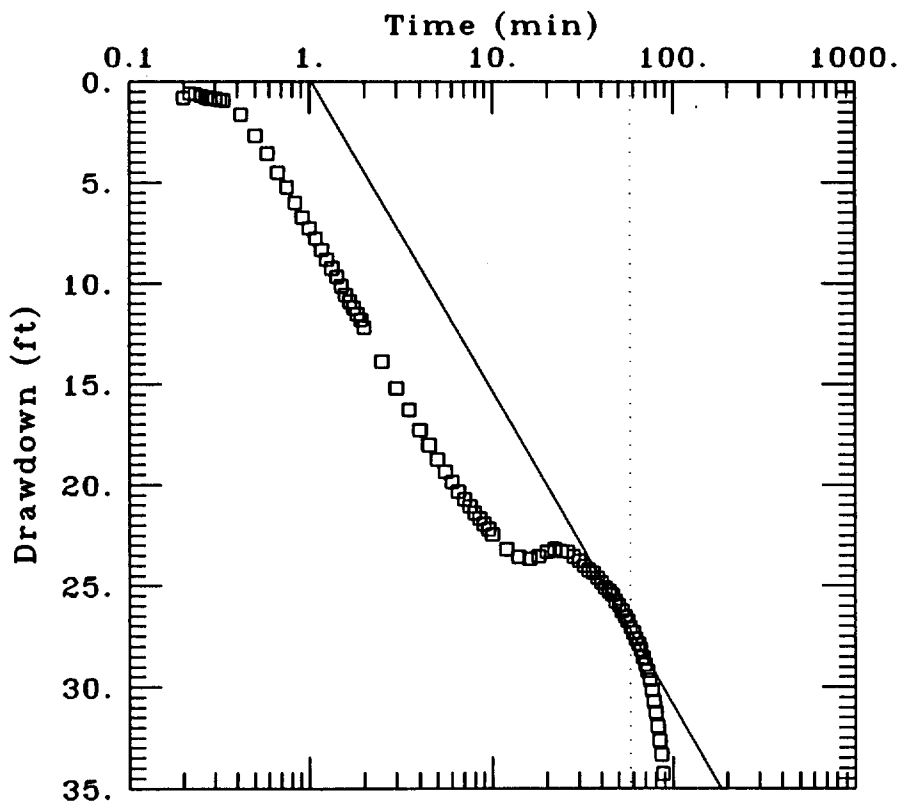
ESTIMATED PARAMETERS:
T = 0.9 $ft^2$/min

TEST DATA:
Q = 2.726 $ft^3$/min

rc = 0.25 ft
rw = 0.363 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAAS EL TORO (SITE 18) |

# WELL 5D: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well5d\s5dp.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
3 November 1992

TEST WELL:
Well 5D

OBS. WELL:
Same

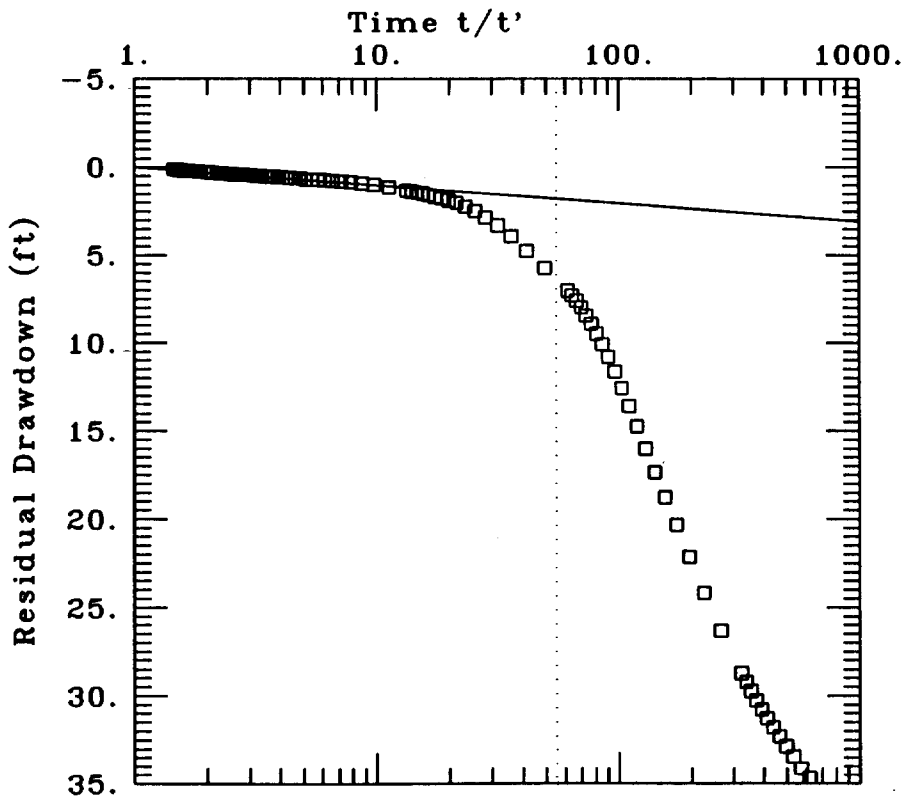
ESTIMATED PARAMETERS:
T = 0.05515 $ft^2$/min

TEST DATA:
Q = 4.678 $ft^3$/min

rc = 0.25 ft
rw = 0.363 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAAS EL TORO (SITE 18) |

# WELL 5D: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL5D\S5DR.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
3 November 1992

TEST WELL:
Well 5D

OBS. WELL:
Same

ESTIMATED PARAMETERS:
T = 0.8398 $ft^2$/min

TEST DATA:
Q = 4.678 $ft^3$/min

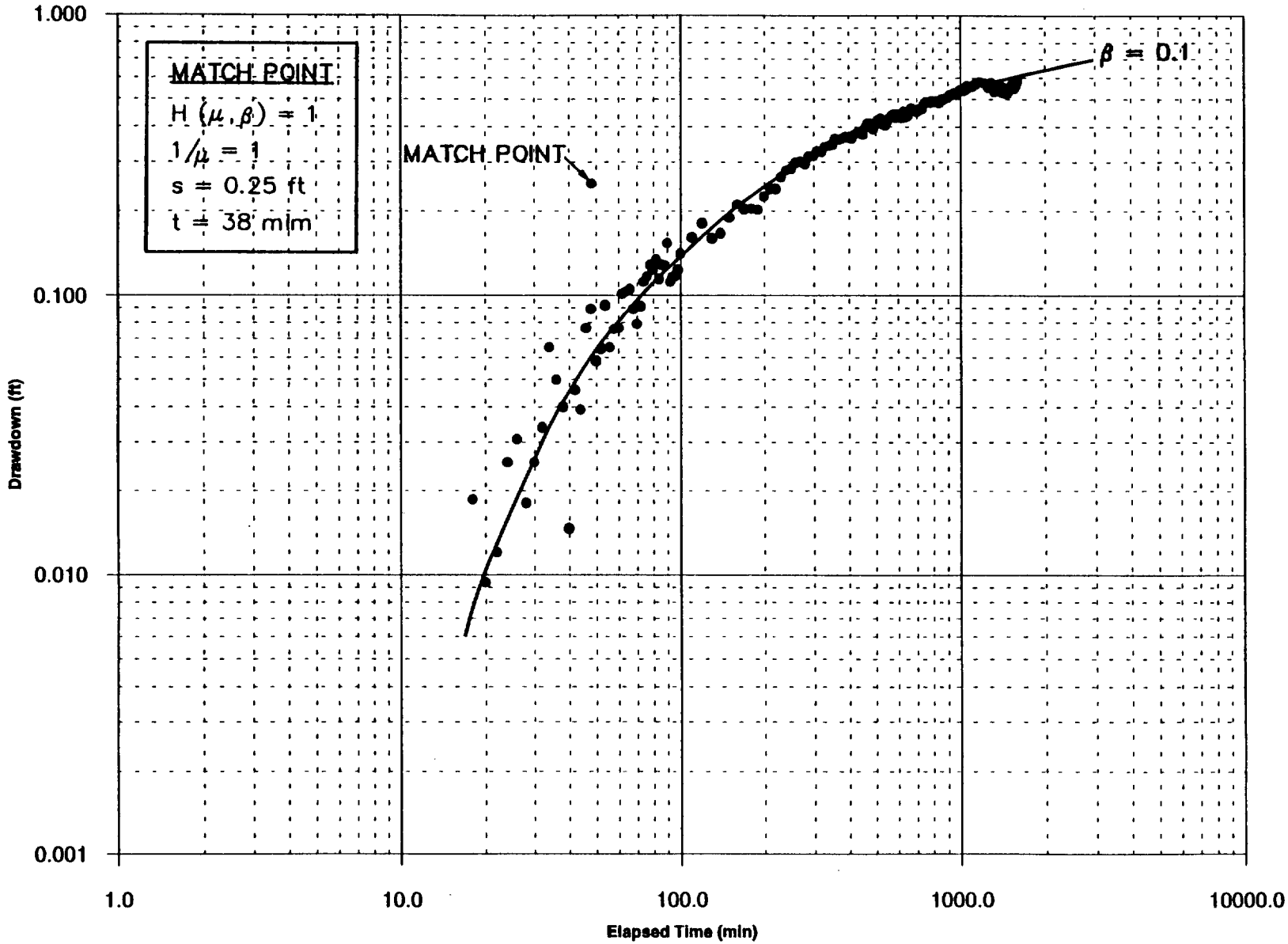
rc = 0.25 ft
rw = 0.363 ft

MCAS EL TORO RI/FS PHASE I
Project No.: CTO #145

Client: NAVY SOUTHWEST DIV
Location: MCAS EL TORO (SITE 18)

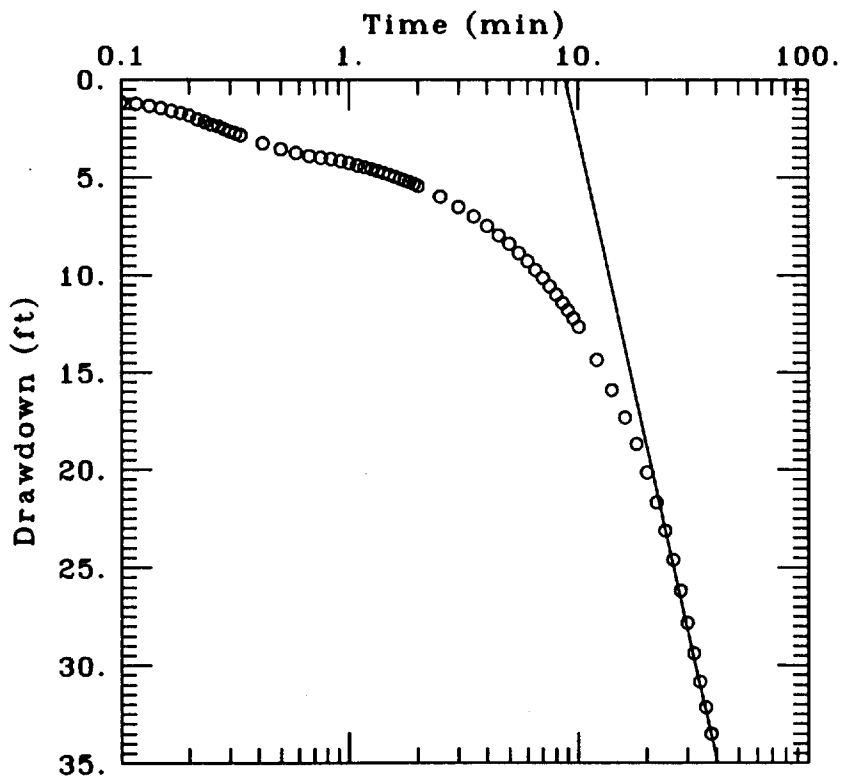
## HANTUSH (WITH STORAGE)

Pumped Well: 5D Observation Well: 5E



| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 12 (Test 1): COOPER-JACOB METHOD




DATA SET:
s12p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
6 November 1992

TEST WELL:
Well 12

OBS. WELL:
Same

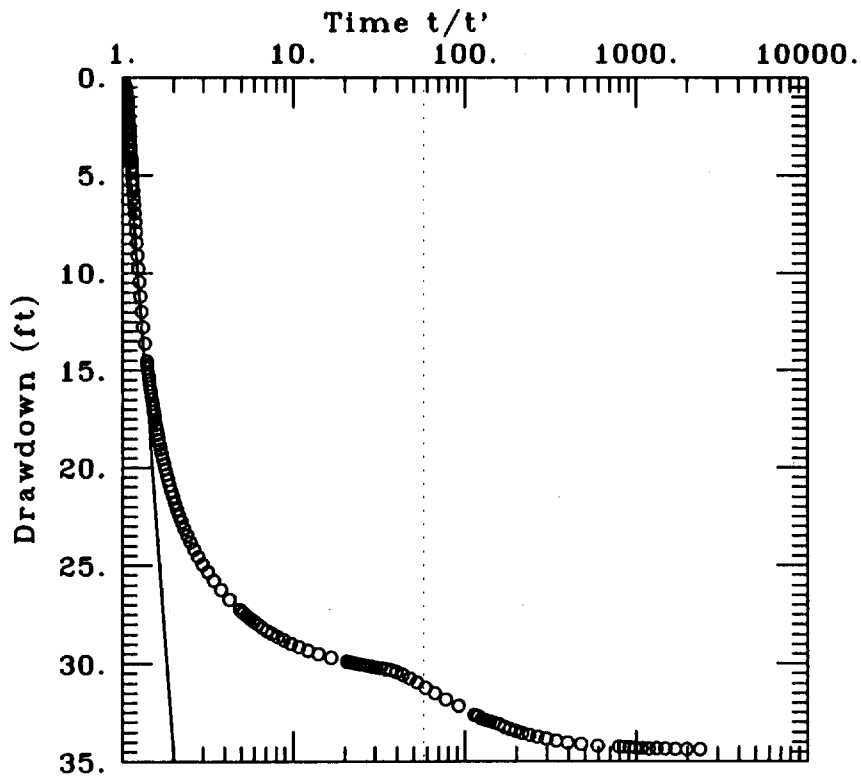
ESTIMATED PARAMETERS:
T = 0.0006514 $ft^2$/min

TEST DATA:
Q = 0.1872 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 12 (Test 1): RECOVERY




DATA SET:
s12R.dat
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
6 November 1992

TEST WELL:
Well 12

OBS. WELL:
Same

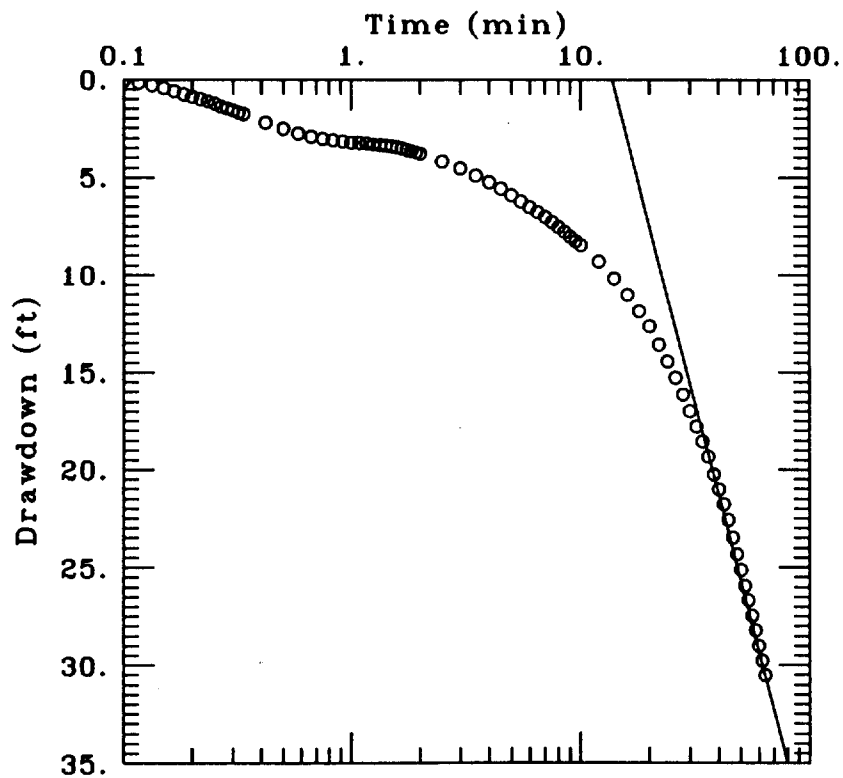
ESTIMATED PARAMETERS:
T = 0.000295 $ft^2$/min

TEST DATA:
Q = 0.1872 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 12 (Test 2): COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\long12p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
9 November 1992

TEST WELL:
Well 12

OBS. WELL:
Same

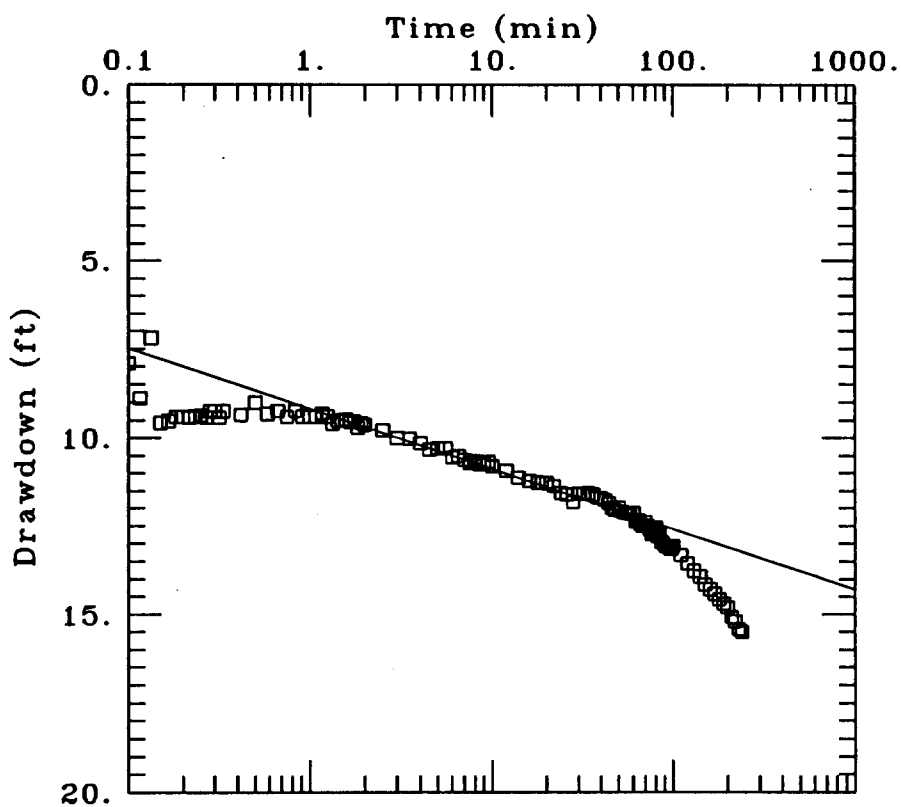
ESTIMATED PARAMETERS:
T = 0.0004456 $ft^2$/min

TEST DATA:
Q = 0.111 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 14: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well14\14p.dat
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
20 October 1992

TEST WELL:
Well 14

OBS. WELL:
Same

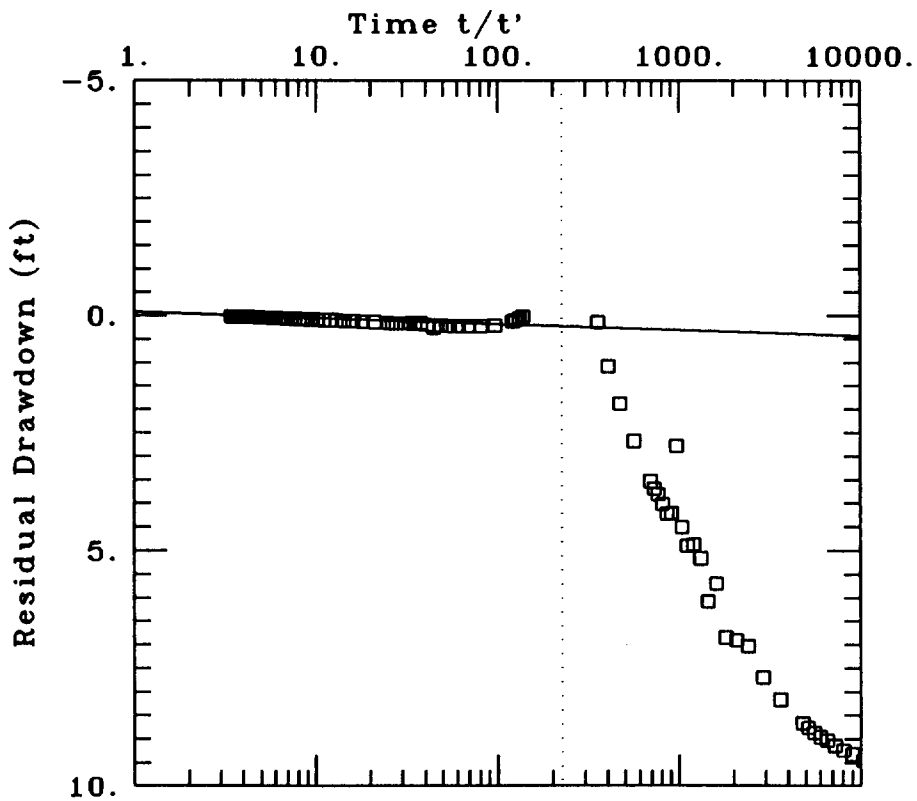
ESTIMATED PARAMETERS:
T = 0.1193 $ft^2$/min

TEST DATA:
Q = 1.109 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 14: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL14\14R.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
20 October 1992

TEST WELL:
Well 14

OBS. WELL:
Same

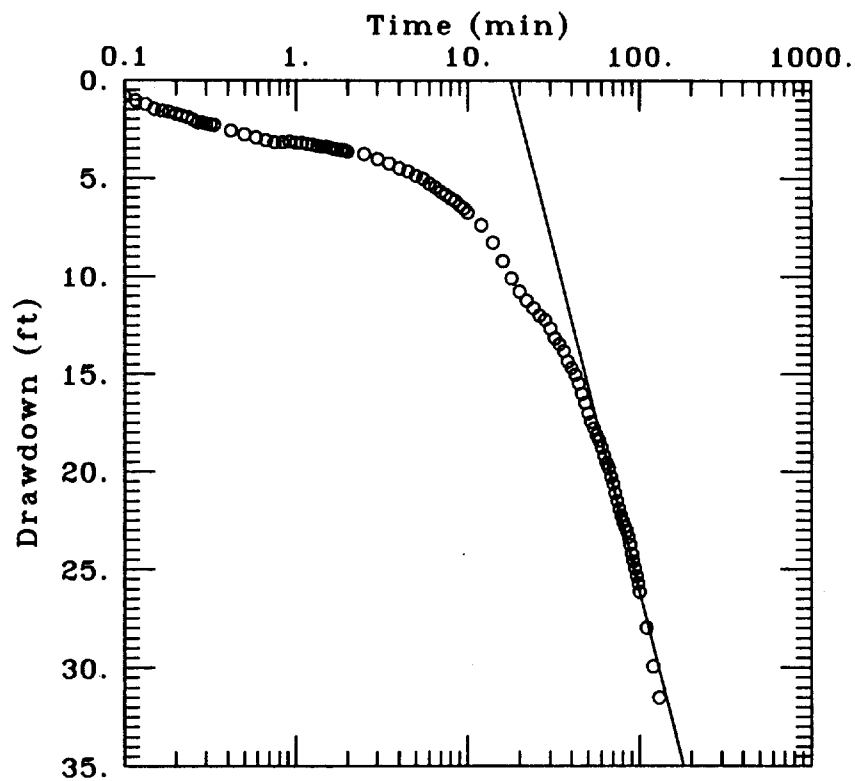
ESTIMATED PARAMETERS:
T = 1.581 $ft^2$/min

TEST DATA:
Q = 1.109 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 15: COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\15p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 October 1992

TEST WELL:
Well 15

OBS. WELL:
Same

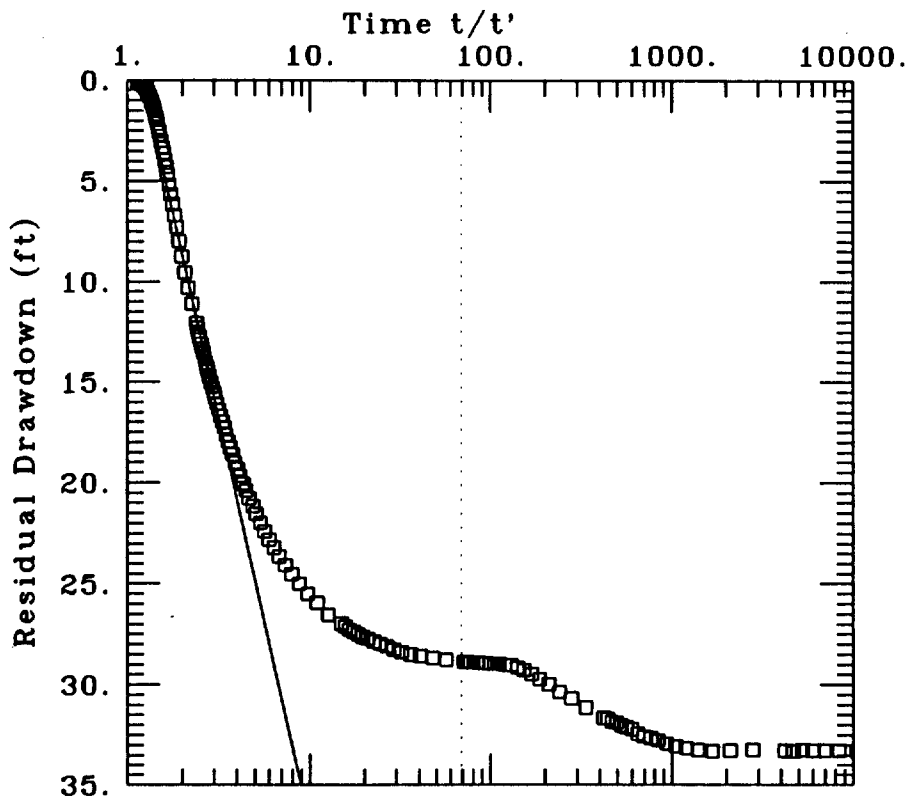
ESTIMATED PARAMETERS:
T = 0.0004938 $ft^2$/min

TEST DATA:
Q = 0.09358 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 15: RECOVERY METHOD




DATA SET:
c:\aqtest\well15\15r.dat
03/22/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 October 1992

TEST WELL:
Well 15

OBS. WELL:
Same

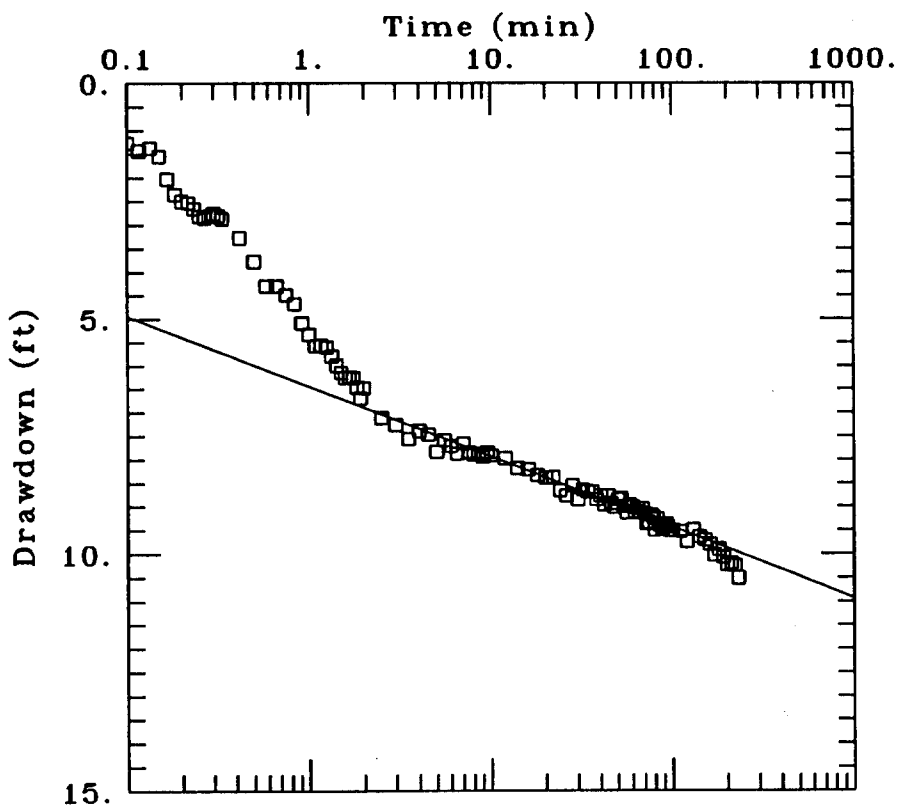
ESTIMATED PARAMETERS:
T = 0.0004224 $ft^2$/min

TEST DATA:
Q = 0.09358 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 16: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL16\16P.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
23 October 1992

TEST WELL:
Well 16

OBS. WELL:
Same

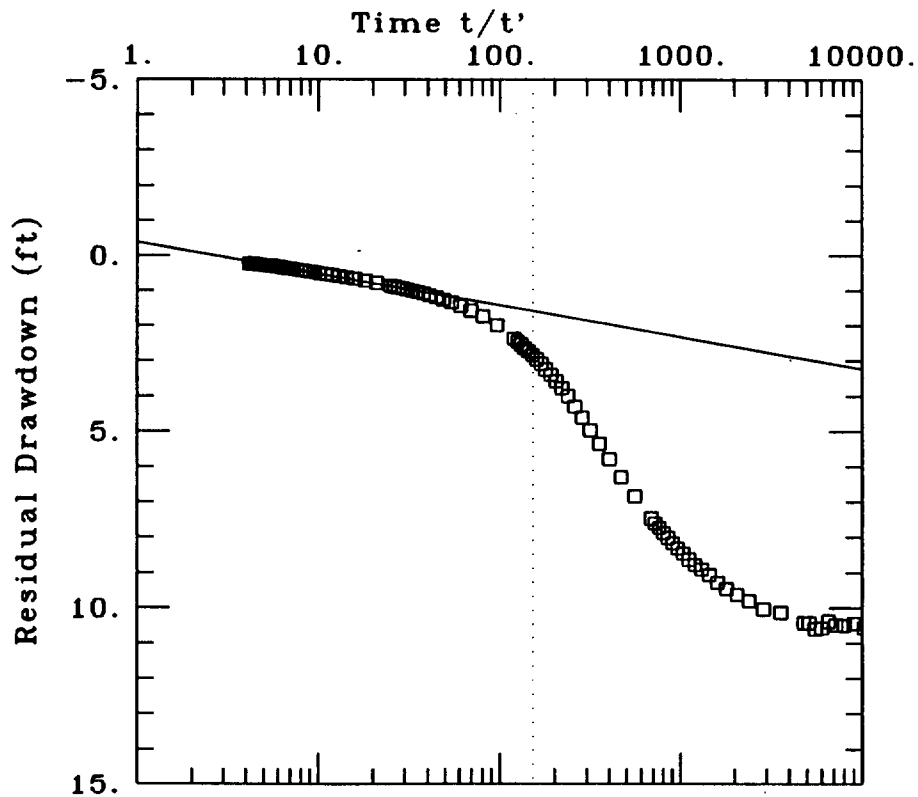
ESTIMATED PARAMETERS:
T = 0.2779 $ft^2$/min

TEST DATA:
Q = 2.272 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 16: RECOVERY METHOD




DATA SET:
16R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
23 October 1992

TEST WELL:
Well 16

OBS. WELL:
Same

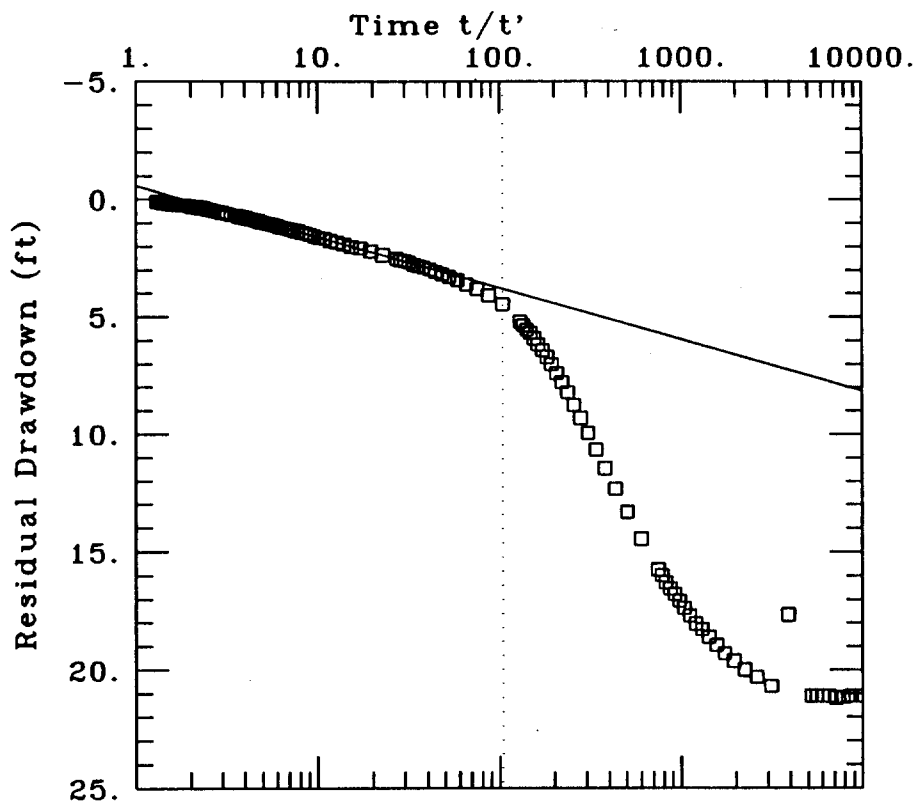
ESTIMATED PARAMETERS:
T = 0.4599 $ft^2$/min

TEST DATA:
Q = 2.272 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 17: RECOVERY METHOD




DATA SET:
17R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
22 October 1992

TEST WELL:
Well 17

OBS. WELL:
Same

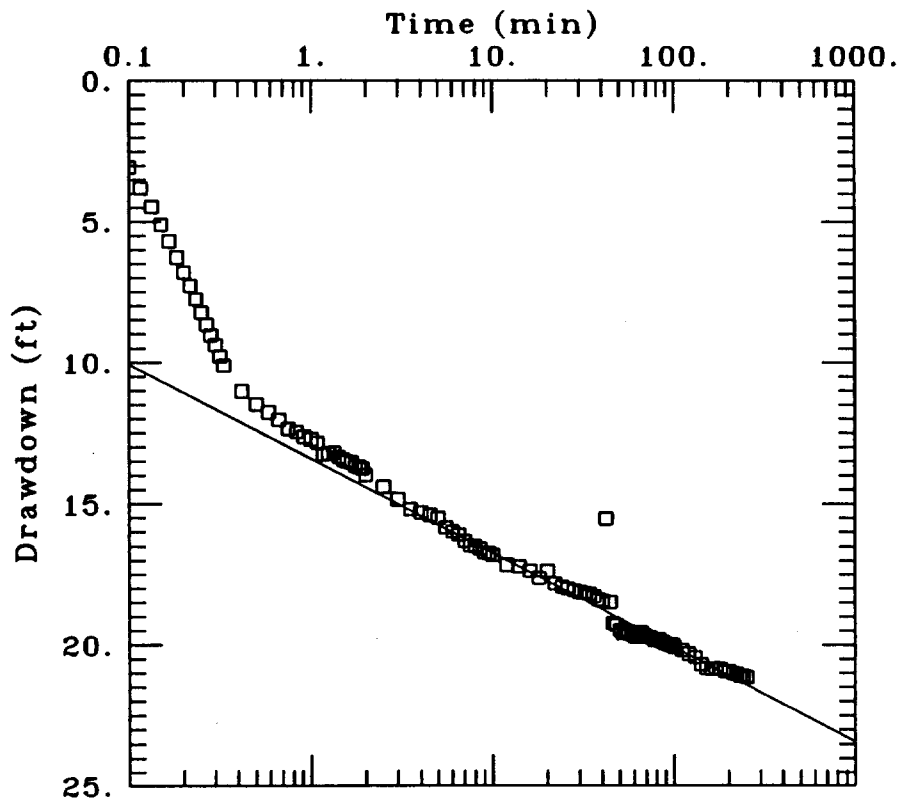
ESTIMATED PARAMETERS:
T = 0.2021 $ft^2$/min

TEST DATA:
Q = 2.406 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 17: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL17\17P.DAT
02/08/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
22 October 1992

TEST WELL:
Well 17

OBS. WELL:
Same

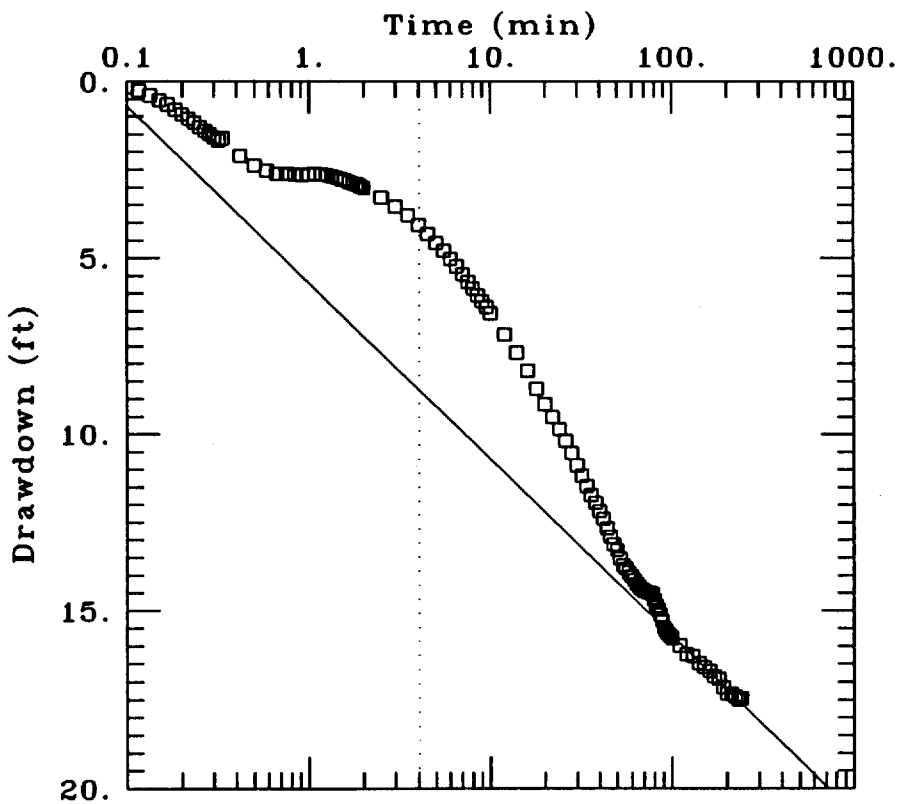
ESTIMATED PARAMETERS:
T = 0.132 $ft^2$/min

TEST DATA:
Q = 2.406 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAAS EL TORO (SITE 18) |

# WELL 18: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL18\18P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
9 November 1992

TEST WELL:
Well 18

OBS. WELL:
Same

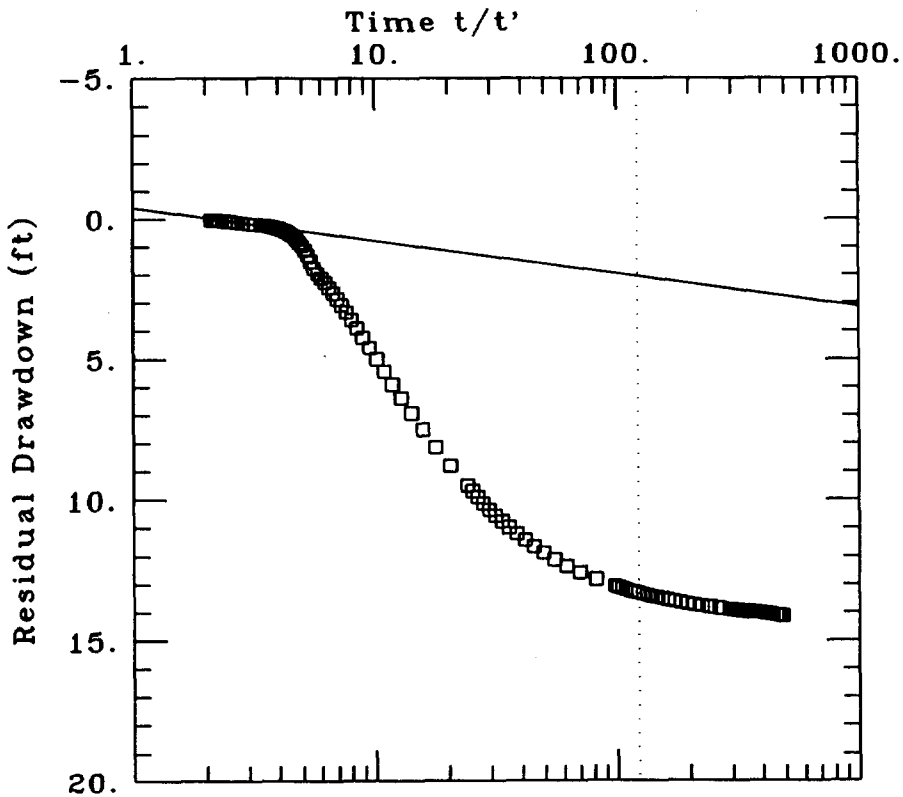
ESTIMATED PARAMETERS:
T = 0.00774 $ft^2$/min

TEST DATA:
Q = 0.2112 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 18: RECOVERY METHOD




DATA SET:
18R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
9 November 1992

TEST WELL:
Well 18

OBS. WELL:
Same

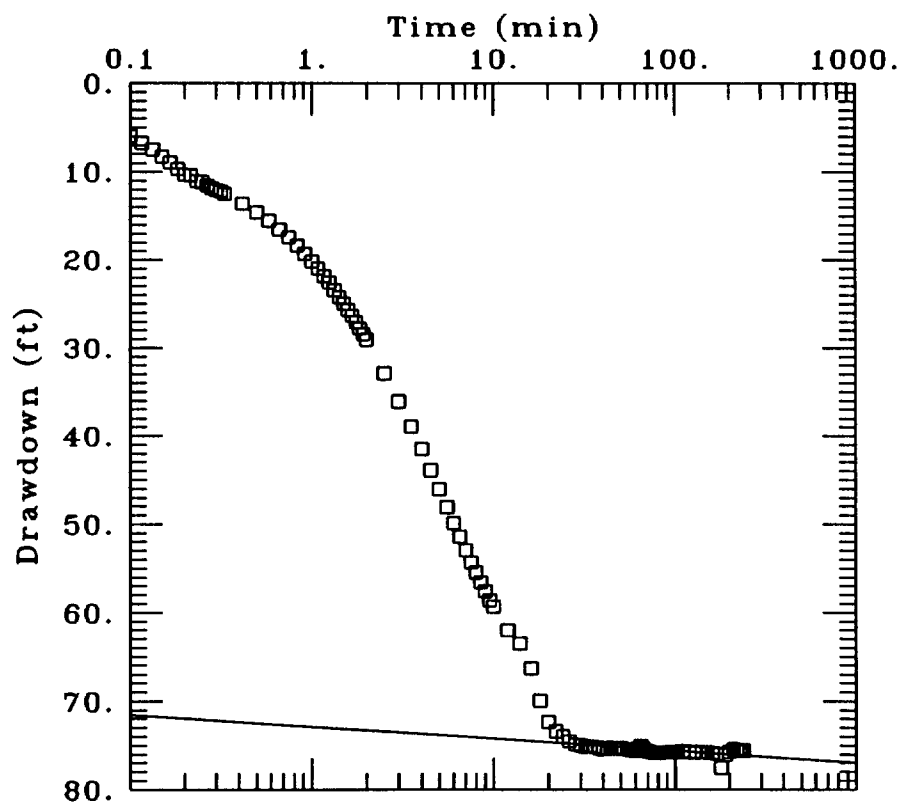
ESTIMATED PARAMETERS:
T = 0.0329 $ft^2$/min

TEST DATA:
Q = 0.2112 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 19C: COOPER-JACOB METHOD




DATA SET:
19CP.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 September 1992

TEST WELL:
Well 19C

OBS. WELL:
Same

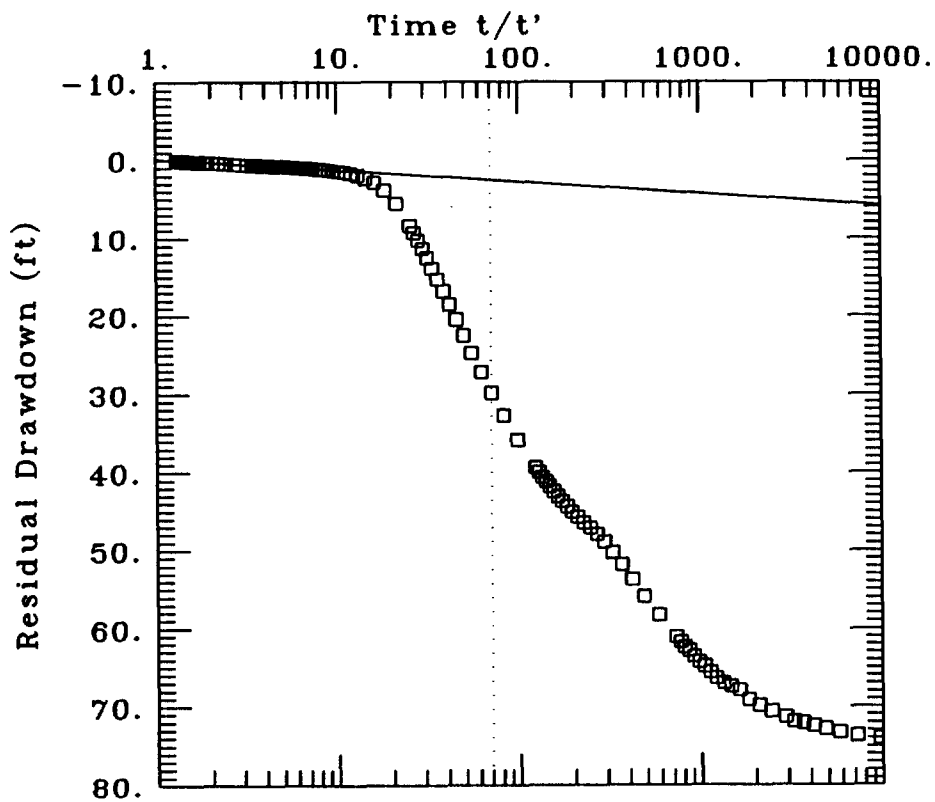
ESTIMATED PARAMETERS:
T = 0.1904 $ft^2$/min

TEST DATA:
Q = 1.417 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 19C: RECOVERY METHOD




DATA SET:
19cr.dat
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 September 1992

TEST WELL:
Well 19C

OBS. WELL:
Same

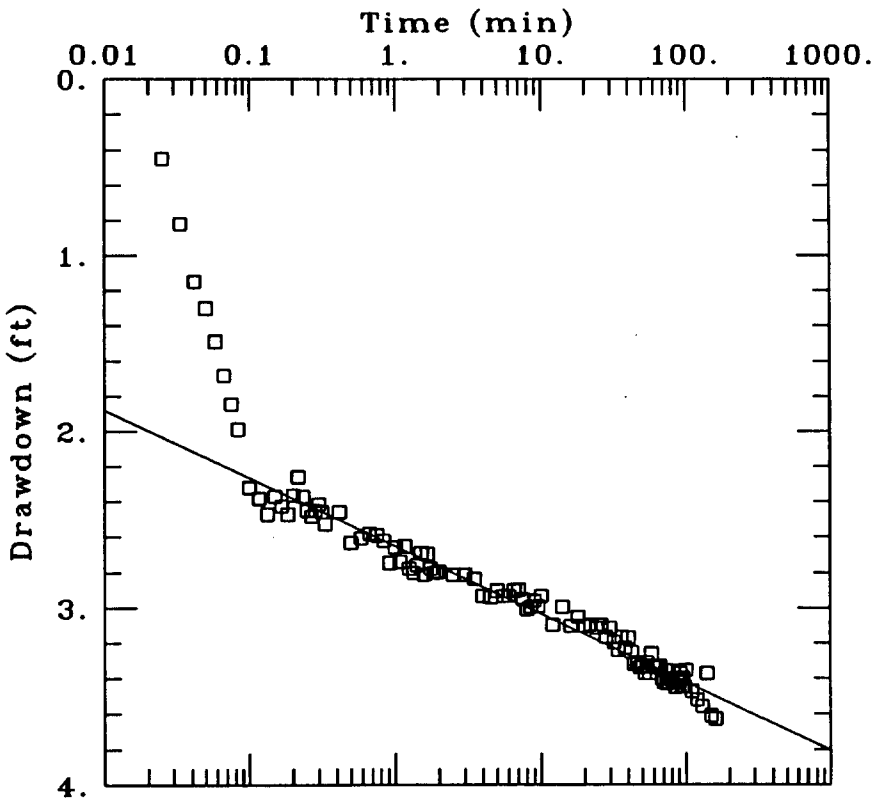
ESTIMATED PARAMETERS:
T = 0.1743 $ft^2$/min

TEST DATA:
Q = 1.417 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 19D: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well19d\19dp.dat
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
25 September 1992

TEST WELL:
Well 19D

OBS. WELL:
Same

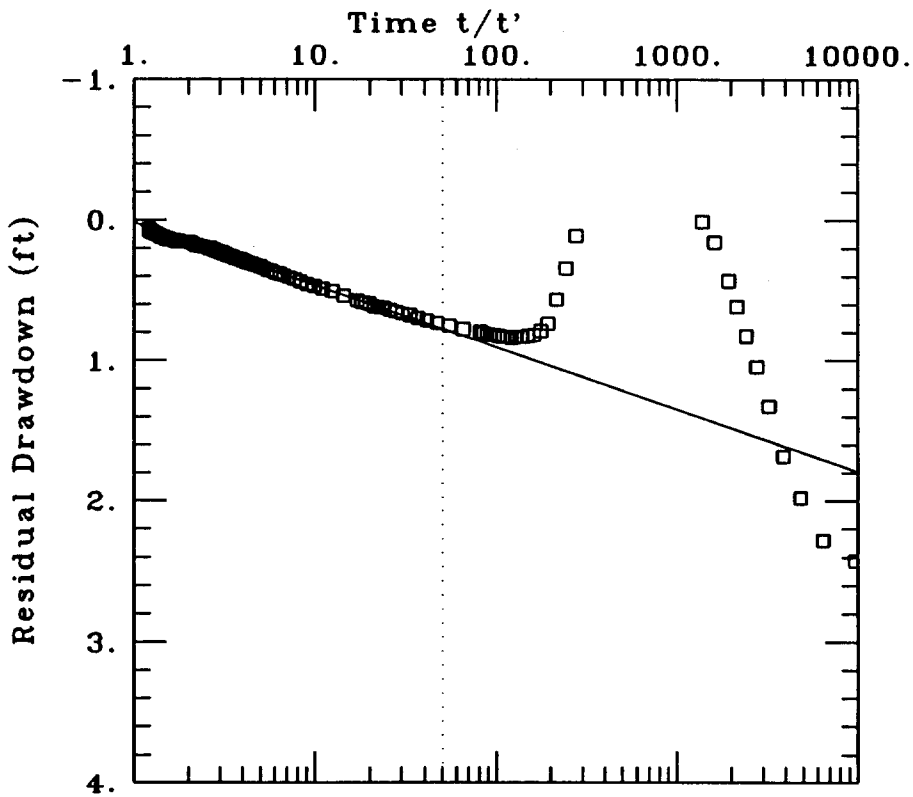
ESTIMATED PARAMETERS:
$T = 2.418\ ft^2/min$

TEST DATA:
$Q = 5.079\ ft^3/min$

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 19D: RECOVERY METHOD




DATA SET:
19DR.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
25 September 1992

TEST WELL:
Well 19D

OBS. WELL:
Same

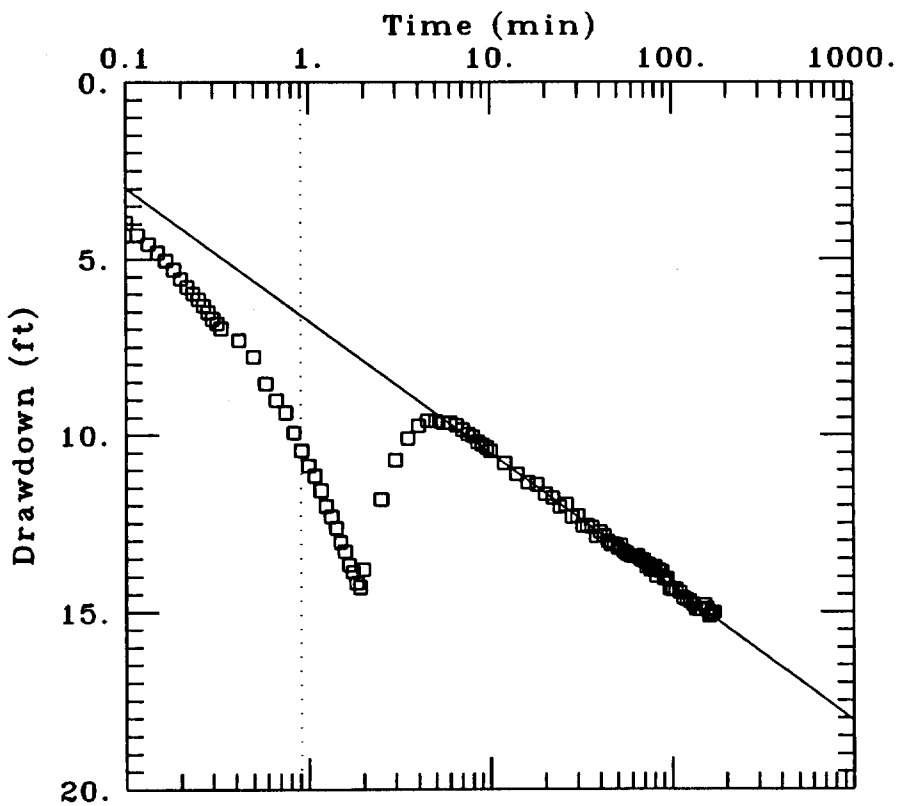
ESTIMATED PARAMETERS:
T = 2.104 $ft^2$/min

TEST DATA:
Q = 5.079 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAAS EL TORO (SITE 18) |

# WELL 22: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL22\22P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 August 1992

TEST WELL:
Well 22

OBS. WELL:
Same

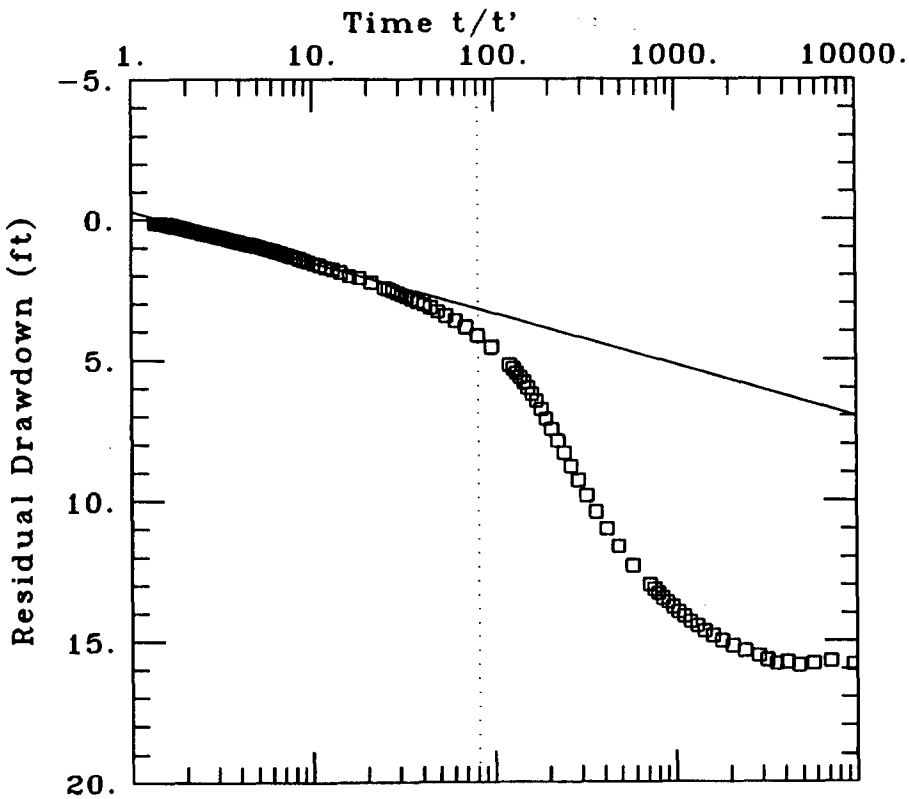
ESTIMATED PARAMETERS:
T = 0.07798 $ft^2$/min

TEST DATA:
Q = 1.604 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 22: RECOVERY METHOD




DATA SET:
22R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 August 1992

TEST WELL:
Well 22

OBS. WELL:
Same

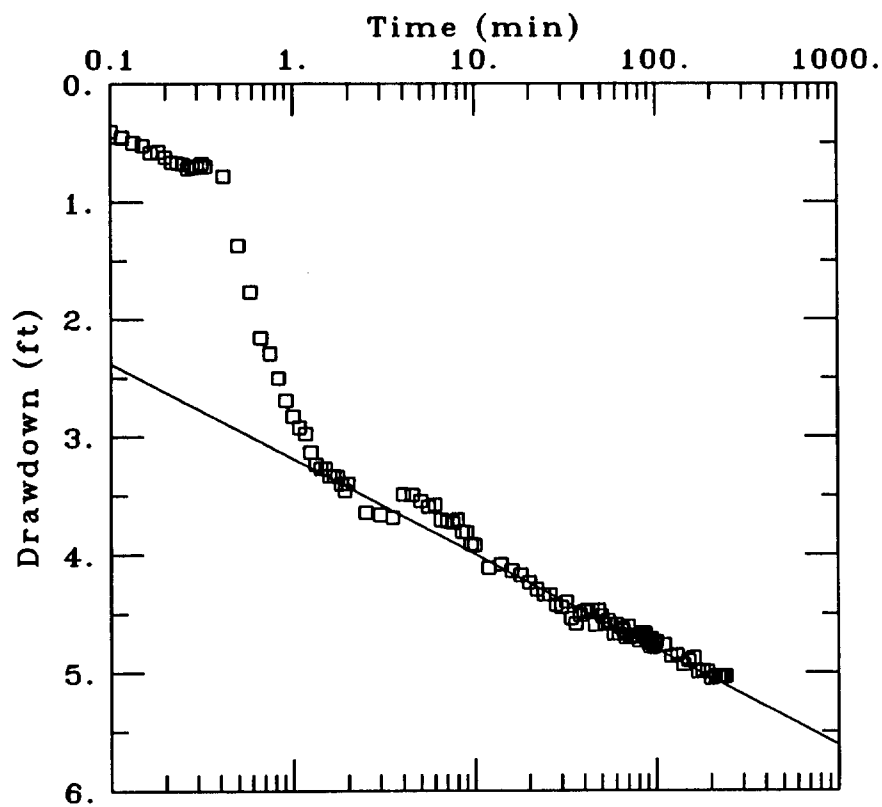
ESTIMATED PARAMETERS:
T = 0.161 $ft^2$/min

TEST DATA:
Q = 1.604 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 26: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL26\26P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 26

OBS. WELL:
Same

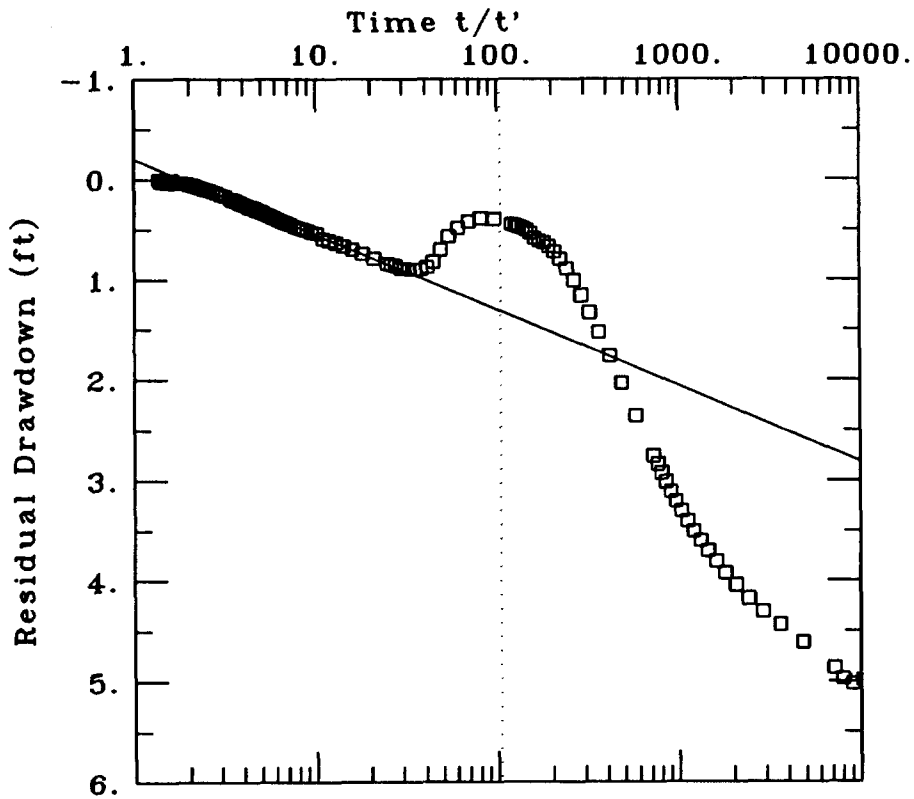
ESTIMATED PARAMETERS:
T = 0.2728 $ft^2$/min

TEST DATA:
Q = 1.203 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 26: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL26\26R.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 September 1992

TEST WELL:
Well 26

OBS. WELL:
Same

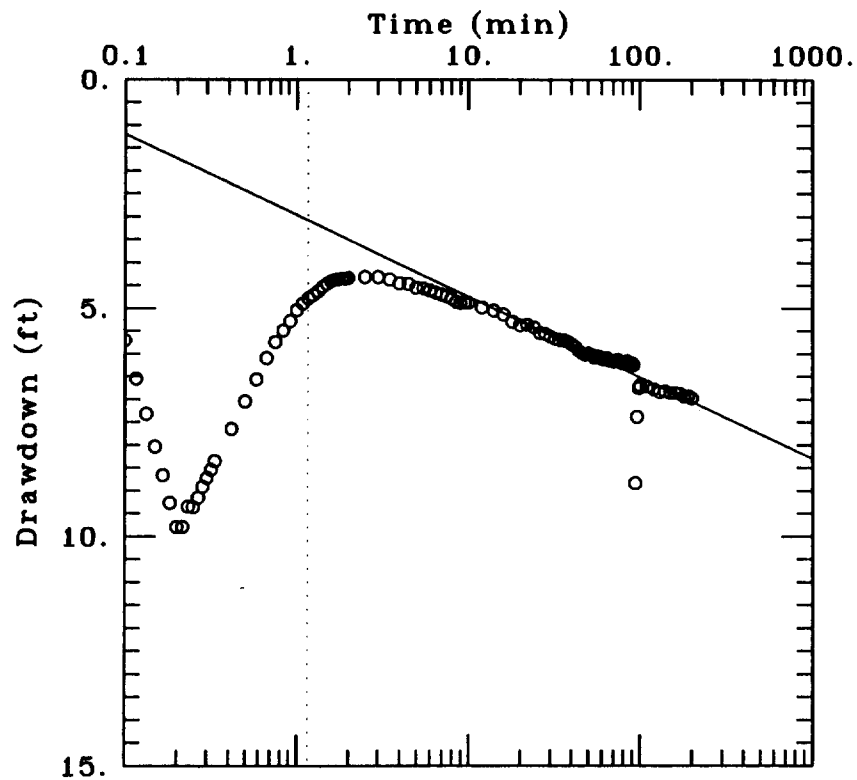
ESTIMATED PARAMETERS:
T = 0.2926 $ft^2$/min

TEST DATA:
Q = 1.203 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 31: COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\31p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
8 October 1992

TEST WELL:
Well 31

OBS. WELL:
Same

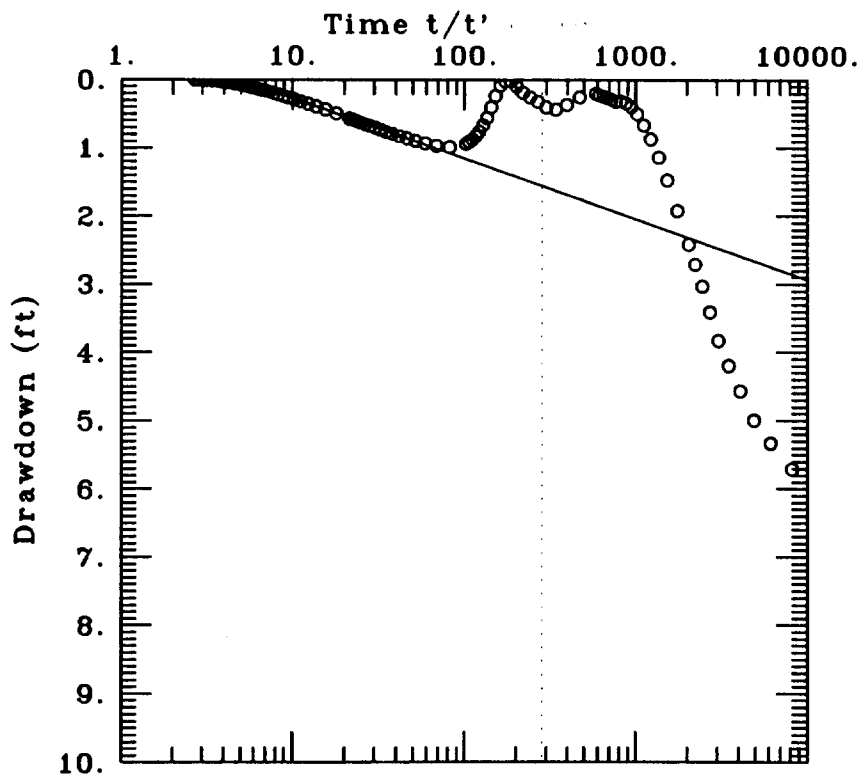
ESTIMATED PARAMETERS:
T = 0.1189 $ft^2$/min

TEST DATA:
Q = 1.15 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 15) |

# WELL 31: RECOVERY METHOD




DATA SET:
I:\31981\GRND\PT\31R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
8 October 1992

TEST WELL:
Well 31

OBS. WELL:
Same

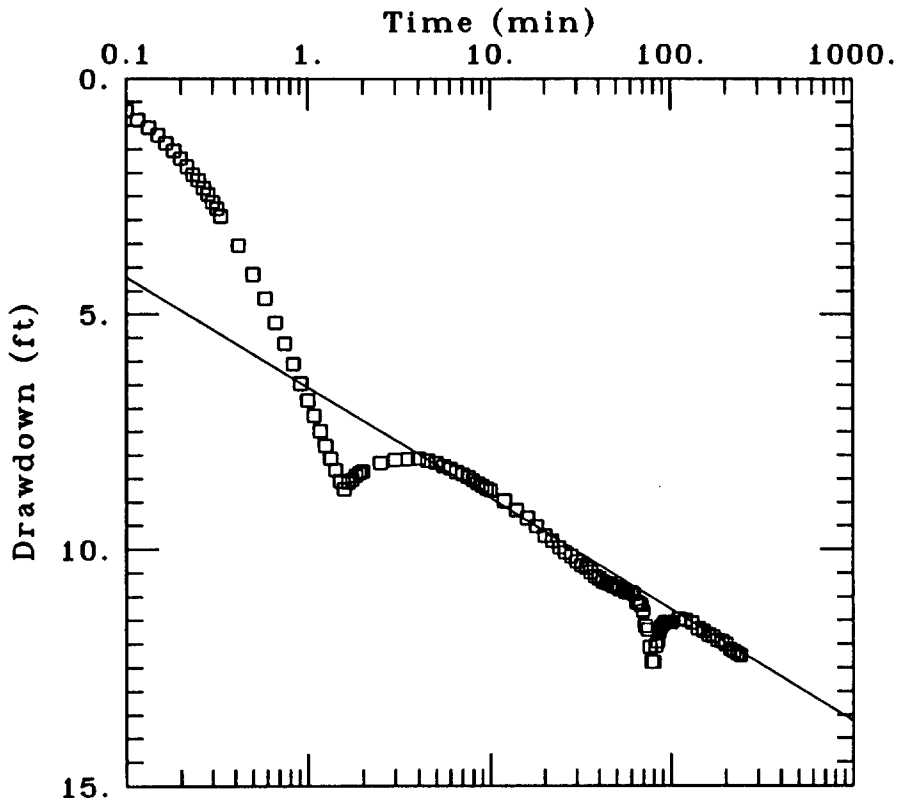
ESTIMATED PARAMETERS:
T = 0.2371 $ft^2$/min

TEST DATA:
Q = 1.15 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 39: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\well39\39p.dat
03/22/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
9 October 1992

TEST WELL:
Well 39

OBS. WELL:
Same

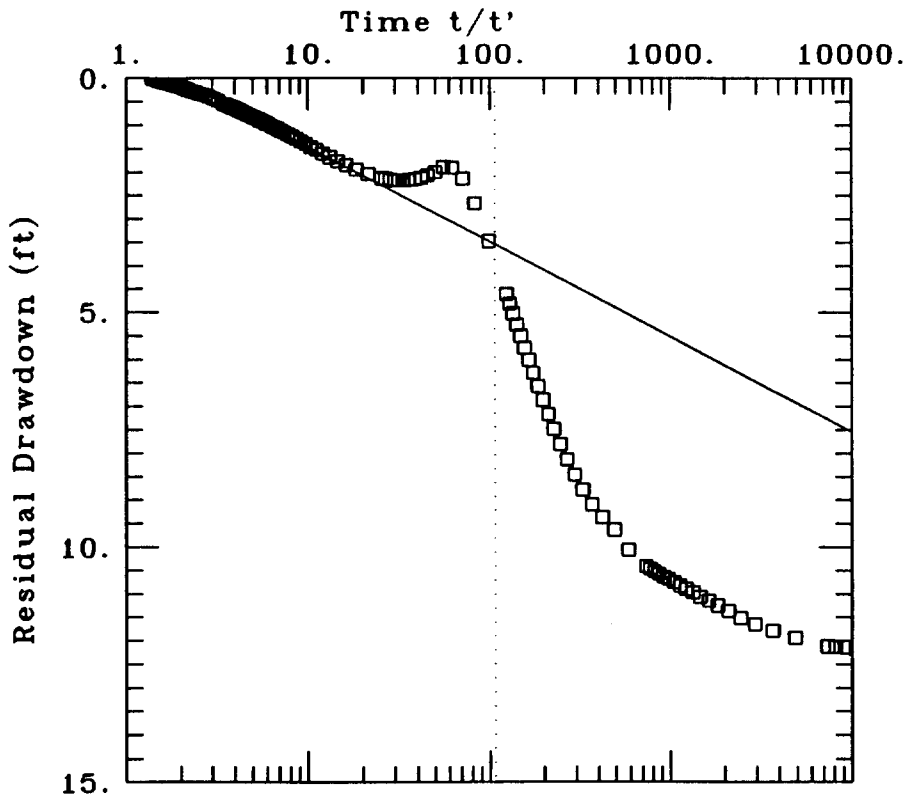
ESTIMATED PARAMETERS:
T = 0.03853 $ft^2$/min

TEST DATA:
Q = 0.4945 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 39: RECOVERY METHOD




DATA SET:
c:\aqtest\well39\39r.dat
02/15/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
9 October 1992

TEST WELL:
Well 39

OBS. WELL:
Same

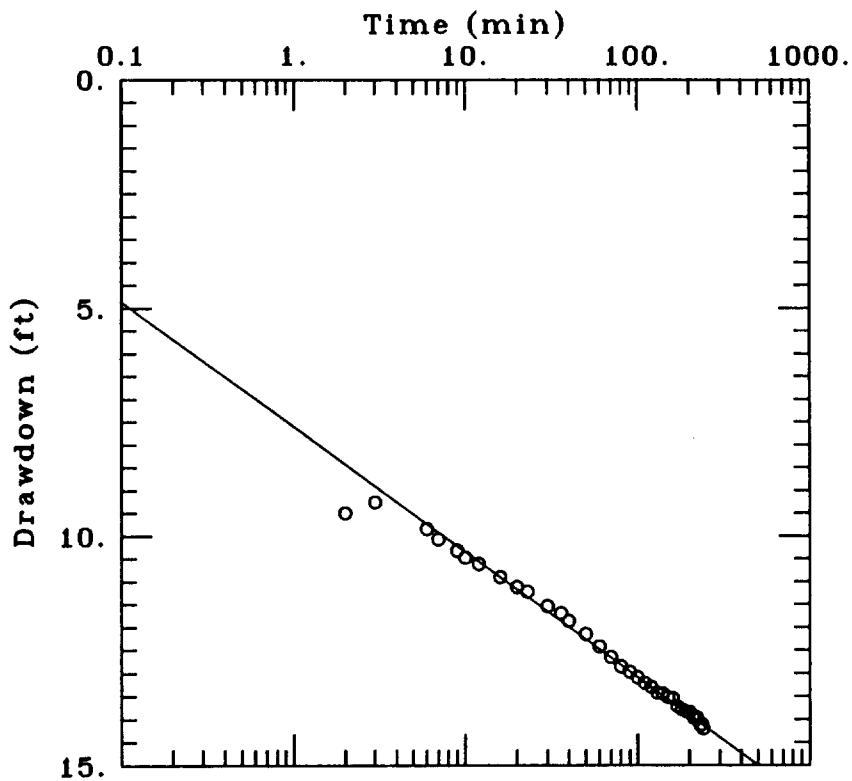
ESTIMATED PARAMETERS:
T = 0.04468 $ft^2$/min

TEST DATA:
Q = 0.4945 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 47: COOPER-JACOB METHOD




DATA SET:
I:\31981\grnd\pt\47p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
29 September 1992

TEST WELL:
Well 47

OBS. WELL:
Same

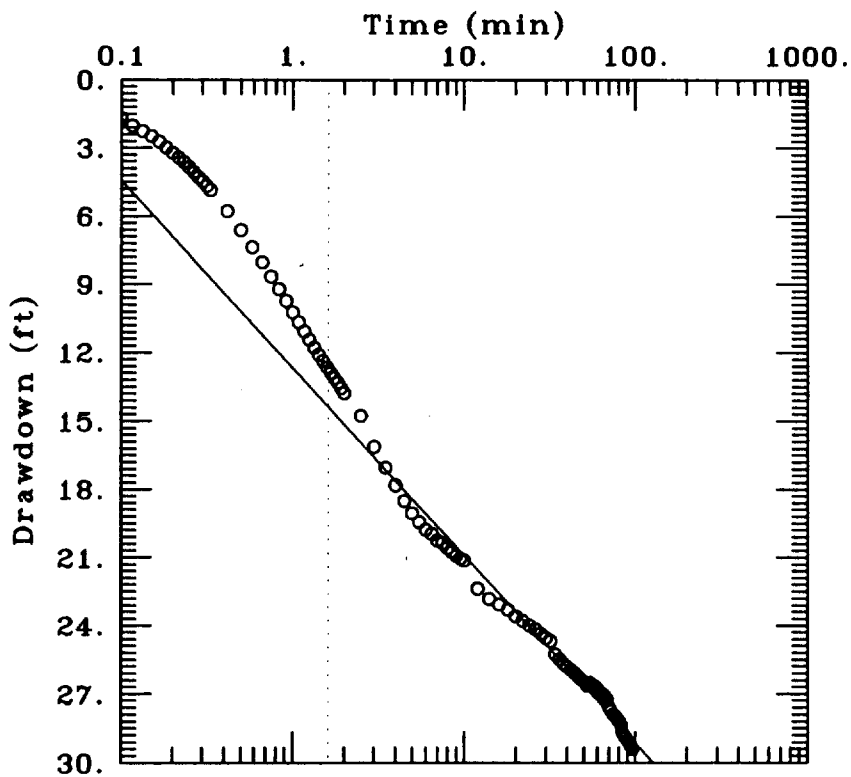
ESTIMATED PARAMETERS:
T = 0.1787 $ft^2$/min

TEST DATA:
Q = 2.674 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 21) |

# WELL 56: COOPER-JACOB METHOD




DATA SET:
56p.dat
02/18/93

AQUIFER TYPE:
Confined
SOLUTION METHOD:
Cooper-Jacob
TEST DATE:
18 November 1992
TEST WELL:
Well 56
OBS. WELL:
Same

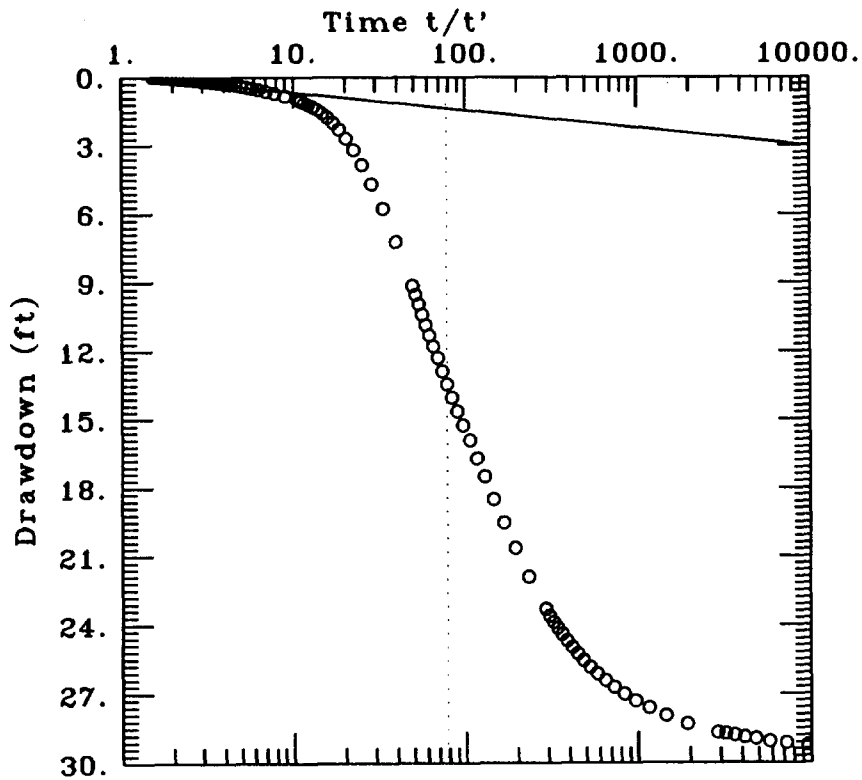
ESTIMATED PARAMETERS:
T = 0.04766 $ft^2$/min

TEST DATA:
Q = 2.139 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 21) |

# WELL 56: RECOVERY METHOD




DATA SET:
I:\31981\GRND\PT\56R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
18 November 1992

TEST WELL:
Well 56

OBS. WELL:
Same

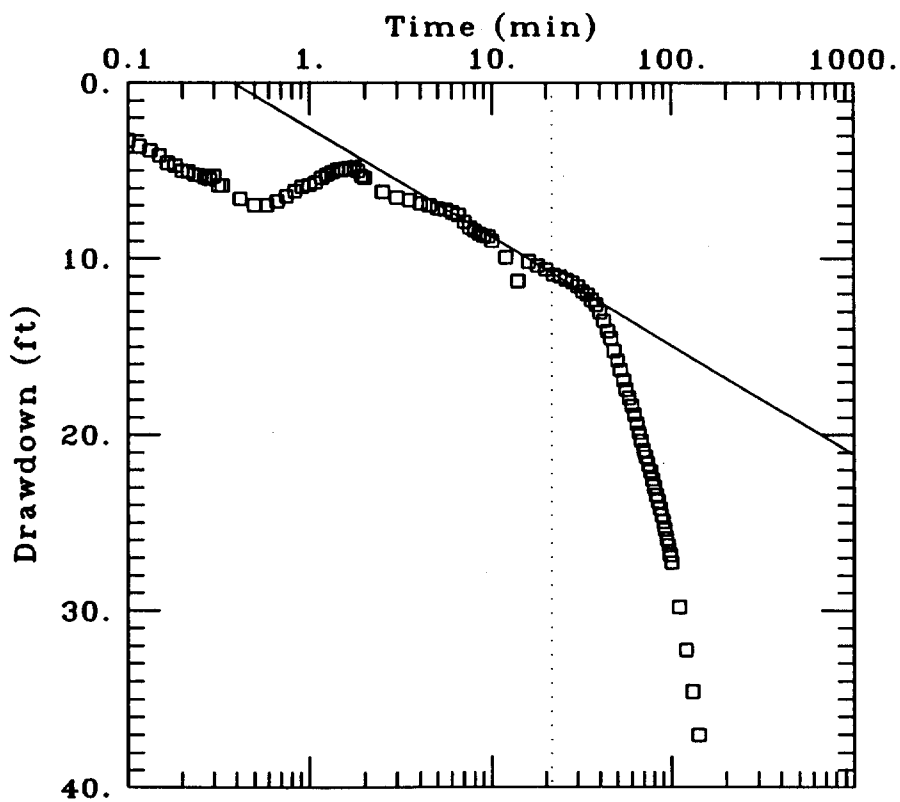
ESTIMATED PARAMETERS:
T = 0.5029 $ft^2$/min

TEST DATA:
Q = 2.139 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 63: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL63\63P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 November 1992

TEST WELL:
Well 63

OBS. WELL:
Same

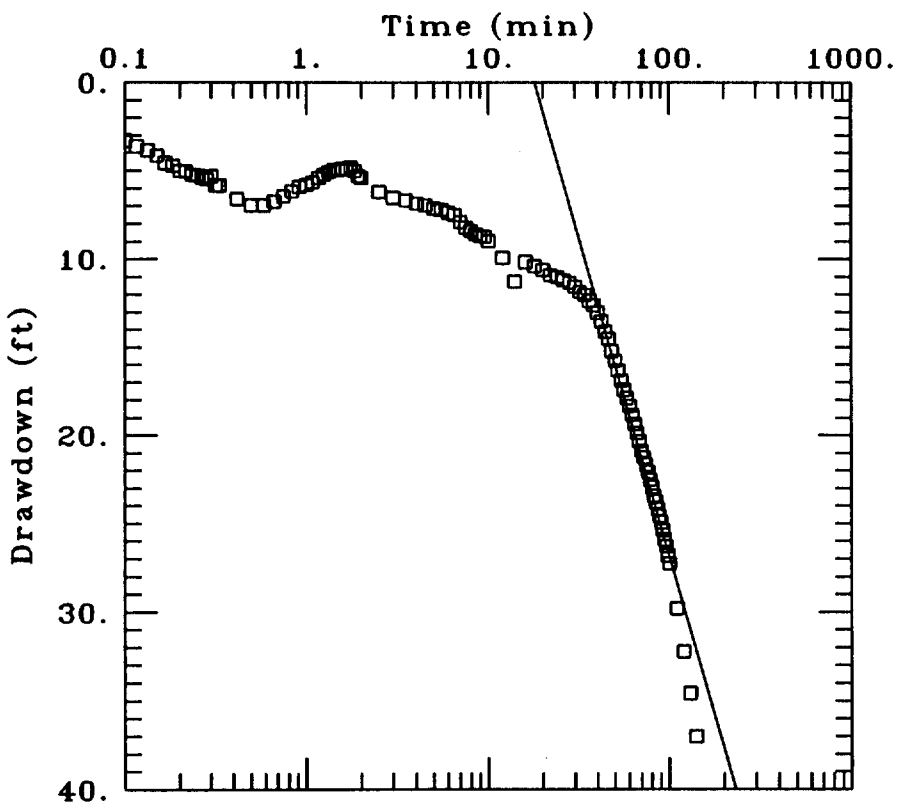
ESTIMATED PARAMETERS:
T = 0.04636 $ft^2$/min

TEST DATA:
Q = 1.564 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 63: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL63\63P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 November 1992

TEST WELL:
Well 63

OBS. WELL:
Same

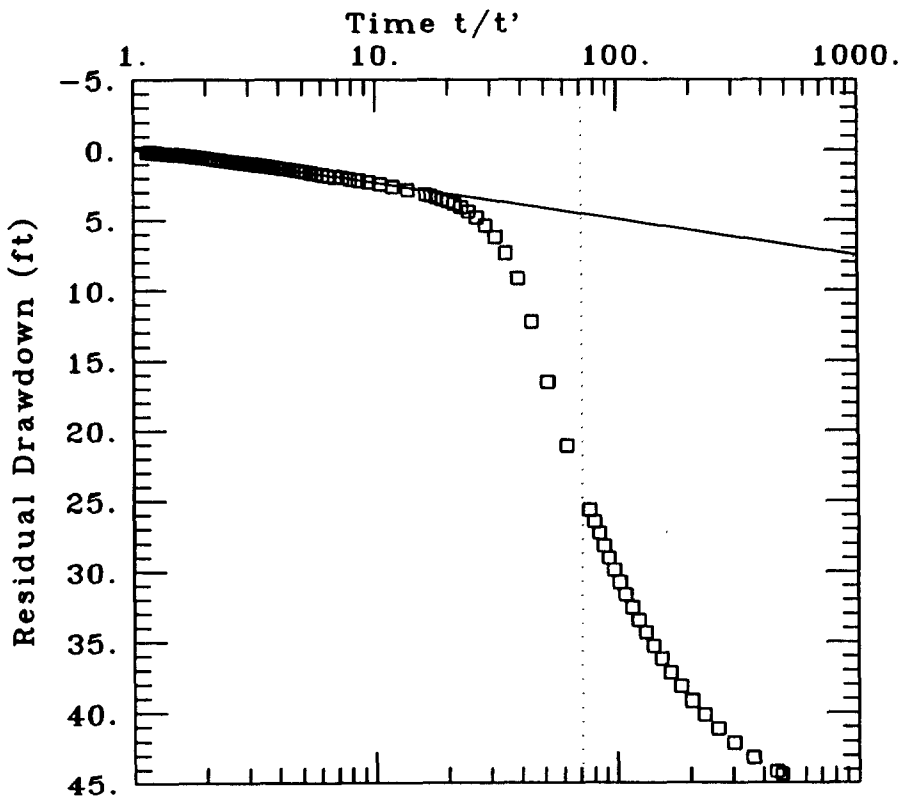
ESTIMATED PARAMETERS:
T = 0.007942 $ft^2$/min

TEST DATA:
Q = 1.564 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 3) |

# WELL 63: RECOVERY METHOD




DATA SET:
63R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
24 November 1992

TEST WELL:
Well 63

OBS. WELL:
Same

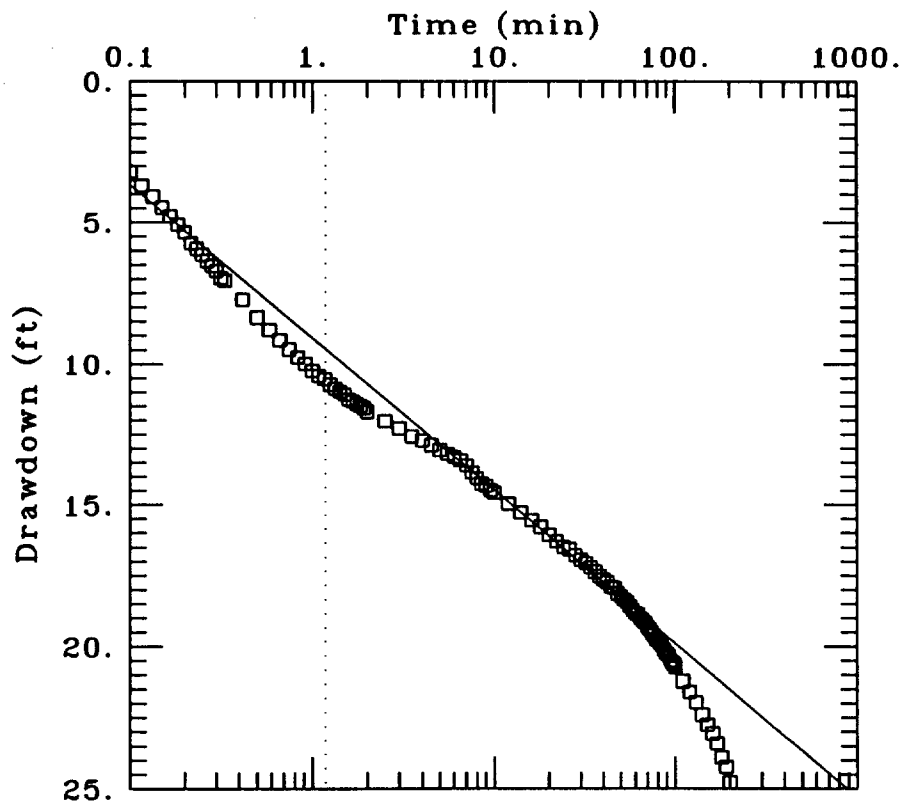
ESTIMATED PARAMETERS:
T = 0.1108 $ft^2$/min

TEST DATA:
Q = 1.564 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 4) |

# WELL 66: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL66\66P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
20 November 1992

TEST WELL:
Well 66

OBS. WELL:
Same

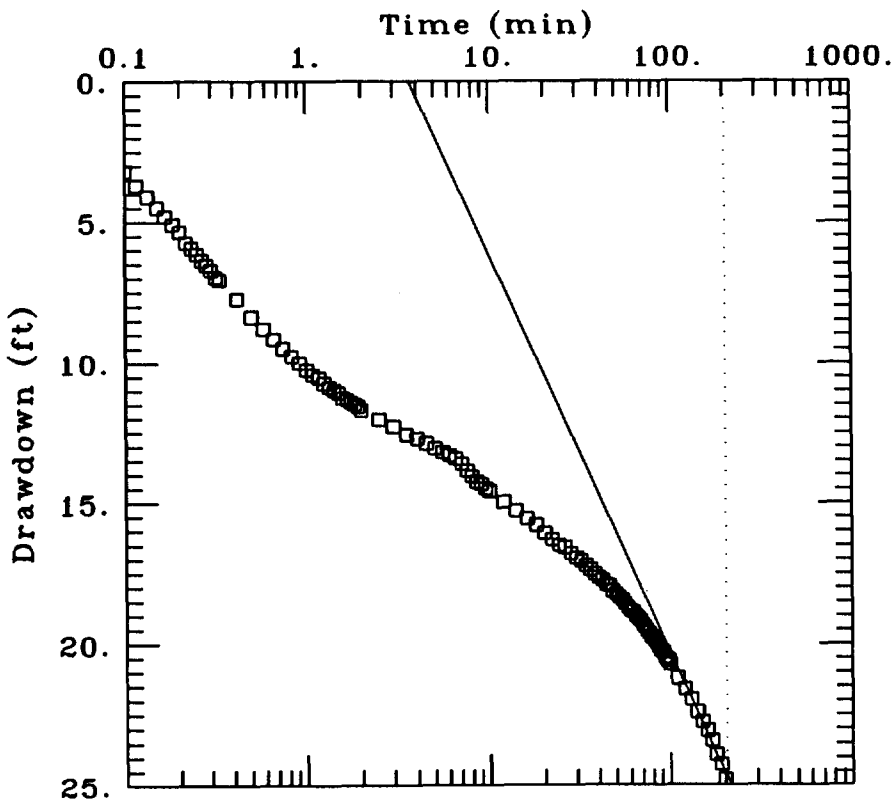
ESTIMATED PARAMETERS:
T = 0.1766 $ft^2$/min

TEST DATA:
Q = 5.212 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 4) |

# WELL 66: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL66\66P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
20 November 1992

TEST WELL:
Well 66

OBS. WELL:
Same

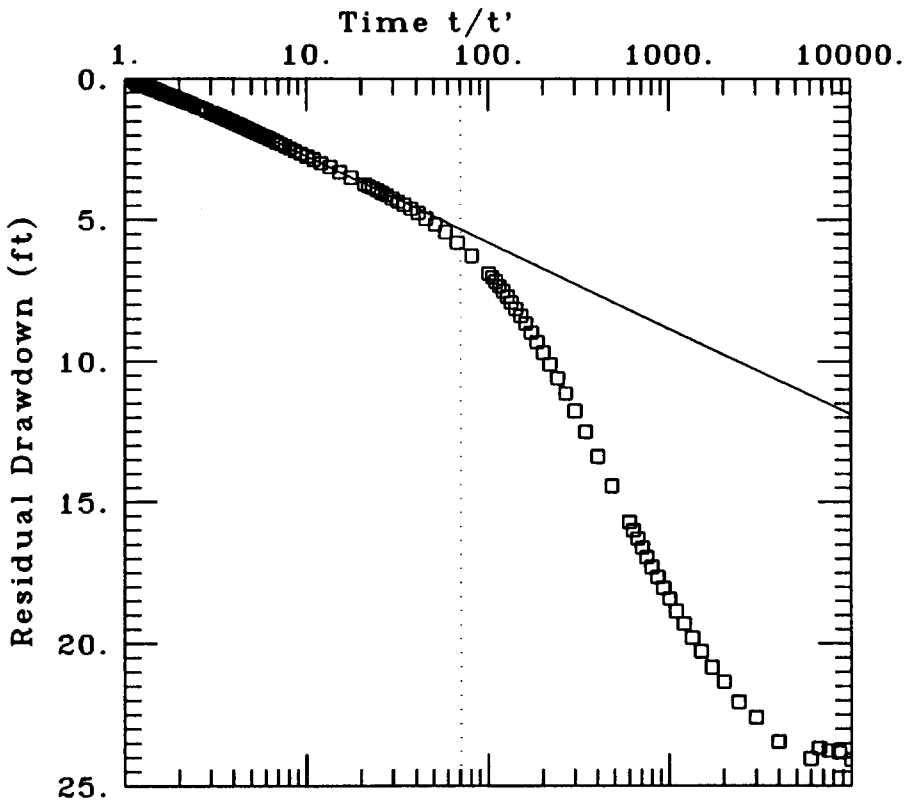
ESTIMATED PARAMETERS:
T = 0.06758 $ft^2$/min

TEST DATA:
Q = 5.212 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 4) |

# WELL 66: RECOVERY METHOD




DATA SET:
C:\AQTEST\WELL66\66R.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
20 November 1992

TEST WELL:
Well 66

OBS. WELL:
Same

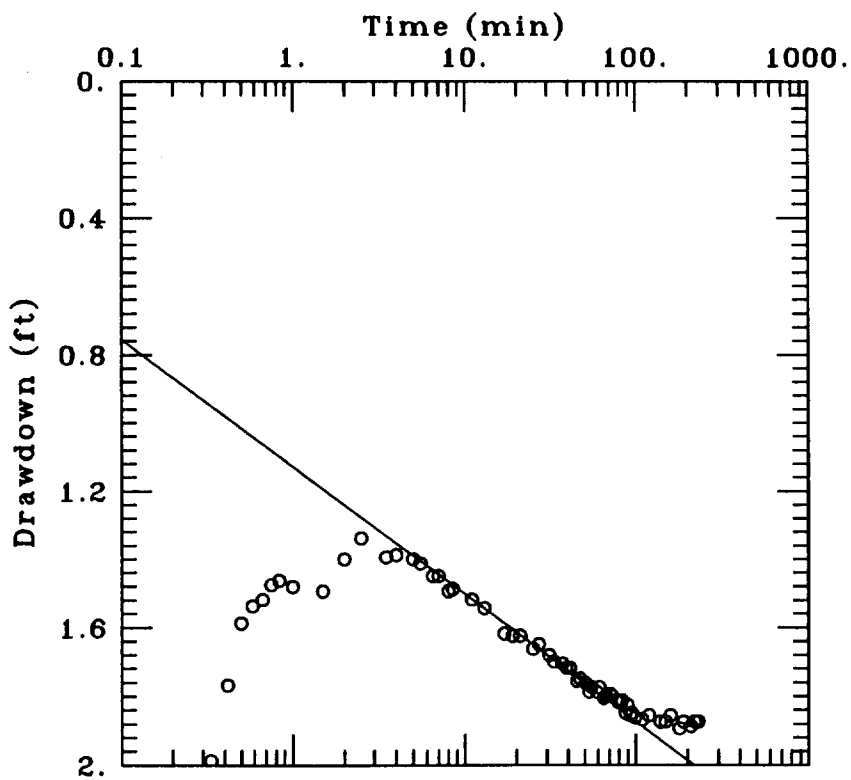
ESTIMATED PARAMETERS:
T = 0.3135 $ft^2$/min

TEST DATA:
Q = 5.212 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 5) |

# WELL 67: COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\67p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 November 1992

TEST WELL:
Well 67

OBS. WELL:
Same

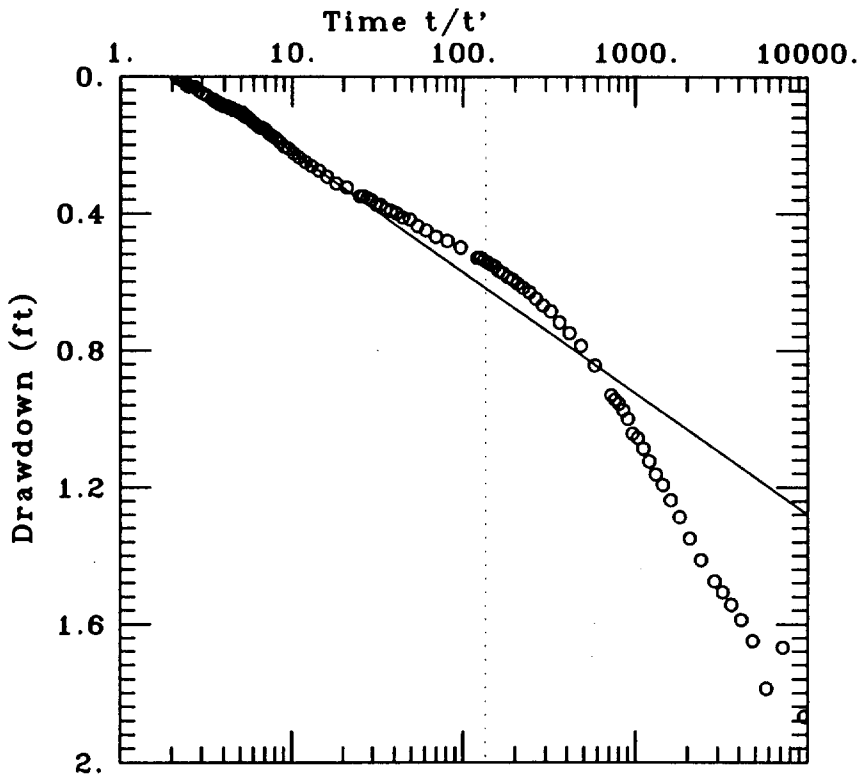
ESTIMATED PARAMETERS:
T = 1.105 $ft^2$/min

TEST DATA:
Q = 2.246 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 5) |

# WELL 67: RECOVERY METHOD




DATA SET:
I:\31981\GRND\PT\67R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
30 November 1992

TEST WELL:
Well 67

OBS. WELL:
Same

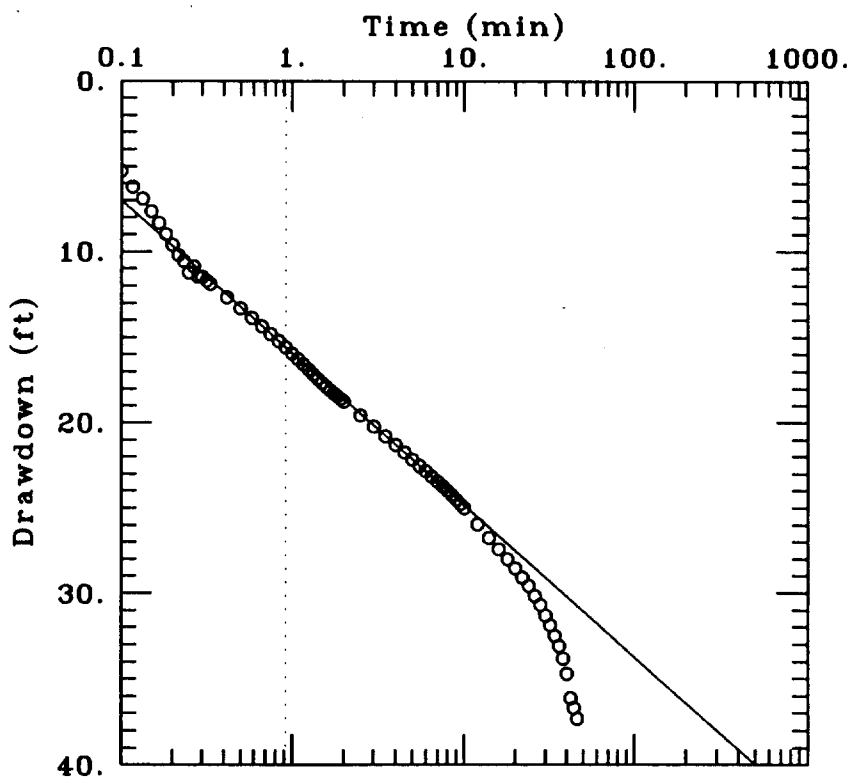
ESTIMATED PARAMETERS:
T = 1.163 $ft^2$/min

TEST DATA:
Q = 2.246 $ft^3$/min

rc = 0.2083 ft
rw = 0.3441 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 7) |

# WELL 72 (Test 1): COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\S72P.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
19 November 1992

TEST WELL:
Well 72

OBS. WELL:
Same

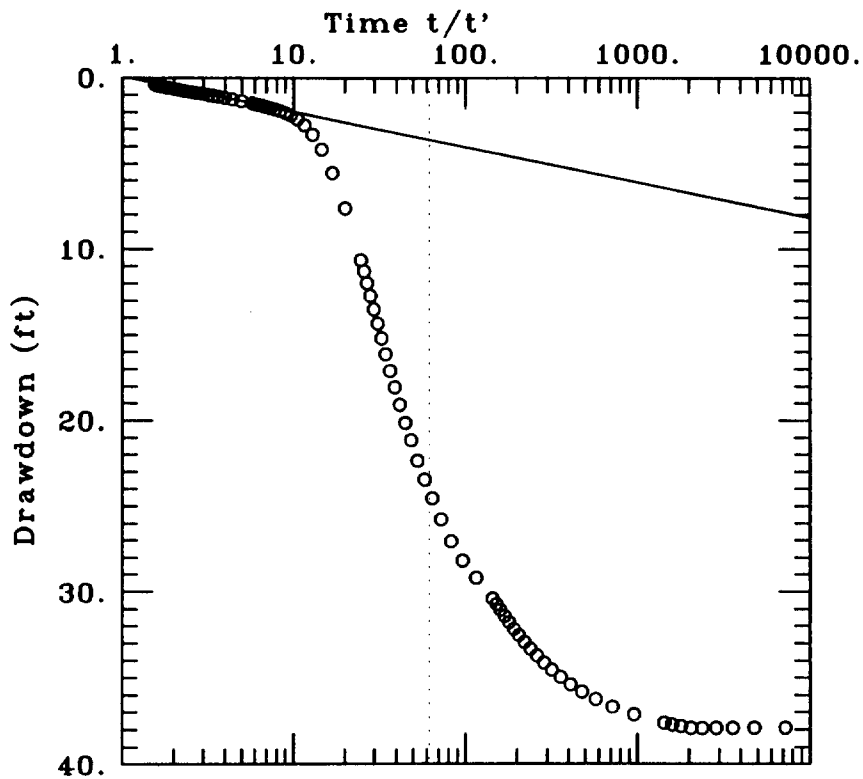
ESTIMATED PARAMETERS:
T = 0.05217 $ft^2$/min

TEST DATA:
Q = 2.54 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 7) |

# WELL 72 (Test 1): RECOVERY




DATA SET:
I:\31981\GRND\PT\S72R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
19 November 1992

TEST WELL:
Well 72

OBS. WELL:
Same

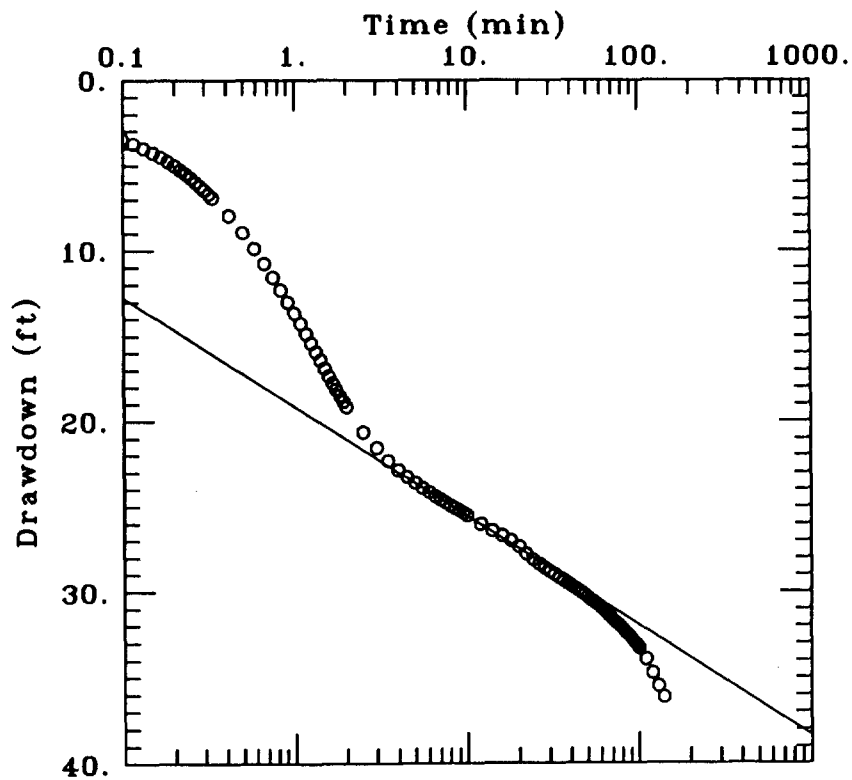
ESTIMATED PARAMETERS:
T = 0.225 $ft^2$/min

TEST DATA:
Q = 2.54 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 7) |

# WELL 72 (Test 2): COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\72P.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
19 November 1992

TEST WELL:
Well 72

OBS. WELL:
Same

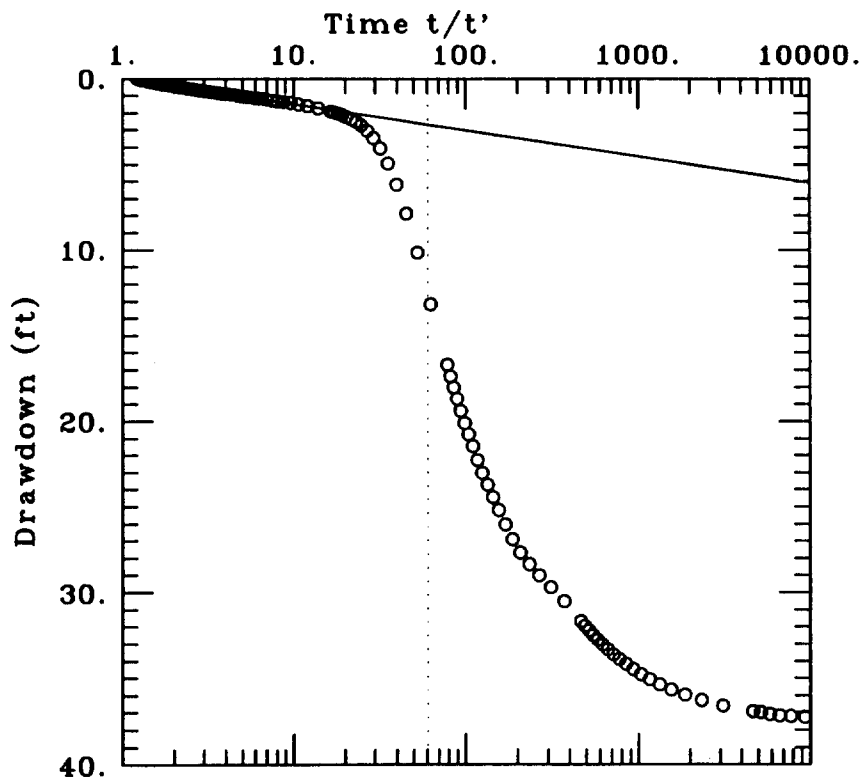
ESTIMATED PARAMETERS:
T = 0.05168 $ft^2$/min

TEST DATA:
Q = 1.805 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 7) |

# WELL 72 (Test 2): RECOVERY




DATA SET:
72p.dat
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
19 November 1992

TEST WELL:
Well 72

OBS. WELL:
Same

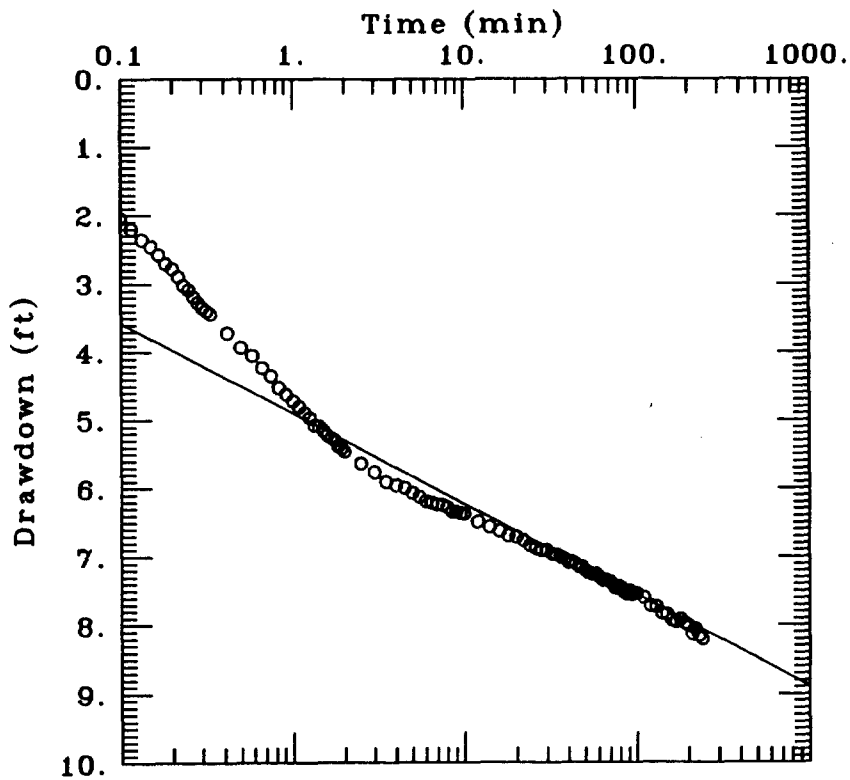
ESTIMATED PARAMETERS:
T = 0.2159 $ft^2$/min

TEST DATA:
Q = 1.805 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 8) |

# WELL 74: COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\74P.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
16 November 1992

TEST WELL:
Well 74

OBS. WELL:
Same

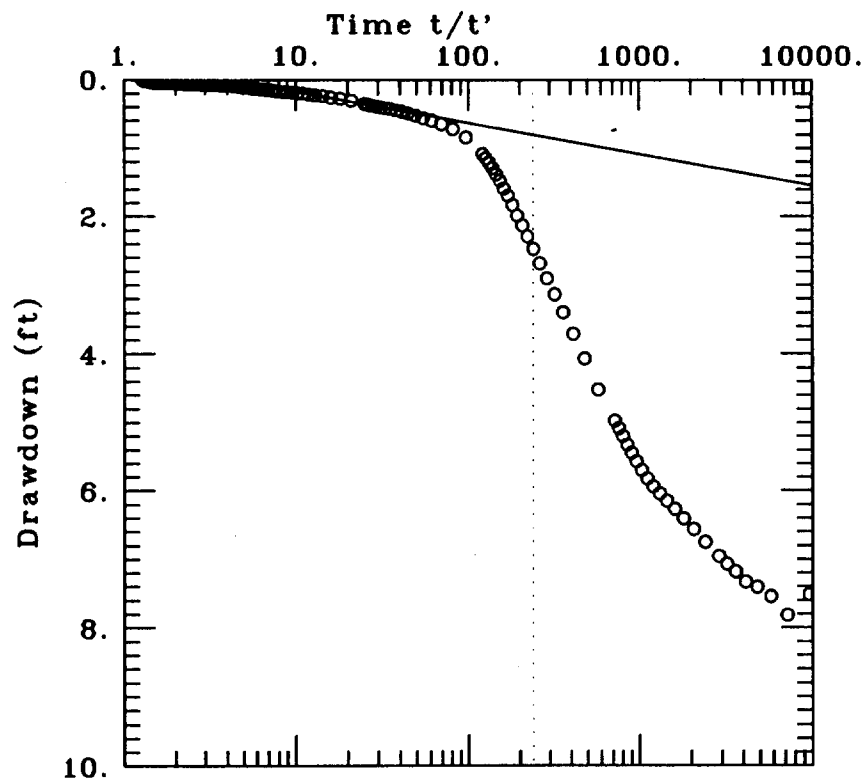
ESTIMATED PARAMETERS:
T = 0.2212 $ft^2$/min

TEST DATA:
Q = 1.604 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 8) |

# WELL 74: RECOVERY METHOD




DATA SET:
74R.dat
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
16 November 1992

TEST WELL:
Well 74

OBS. WELL:
Same

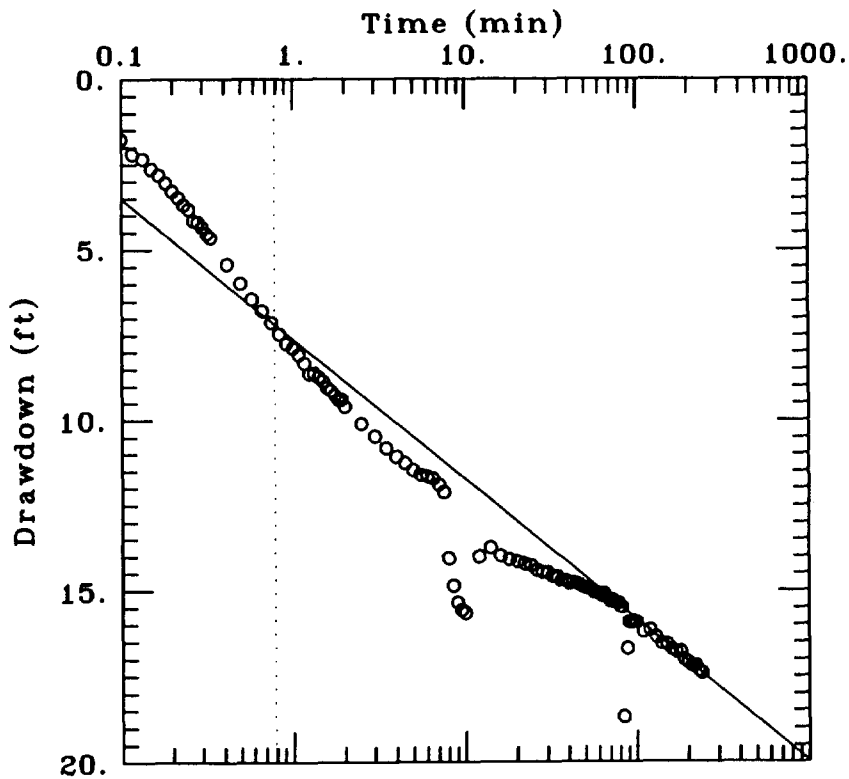
ESTIMATED PARAMETERS:
T = 0.6408 $ft^2$/min

TEST DATA:
Q = 1.604 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 9) |

# WELL 75: COOPER-JACOB METHOD




DATA SET:
i:\31981\grnd\pt\75P.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
1 December 1992

TEST WELL:
Well 75

OBS. WELL:
Same

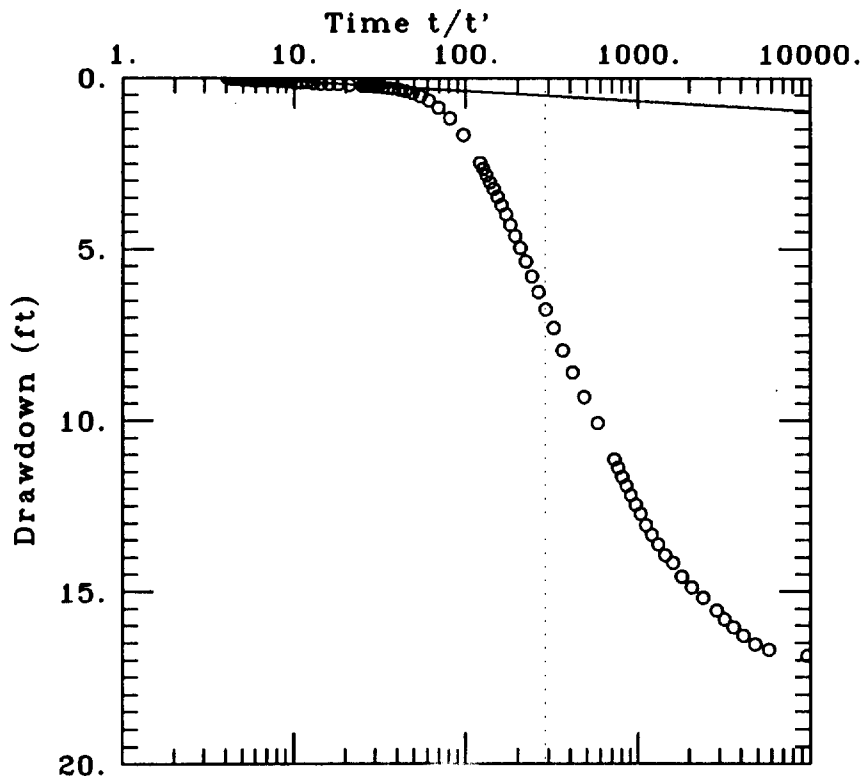
ESTIMATED PARAMETERS:
T = 0.1131 $ft^2$/min

TEST DATA:
Q = 2.54 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 9) |

# WELL 75: RECOVERY METHOD




DATA SET:
I:\31981\GRND\PT\75R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
1 December 1992

TEST WELL:
Well 75

OBS. WELL:
Same

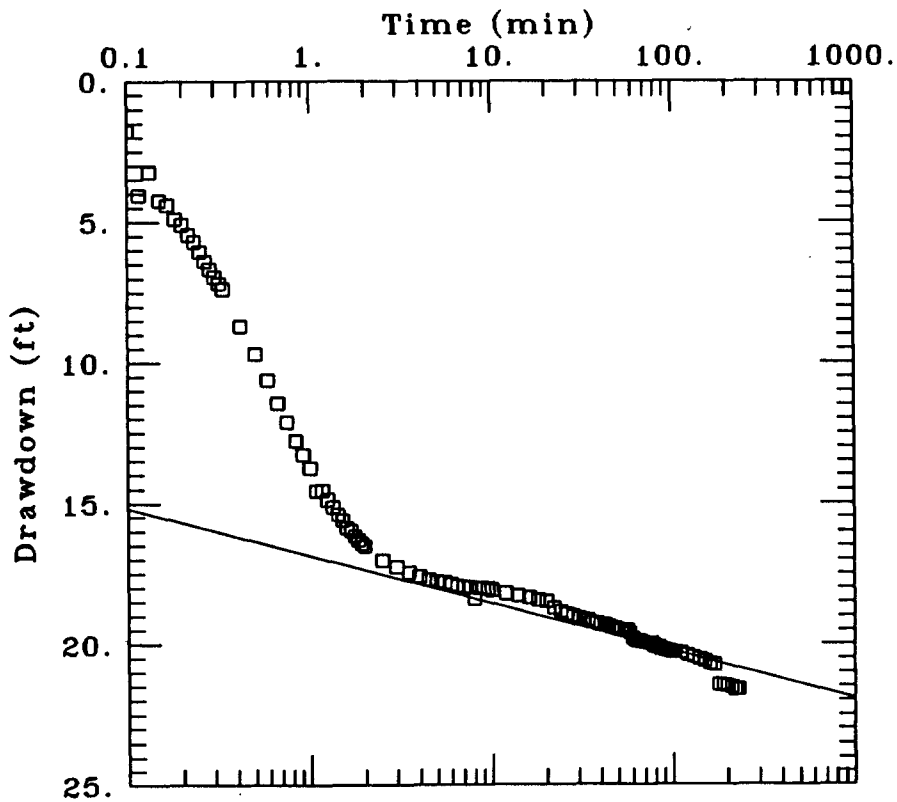
ESTIMATED PARAMETERS:
T = 1.583 $ft^2$/min

TEST DATA:
Q = 2.54 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 10) |

# WELL 77: COOPER-JACOB METHOD




DATA SET:
A:\77P.DAT
03/22/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
17 November 1992

TEST WELL:
Well 77

OBS. WELL:
Same

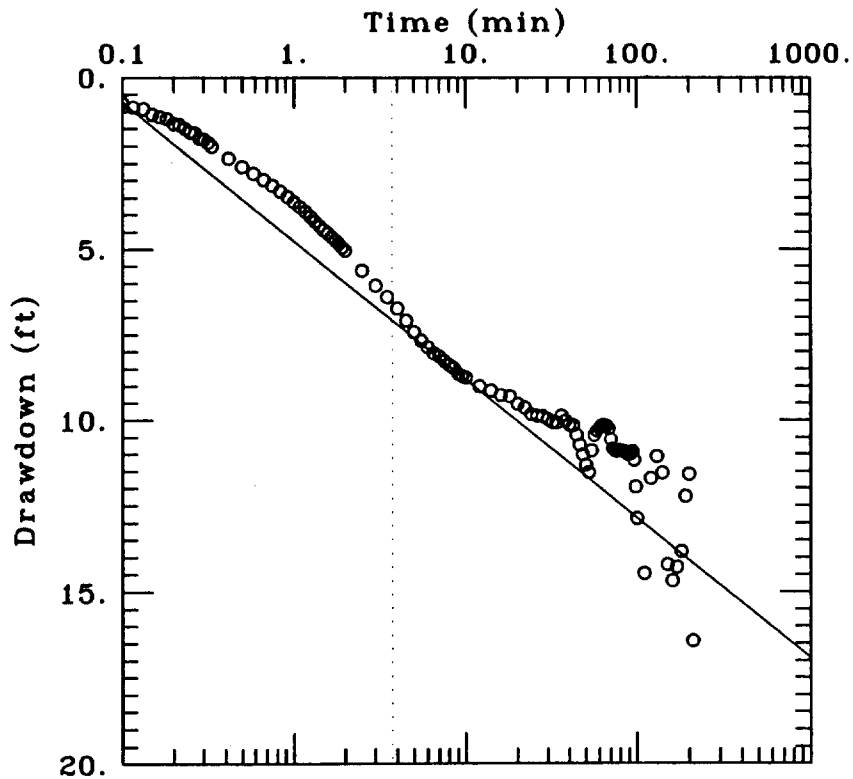
ESTIMATED PARAMETERS:
T = 0.265 $ft^2$/min

TEST DATA:
Q = 2.433 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 13) |

# WELL 78: COOPER-JACOB METHOD




DATA SET:
78p.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
23 November 1992

TEST WELL:
Well 78

OBS. WELL:
Same

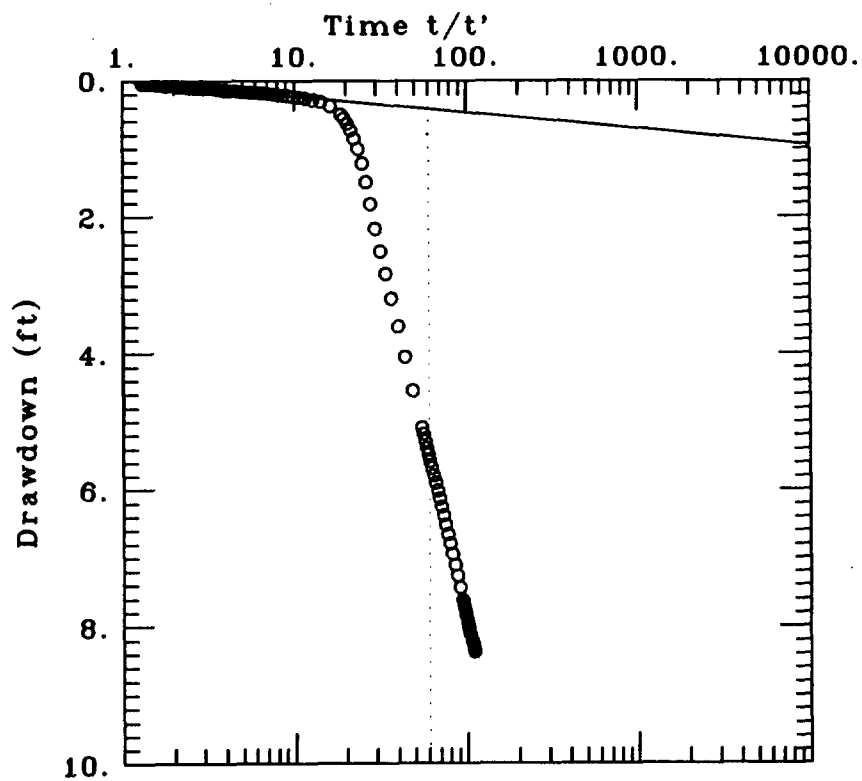
ESTIMATED PARAMETERS:
T = 0.0278 $ft^2$/min

TEST DATA:
Q = 0.615 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 13) |

# WELL 78: RECOVERY METHOD




DATA SET:
78R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
23 November 1992

TEST WELL:
Well 78

OBS. WELL:
Same

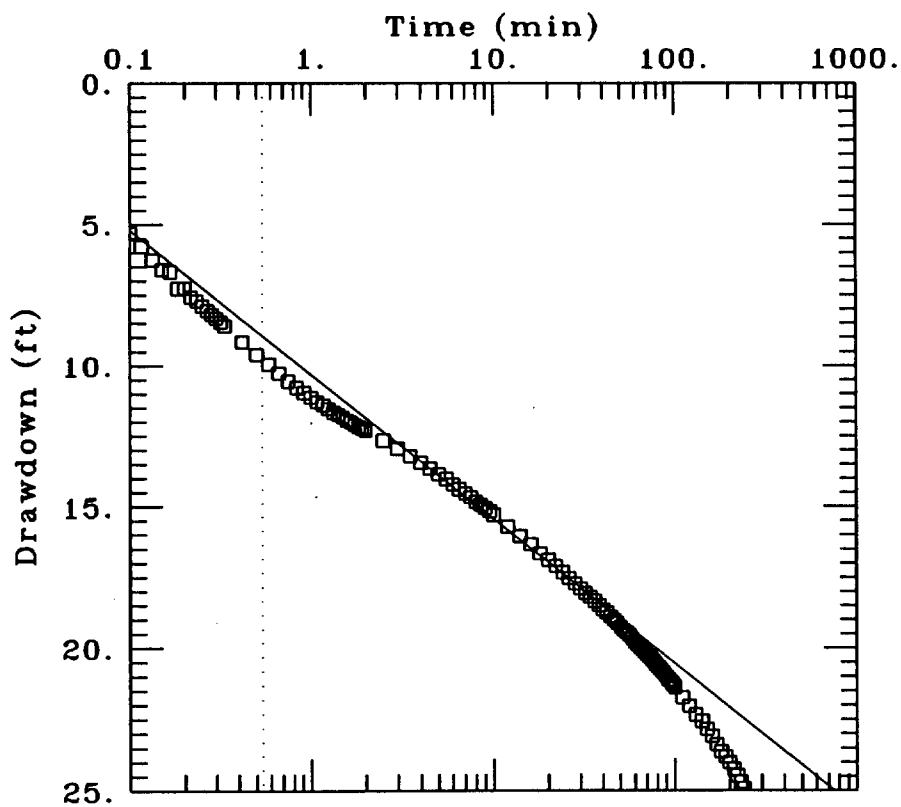
ESTIMATED PARAMETERS:
$T = 0.4759\ ft^2/min$

TEST DATA:
$Q = 0.615\ ft^3/min$

$rc = 0.1667\ ft$
$rw = 0.2872\ ft$

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAAS EL TORO (SITE 18) |

# WELL 101: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL101\101P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
13 November 1992

TEST WELL:
Well 101

OBS. WELL:
Same

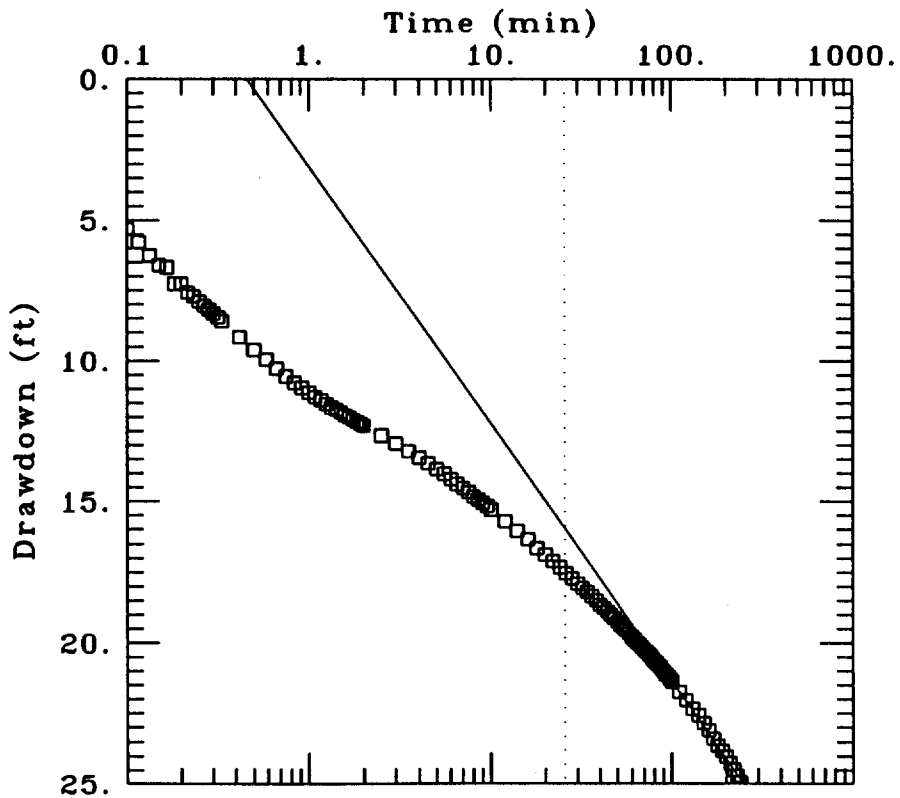
ESTIMATED PARAMETERS:
T = 0.1294 $ft^2$/min

TEST DATA:
Q = 3.609 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAAS EL TORO (SITE 18) |

# WELL 101: COOPER-JACOB METHOD




DATA SET:
C:\AQTEST\WELL101\101P.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
13 November 1992

TEST WELL:
Well 101

OBS. WELL:
Same

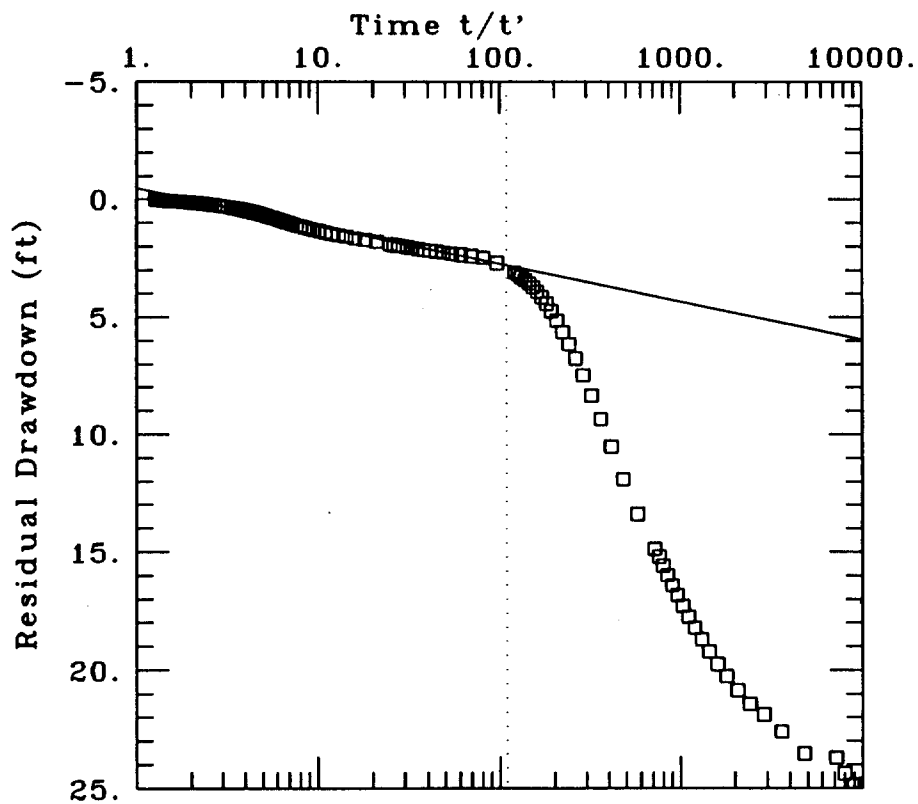
ESTIMATED PARAMETERS:
T = 0.0725 $ft^2$/min

TEST DATA:
Q = 3.609 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL 101: RECOVERY METHOD




DATA SET:
101R.DAT
02/19/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
13 November 1992

TEST WELL:
Well 101

OBS. WELL:
Same

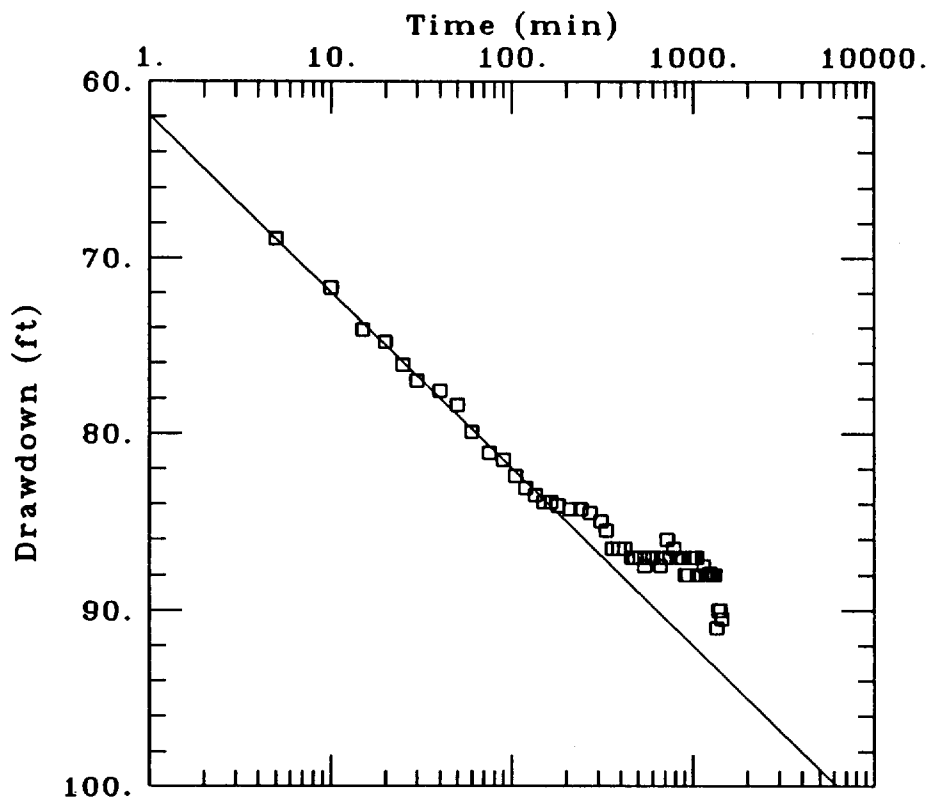
ESTIMATED PARAMETERS:
T = 0.4133 $ft^2$/min

TEST DATA:
Q = 3.609 $ft^3$/min

rc = 0.1667 ft
rw = 0.2872 ft

| MCAS EL TORO RI/FS PHASE I | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO (SITE 18) |

# WELL IDP1: COOPER-JACOB METHOD




DATA SET:
c:\aqtest\wellidp1\idp1p.dat
02/10/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper-Jacob

TEST DATE:
12 January 1993

TEST WELL:
Well IDP1 (OCWD)

OBS. WELL:
Same

ESTIMATED PARAMETERS:
T = 2.899 $ft^2$/min

TEST DATA:
Q = 158.7 $ft^3$/min

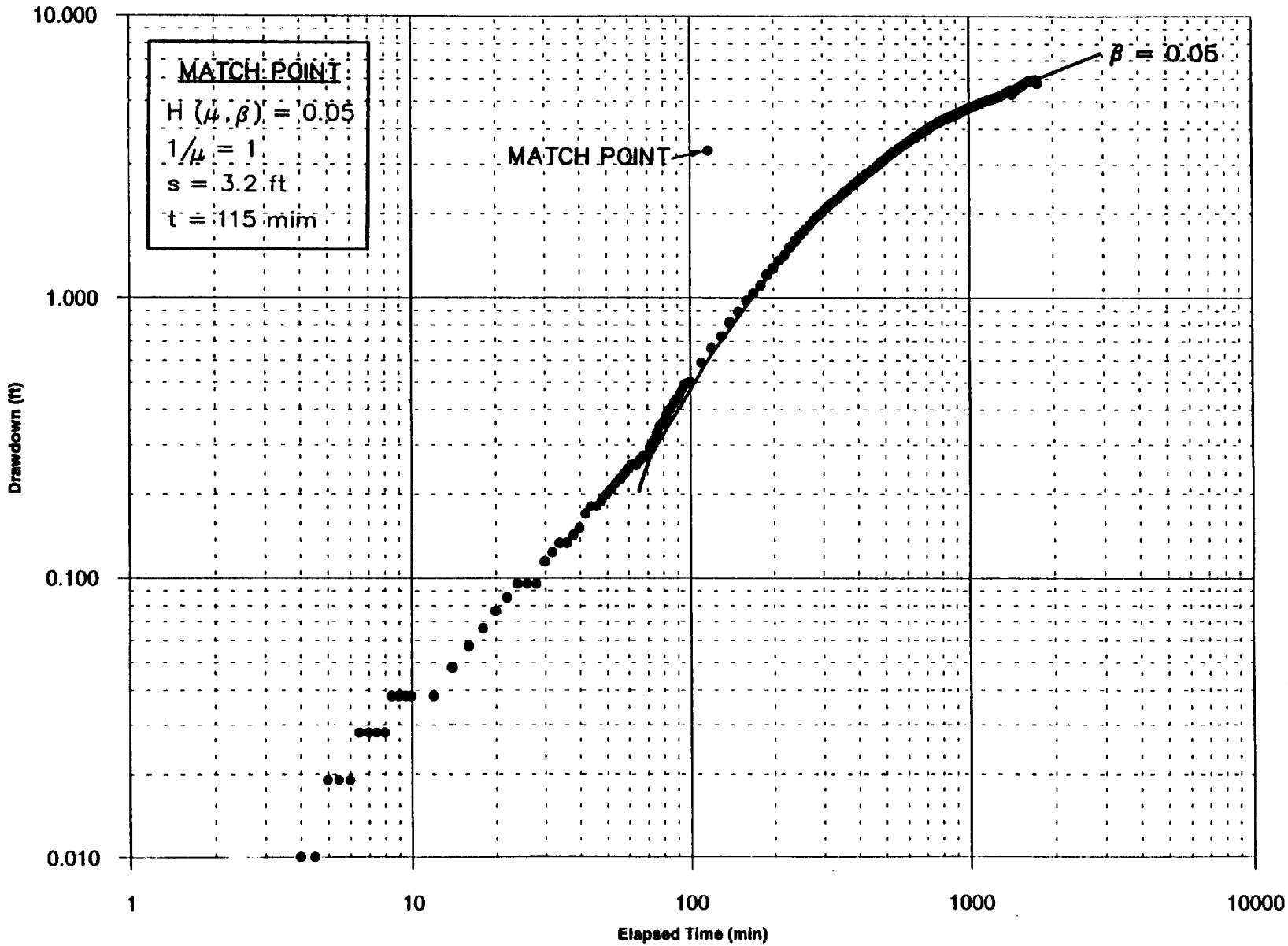
rc = 0.75 ft
rw = 0.8956 ft

MCAS EL TORO RI/FS PHASE I
Project No.: CTO #145

Client: NAVY SOUTHWEST DIV
Location: MCAS EL TORO (SITE 18)

HANTUSH (WITH STORAGE)

Pumped Well: IDP1 Observation Well: 103

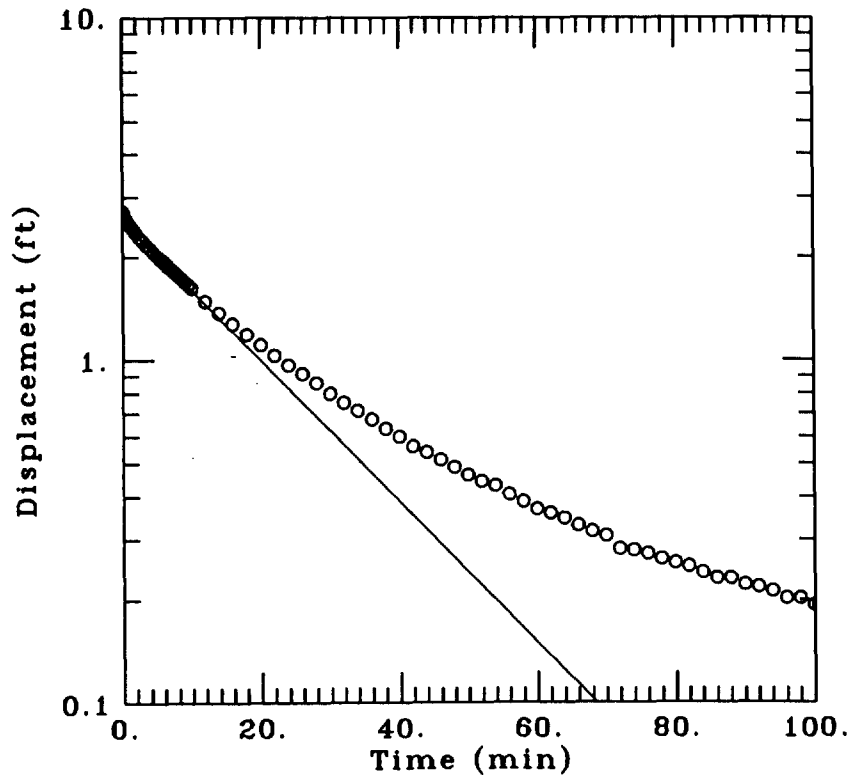


# ATTACHMENT 9
# to Appendix F

## Data Plots for Slug Tests

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 1B (TEST 1): BOUWER-RICE METHOD




DATA SET:
1bs1l.dat
02/02/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/16/92

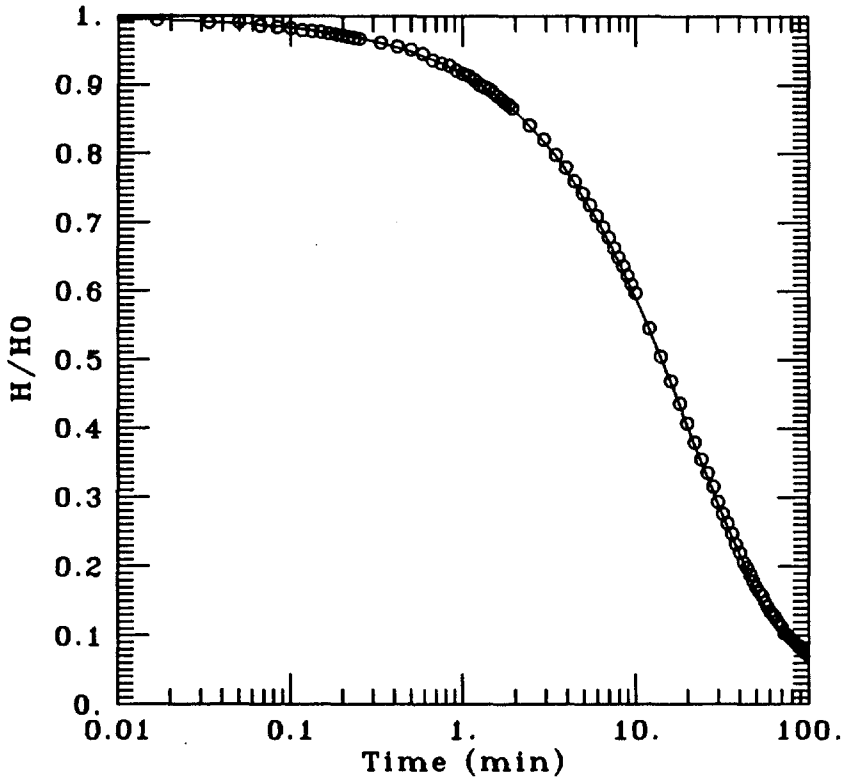
TEST WELL:
Well 1b (Site 18)

ESTIMATED PARAMETERS:
K = 0.0001483 ft/min
y0 = 2.564 ft

TEST DATA:
H0 = 2.718 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 1B (TEST 1): COOPER ET AL. METHOD




DATA SET:
well1b\1bcbp1 dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/16/92

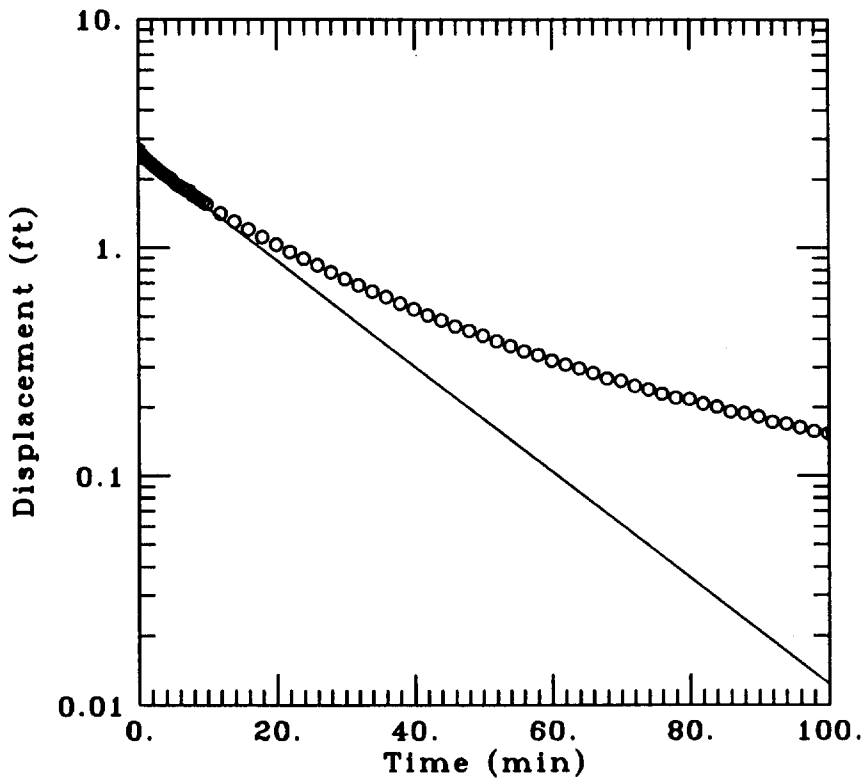
TEST WELL:
Well 1b (Site 18)

ESTIMATED PARAMETERS:
T = 0.00338 $ft^2$/min
S = 0.0004305

TEST DATA:
H0 = 2.718 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 1B (TEST 2): BOUWER-RICE METHOD




DATA SET:
well1b\1bs2.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/16/92

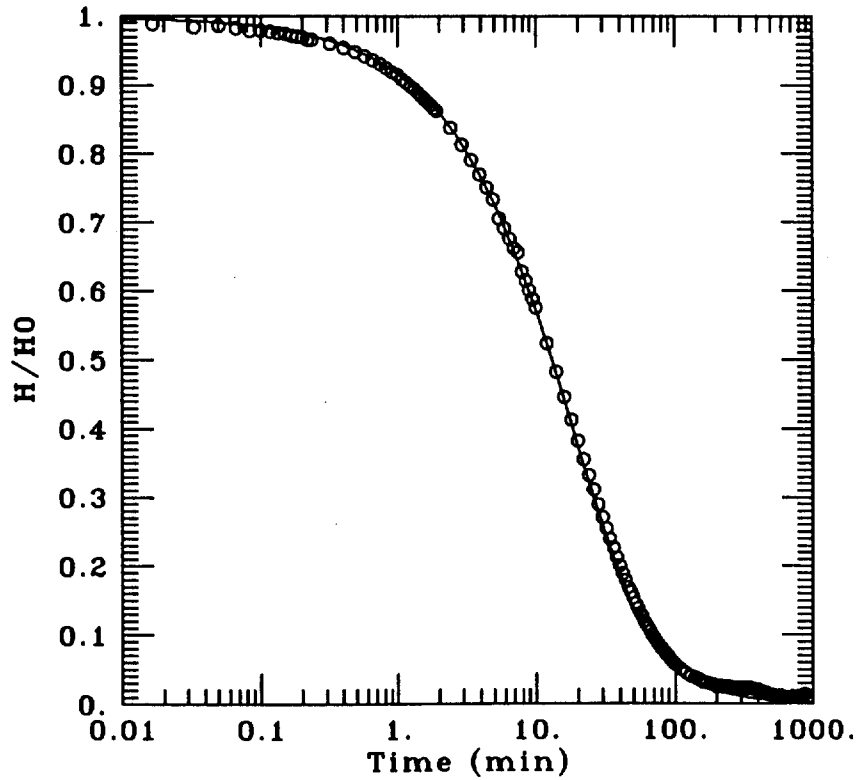
TEST WELL:
Well 1b (Site 18)

ESTIMATED PARAMETERS:
K = 0.000167 ft/min
y0 = 2.558 ft

TEST DATA:
H0 = 2.694 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 1B (TEST 2): COOPER ET AL. METHOD




DATA SET:
well1b\1bcbp2.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/16/92

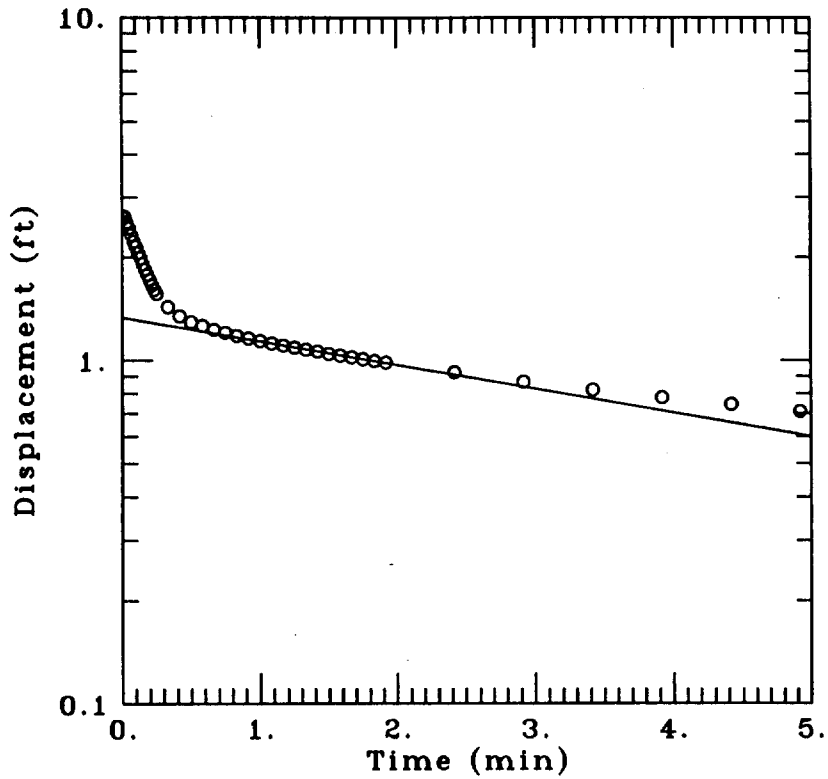
TEST WELL:
Well 1b (Site 18)

ESTIMATED PARAMETERS:
T = 0.004246 $ft^2$/min
S = 0.0001818

TEST DATA:
H0 = 2.694 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 1E (TEST 1): BOUWER-RICE METHOD




DATA SET:
1es1.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/15/92

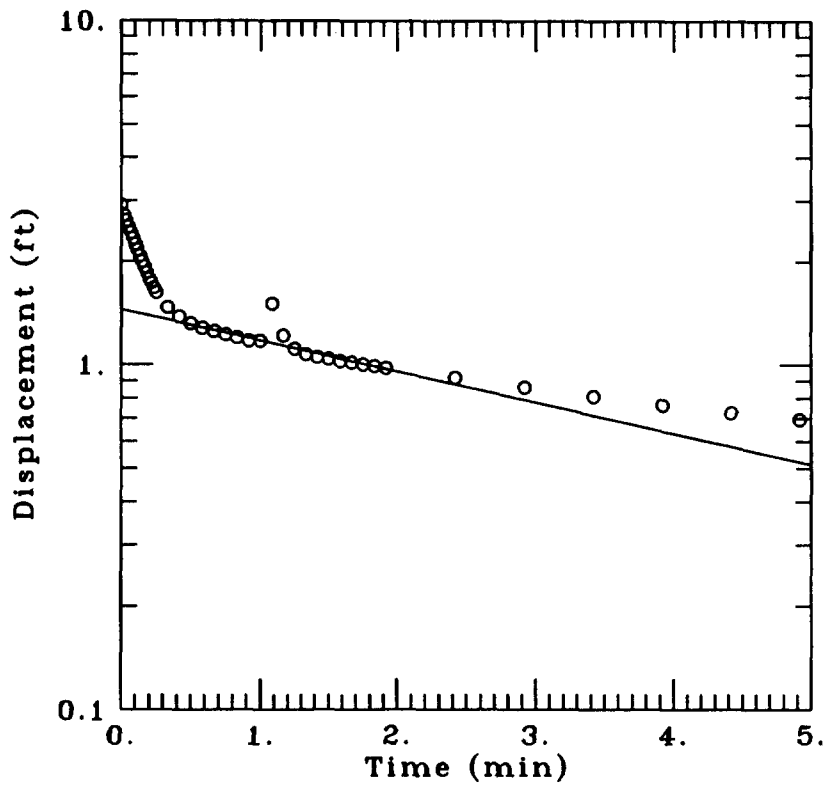
TEST WELL:
Well 1e (Site 18)

ESTIMATED PARAMETERS:
K = 0.001446 ft/min
y0 = 1.336 ft

TEST DATA:
H0 = 2.644 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 10.8 ft
b = 10.8 ft
H = 10.8 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 1E (TEST 2): BOUWER-RICE METHOD




DATA SET:
1es2.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/15/92

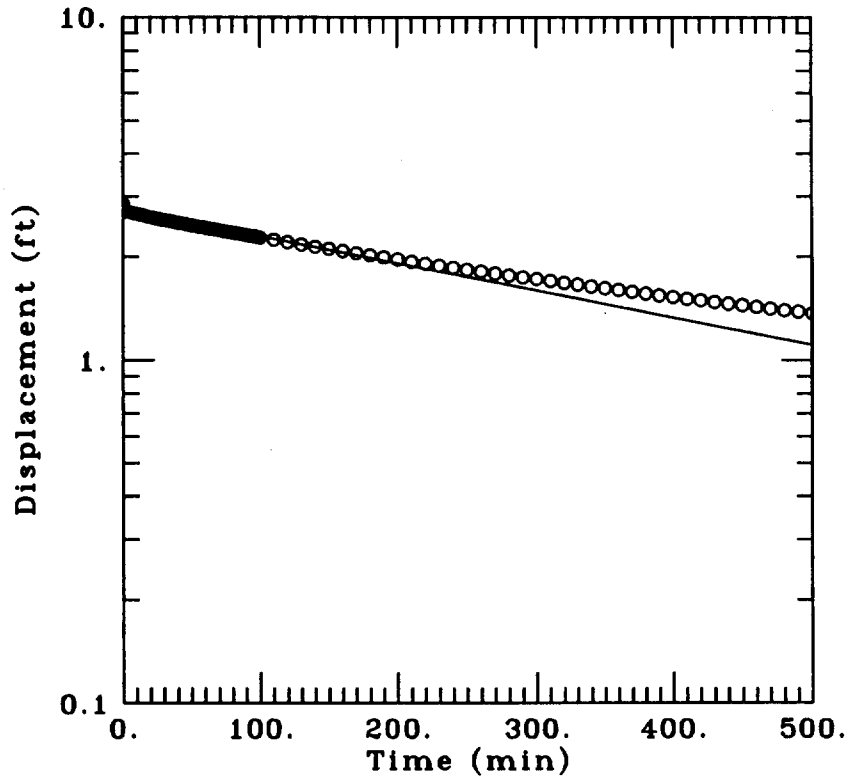
TEST WELL:
Well 1e (Site 18)

ESTIMATED PARAMETERS:
K = 0.001878 ft/min
y0 = 1.45 ft

TEST DATA:
H0 = 2.919 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 10.8 ft
b = 10.8 ft
H = 10.8 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2A: BOUWER-RICE METHOD




DATA SET:
well2a\2as1.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/19/92

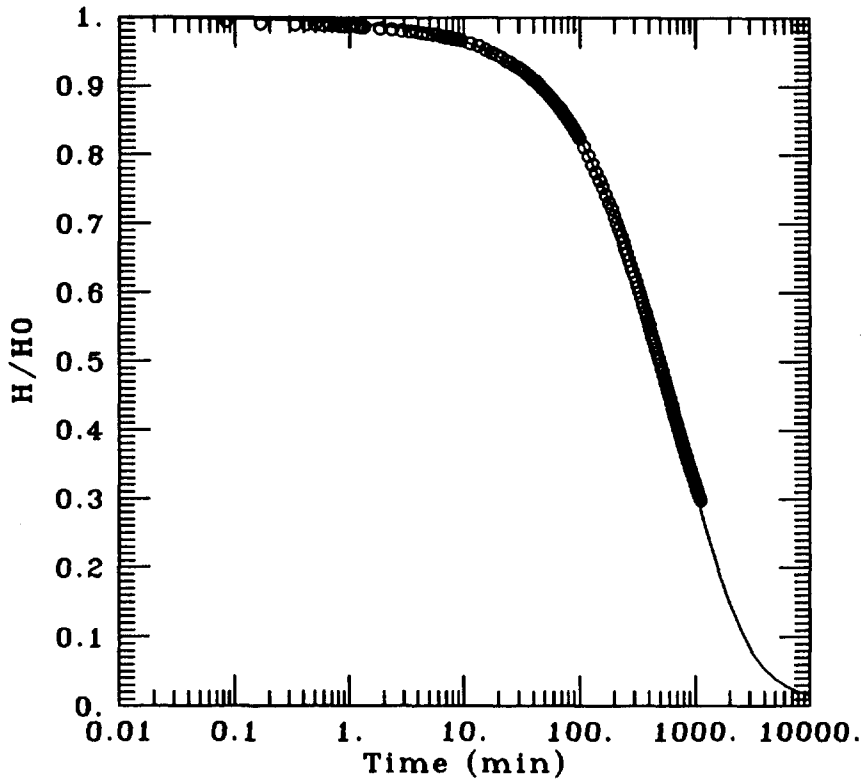
TEST WELL:
Well 2a (Site 18)

ESTIMATED PARAMETERS:
K = 5.7002E-06 ft/min
y0 = 2.754 ft

TEST DATA:
H0 = 2.847 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2A: COOPER ET AL. METHOD




DATA SET:
WELL2A\2AS1CBP.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/19/92

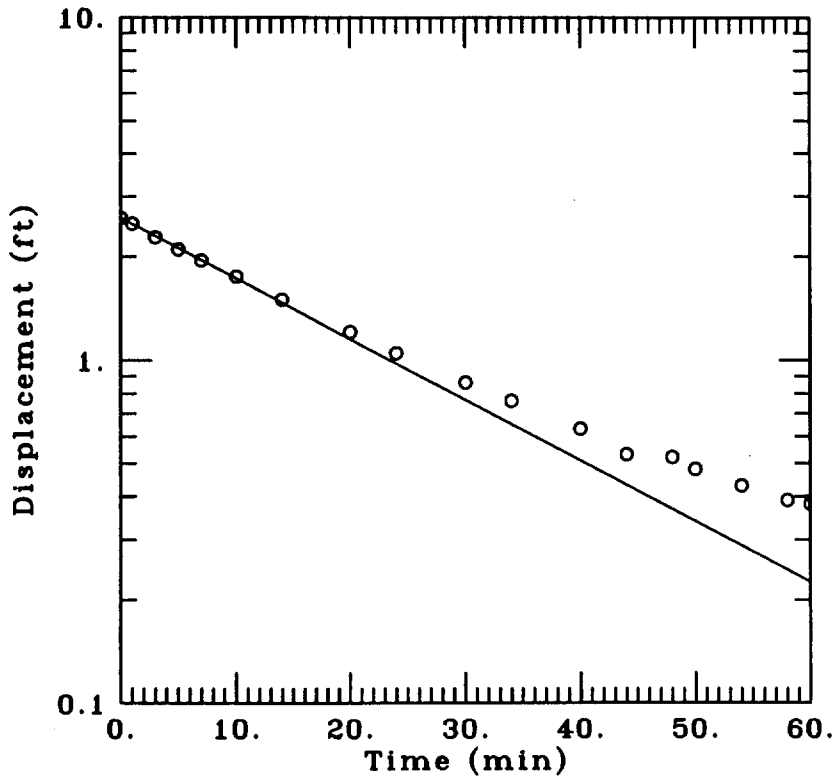
TEST WELL:
Well 2a (Site 18)

ESTIMATED PARAMETERS:
T = 9.0683E-05 $ft^2$/min
S = 0.0005082

TEST DATA:
HO = 2.758 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2C: BOUWER-RICE METHOD




DATA SET:
2cs1.dat
02/02/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/19/92

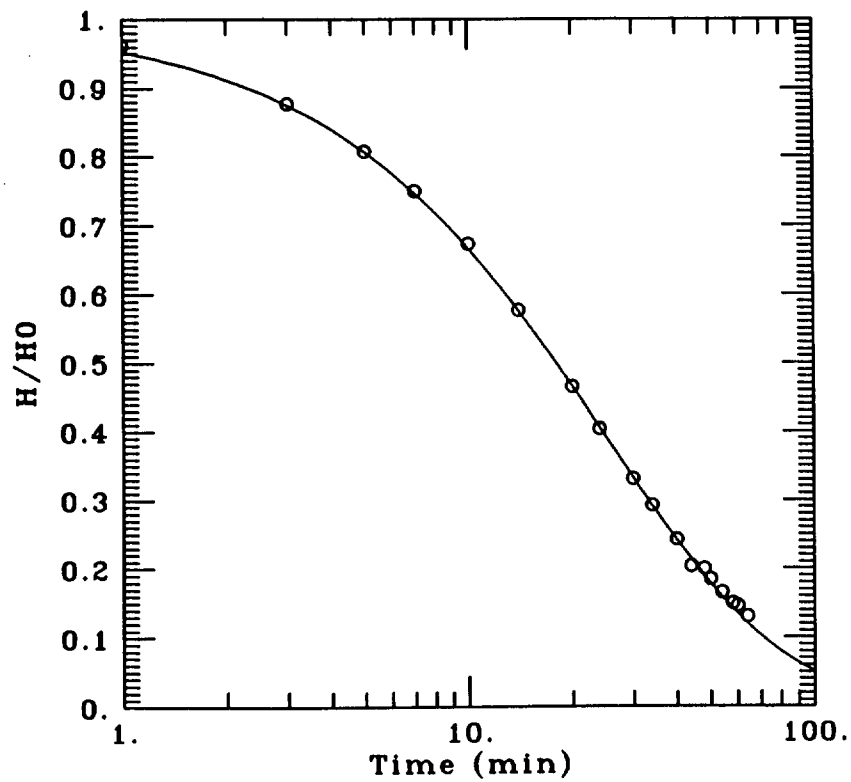
TEST WELL:
Well 2c (Site 18)

ESTIMATED PARAMETERS:
K = 0.0001277 ft/min
y0 = 2.605 ft

TEST DATA:
H0 = 2.6 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2C: COOPER ET AL. METHOD




DATA SET:
well2c\2ccbp1.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/19/92

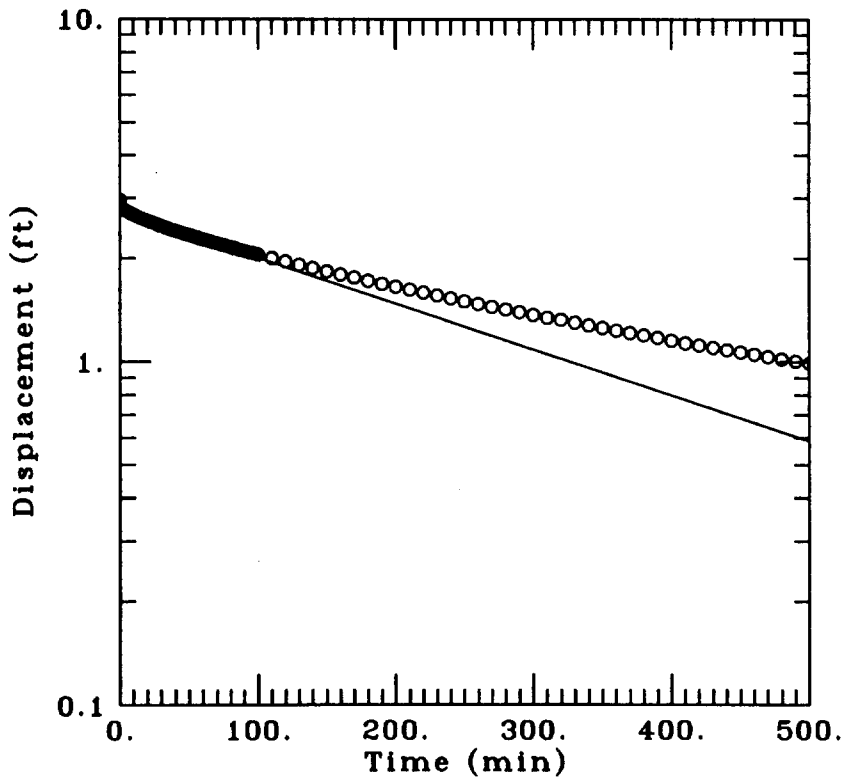
TEST WELL:
Well 2c (Site 18)

ESTIMATED PARAMETERS:
T = 0.00669 $ft^2$/min
S = 6.2658E-08

TEST DATA:
HO = 2.6 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2D (TEST 1): BOUWER-RICE METHOD




DATA SET:
..\well2d\2ds1.dat
02/02/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/19/92

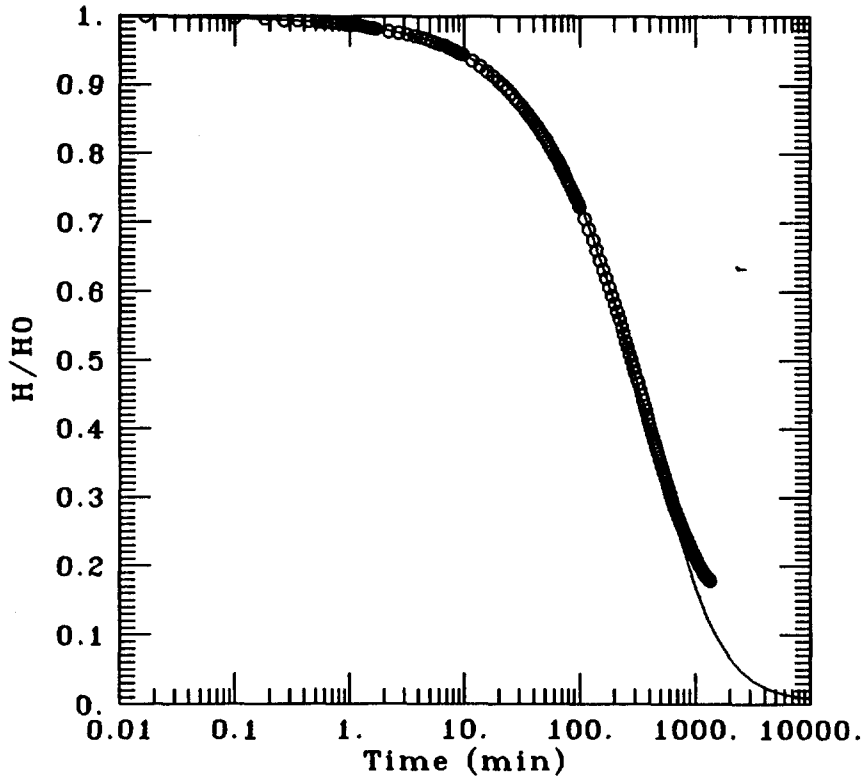
TEST WELL:
Well 2d (Site 18)

ESTIMATED PARAMETERS:
K = 9.6134E-06 ft/min
y0 = 2.725 ft

TEST DATA:
H0 = 2.951 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2D (TEST 1): COOPER ET AL. METHOD




DATA SET:
well2d\2dcbp1.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/19/92

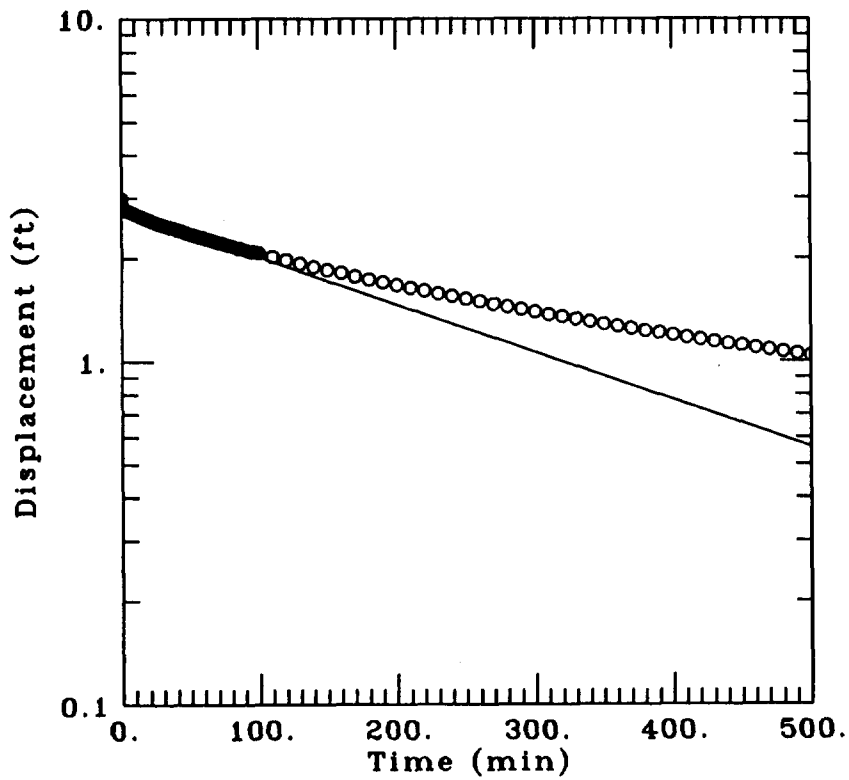
TEST WELL:
Well 2d (Site 18)

ESTIMATED PARAMETERS:
T = 0.0001556 $ft^2$/min
S = 0.00074

TEST DATA:
H0 = 2.836 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2D (TEST 2): BOUWER-RICE METHOD




DATA SET:
..\well2d\2ds2.dat
02/02/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/20/92

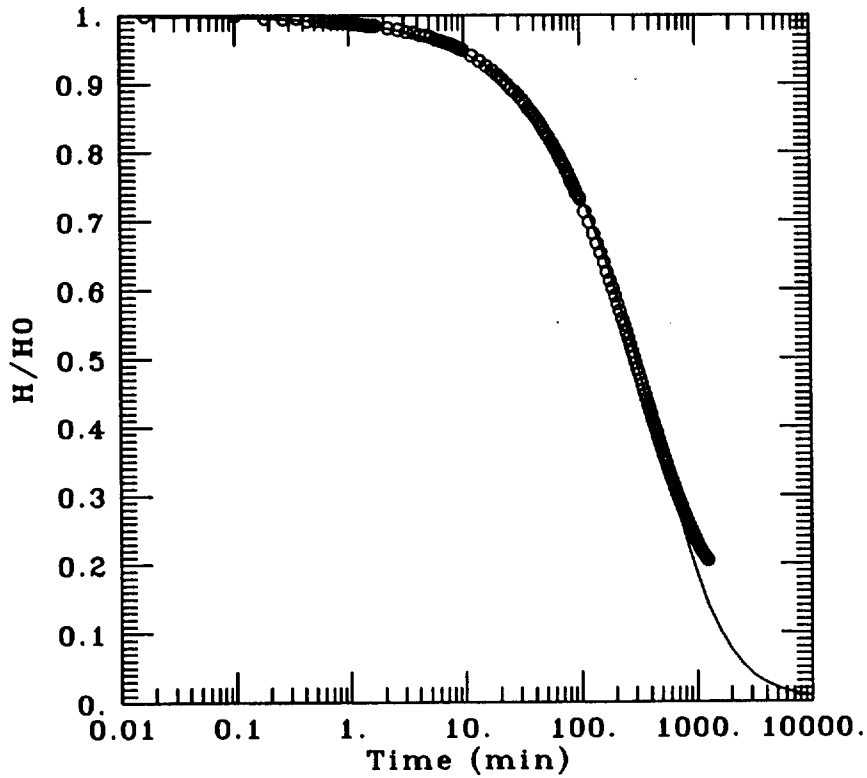
TEST WELL:
Well 2d (Site 18)

ESTIMATED PARAMETERS:
K = 1.0018E-05 ft/min
y0 = 2.776 ft

TEST DATA:
H0 = 2.975 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 2D (TEST 2): COOPER ET AL. METHOD




DATA SET:
well2d\2dcbp2.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/20/92

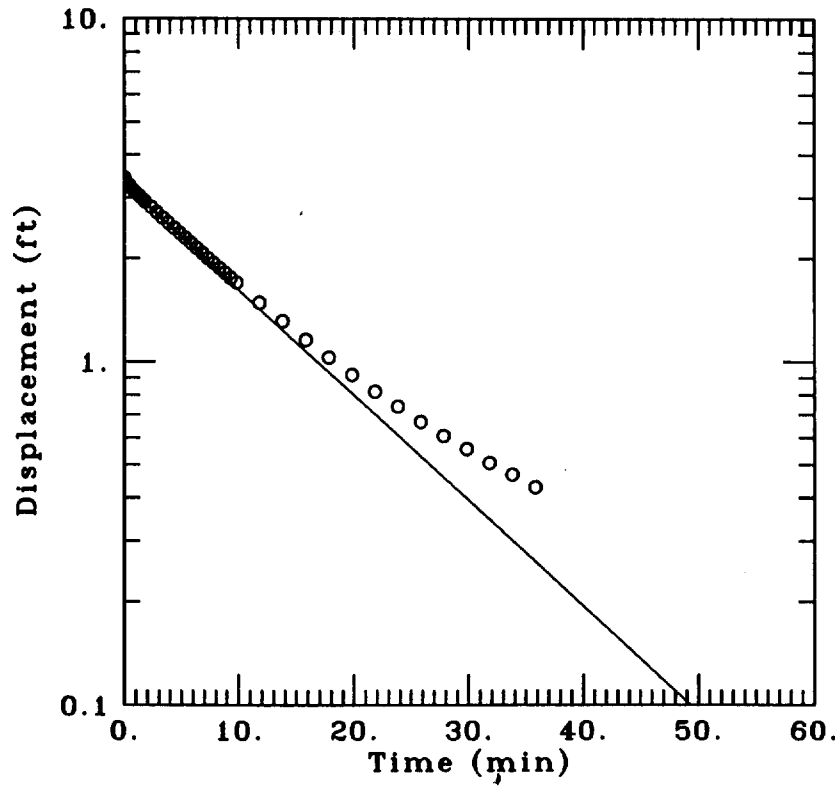
TEST WELL:
Well 2d (Site 18)

ESTIMATED PARAMETERS:
T = 0.0001394 $ft^2$/min
S = 0.0008601

TEST DATA:
HO = 2.832 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 3E (TEST 1): BOUWER-RICE METHOD




DATA SET:
..\well3e\3es1h.dat
02/02/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/15/92

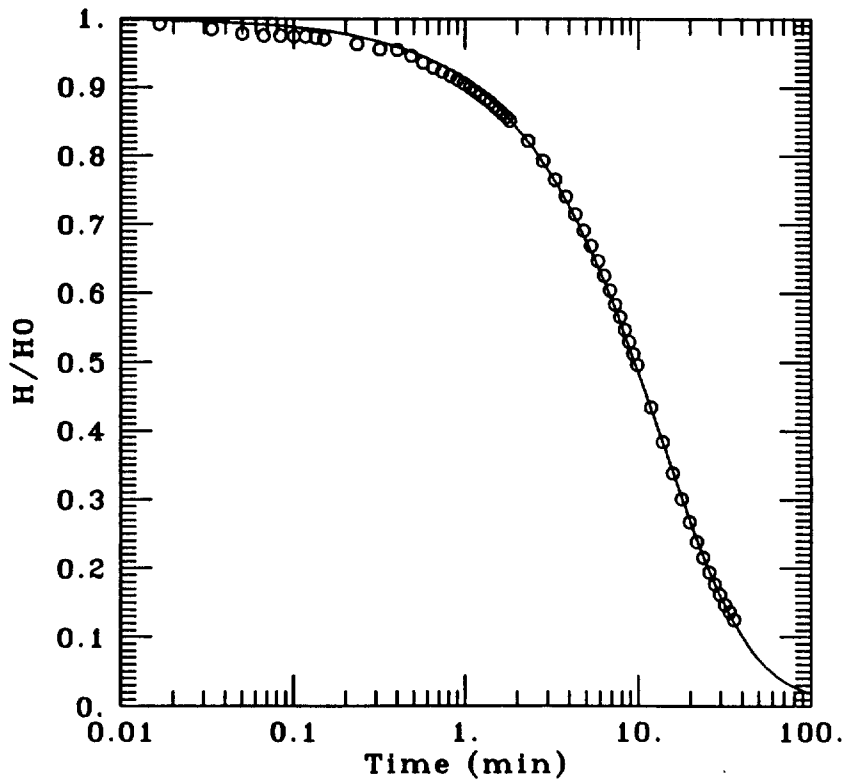
TEST WELL:
Well 3e (Site 18)

ESTIMATED PARAMETERS:
K = 8.8529E-05 ft/min
y0 = 3.281 ft

TEST DATA:
H0 = 3.429 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 52. ft
H = 52. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 3E (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL3E\3ECBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/15/92

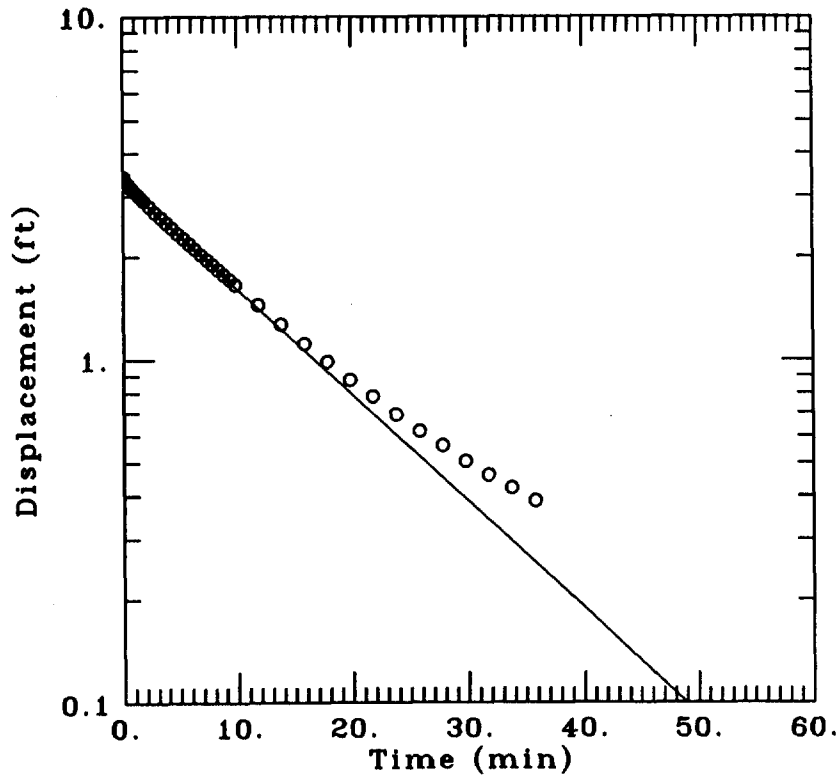
TEST WELL:
Well 3e (Site 18)

ESTIMATED PARAMETERS:
T = 0.006043 $ft^2$/min
S = 2.3331E-06

TEST DATA:
HO = 3.429 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 3E (TEST 2): BOUWER-RICE METHOD




DATA SET:
..\WELL3E\3ES2H.DAT
02/02/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/15/92

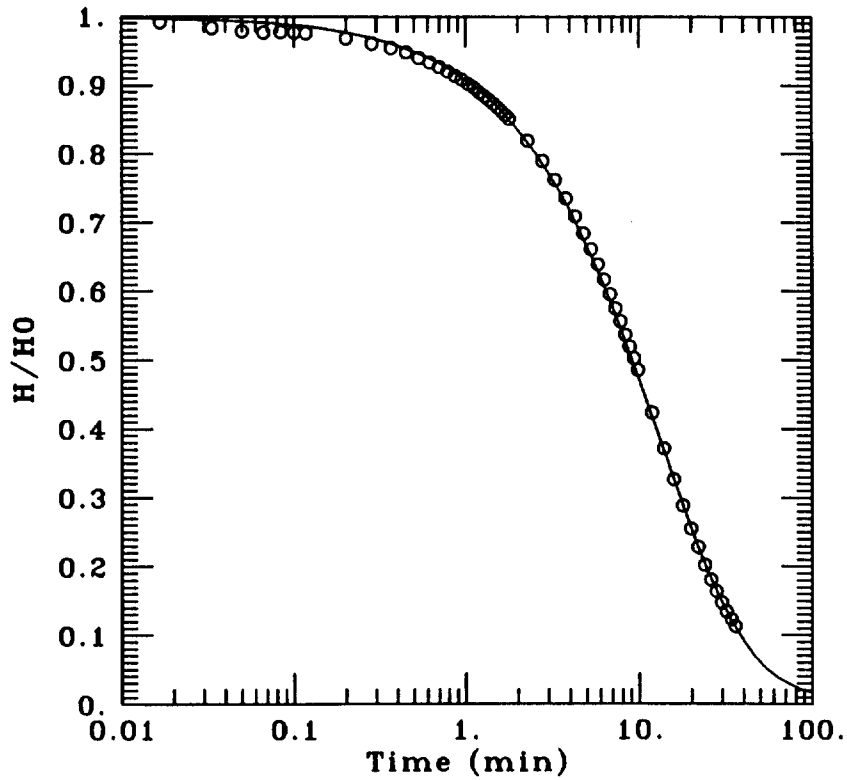
TEST WELL:
Well 3e (Site 18)

ESTIMATED PARAMETERS:
K = 8.946E-05 ft/min
y0 = 3.292 ft

TEST DATA:
H0 = 3.415 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 52. ft
H = 52. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 3E (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL3E\3ECBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/15/92

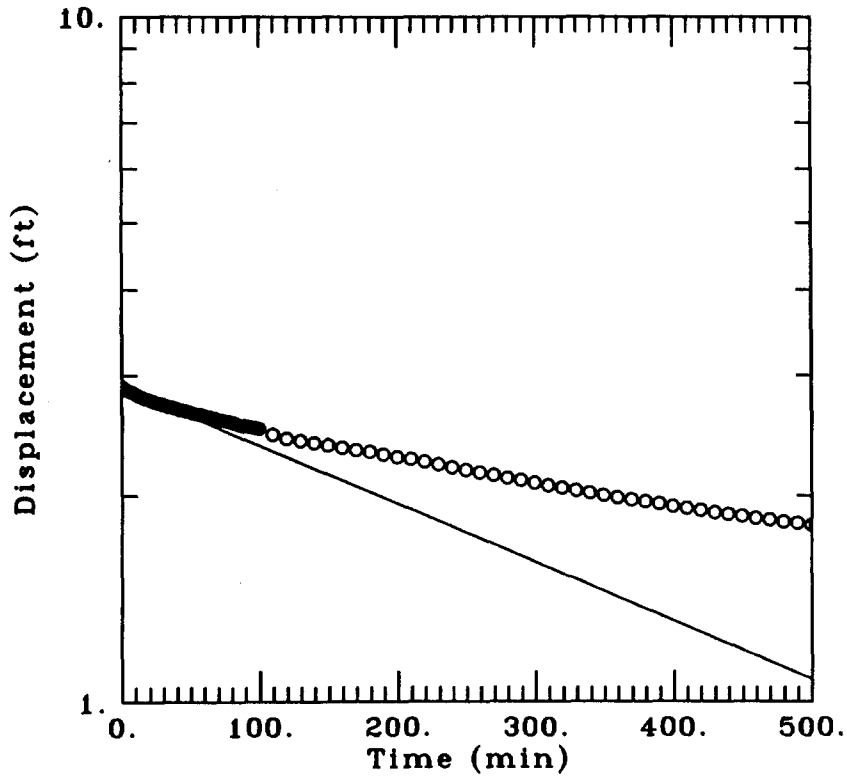
TEST WELL:
Well 3e (Site 18)

ESTIMATED PARAMETERS:
T = 0.006512 $ft^2$/min
S = 1.692E-06

TEST DATA:
HO = 3.415 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 5A: BOUWER-RICE METHOD




DATA SET:
well5a\5as1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/21/92

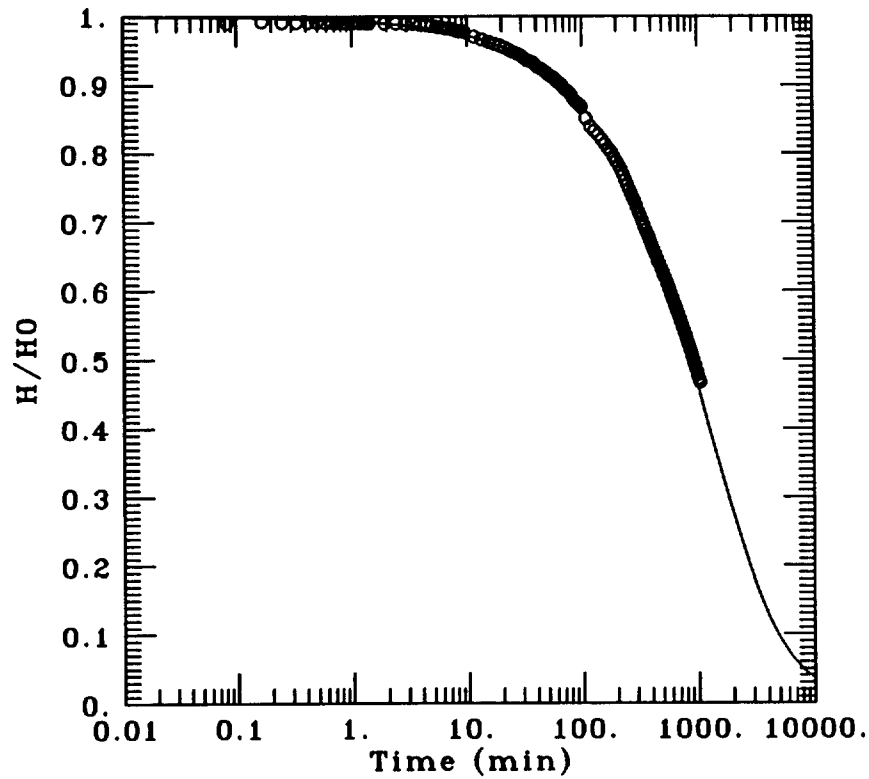
TEST WELL:
Well 5a (Site 18)

ESTIMATED PARAMETERS:
K = 6.1362E-06 ft/min
y0 = 2.878 ft

TEST DATA:
H0 = 2.885 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 5A: COOPER ET AL. METHOD




DATA SET:
WELL5A\5ACBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/21/92

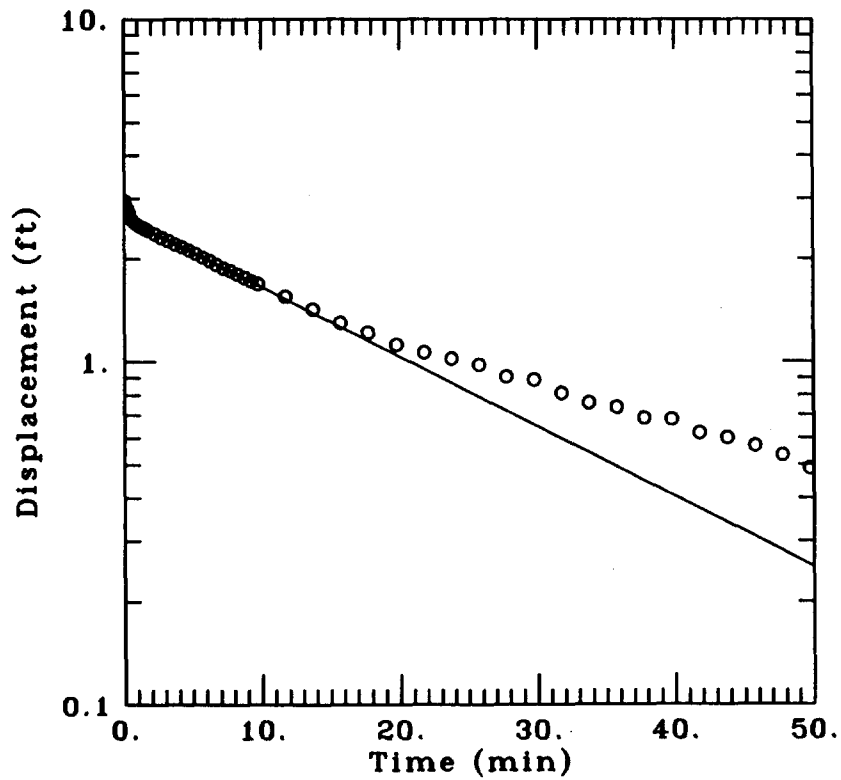
TEST WELL:
Well 5a (Site 18)

ESTIMATED PARAMETERS:
T = 4.6314E-05 $ft^2$/min
S = 0.001078

TEST DATA:
H0 = 2.885 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 19E (TEST 1): BOUWER-RICE METHOD




DATA SET:
well19e\19es1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/15/92

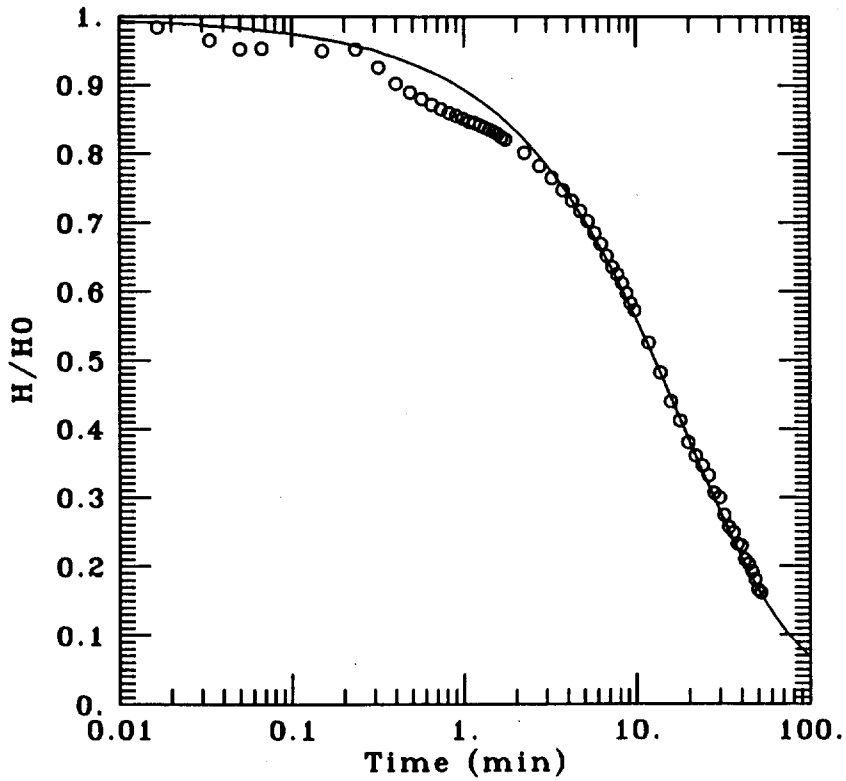
TEST WELL:
Well 19e (Site 18)

ESTIMATED PARAMETERS:
K = 0.0001673 ft/min
y0 = 2.647 ft

TEST DATA:
H0 = 2.95 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 40.7 ft
H = 40.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 19E (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL19E\19ECBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/15/92

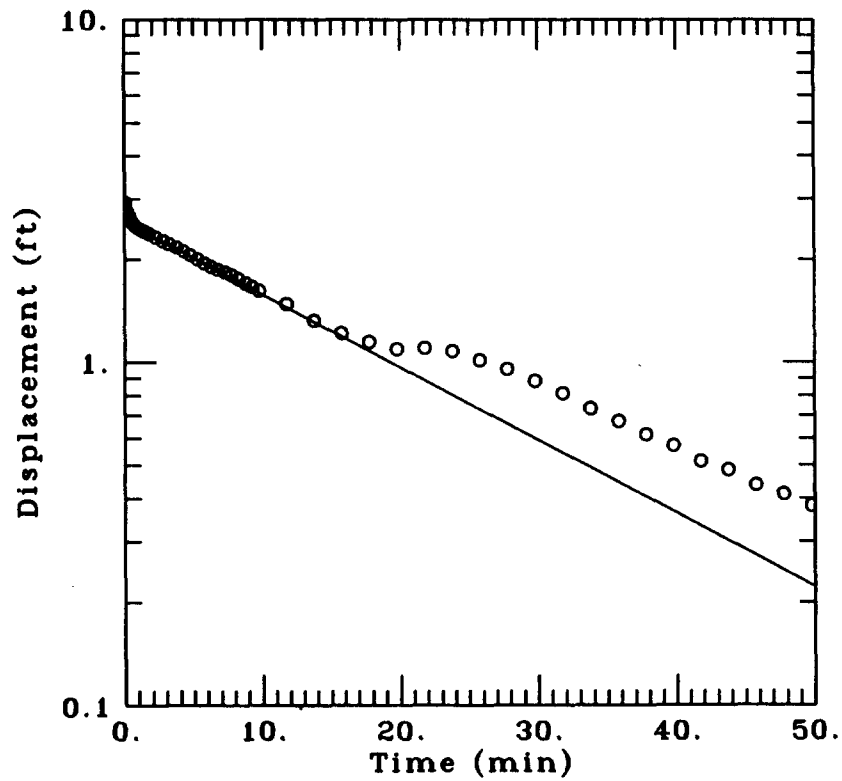
TEST WELL:
Well 19e (Site 18)

ESTIMATED PARAMETERS:
T = 0.005239 $ft^2/min$
S = 0.004979

TEST DATA:
HO = 2.95 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 19E (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL19E\19ES2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/15/92

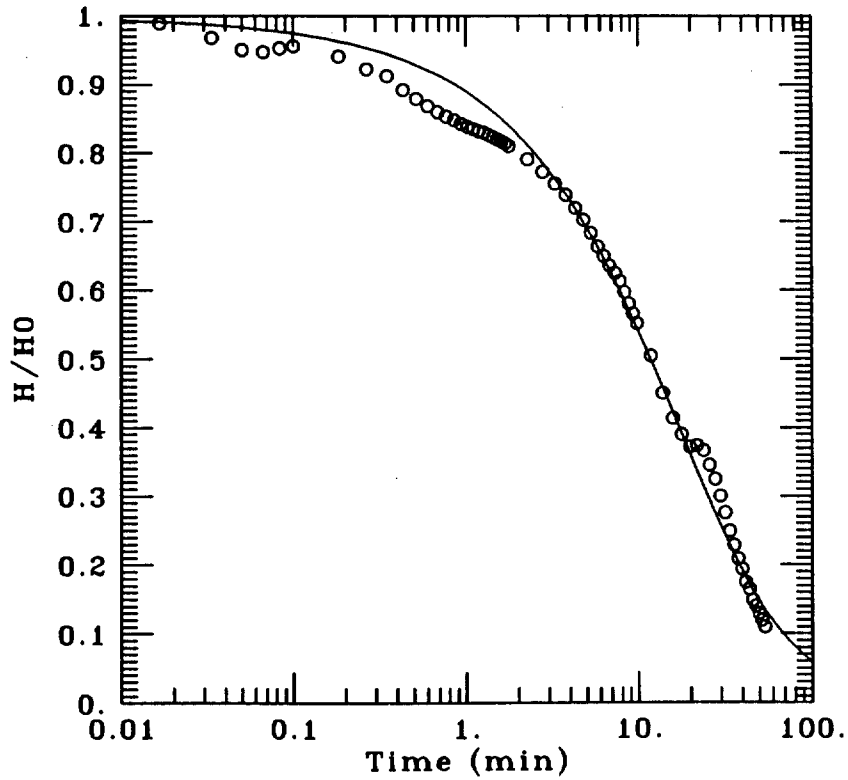
TEST WELL:
Well 19e (Site 18)

ESTIMATED PARAMETERS:
K = 0.0001746 ft/min
y0 = 2.58 ft

TEST DATA:
H0 = 2.937 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 40.7 ft
H = 40.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 19E (TEST 2): COOPER ET AL. METHOD




DATA SET:
well19e\19ecbp2.dat
02/10/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al

TEST DATE:
10/15/92

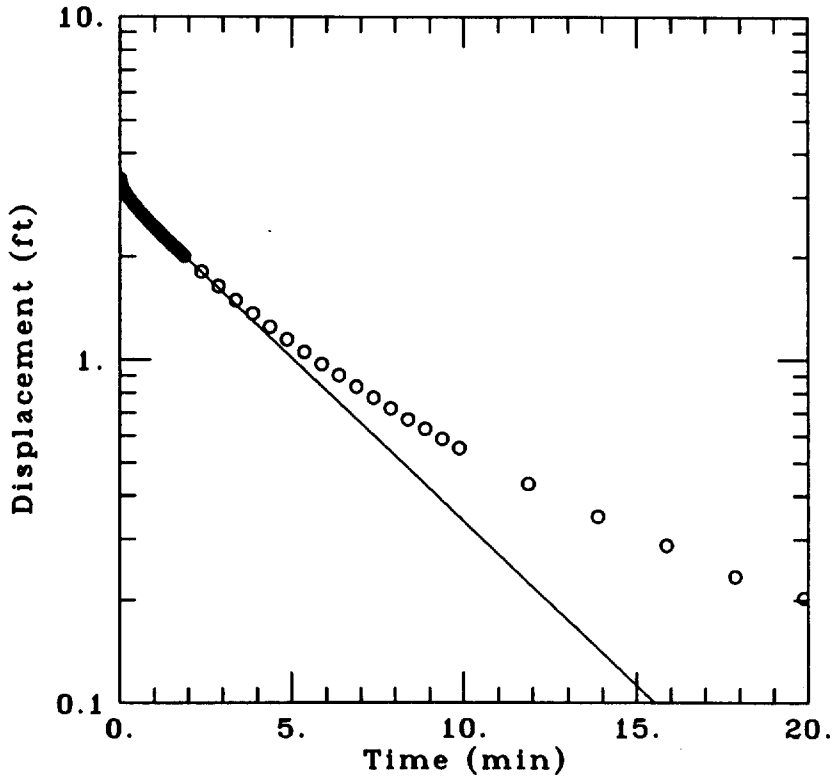
TEST WELL:
Well 19e (Site 18)

ESTIMATED PARAMETERS:
T = 0.00596 $ft^2/min$
S = 0.004114

TEST DATA:
H0 = 2.937 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 24 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well24\24s1.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/23/92

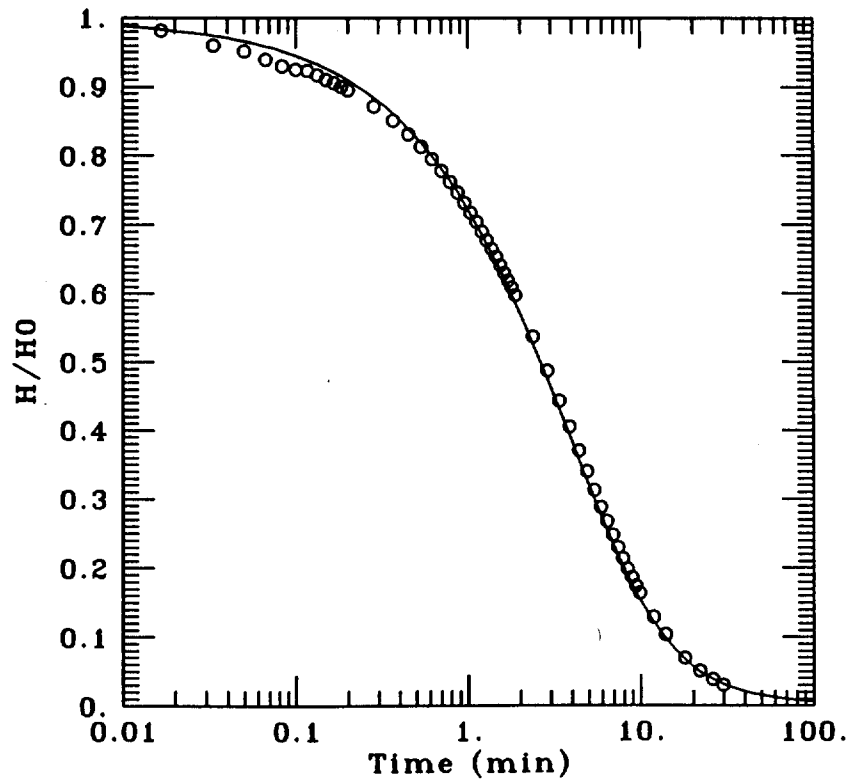
TEST WELL:
WELL 24 (SITE 18)

ESTIMATED PARAMETERS:
K = 0.001347 ft/min
y0 = 3.043 ft

TEST DATA:
H0 = 3.368 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 20. ft
b = 22.8 ft
H = 22.8 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 24 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL24\24CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/23/92

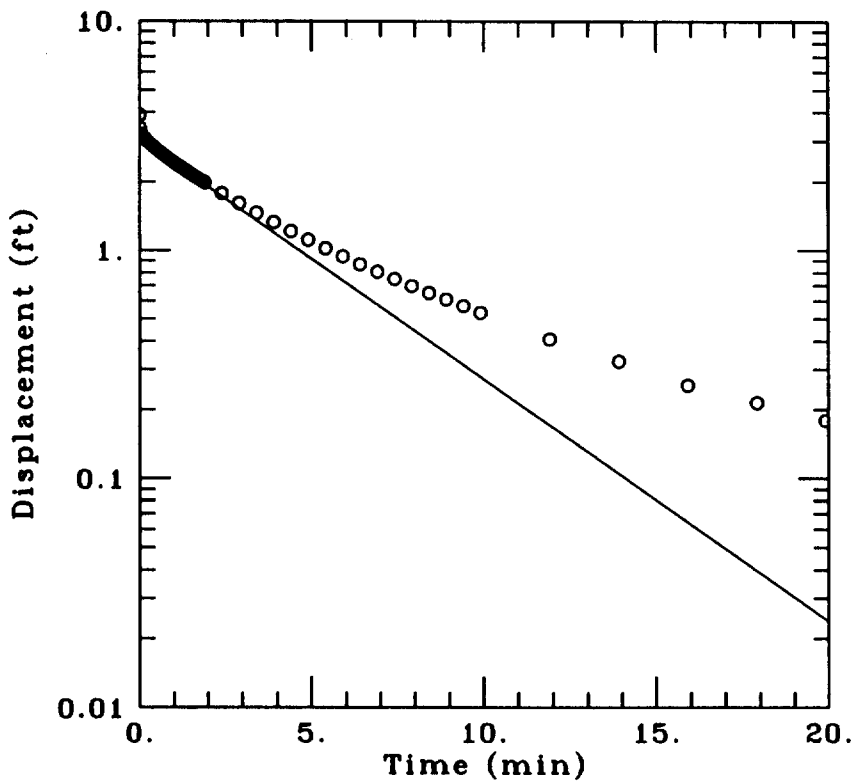
TEST WELL:
WELL 24 (SITE 18)

ESTIMATED PARAMETERS:
T = 0.03372 $ft^2/min$
S = 0.001331

TEST DATA:
HO = 3.368 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 24 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well24\24s2.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/23/92

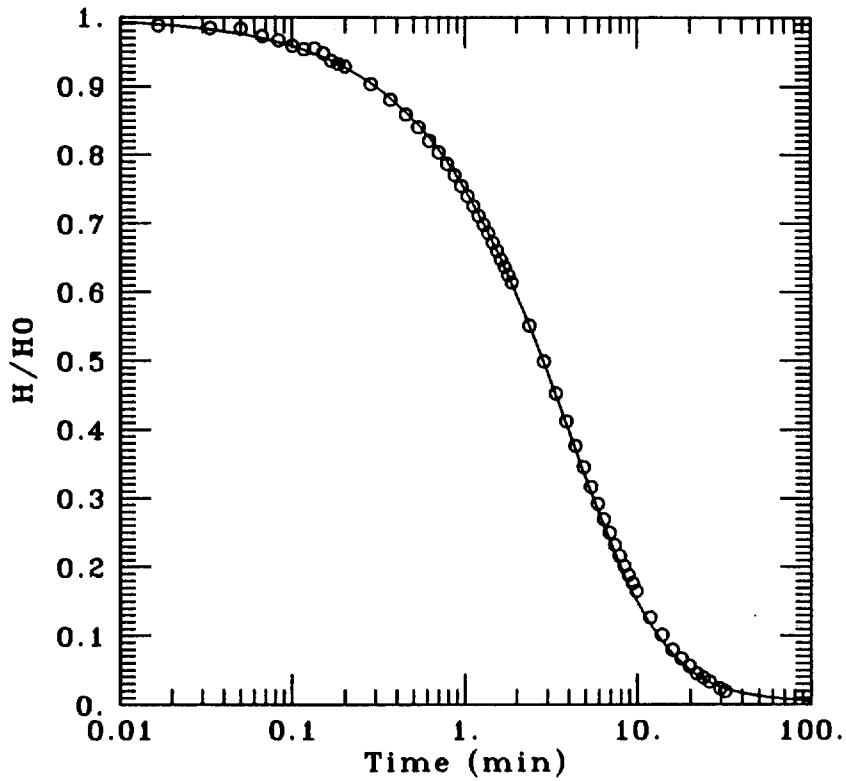
TEST WELL:
Well 24 (Site 18)

ESTIMATED PARAMETERS:
K = 0.001489 ft/min
y0 = 3.094 ft

TEST DATA:
H0 = 3.891 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 20. ft
b = 22.8 ft
H = 22.8 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 24 (TEST 2): COOPER ET AL. METHOD




DATA SET:
well24\24cbp2.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/23/92

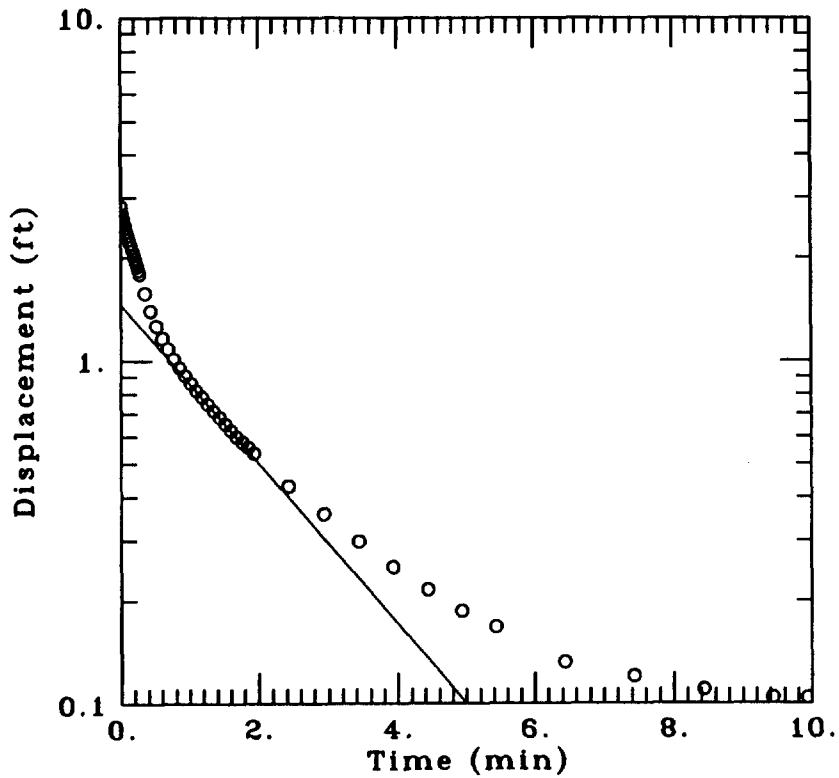
TEST WELL:
Well 24 (Site 18)

ESTIMATED PARAMETERS:
T = 0.043 $ft^2$/min
S = 0.0001611

TEST DATA:
H0 = 3.222 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 25 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well25\25s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/13/92

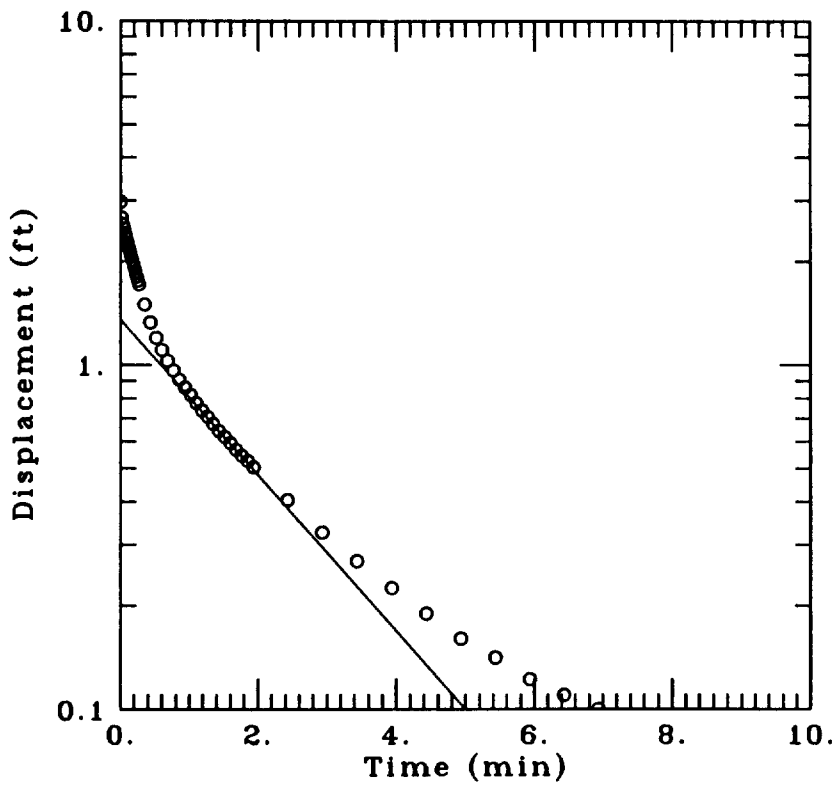
TEST WELL:
Well 25 (Site 2)

ESTIMATED PARAMETERS:
K = 0.003281 ft/min
y0 = 1.46 ft

TEST DATA:
H0 = 2.83 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 19.2 ft
b = 19.2 ft
H = 19.2 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 25 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well25\25s2.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/13/92

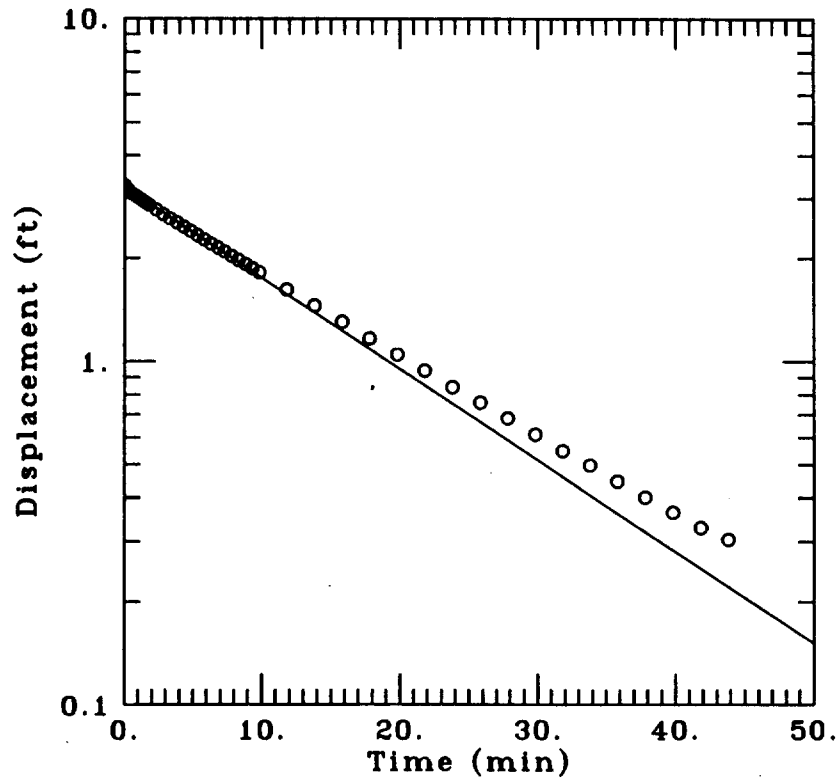
TEST WELL:
Well 25 (Site 2)

ESTIMATED PARAMETERS:
K = 0.003195 ft/min
y0 = 1.358 ft

TEST DATA:
H0 = 2.979 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 19.2 ft
b = 19.2 ft
H = 19.2 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 29 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well29\29s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/14/92

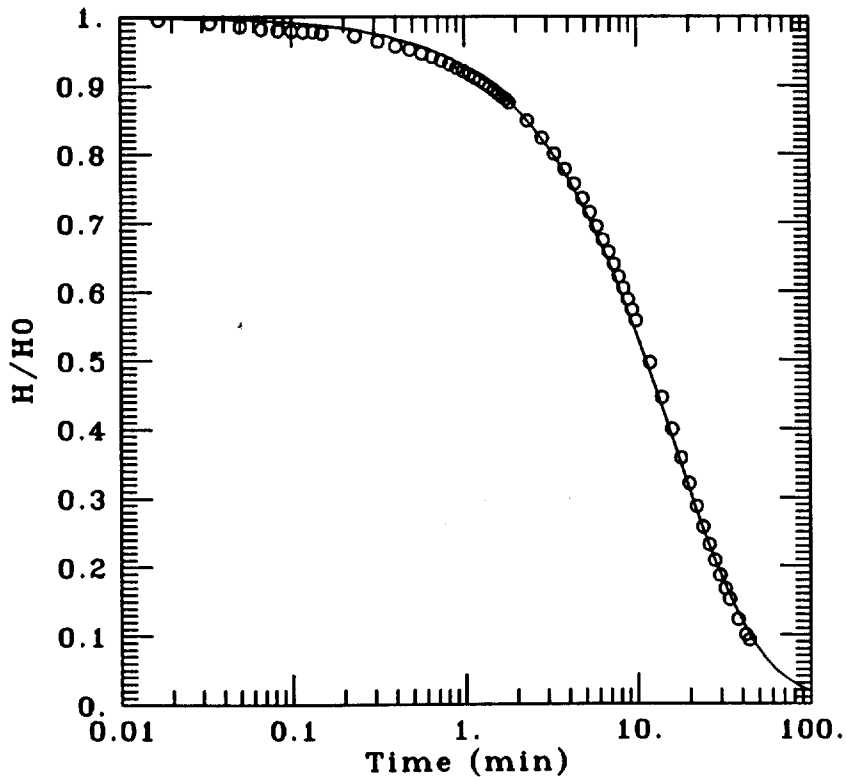
TEST WELL:
Well 29 (Site 8)

ESTIMATED PARAMETERS:
K = 7.4458E-05 ft/min
y0 = 3.239 ft

TEST DATA:
H0 = 3.266 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 43.6 ft
H = 43.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 29 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL29\29CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/14/92

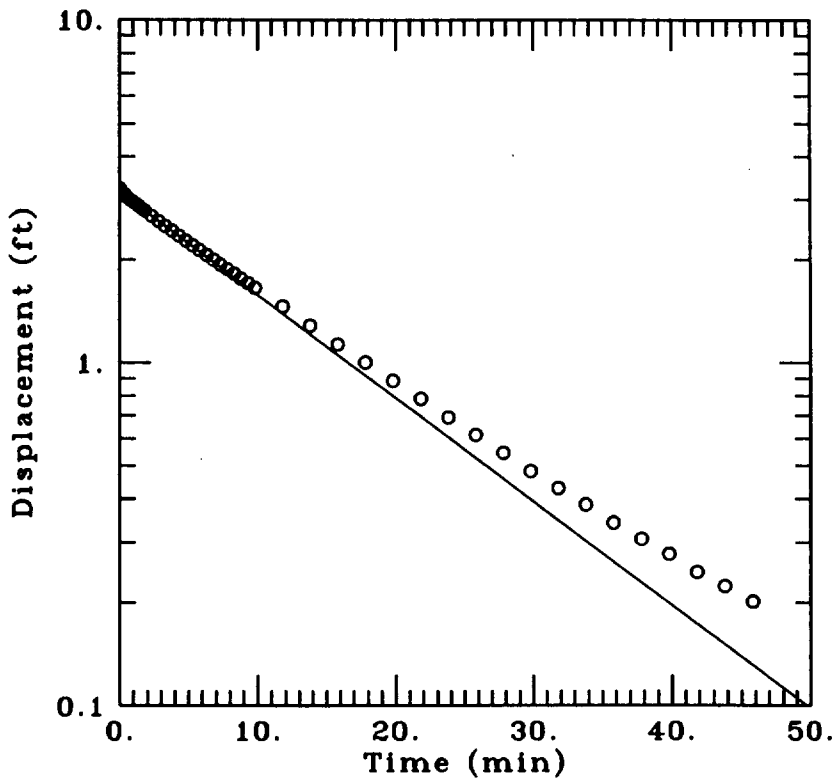
TEST WELL:
Well 29 (Site 8)

ESTIMATED PARAMETERS:
T = 0.006877 $ft^2$/min
S = 5.61E-08

TEST DATA:
H0 = 3.266 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 29 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL29\29S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/14/92

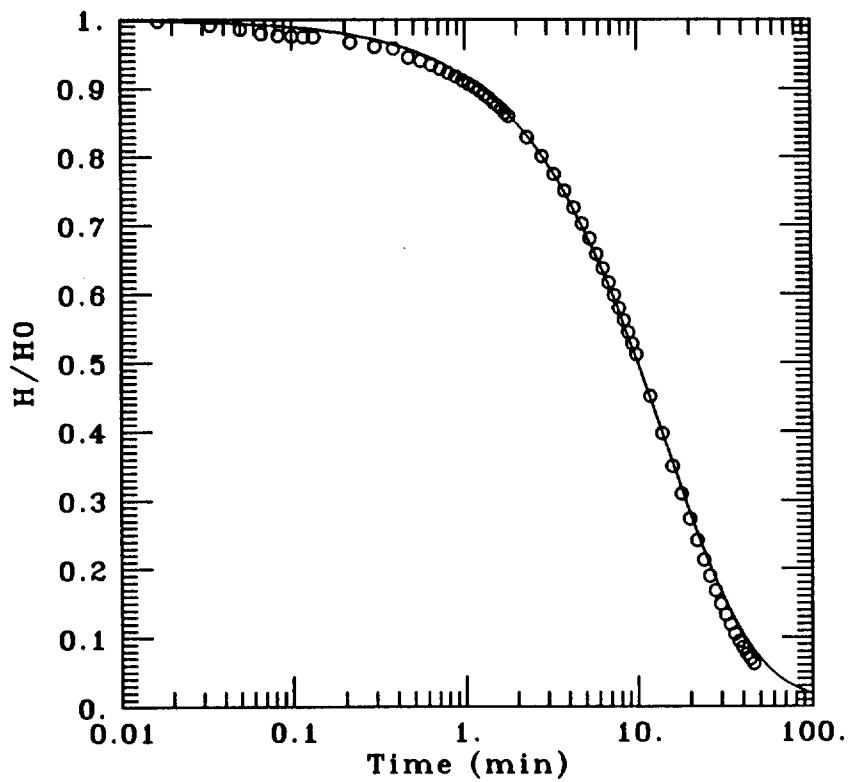
TEST WELL:
Well 29 (Site 8)

ESTIMATED PARAMETERS:
K = 8.4302E-05 ft/min
y0 = 3.158 ft

TEST DATA:
H0 = 3.237 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 43.6 ft
H = 43.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 29 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL29\29CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/14/92

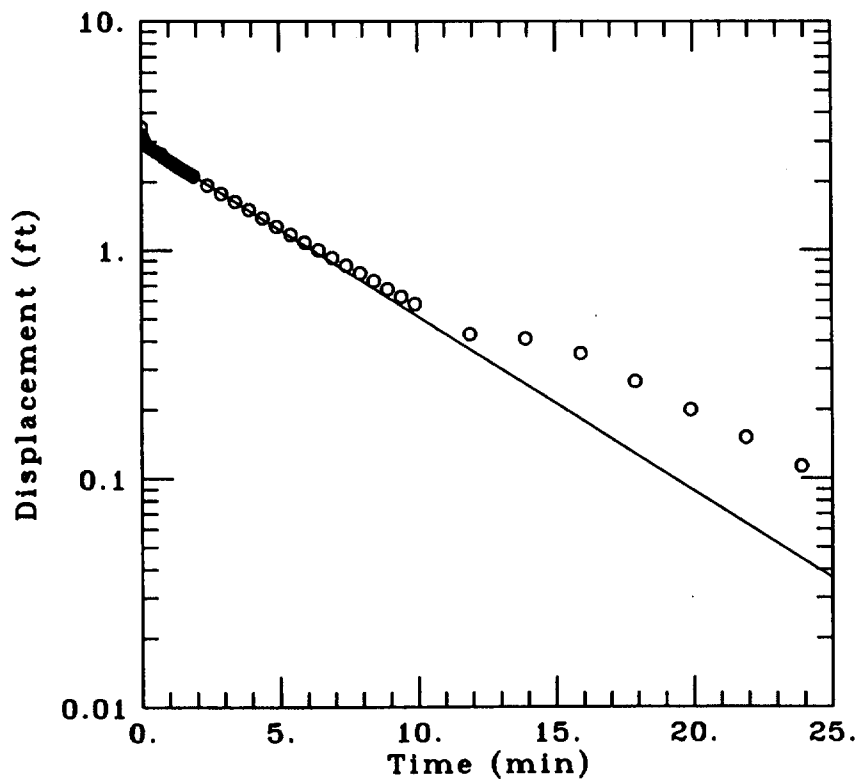
TEST WELL:
Well 29 (Site 8)

ESTIMATED PARAMETERS:
T = 0.006313 $ft^2$/min
S = 7.8552E-07

TEST DATA:
HO = 3.237 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 32 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well32\32s1.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

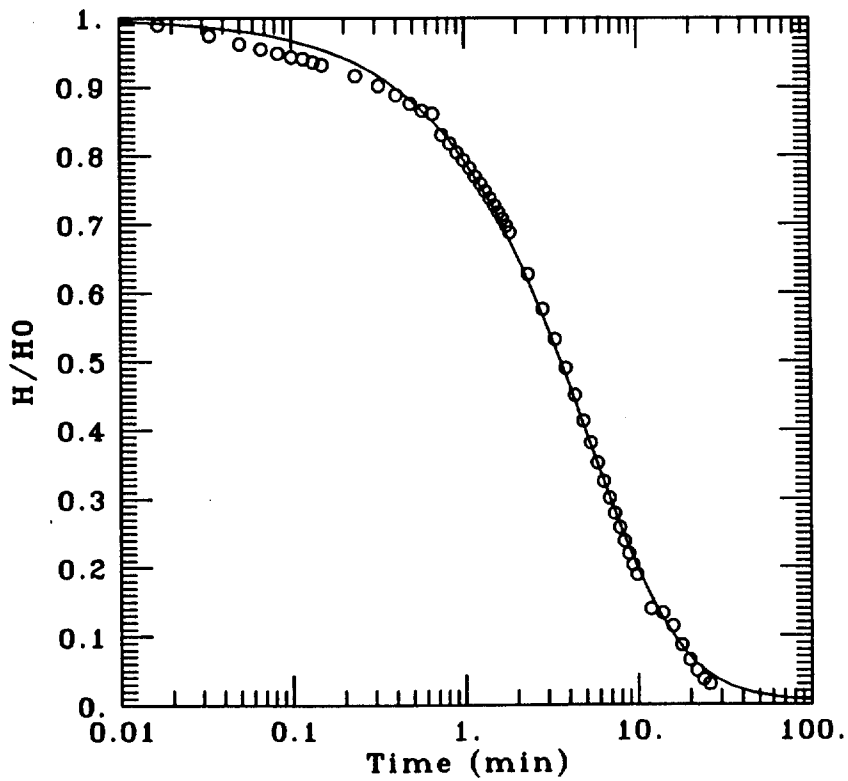
TEST WELL:
Well 32 (Site 13)

ESTIMATED PARAMETERS:
K = 0.0006302 ft/min
y0 = 2.954 ft

TEST DATA:
H0 = 3.464 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 43.1 ft
H = 43.1 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 32 (TEST 1): COOPER ET AL. METHOD




DATA SET:
well32\32cbp1.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/22/92

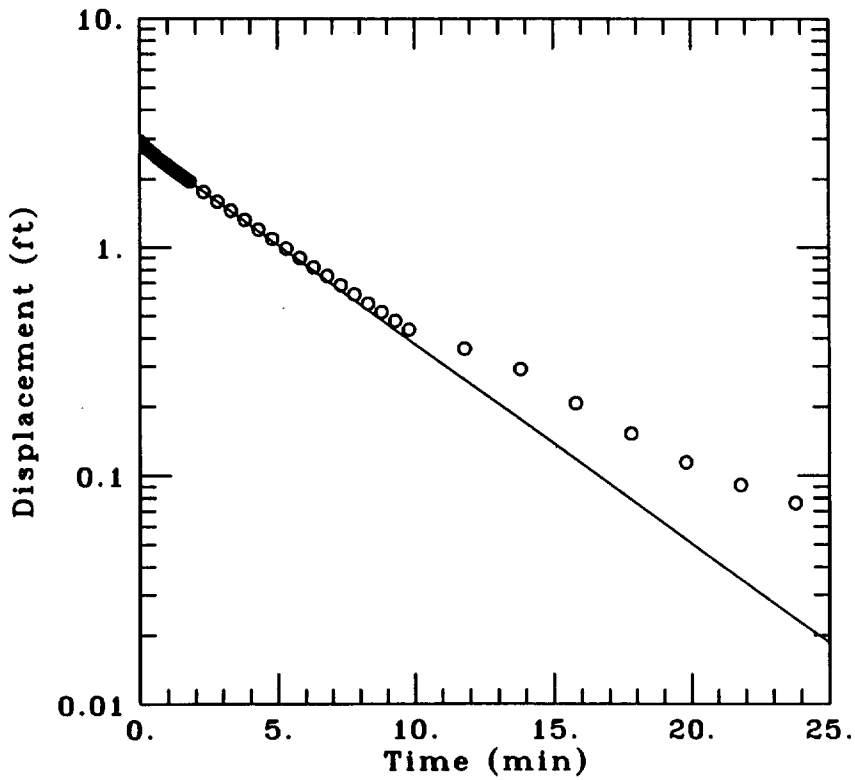
TEST WELL:
Well 32 (Site 13)

ESTIMATED PARAMETERS:
T = 0.03726 $ft^2$/min
S = 8.1E-05

TEST DATA:
H0 = 3.07 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 32 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well32\32s2.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

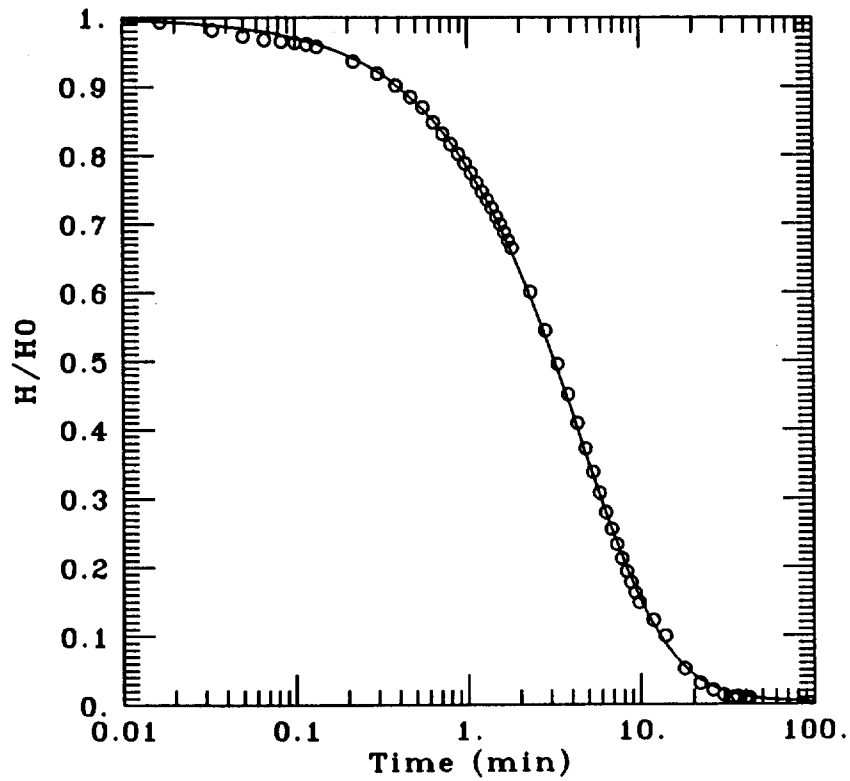
TEST WELL:
Well 32 (Site 13)

ESTIMATED PARAMETERS:
K = 0.000721 ft/min
y0 = 2.8 ft

TEST DATA:
H0 = 2.925 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 43.1 ft
H = 43.1 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 32 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL32\32CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/22/92

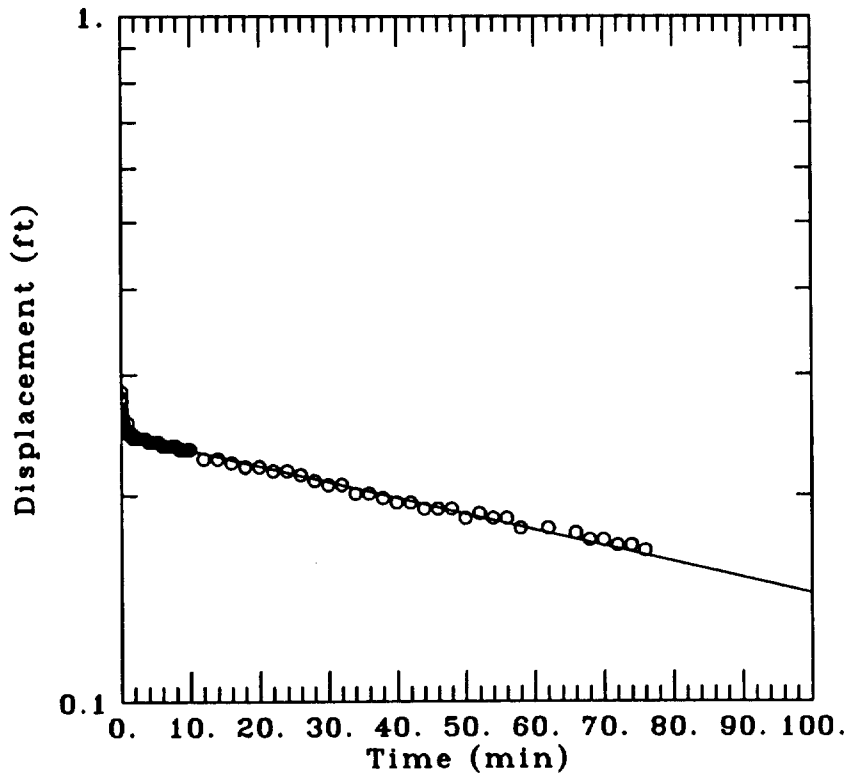
TEST WELL:
Well 32 (Site 13)

ESTIMATED PARAMETERS:
T = 0.06167 $ft^2$/min
S = 1.4781E-06

TEST DATA:
H0 = 2.925 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 33 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well33\33s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/16/92

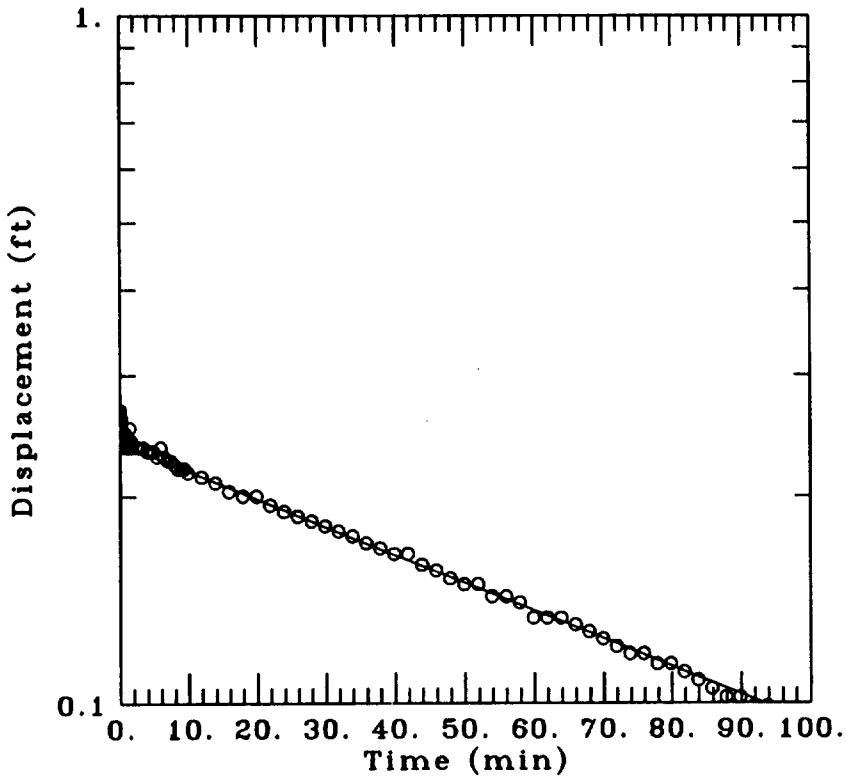
TEST WELL:
Well 33 (Site 16)

ESTIMATED PARAMETERS:
K = 1.9852E-05 ft/min
y0 = 0.2454 ft

TEST DATA:
H0 = 0.283 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 37.7 ft
b = 37.7 ft
H = 37.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 33 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well33\33s2.dat
02/24/93

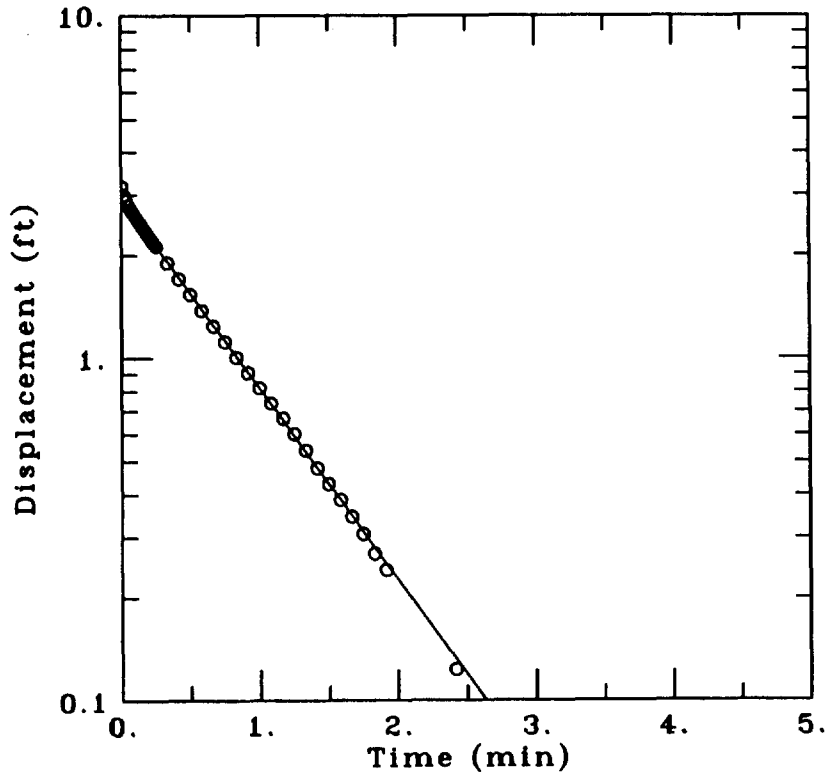
AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
10/16/92
TEST WELL:
Well 33 (Site 16)

ESTIMATED PARAMETERS:
K = 3.4551E-05 ft/min
y0 = 0.2386 ft

TEST DATA:
H0 = 0.266 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 37.7 ft
b = 37.7 ft
H = 37.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 48 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well48\48s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/6/92

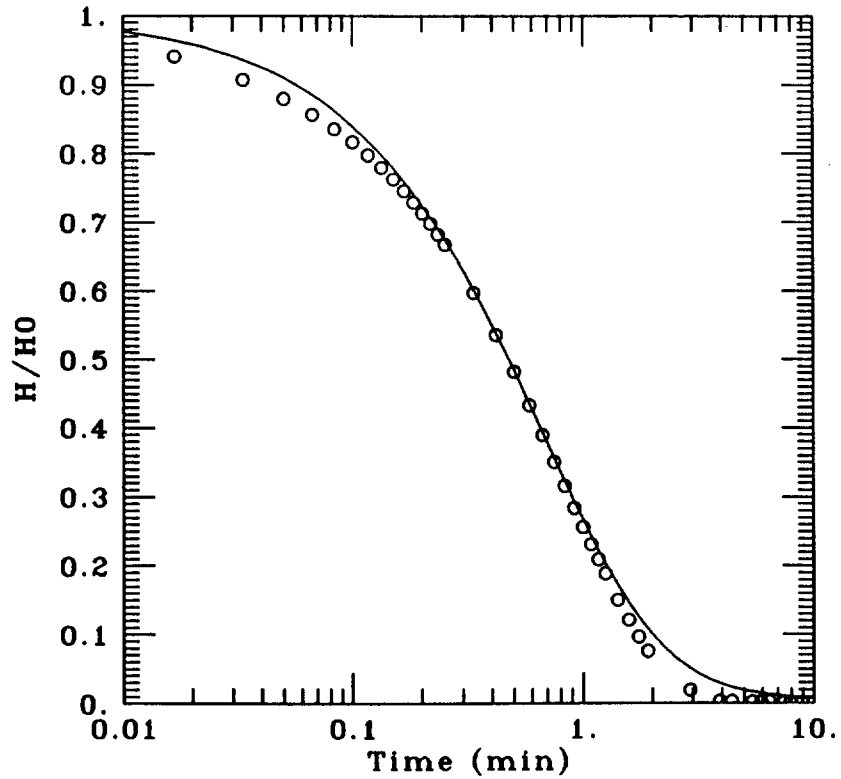
TEST WELL:
Well 48 (Site 12)

ESTIMATED PARAMETERS:
K = 0.004602 ft/min
y0 = 2.938 ft

TEST DATA:
H0 = 3.179 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 39.4 ft
b = 39.4 ft
H = 39.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 48 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL48\48CBP1.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/6/92

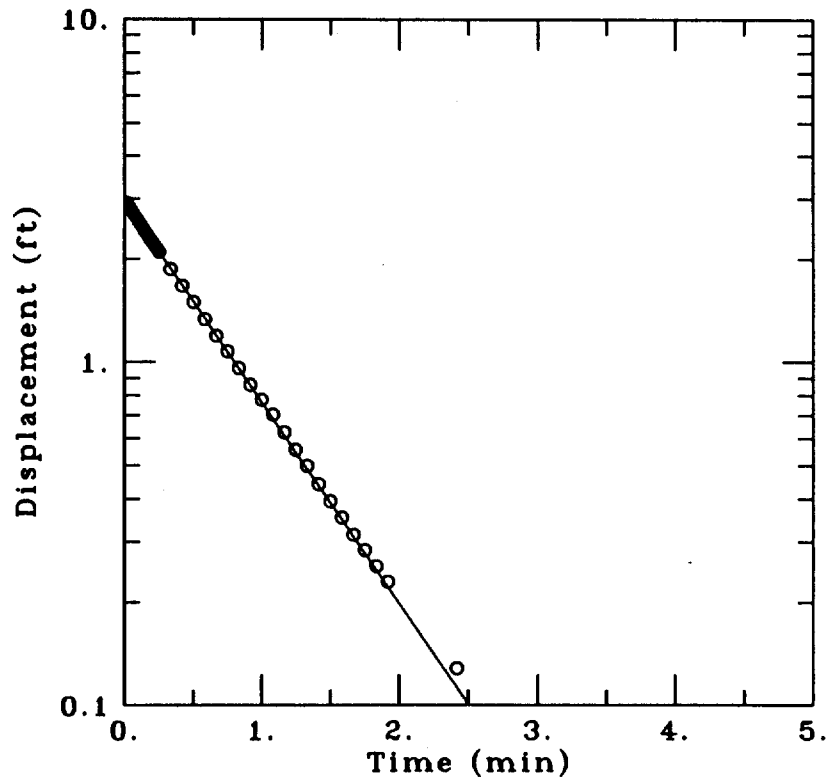
TEST WELL:
Well 48 (Site 12)

ESTIMATED PARAMETERS:
T = 0.3487 $ft^2$/min
S = 1.E-05

TEST DATA:
HO = 3.179 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 48 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well48\48s2.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/6/92

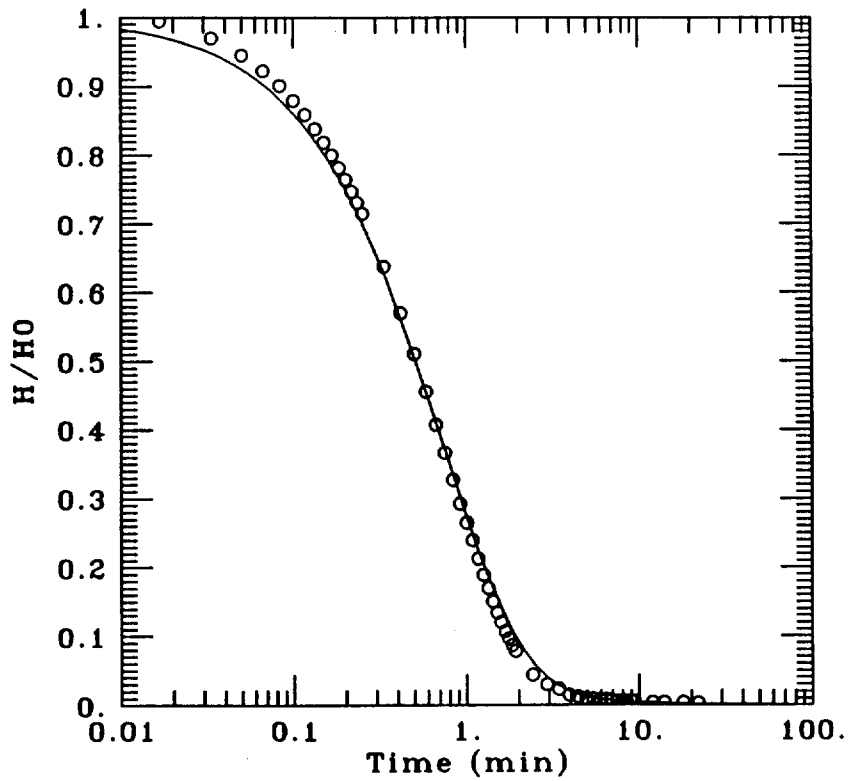
TEST WELL:
Well 48 (Site 12)

ESTIMATED PARAMETERS:
K = 0.004824 ft/min
y0 = 2.934 ft

TEST DATA:
H0 = 2.931 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 39.5 ft
b = 39.5 ft
H = 39.5 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 48 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL48\48CBP2.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/6/92

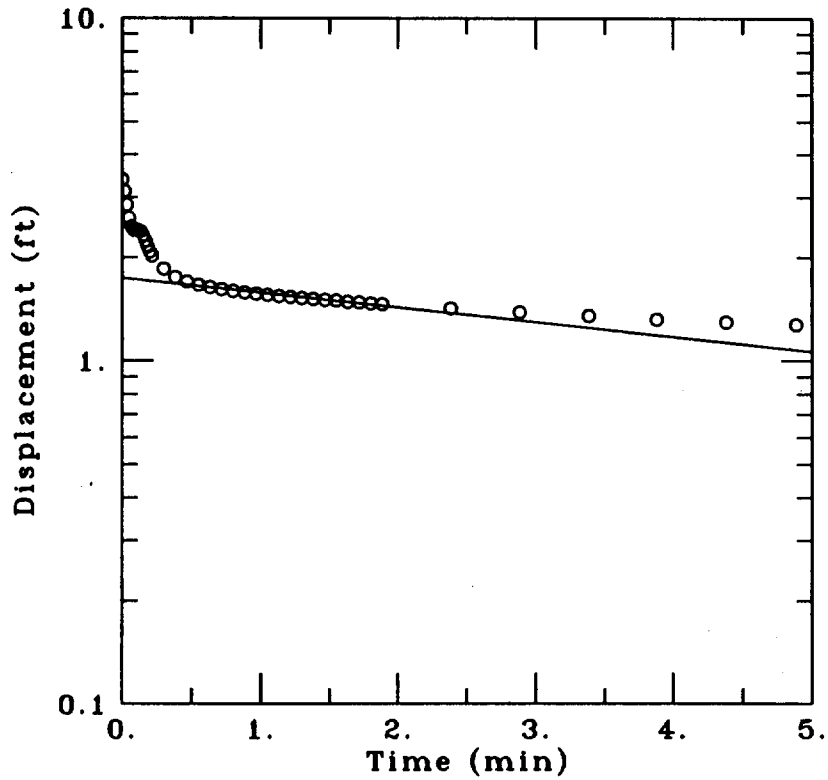
TEST WELL:
Well 48 (Site 12)

ESTIMATED PARAMETERS:
T = 0.6001 $ft^2/min$
S = 1.0002E-09

TEST DATA:
HO = 2.931 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 51 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well51\51s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

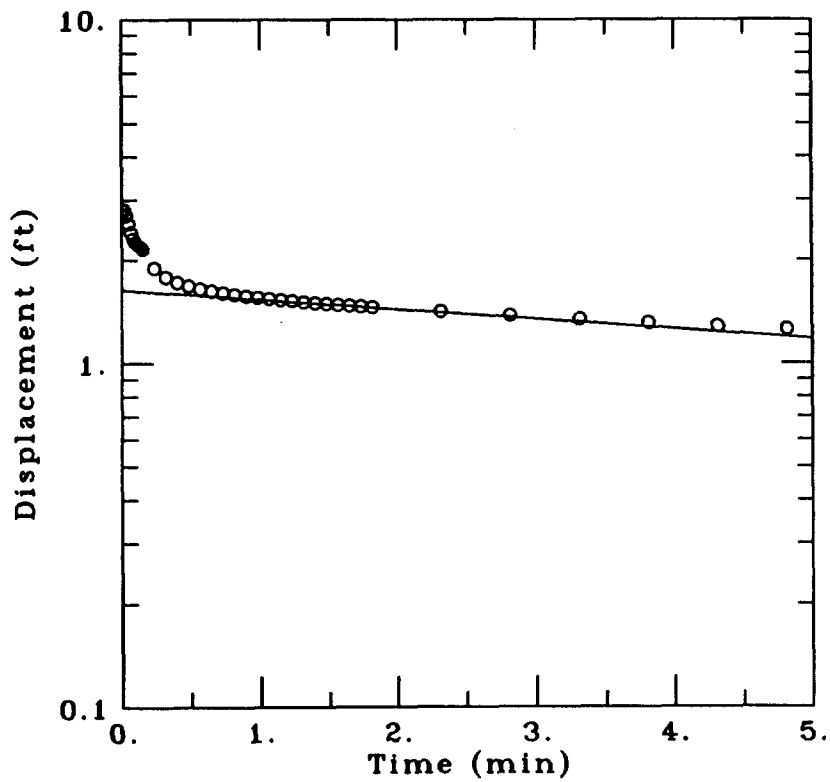
TEST WELL:
Well 51 (Site 15)

ESTIMATED PARAMETERS:
K = 0.0003637 ft/min
y0 = 1.744 ft

TEST DATA:
H0 = 3.382 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 38.4 ft
b = 38.4 ft
H = 38.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 51 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well51\51s2.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

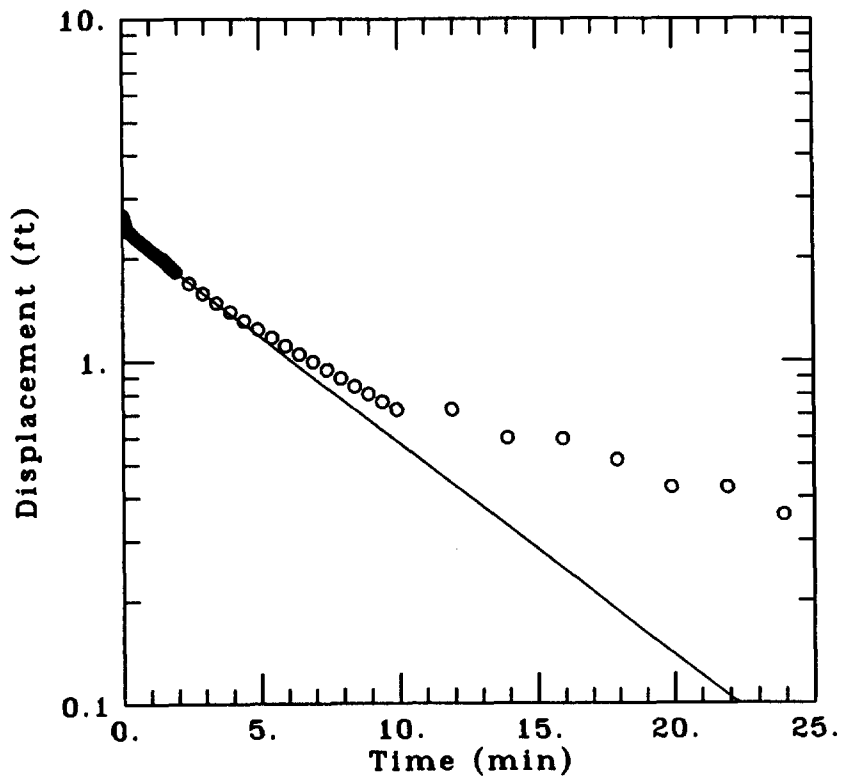
TEST WELL:
Well 51 (Site 15)

ESTIMATED PARAMETERS:
K = 0.0002411 ft/min
y0 = 1.635 ft

TEST DATA:
H0 = 2.816 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 38.4 ft
b = 38.4 ft
H = 38.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 52 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well52\52s1.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/16/92

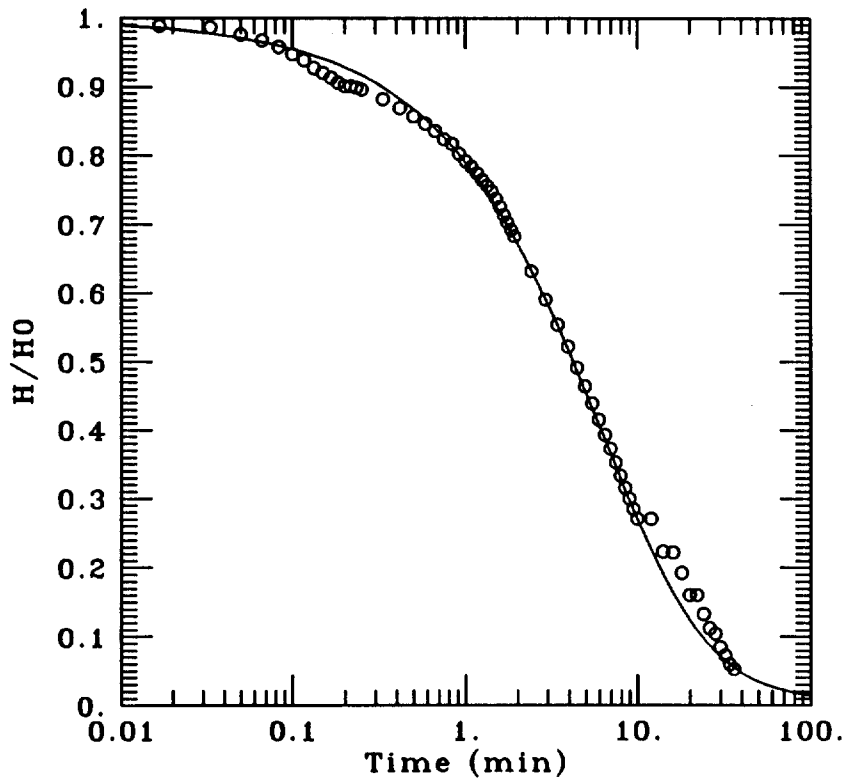
TEST WELL:
Well 52 (Site 16)

ESTIMATED PARAMETERS:
K = 0.0005065 ft/min
y0 = 2.406 ft

TEST DATA:
H0 = 2.669 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 40.6 ft
H = 40.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 52 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL52\52CBP1.DAT
02/10/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/16/92

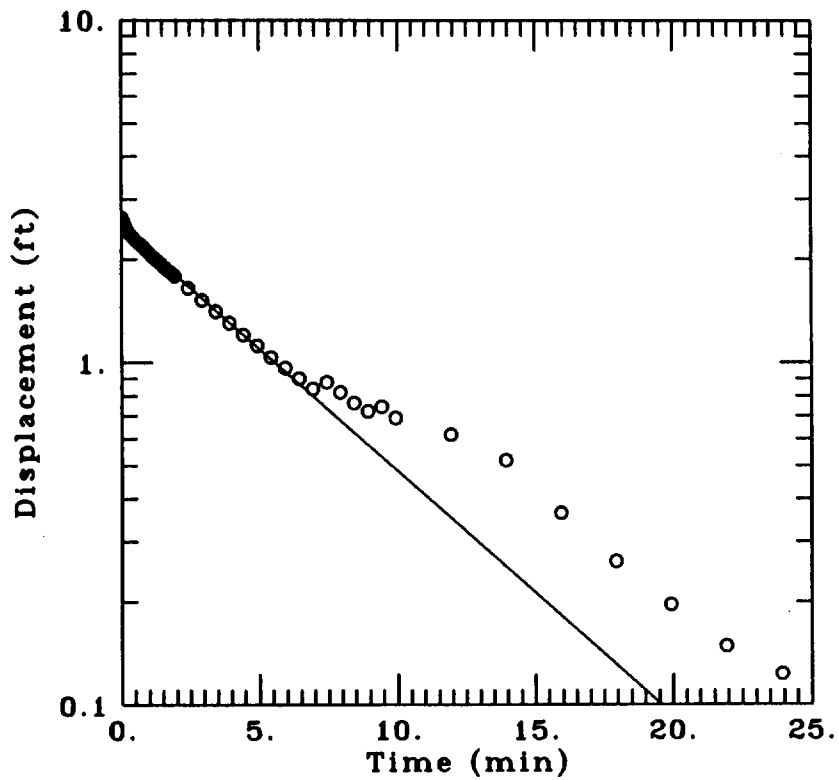
TEST WELL:
Well 52 (Site 16)

ESTIMATED PARAMETERS:
T = 0.01808 $ft^2/min$
S = 0.00281

TEST DATA:
H0 = 2.669 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 52 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL52\52S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/16/92

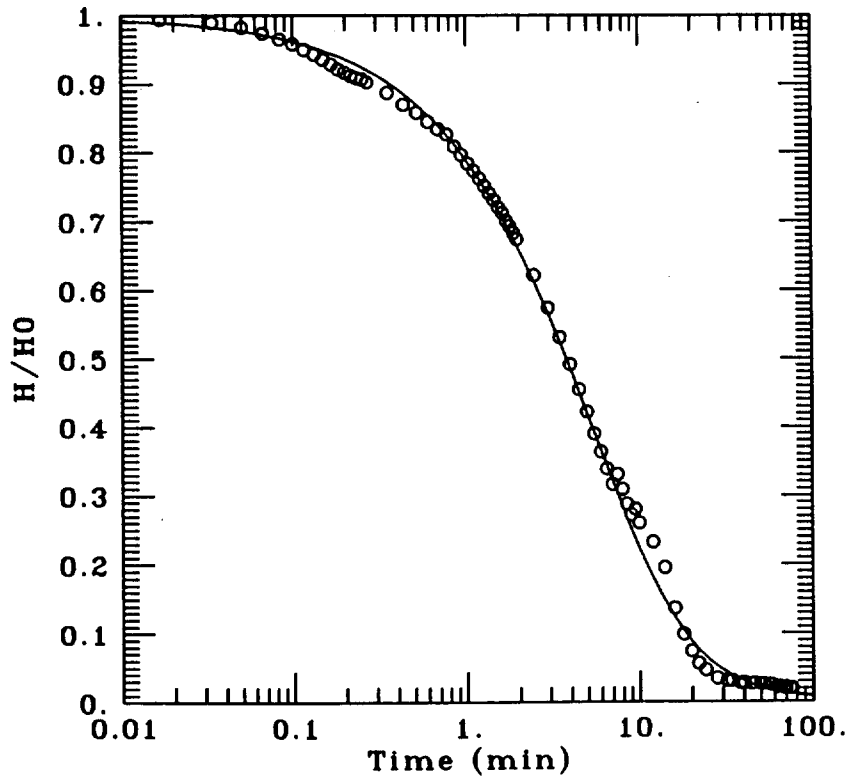
TEST WELL:
Well 52 (Site 16)

ESTIMATED PARAMETERS:
K = 0.0005835 ft/min
y0 = 2.493 ft

TEST DATA:
H0 = 2.65 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 40.6 ft
H = 40.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 52 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL52\52CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/16/92

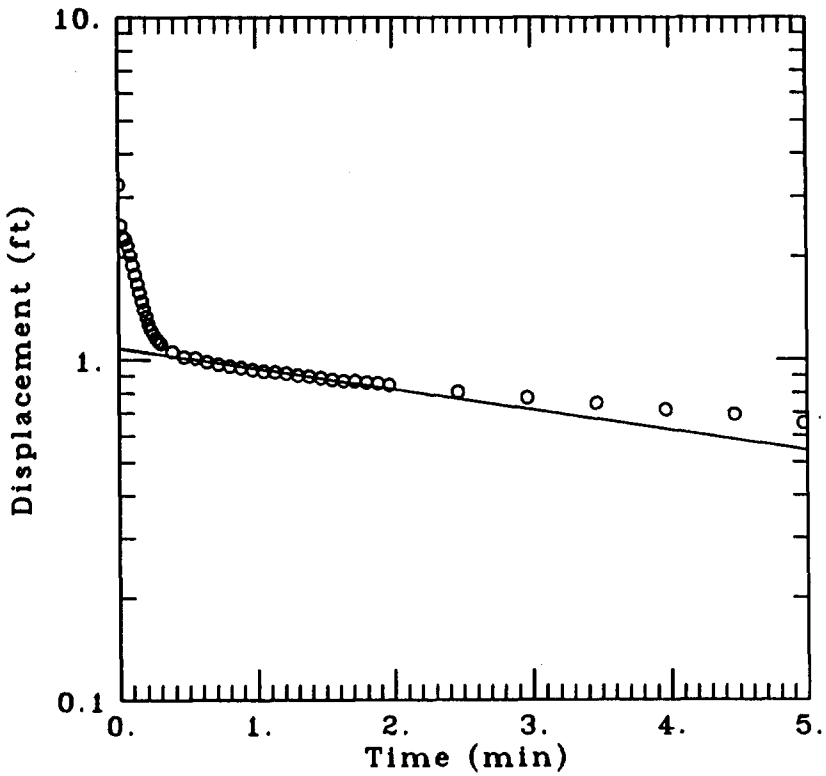
TEST WELL:
Well 52 (Site 16)

ESTIMATED PARAMETERS:
T = 0.02734 $ft^2/min$
S = 0.000556

TEST DATA:
HO = 2.65 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 54 (TEST 1): BOUWER-RICE METHOD




DATA SET:
54s1.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/21/92

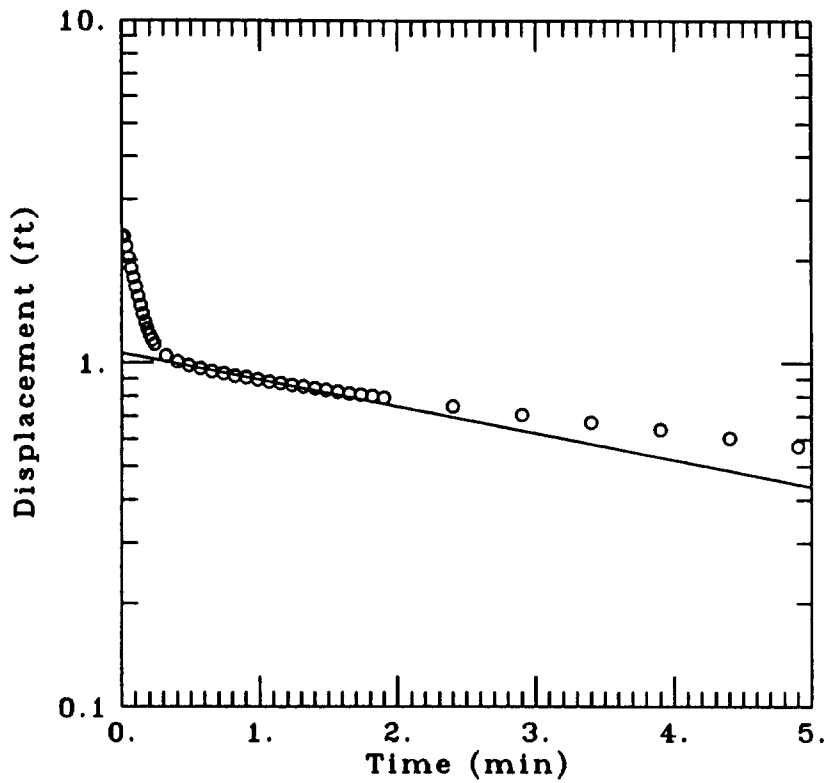
TEST WELL:
Well 54 (Site 19)

ESTIMATED PARAMETERS:
K = 0.000599 ft/min
y0 = 1.082 ft

TEST DATA:
H0 = 3.253 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 30.7 ft
b = 30.7 ft
H = 30.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 54 (TEST 2): BOUWER-RICE METHOD




DATA SET:
54s2.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/21/92

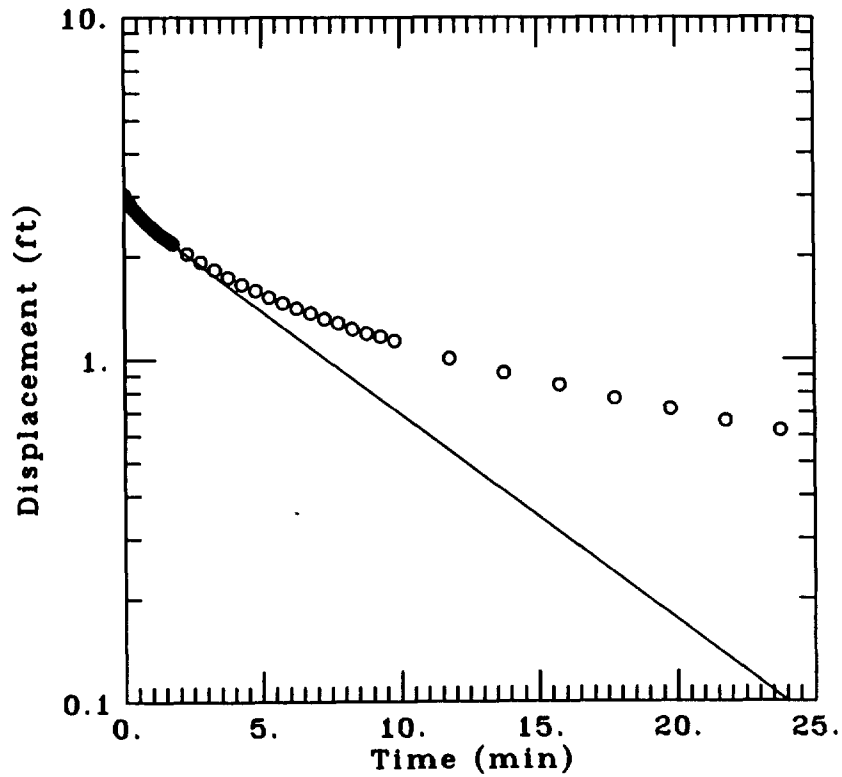
TEST WELL:
Well 54 (Site 19)

ESTIMATED PARAMETERS:
K = 0.0007771 ft/min
y0 = 1.066 ft

TEST DATA:
H0 = 2.346 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 30.6 ft
b = 30.6 ft
H = 30.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 57 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well57\57s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/23/92

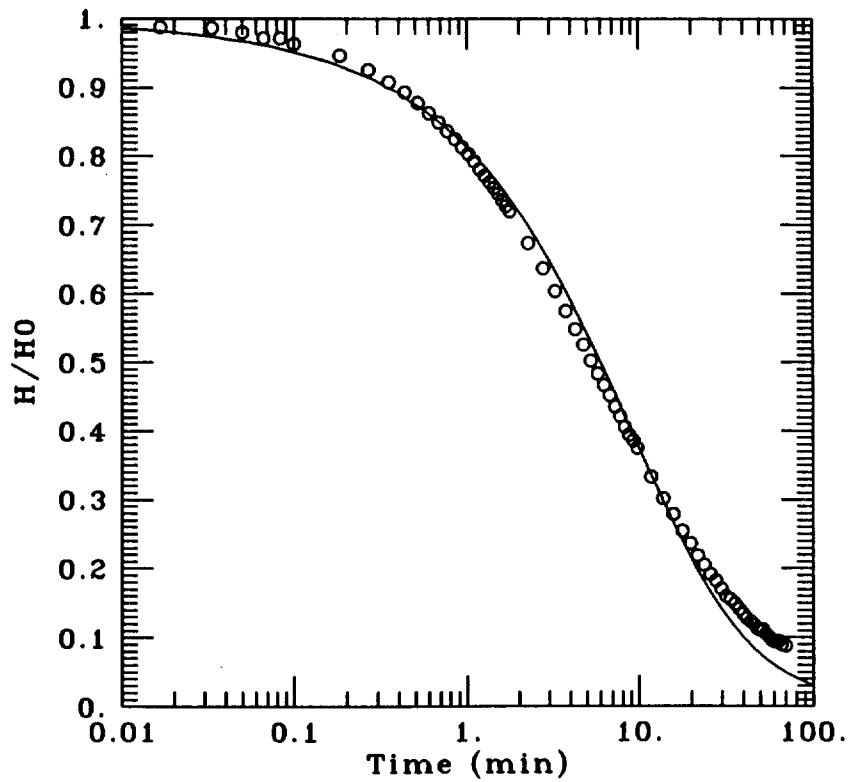
TEST WELL:
Well 57 (Site 1)

ESTIMATED PARAMETERS:
K = 0.000851 ft/min
y0 = 2.76 ft

TEST DATA:
H0 = 3.025 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 20. ft
b = 23.5 ft
H = 23.5 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 57 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL57\57CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/23/92

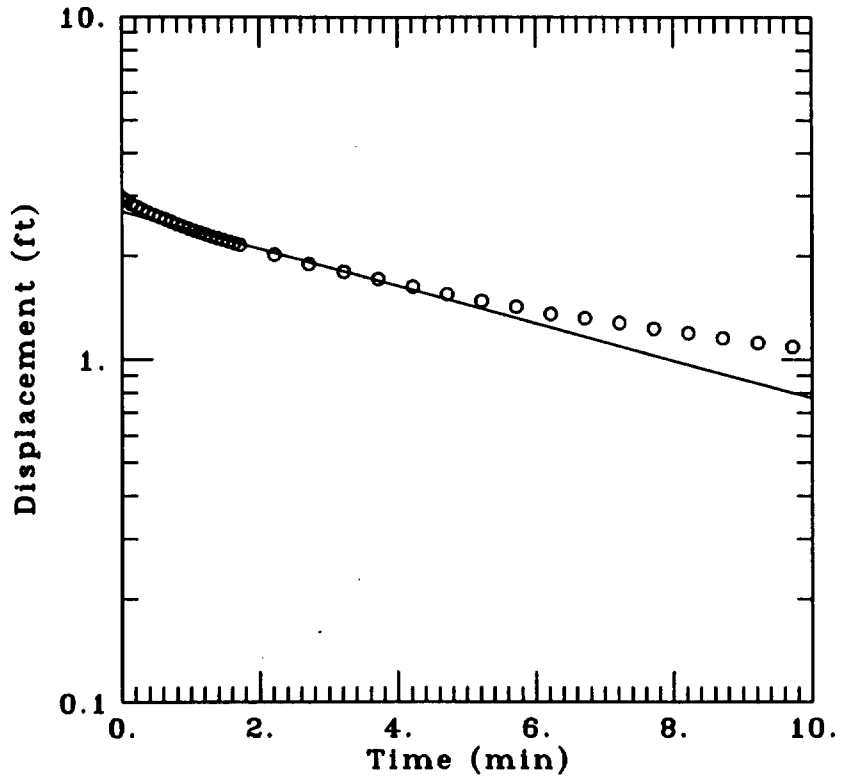
TEST WELL:
Well 57 (Site 1)

ESTIMATED PARAMETERS:
T = 0.008825 $ft^2$/min
S = 0.01184

TEST DATA:
H0 = 3.025 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 57 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL57\57S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/23/92

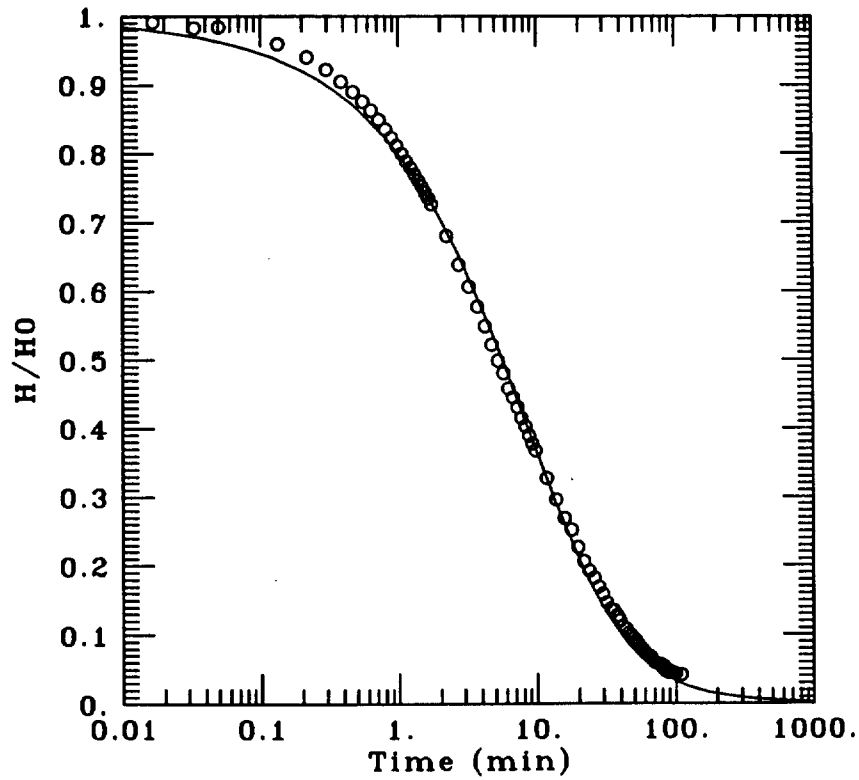
TEST WELL:
Well 57 (Site 1)

ESTIMATED PARAMETERS:
K = 0.0007704 ft/min
y0 = 2.696 ft

TEST DATA:
H0 = 2.96 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 20. ft
b = 23.4 ft
H = 23.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 57 (TEST 2): COOPER ET AL. METHOD




DATA SET:
well57\57cbp2.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/23/92

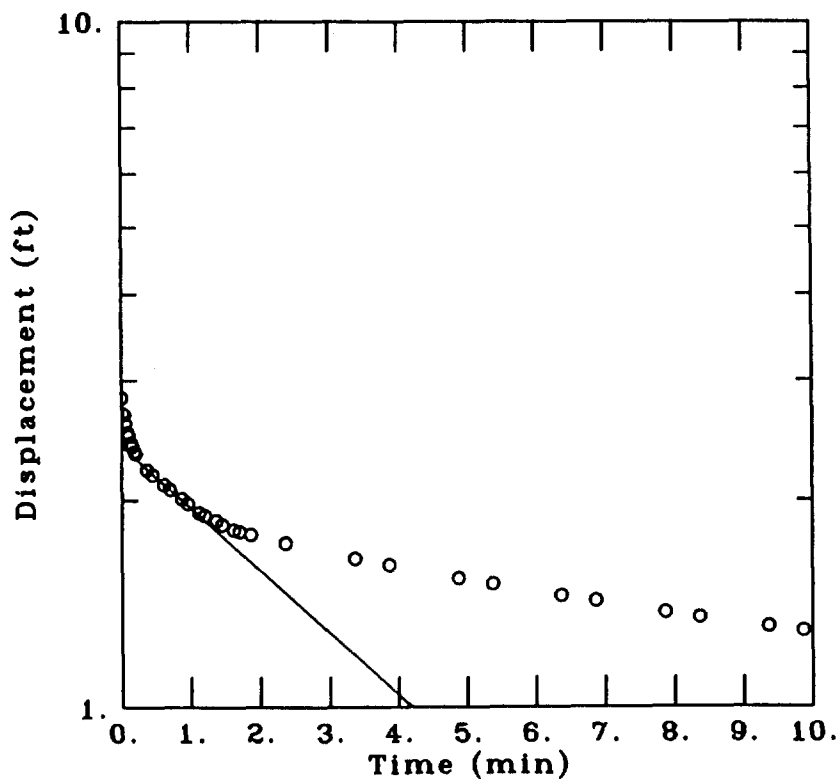
TEST WELL:
Well 57 (Site 1)

ESTIMATED PARAMETERS:
T = 0.008407 $ft^2/min$
S = 0.01685

TEST DATA:
H0 = 2.96 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 59 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well59\59s1.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/12/92

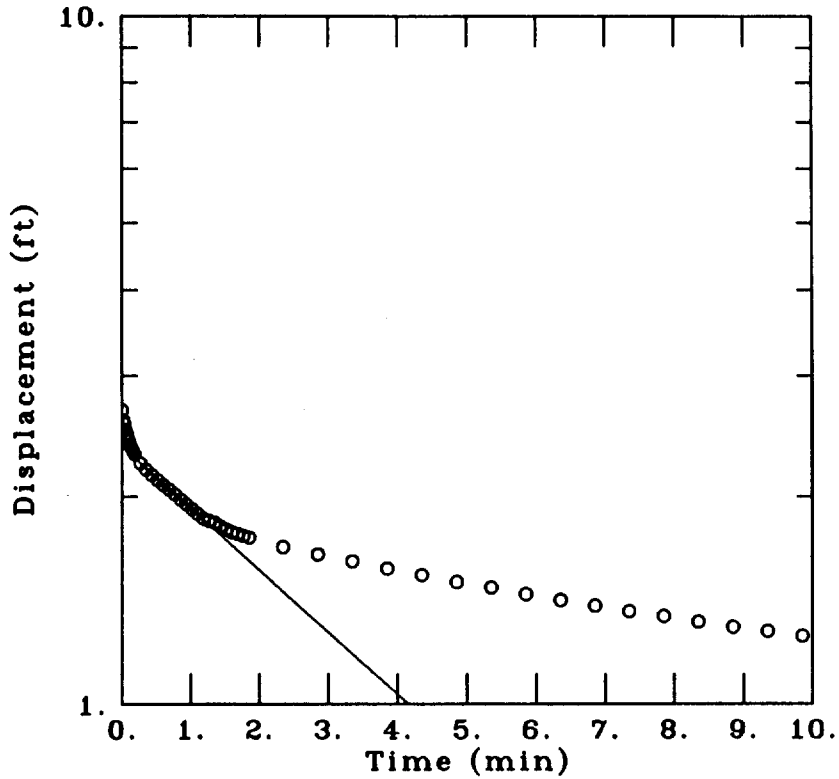
TEST WELL:
Well 59 (Site 2)

ESTIMATED PARAMETERS:
K = 0.001249 ft/min
y0 = 2.402 ft

TEST DATA:
H0 = 2.825 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 20. ft
b = 20.4 ft
H = 20.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 59 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL59\59S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/13/92

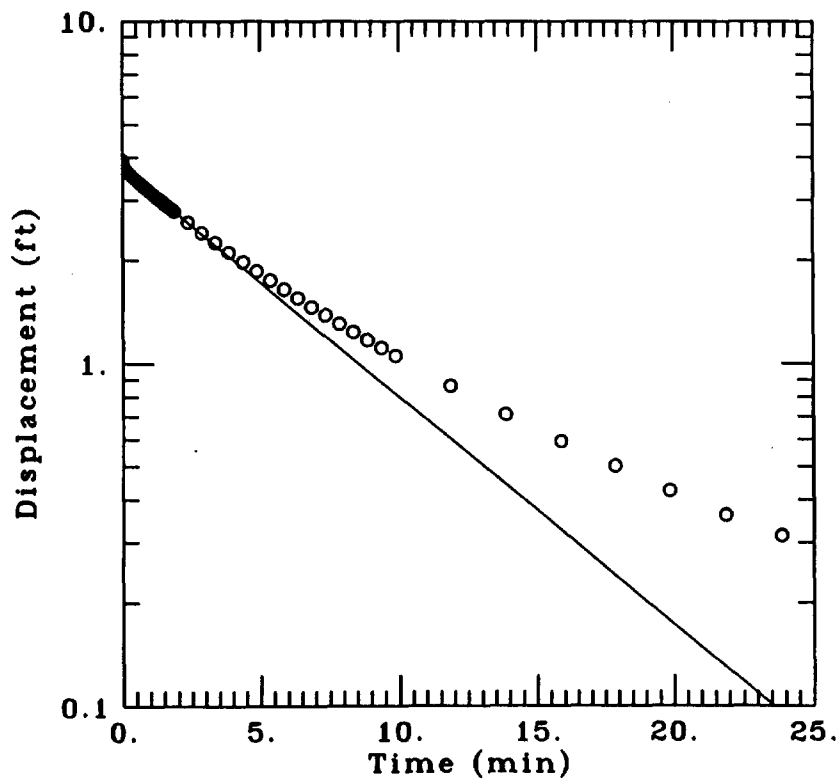
TEST WELL:
Well 59 (Site 2)

ESTIMATED PARAMETERS:
K = 0.001237 ft/min
y0 = 2.366 ft

TEST DATA:
H0 = 2.67 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 20. ft
b = 20.3 ft
H = 20.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 60 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well60\60s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

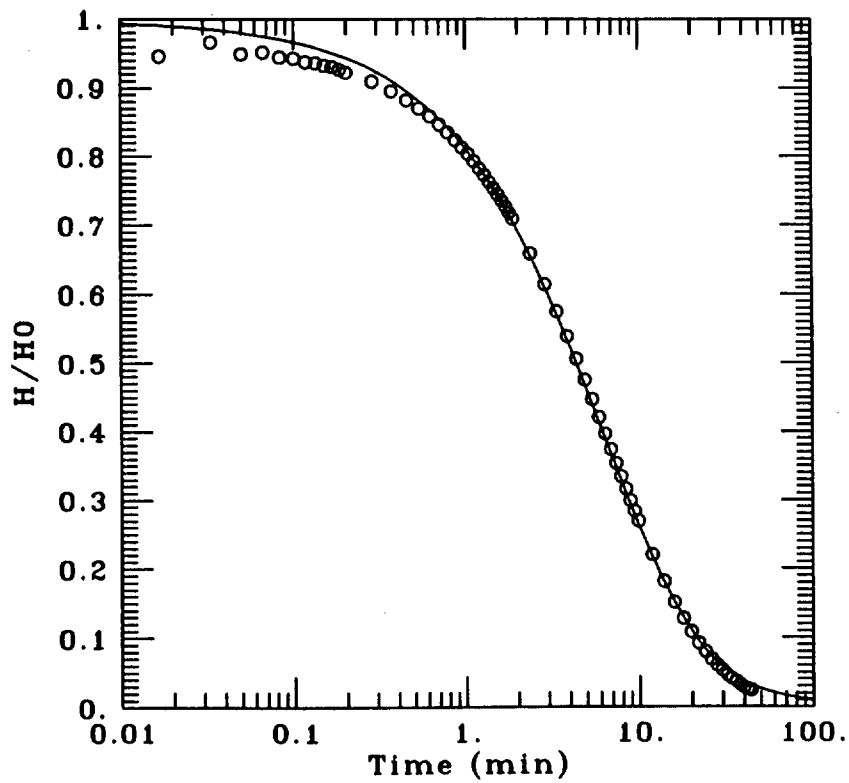
TEST WELL:
Well 60 (Site 2)

ESTIMATED PARAMETERS:
K = 0.0003258 ft/min
y0 = 3.716 ft

TEST DATA:
H0 = 3.915 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 20. ft
b = 26.3 ft
H = 26.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 60 (TEST 1): COOPER ET AL. METHOD




DATA SET:
well60\60cbp1.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/22/92

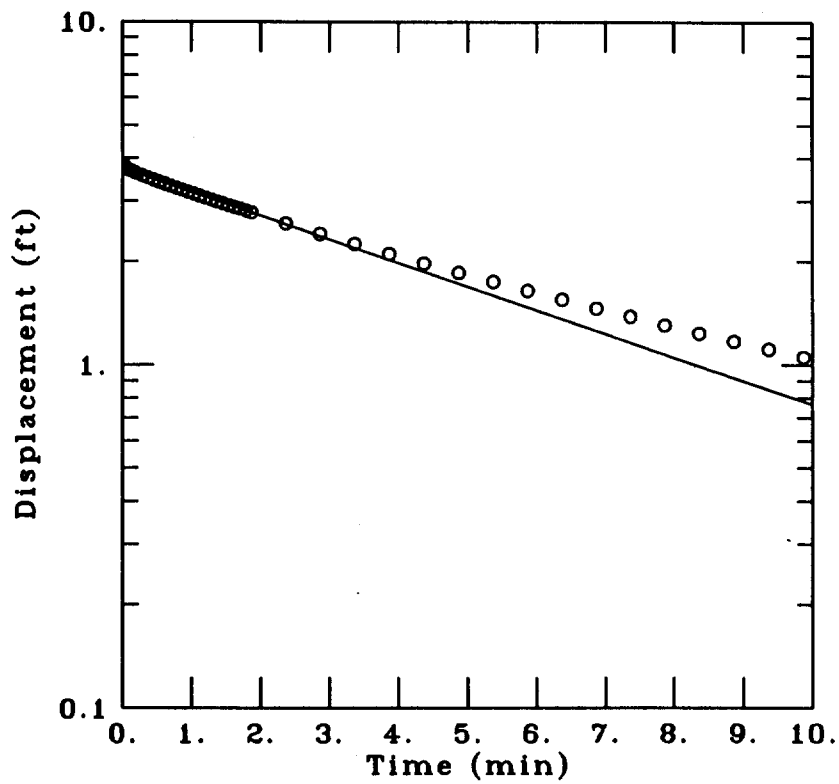
TEST WELL:
Well 60 (Site 2)

ESTIMATED PARAMETERS:
T = 0.0081 $ft^2$/min
S = 0.0001611

TEST DATA:
HO = 3.915 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 60 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL60\60S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/22/92

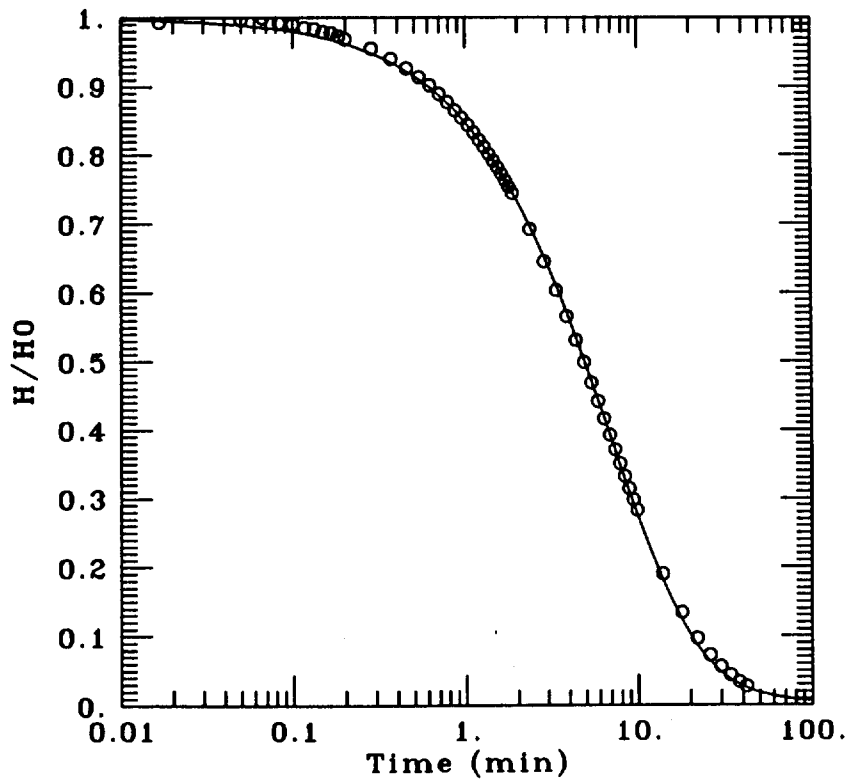
TEST WELL:
Well 60 (Site 2)

ESTIMATED PARAMETERS:
K = 0.0003367 ft/min
y0 = 3.738 ft

TEST DATA:
H0 = 3.728 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 20. ft
b = 26.4 ft
H = 26.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 60 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL60\60CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
10/22/92

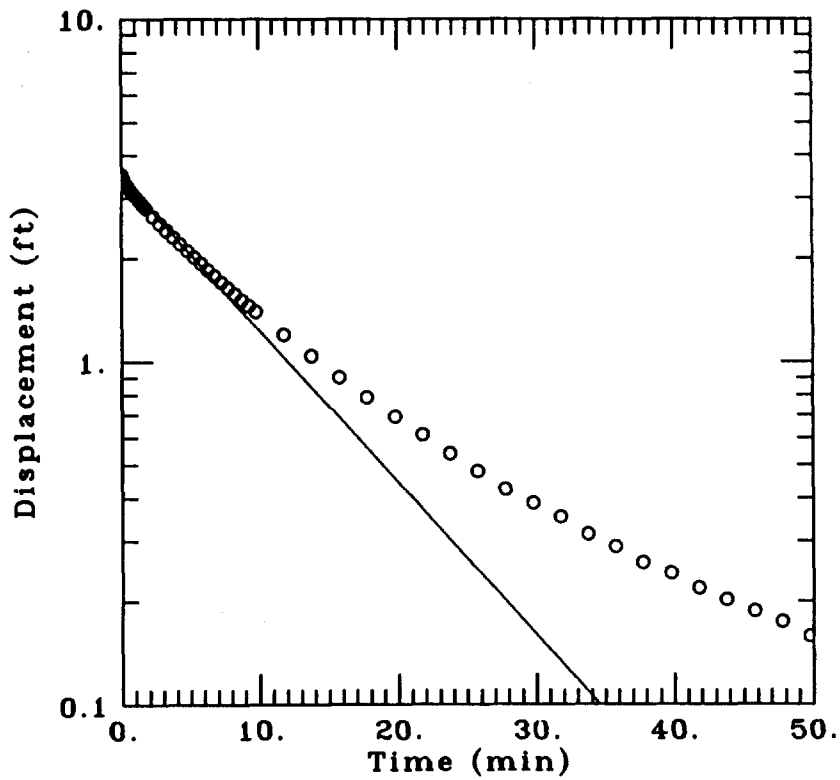
TEST WELL:
Well 60 (Site 2)

ESTIMATED PARAMETERS:
T = 0.01285 $ft^2$/min
S = 8.384E-07

TEST DATA:
HO = 3.728 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 61 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well61\61s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/12/92

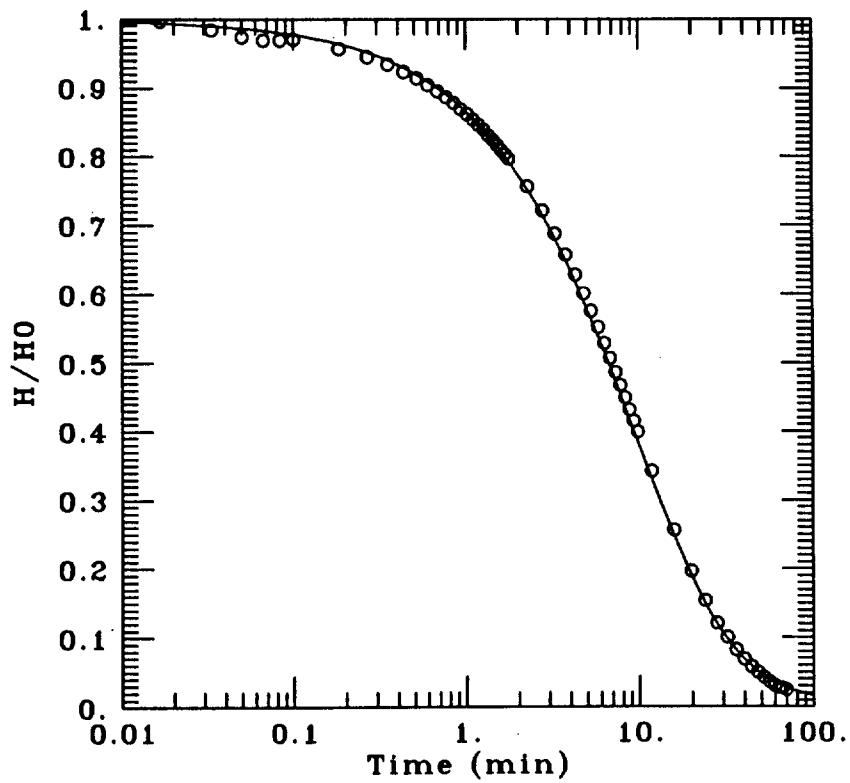
TEST WELL:
Well 61 (Site 2)

ESTIMATED PARAMETERS:
K = 0.0002152 ft/min
y0 = 3.44 ft

TEST DATA:
H0 = 3.509 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 20. ft
b = 25. ft
H = 25. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 61 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL61\61CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/12/92

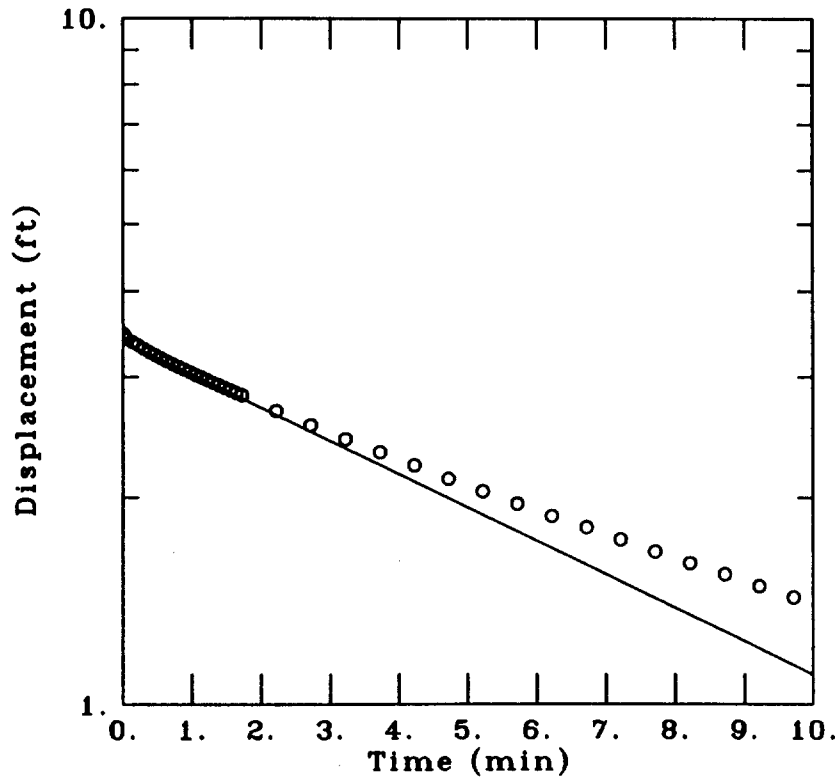
TEST WELL:
Well 61 (Site 2)

ESTIMATED PARAMETERS:
T = 0.005788 $ft^2$/min
S = 8.9991E-05

TEST DATA:
H0 = 3.509 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 61 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL61\61S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/12/92

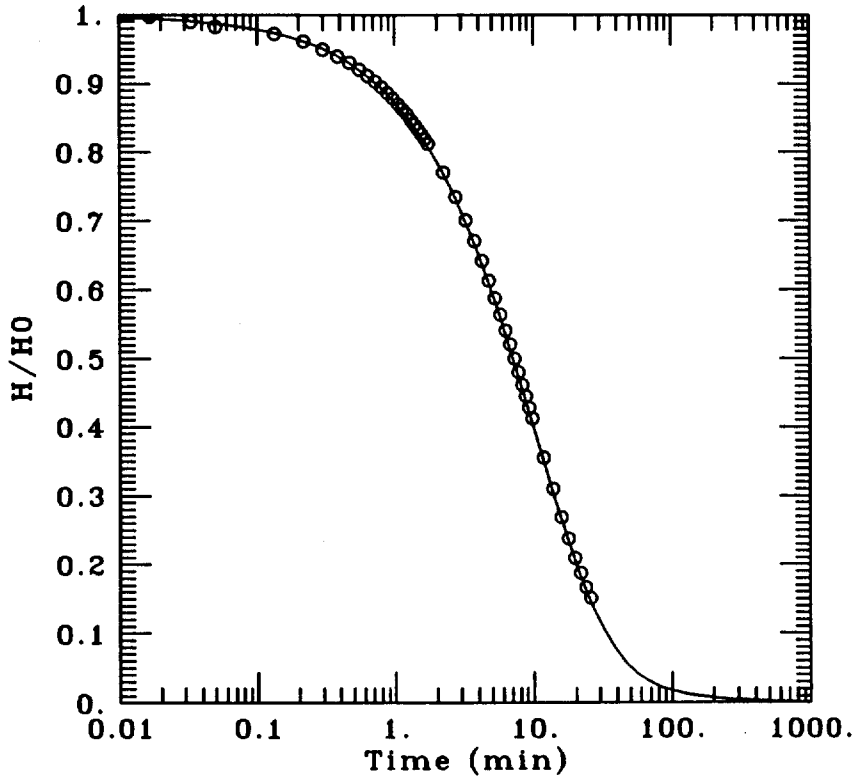
TEST WELL:
Well 61 (Site 2)

ESTIMATED PARAMETERS:
K = 0.0002577 ft/min
y0 = 3.379 ft

TEST DATA:
H0 = 3.469 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 20. ft
b = 40. ft
H = 40. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 61 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL61\61CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/12/92

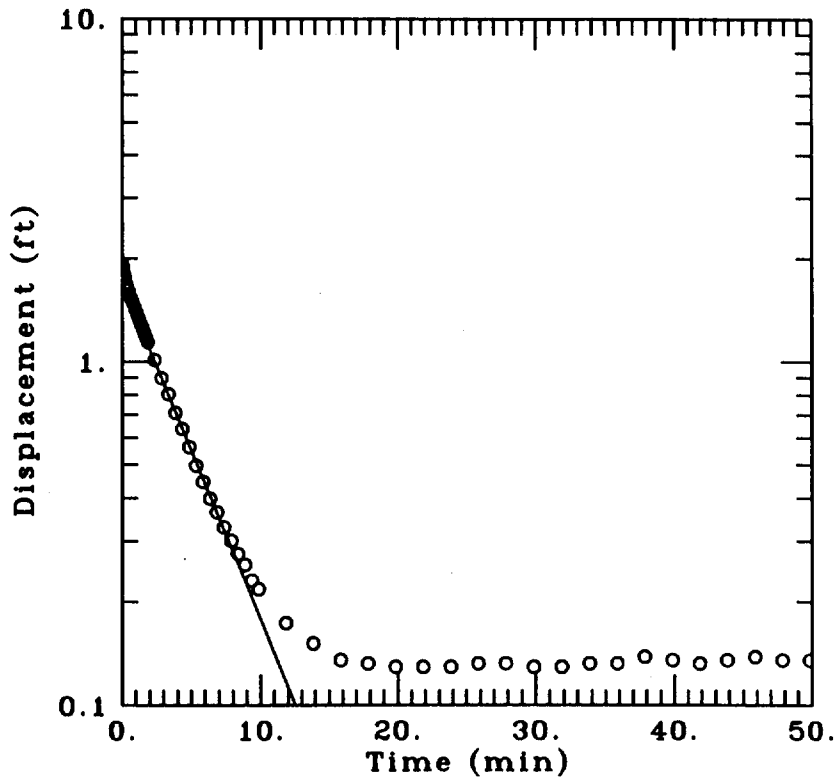
TEST WELL:
Well 61 (Site 2)

ESTIMATED PARAMETERS:
T = 0.005558 $ft^2$/min
S = 7.5706E-05

TEST DATA:
HO = 3.469 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 64 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well64\64s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/12/92

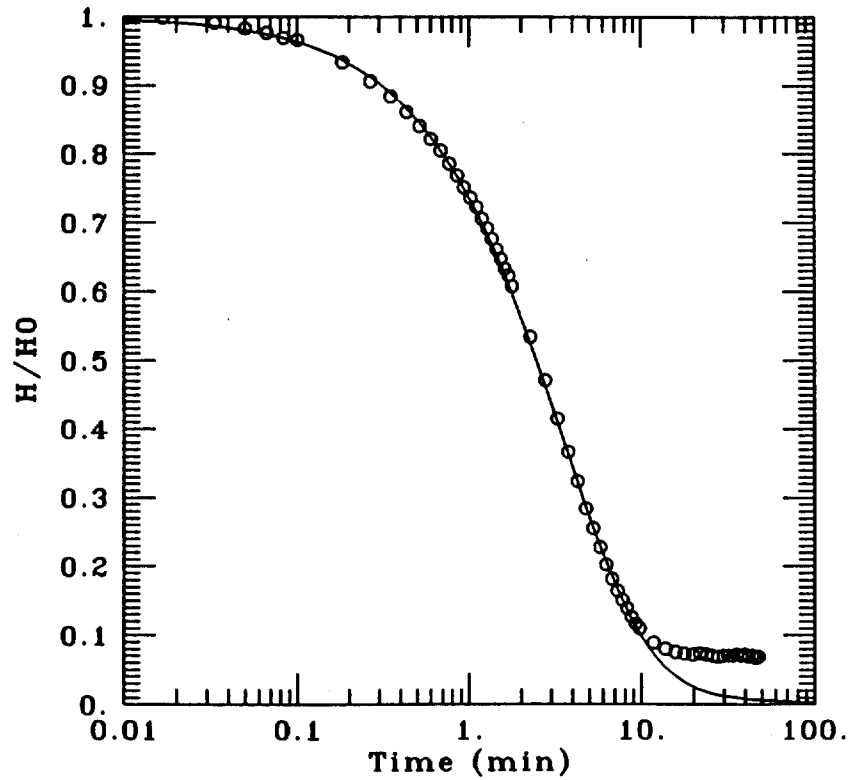
TEST WELL:
Well 64 (Site 3)

ESTIMATED PARAMETERS:
K = 0.0008079 ft/min
y0 = 1.705 ft

TEST DATA:
H0 = 1.919 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 41.9 ft
H = 41.9 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 64 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL64\64CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/10/92

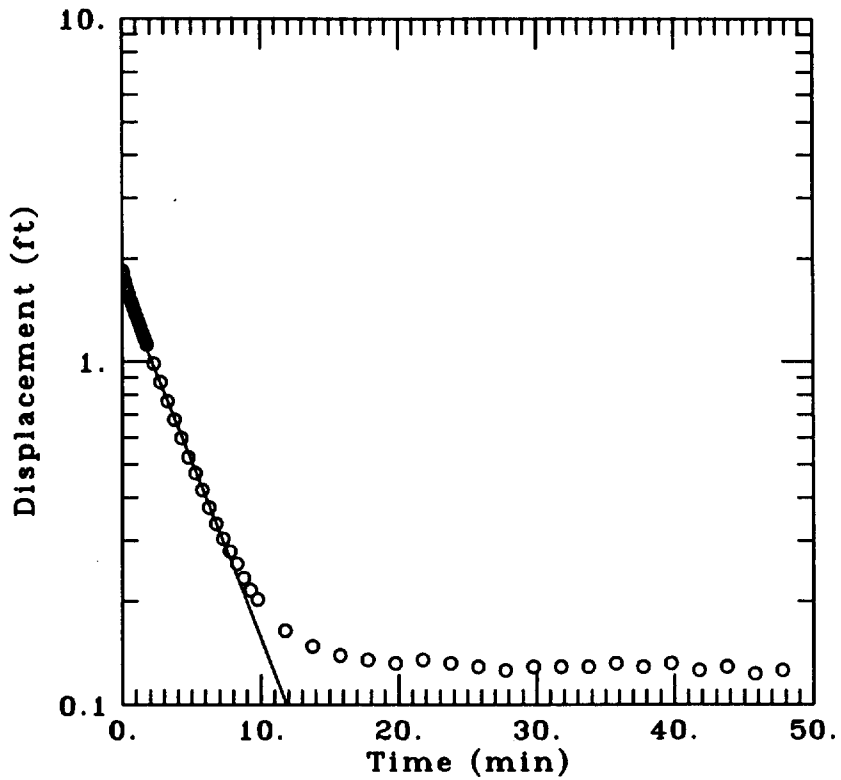
TEST WELL:
Well 64 (Site 3)

ESTIMATED PARAMETERS:
T = 0.08342 $ft^2$/min
S = 7.5456E-07

TEST DATA:
HO = 1.846 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 64 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL64\64S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/11/92

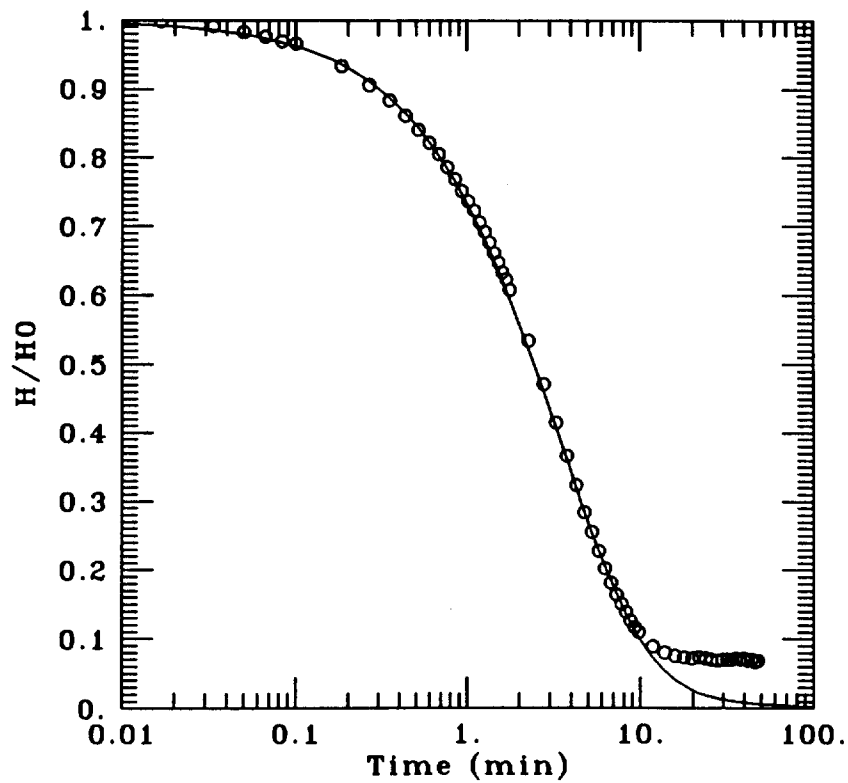
TEST WELL:
Well 64 (Site 3)

ESTIMATED PARAMETERS:
K = 0.000842 ft/min
y0 = 1.649 ft

TEST DATA:
H0 = 1.846 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 41.8 ft
H = 41.8 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 64 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL64\64CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/11/92

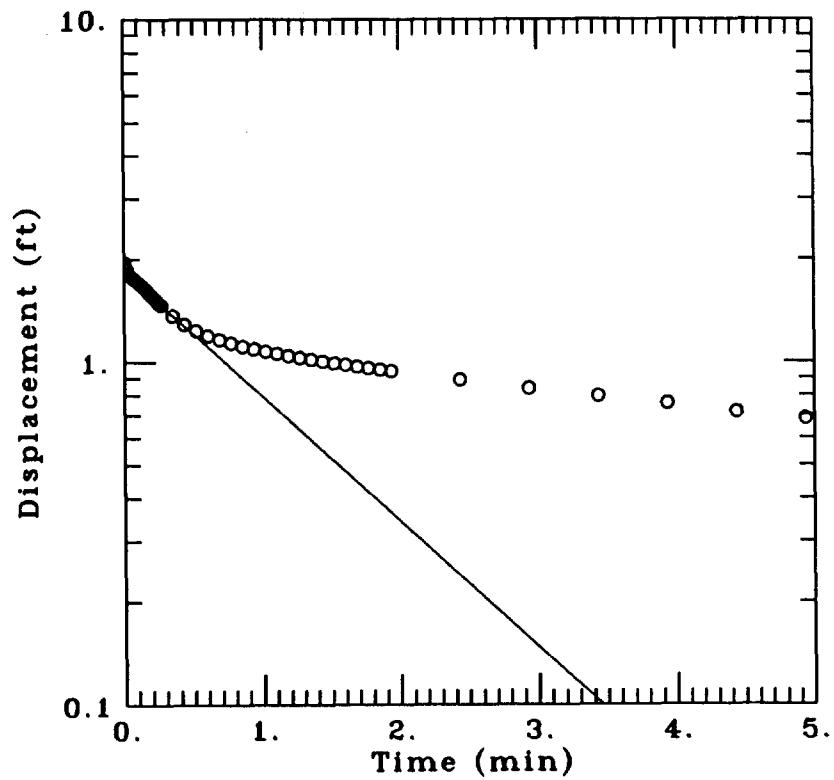
TEST WELL:
Well 64 (Site 3)

ESTIMATED PARAMETERS:
T = 0.08105 $ft^2/min$
S = 1.2399E-06

TEST DATA:
H0 = 1.846 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 65A (TEST 1): BOUWER-RICE METHOD




DATA SET:
65as1.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/10/92

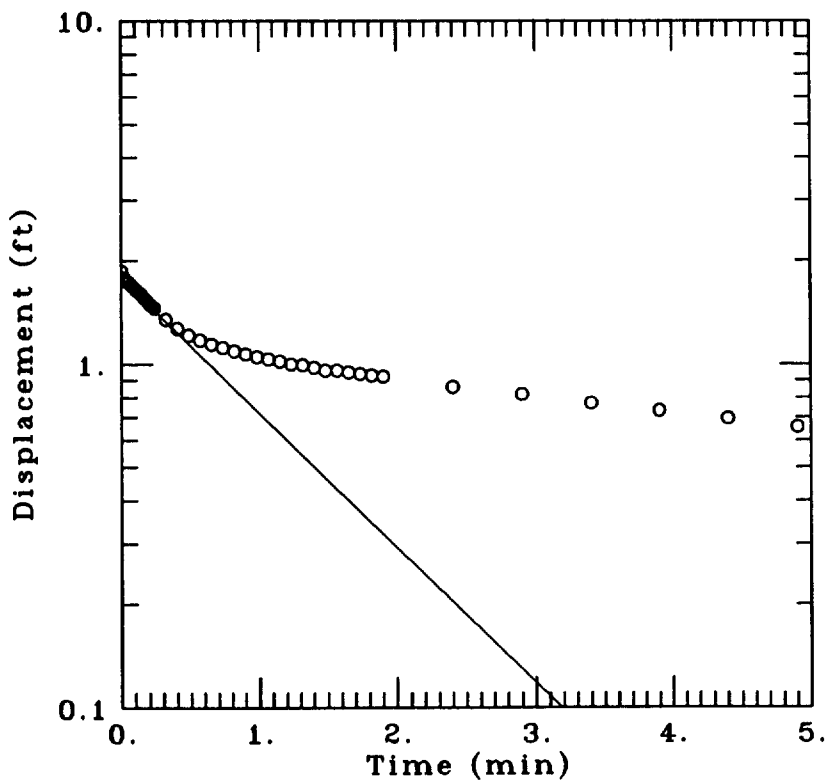
TEST WELL:
Well 65a (Site 3)

ESTIMATED PARAMETERS:
K = 0.004499 ft/min
y0 = 1.836 ft

TEST DATA:
H0 = 1.955 ft
rc = 0.3441 ft
rw = 0.5417 ft
L = 35.6 ft
b = 35.6 ft
H = 35.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 65A (TEST 2): BOUWER-RICE METHOD




DATA SET:
65as2.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/10/92

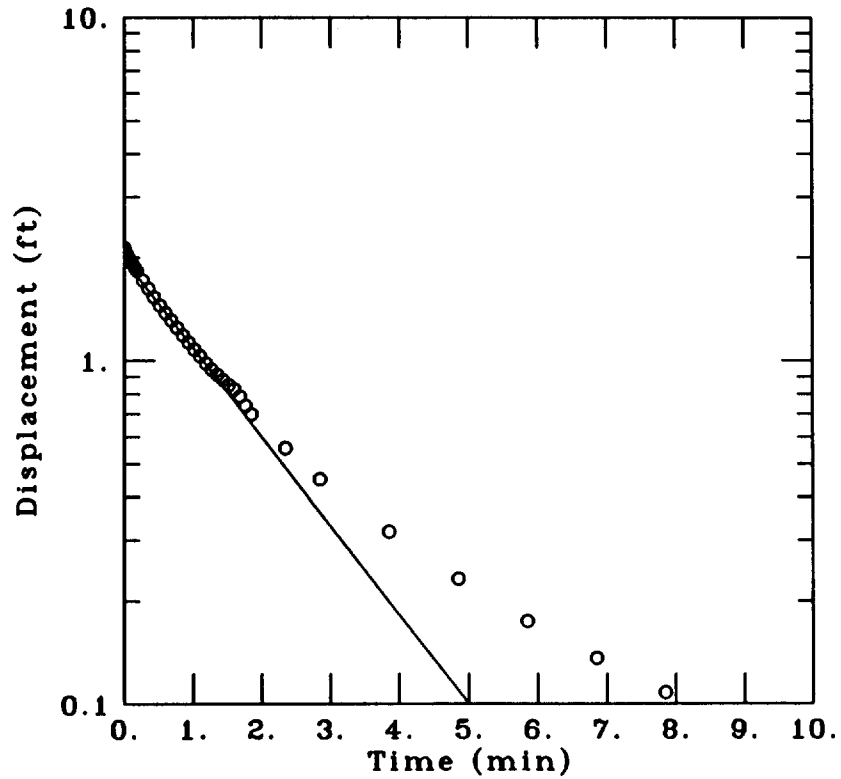
TEST WELL:
Well 65a (Site 3)

ESTIMATED PARAMETERS:
K = 0.004831 ft/min
y0 = 1.777 ft

TEST DATA:
H0 = 1.86 ft
rc = 0.3441 ft
rw = 0.5417 ft
L = 35.6 ft
b = 35.6 ft
H = 35.6 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 68 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well68\68s1.dat
02/09/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

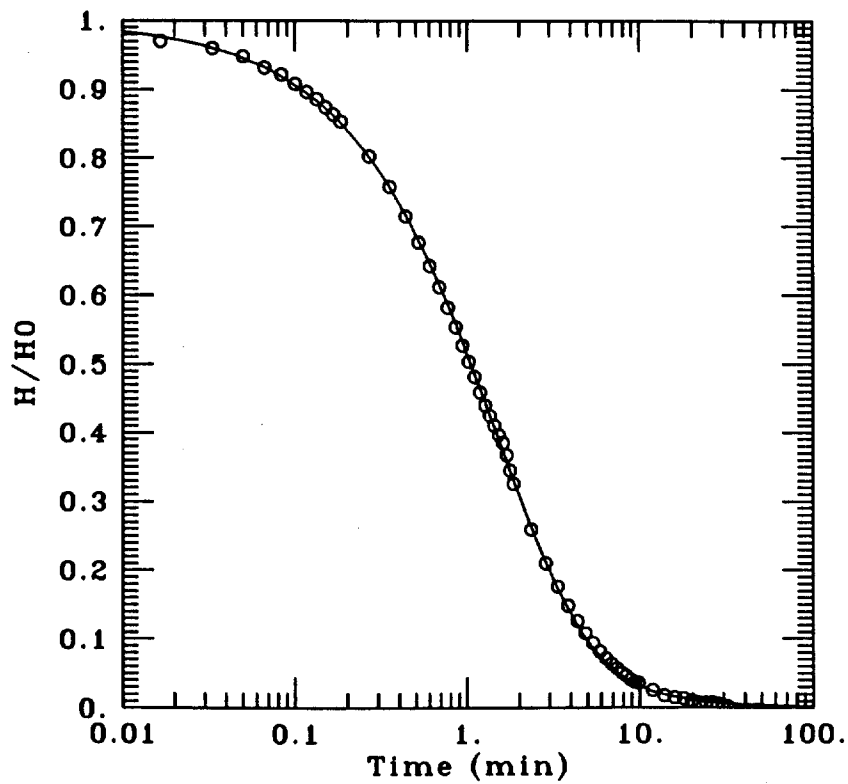
TEST WELL:
Well 68 (Site 5)

ESTIMATED PARAMETERS:
K = 0.001823 ft/min
y0 = 1.98 ft

TEST DATA:
H0 = 2.139 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 22.3 ft
H = 22.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 68 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL68\68CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

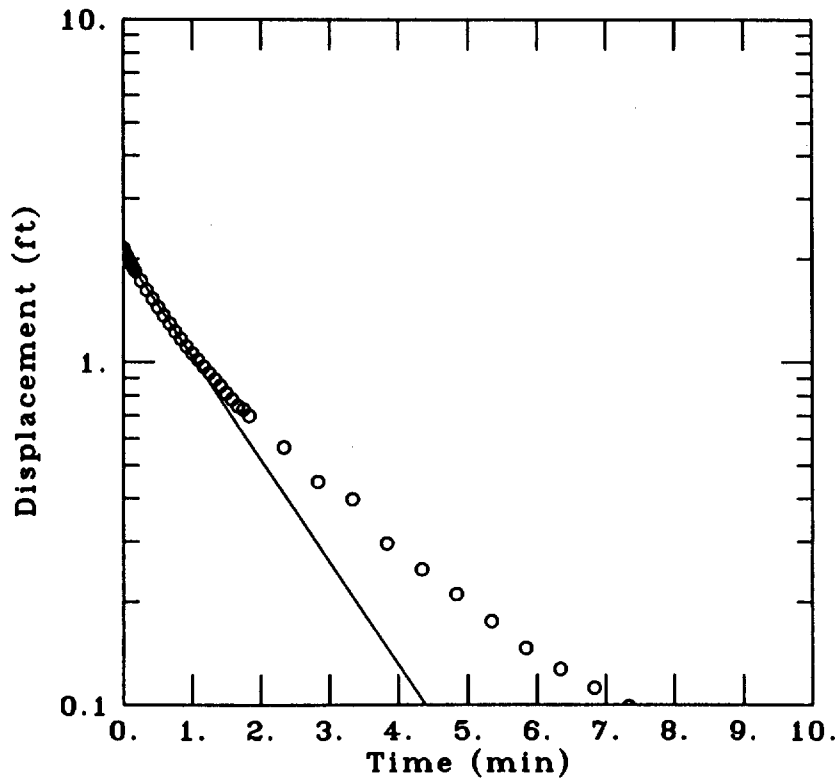
TEST WELL:
Well 68 (Site 5)

ESTIMATED PARAMETERS:
T = 0.05892 $ft^2/min$
S = 8.1E-05

TEST DATA:
HO = 2.139 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 68 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL68\68S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

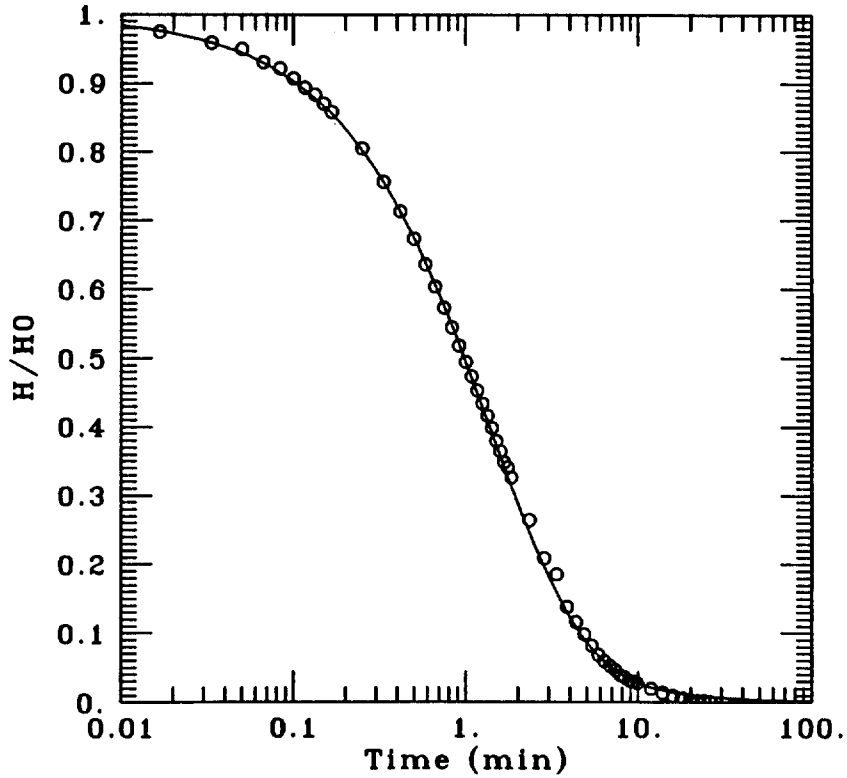
TEST WELL:
Well 68 (Site 5)

ESTIMATED PARAMETERS:
K = 0.002109 ft/min
y0 = 2.071 ft

TEST DATA:
H0 = 2.142 ft
rc = 0.2083 ft
rw = 0.5417 ft
L = 20. ft
b = 22.3 ft
H = 22.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 68 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL68\68CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

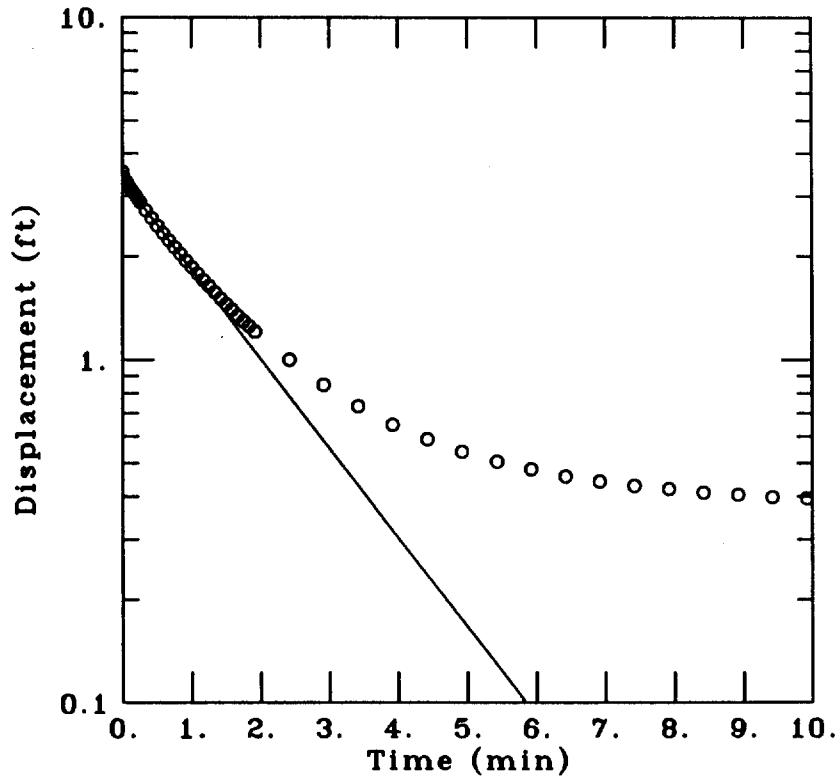
TEST WELL:
Well 68 (Site 5)

ESTIMATED PARAMETERS:
T = 0.06456 $ft^2$/min
S = 6.561E-05

TEST DATA:
H0 = 2.142 ft
rc = 0.2083 ft
rw = 0.5417 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 69 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well69\69s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

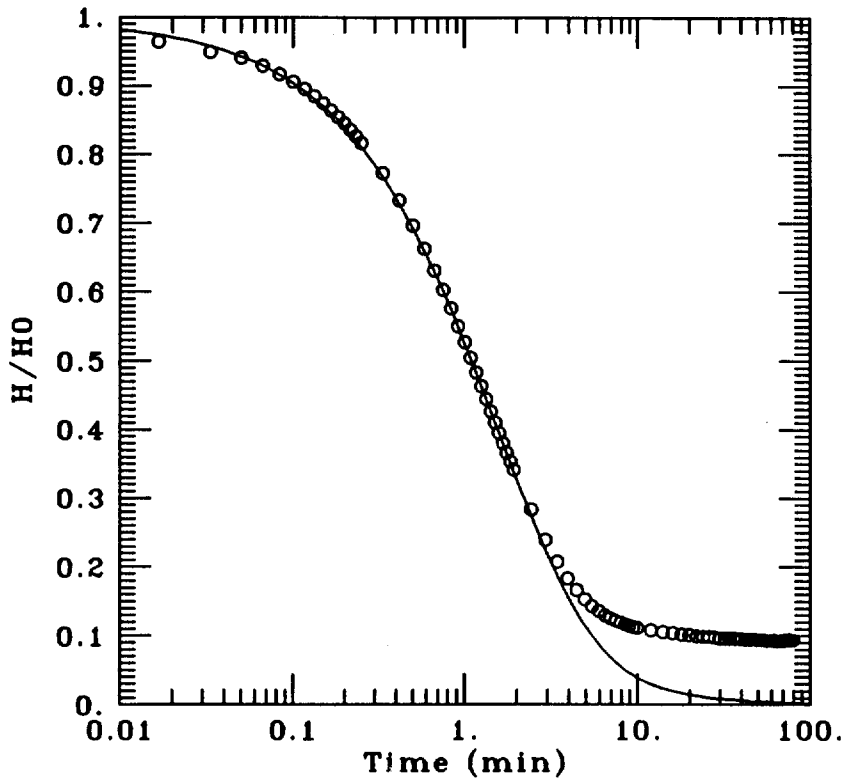
TEST WELL:
Well 69 (Site 6)

ESTIMATED PARAMETERS:
K = 0.0007484 ft/min
y0 = 3.344 ft

TEST DATA:
H0 = 3.534 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 50.3 ft
H = 50.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 69 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL69\69CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

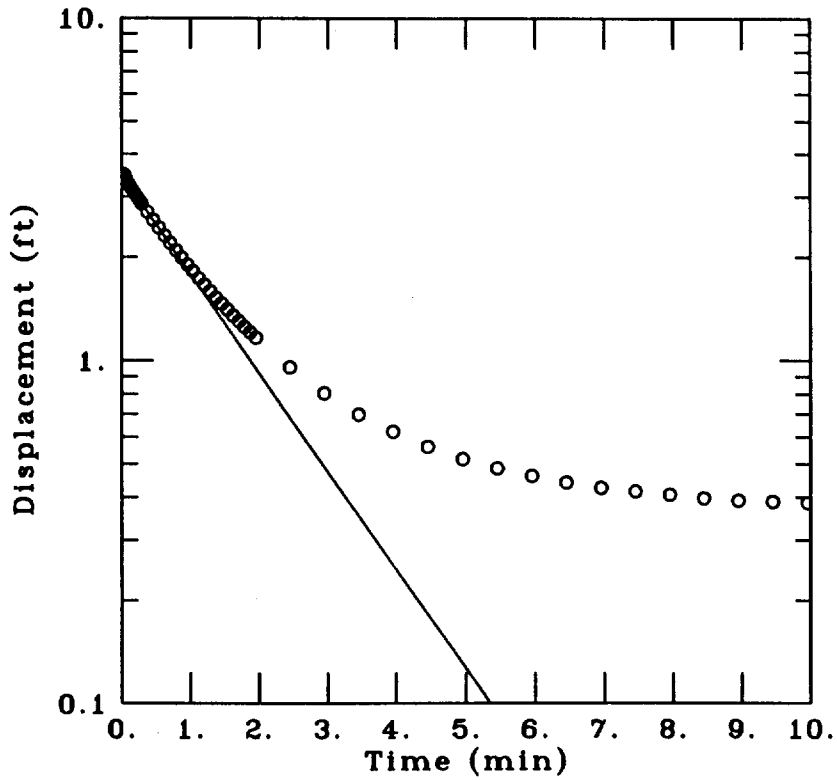
TEST WELL:
Well 69 (Site 6)

ESTIMATED PARAMETERS:
T = 0.03119 $ft^2$/min
S = 0.0001949

TEST DATA:
HO = 3.534 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 69 (TEST 2): BOUWER-RICE METHOD




DATA SET:
WELL69\69S2.DAT
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

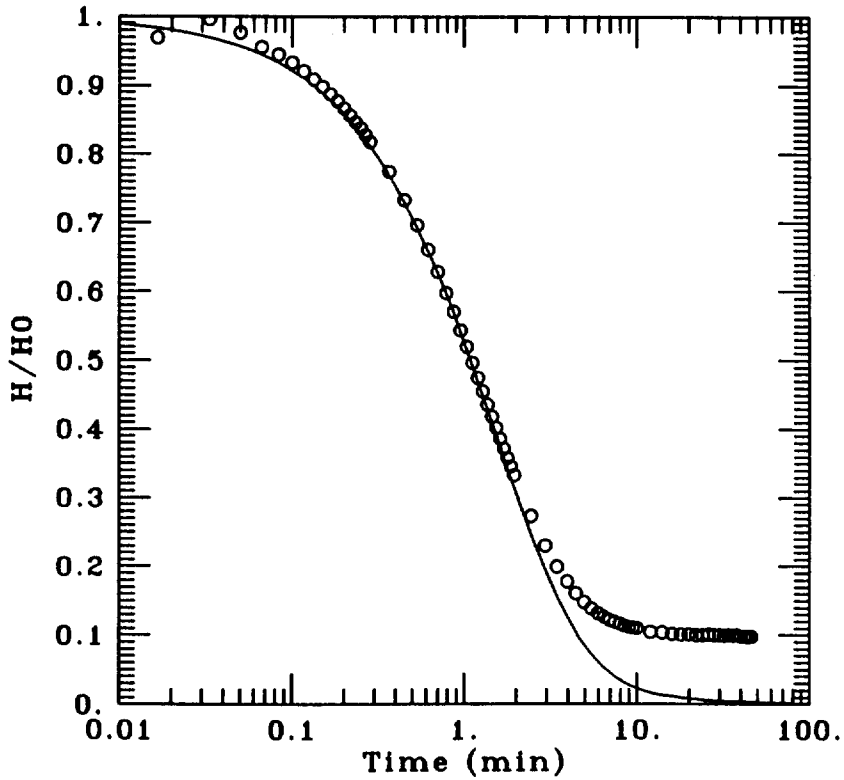
TEST WELL:
Well 69 (Site 6)

ESTIMATED PARAMETERS:
K = 0.0008245 ft/min
y0 = 3.456 ft

TEST DATA:
H0 = 3.501 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 50.3 ft
H = 50.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 69 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL69\69CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

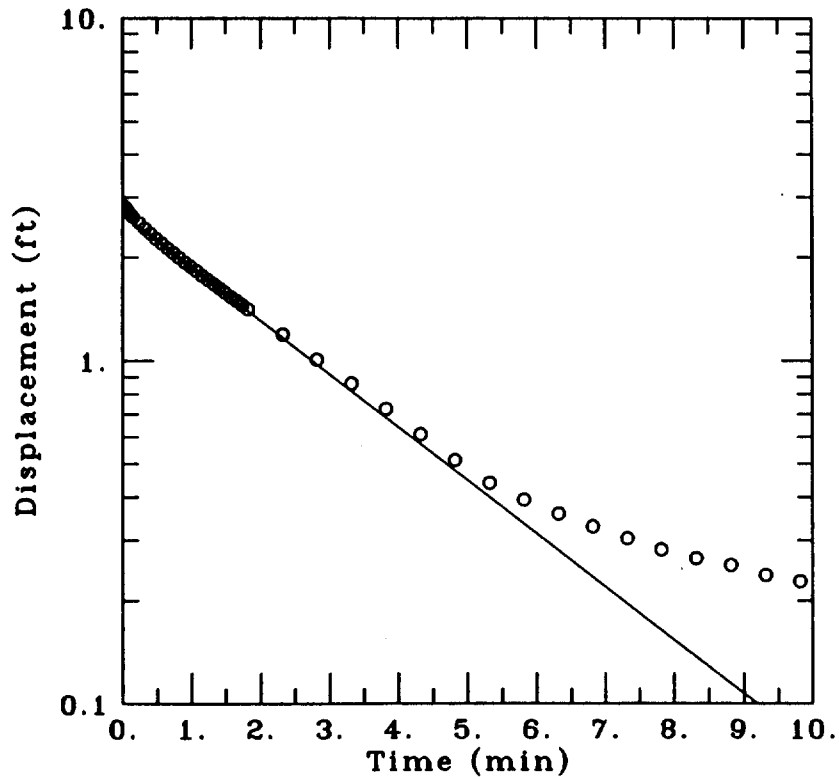
TEST WELL:
Well 69 (Site 6)

ESTIMATED PARAMETERS:
T = 0.05493 $ft^2/min$
S = 1.5307E-06

TEST DATA:
H0 = 3.501 ft
rc = 0.1667 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 70 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well70\70s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/11/92

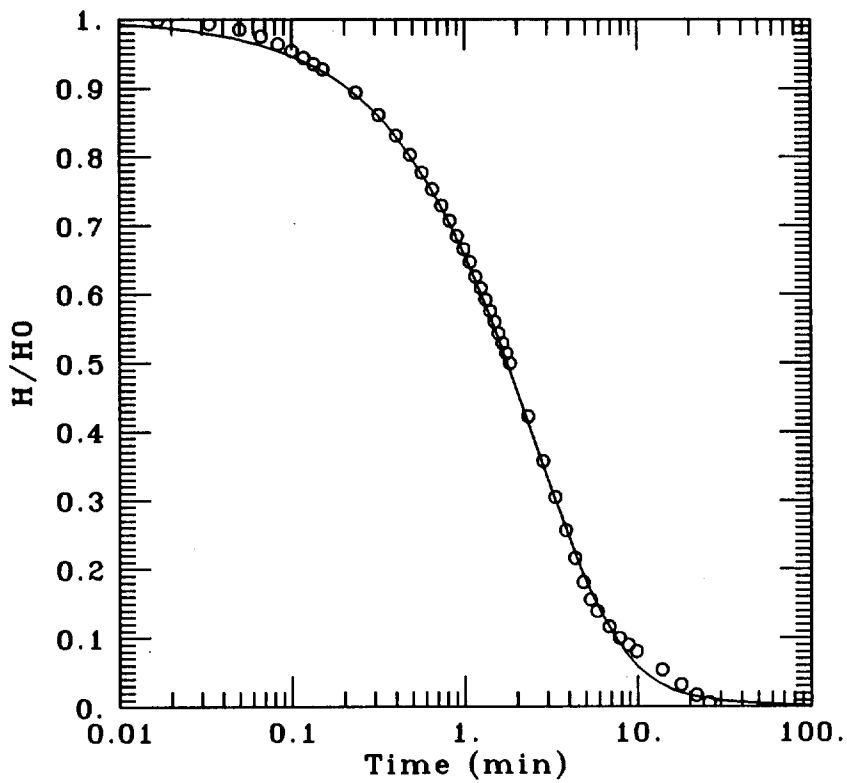
TEST WELL:
Well 70 (Site 7)

ESTIMATED PARAMETERS:
K = 0.001333 ft/min
y0 = 2.668 ft

TEST DATA:
H0 = 2.826 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 37.4 ft
b = 37.4 ft
H = 37.4 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 70 (TEST 1): COOPER ET AL. METHOD




DATA SET:
WELL70\70CBP1.DAT
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/11/92

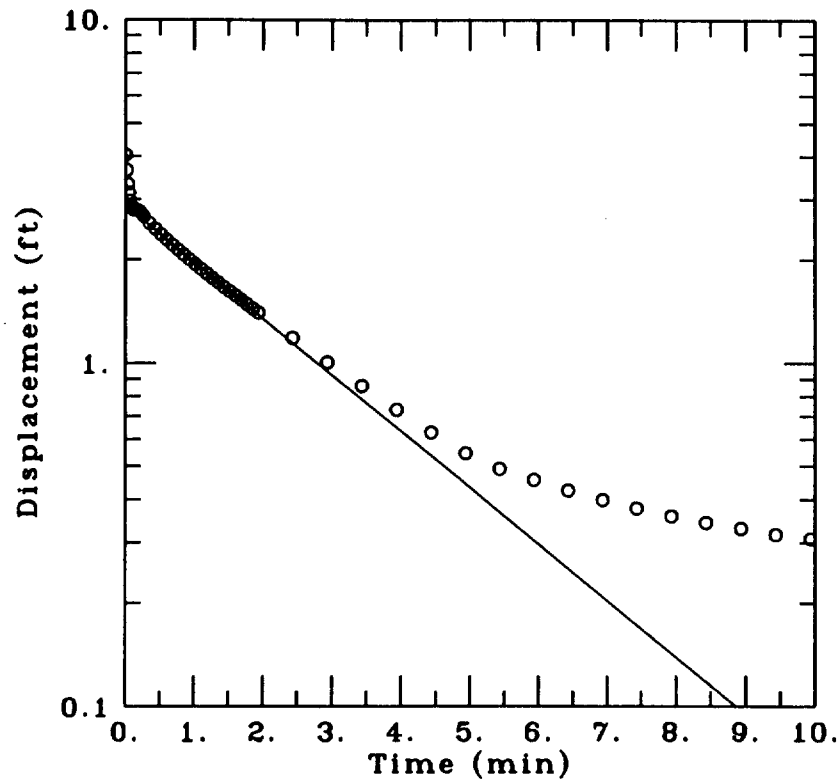
TEST WELL:
Well 70 (Site 7)

ESTIMATED PARAMETERS:
T = 0.09421 $ft^2/min$
S = 1.0045E-05

TEST DATA:
HO = 2.826 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 70 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well70\70s2.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/11/92

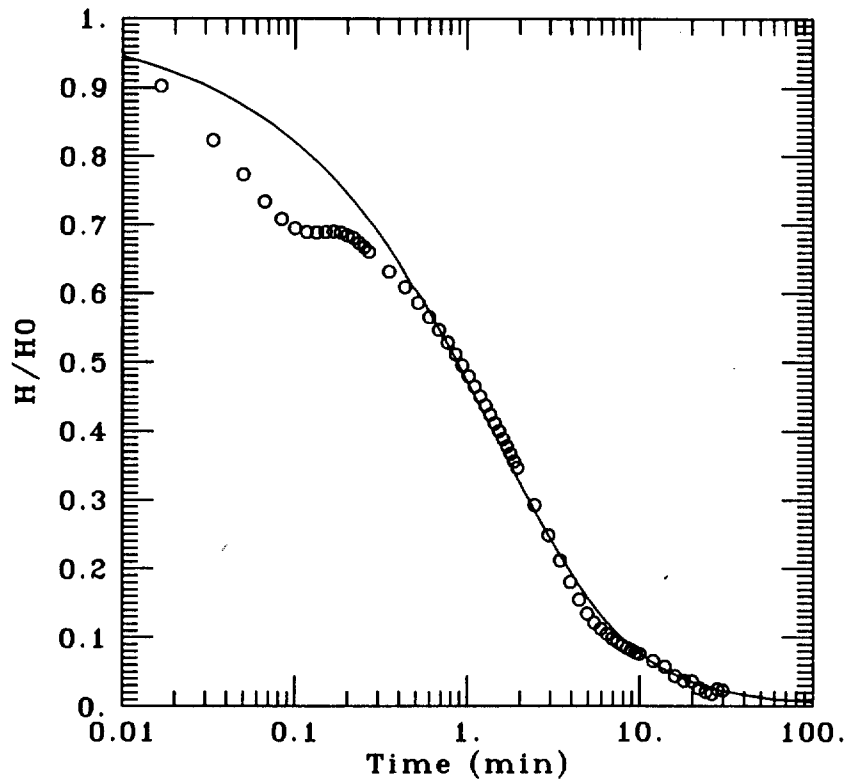
TEST WELL:
Well 70 (Site 7)

ESTIMATED PARAMETERS:
K = 0.00141 ft/min
y0 = 2.872 ft

TEST DATA:
H0 = 4.044 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 37.5 ft
b = 37.5 ft
H = 37.5 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 70 (TEST 2): COOPER ET AL. METHOD




DATA SET:
well70\70cbp2.dat
02/18/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/11/92

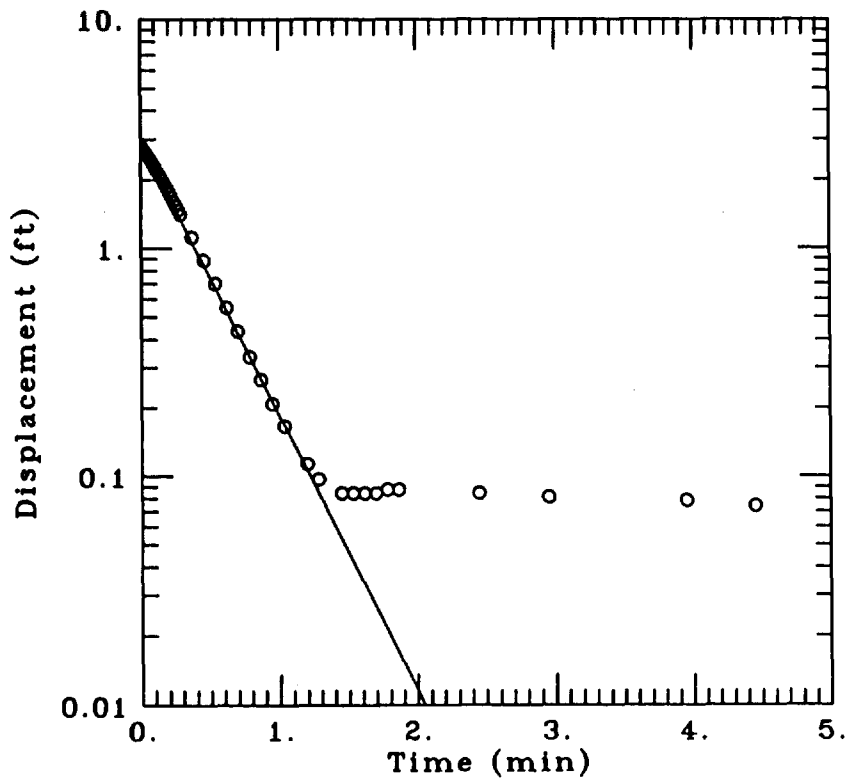
TEST WELL:
Well 70 (Site 7)

ESTIMATED PARAMETERS:
T = 0.03568 $ft^2$/min
S = 0.05

TEST DATA:
H0 = 4.044 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 73 (TEST 1): BOUWER-RICE METHOD




DATA SET:
73s1.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/11/92

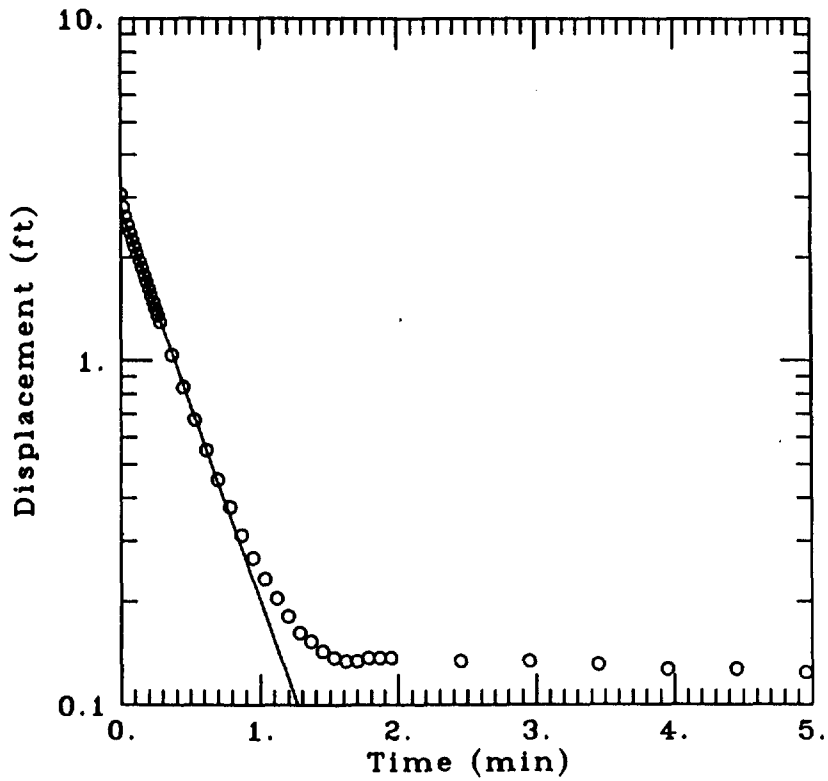
TEST WELL:
Well 73 (Site 8)

ESTIMATED PARAMETERS:
K = 0.009901 ft/min
y0 = 2.938 ft

TEST DATA:
H0 = 2.807 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 41.7 ft
H = 41.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 73 (TEST 2): BOUWER-RICE METHOD




DATA SET:
73s2.dat
03/18/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/11/92

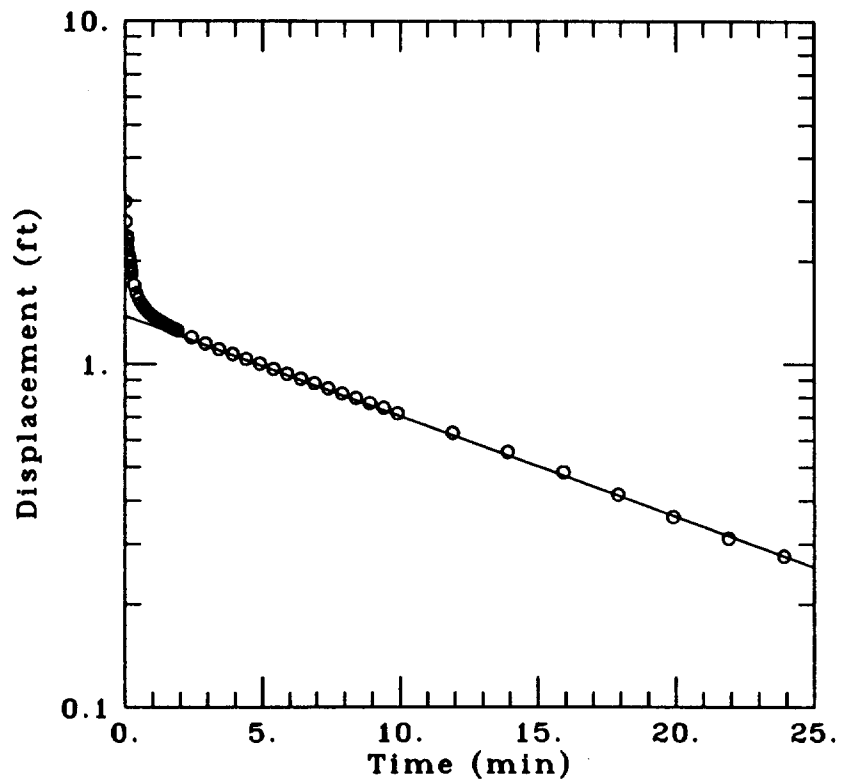
TEST WELL:
Well 73 (Site 8)

ESTIMATED PARAMETERS:
K = 0.009311 ft/min
y0 = 2.744 ft

TEST DATA:
H0 = 3.054 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 41.7 ft
H = 41.7 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 85 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well85\85s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/20/92

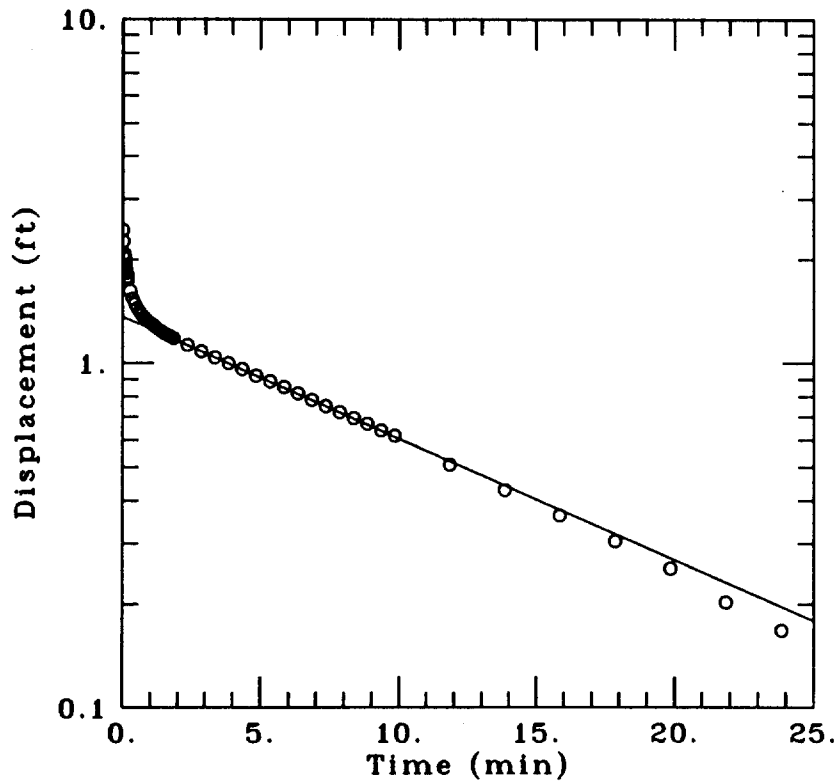
TEST WELL:
Well 85 (Site 19)

ESTIMATED PARAMETERS:
K = 0.0002634 ft/min
y0 = 1.384 ft

TEST DATA:
H0 = 2.983 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 35.3 ft
b = 35.3 ft
H = 35.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 85 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well85\85s2.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/20/92

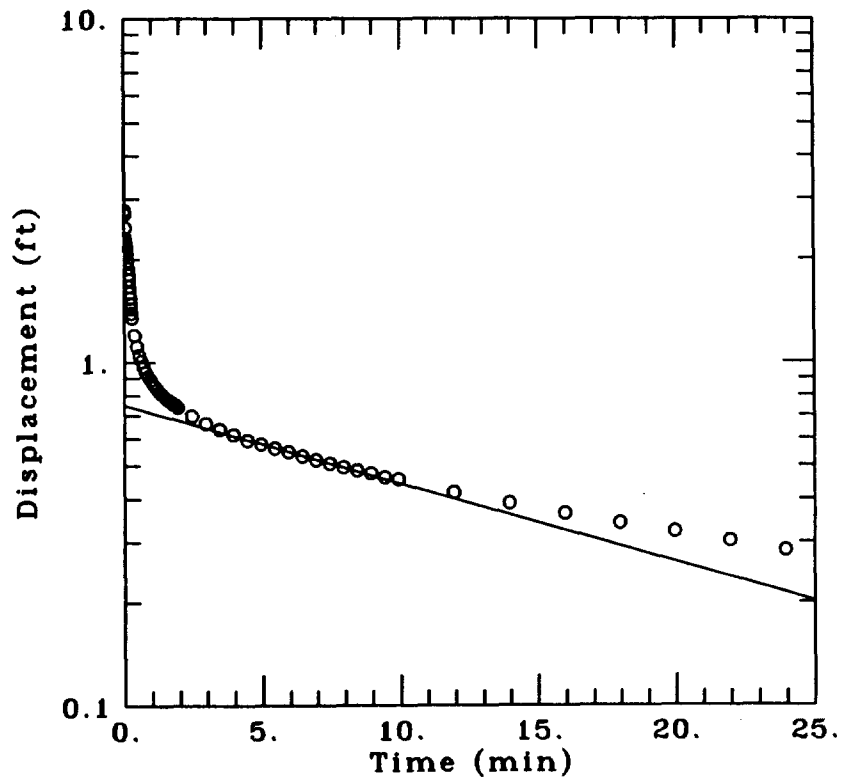
TEST WELL:
Well 85 (Site 19)

ESTIMATED PARAMETERS:
K = 0.0003171 ft/min
y0 = 1.364 ft

TEST DATA:
H0 = 2.441 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 35.3 ft
b = 35.3 ft
H = 35.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 88 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well88\88s1.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/20/92

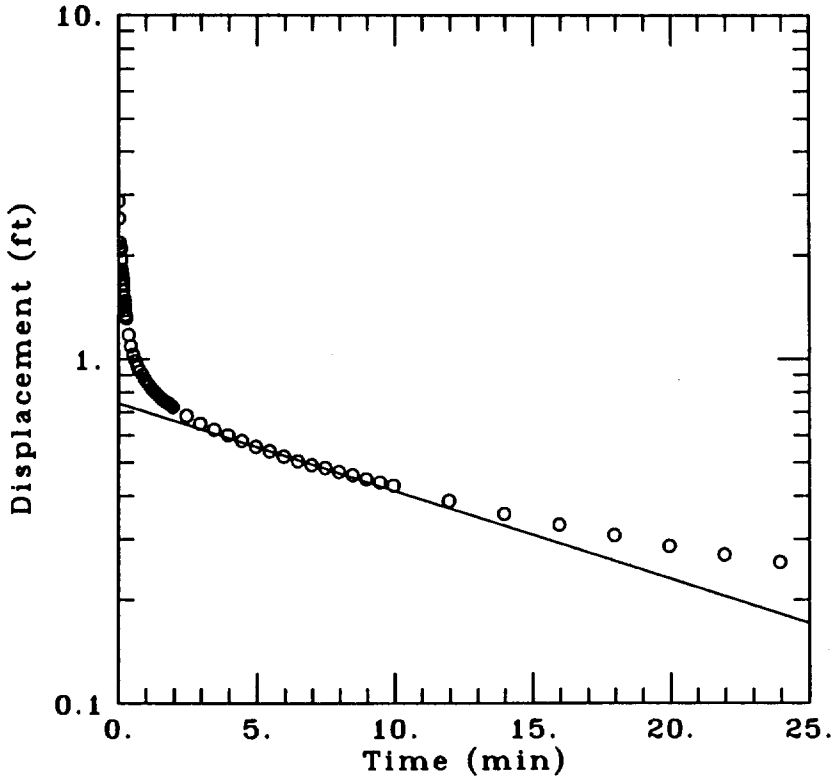
TEST WELL:
Well 88 (Site 20)

ESTIMATED PARAMETERS:
K = 0.0001966 ft/min
y0 = 0.7477 ft

TEST DATA:
H0 = 2.773 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 37.2 ft
b = 37.2 ft
H = 37.2 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 88 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well88\88s2.dat
02/24/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
10/20/92

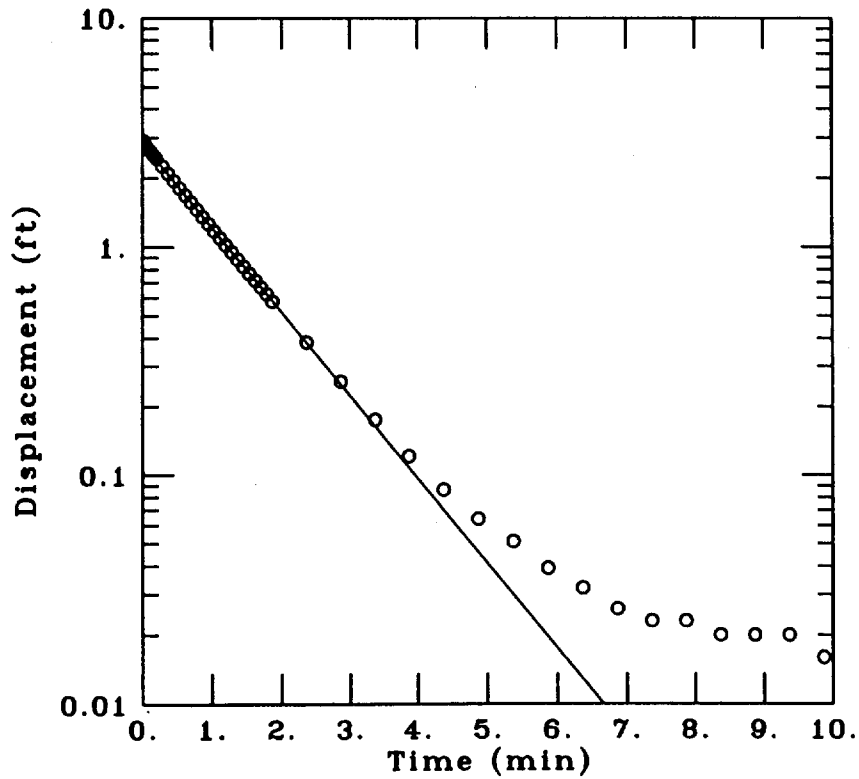
TEST WELL:
Well 88 (Site 20)

ESTIMATED PARAMETERS:
K = 0.0002202 ft/min
y0 = 0.743 ft

TEST DATA:
H0 = 2.876 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 37.2 ft
b = 37.2 ft
H = 37.2 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 91 (TEST 1): BOUWER-RICE METHOD




DATA SET:
well91\91s1.dat
02/04/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

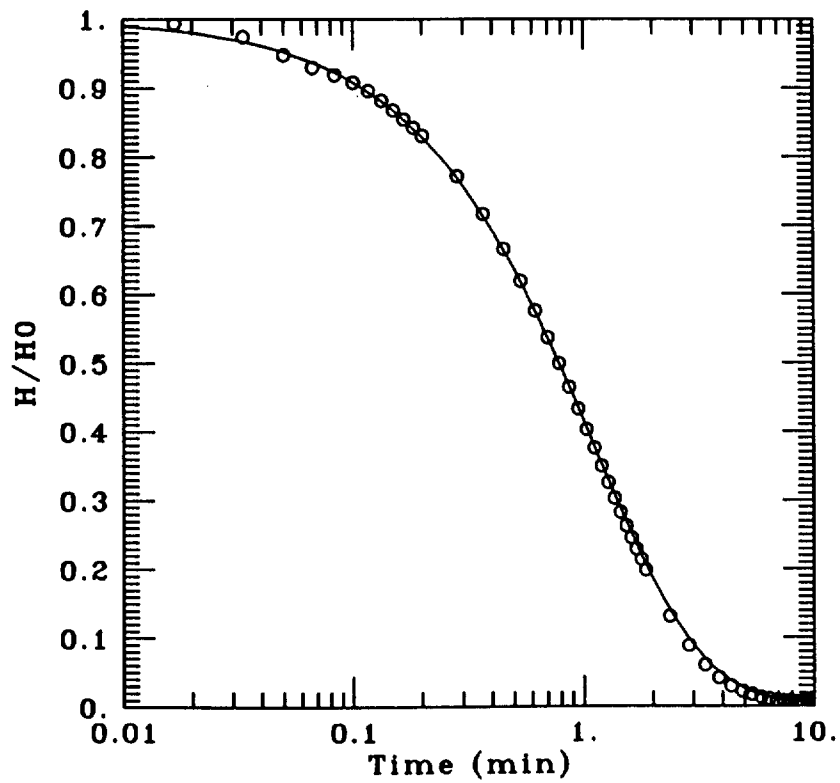
TEST WELL:
Well 91 (Site 7)

ESTIMATED PARAMETERS:
K = 0.003032 ft/min
y0 = 2.832 ft

TEST DATA:
H0 = 2.916 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 42.3 ft
H = 42.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 91 (TEST 1): COOPER ET AL. METHOD




DATA SET:
well91\91cbp1.dat
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

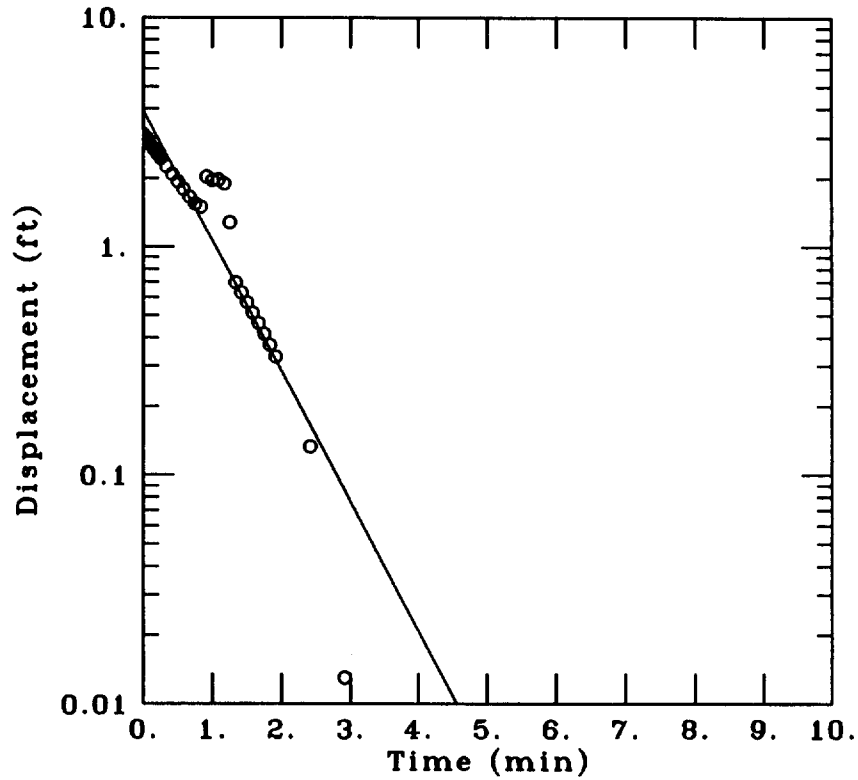
TEST WELL:
Well 91 (Site 7)

ESTIMATED PARAMETERS:
T = 0.5582 $ft^2$/min
S = 1.475E-13

TEST DATA:
H0 = 2.916 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 91 (TEST 2): BOUWER-RICE METHOD




DATA SET:
well91\91s2.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

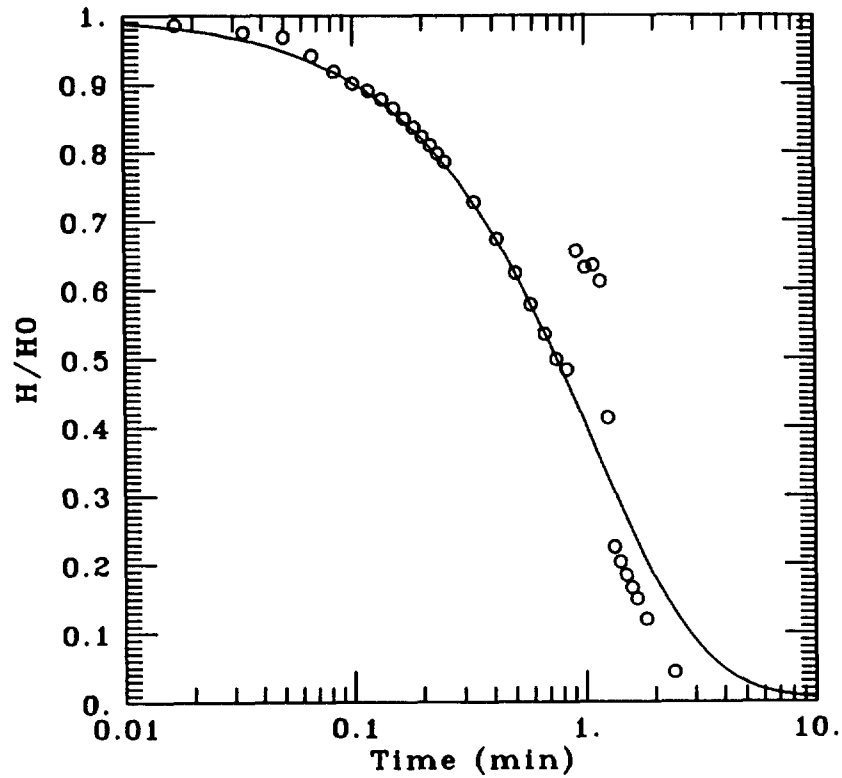
TEST WELL:
Well 91 (Site 7)

ESTIMATED PARAMETERS:
K = 0.004694 ft/min
y0 = 3.928 ft

TEST DATA:
H0 = 3.092 ft
rc = 0.2872 ft
rw = 0.4583 ft
L = 40. ft
b = 42.3 ft
H = 42.3 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 91 (TEST 2): COOPER ET AL. METHOD




DATA SET:
WELL91\91CBP2.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

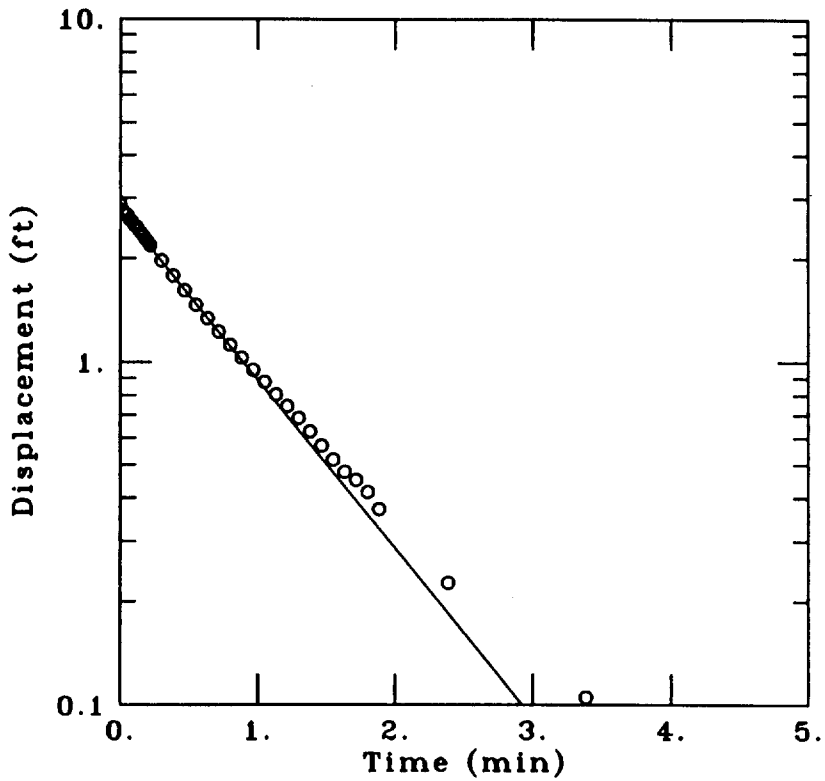
TEST WELL:
Well 91 (Site 7)

ESTIMATED PARAMETERS:
T = 0.4253 $ft^2$/min
S = 3.9867E-10

TEST DATA:
H0 = 3.092 ft
rc = 0.2872 ft
rw = 0.4583 ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 100: BOUWER-RICE METHOD




DATA SET:
well100\100s1.dat
02/08/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
11/5/92

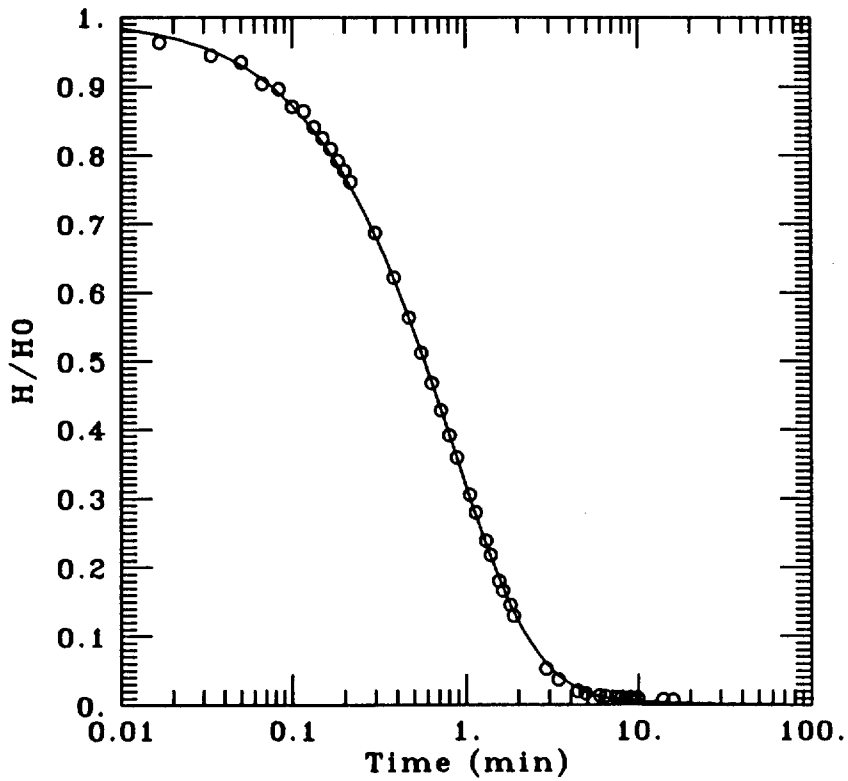
TEST WELL:
Well 100 (Site 7)

ESTIMATED PARAMETERS:
K = 0.001385 ft/min
y0 = 2.759 ft

TEST DATA:
H0 = 2.868 ft
rc = 0.1667 ft
rw = 0.4583 ft
L = 40. ft
b = 45. ft
H = 45. ft

| MCAS EL TORO RI/FS PHASE 1 | Client: NAVY SOUTHWESTDIV |
|---|---|
| Project No.: CTO #145 | Location: MCAS EL TORO |

# WELL 100: COOPER ET AL. METHOD




DATA SET:
WELL100\100CBP1.DAT
02/09/93

AQUIFER TYPE:
Confined

SOLUTION METHOD:
Cooper et al.

TEST DATE:
11/5/92

TEST WELL:
Well 100 (Site 7)

ESTIMATED PARAMETERS:
T = 0.1487 $ft^2$/min
S = 1.045E-08

TEST DATA:
H0 = 2.868 ft
rc = 0.1667 ft
rw = 0.4583 ft

## Appendix G

## WESTBAY WELL REPORTS

G1: Letter Report
on MP System Training Activities

G2: Completion Report
MP System Monitoring Wells MW-6, MW-8, MW-9

G3: Completion Report
MP System Monitoring Well MW-10

G4: Multiple-Level Groundwater
Monitoring with the MP System
(29 May, 1989)

# Appendix G1

## Letter Report
## On MP System Training Activities

Westbay Instruments Inc.

October 29, 1992
WB686

Mr. Darrel Tweidt
Beylik Drilling
751 E. Lambert Road
La Habra, CA 90631

COPY

Subject: Letter Report on MP System Training Activities

Dear Mr. Tweidt:

This letter is to follow up recent training carried out by Westbay at the El Toro Marine Corps Air Station in Orange County, California. The work was performed as outlined in Mr. Dave Larssen's letter to you of September 25, 1992.

Training Activities

Mr. David McEachern of Westbay was on site from October 1 to October 12, 1992. Training was conducted six days a week from Monday to Saturday and on evenings in lieu of Sundays. Mr. John Lovenburg, Mr. Yueh Chuang and Mr. Dan Tiffany of CH2M Hill and Mr. Marco Vasquez of Beylik Drilling all received training in the operation and maintenance of the Model 2410 Electric Sampler Probe and Model 2421 MOSDAX Pressure Probe. They have successfully completed the training and are now certified by Westbay for unsupervised operation of the equipment.

As part of the training procedures, all zones in monitoring well MW-6 were sampled and the field data sheets are included with this report. Zone A (at 70 ft) in MW-8 was also sampled under the direction of Mr. Marco Vasquez and the field data sheets were left on site in Mr. Vasquez's possession. A pressure profile from each monitoring zone in each of the monitoring wells was also taken. The data from these profiles was left in Mr. Yueh Chuang's possession.

At the end of the training program, the rented MP System sampling equipment was left on site in Mr. Marco Vasquez's possession to allow completion of the sampling program. The rental equipment left on site includes:

1 Motorized reel
1 Wooden A-frame tripod
1 Model 2410 Electric Sampler
1 Model 2411 Surface Control Unit
1 Model 4001 Sample Kit (includes assorted tools)
1 120V Briggs and Stratton Generator
Miscellaneous jumper cables and extension cords, etc.

507 E.Third Street, North Vancouver, B.C., Canada V7L 1G4 Phone (604) 984-4215 Fax (604) 984-3538 Phone (in U.S.) (800) 663-8770

This equipment is to be returned as soon as possible to Westbay's storage locker (#C037) at California Self Storage, 1628 S. Anaheim Blvd, Anaheim, CA (phone 714-635-8200).

The Model 4001 Sample Kit is a purchase item only and will be included in CH2M Hill's pending MP System equipment purchase.

It was a pleasure working with Beylik and CH2M Hill on the El Toro project. Please call if you have any questions.

Yours truly,

WK Patton
M.

Dave McEachern

Enclosures: MW-6 Sampling Field Data Sheets (6 pages)

c.c. Mr. Dolat Desai
CH2M Hill

686dmc02

Westbay Instruments Inc.

# Groundwater Sampling

## FIELD DATA SHEET

Project EL TORO · RI/FS Location — Depth 448' Date 10-8-92

Drillhole No. MW-6 Sampling Zone No. A Starting Time 8:30 Finishing Time 4:00

Technicians

Water Level Inside MP Casing (Beginning of Session) 81.19 (End of Session) 86.75

Sampler Probe Preparation - See Sampling Plan Collection Bottle Preparation - See Sampling Plan

| SURFACE FUNCTION CHECKS | | | | | | SAMPLE COLLECTION CHECKS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Activation | Vacuum Check Valve Closed | Valve Open | Evacuate Container | Valve Closed | Water Level In MP (ft, m) | Valve Open Time | Valve Closed Time | Water Level In MP (ft, m) | Volume Retrieved (l) | Sample Container Type |
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | 71.62 | 8:44 | 8:48 | 71.61 | | 4 Bottles |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | 71.69 | 9:21 | 9:25 | 71.69 | | 4 Bottles |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | 71.81 | 9:57 | 10:01 | 71.81 | | 4 Bottles |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | 71.91 | 10:23 | 10:28 | 71.91 | | 4 Bottles |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 72.01 | 10:52 | 10:56 | 72.04 | | " |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓ | 72.14 | 11:17 | 11:22 | 74.20 | | Inside Casing (H2O) |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | 75.55 | 12:00 | 12:04 | 75.49 | | (Duplicate) |
| 8 | ✓ | ✓ | ✓ | ✓ | ✓ | 75.60 | 12:33 | 12:37 | 75.62 | | 4 Bottles |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | 75.76 | 12:59 | 13:04 | 75.76 | | " |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | 75.92 | 1:26 | 1:30 | 75.92 | | |
| 11 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | No trip made |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | ✓ | ✓ | ✓ | ✓ | ✓ | 81.13 | 2:55 | 2:56 | 81.90 | "Zone C" | (Inside Sample |
| 15 | ✓ | ✓ | ✓ | ✓ | ✓ | 81.98 | 3:13 | 3:14 | 82.75 | " | for analysis) |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

Total Volume :

FIELD DETERMINATIONS ( APPEARANCE, pH, S.C. , etc. )

270788

Westbay Instruments Inc.

# Groundwater Sampling

FIELD DATA SHEET

Project EL TORO / CH2M HILL Location — Depth 109' Date Oct 1/92

Drillhole No. MW-6 Sampling Zone No. E Starting Time 11:00 Finishing Time 11:00 Oct 2/92

Technicians DMc / M.V. / J.L. / Y.C. / D.T.

Water Level Inside MP Casing (Beginning of Session) 71.12 ft (End of Session) See Zone D

Sampler Probe Preparation - See Sampling Plan Collection Bottle Preparation - See Sampling Plan

| | SURFACE FUNCTION CHECKS | | | | | SAMPLE COLLECTION CHECKS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | 1 Activation | 2 Vacuum Check Valve Closed | 3 Valve Open | 4 Evacuate Container | 5 Valve Closed | Water Level in MP (ft, m) | Valve Open Time | Valve Closed Time | Water Level in MP (ft, m) | Volume Retrieved (l) | Sample Container Type |
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.63 | 11:22 | 11:24 | 66.66 | — | 2 Bott 6 Samples/5 ft 1. |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.72 | 11:50 | 11:52 | 66.73 | 300 | |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.78 | 12:56 | 12:59 | 66.79 | 500 | |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.85 | 1:24 | 1:28 | 66.85 | 500 | |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.89 | 1:43 | 1:48 | 66.90 | 500 | |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓ | [illegible] | 2:08 | 2:12 | 66.93 | 500 | |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.98 | 2:29 | 2:33 | 66.99 | 500 | |
| 8 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.07 | 2:47 | 2:51 | 67.01 | 500 | |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.06 | 3:08 | 3:12 | 67.08 | 500 | |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.11 | 3:25 | 3:29 | 67.13 | 500 | |
| 11 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.72 | 3:45 | 3:50 | 65.74 | 750 | 3 BOTTLES |
| 12 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.78 | 4:09 | 4:15 | 65.77 | | |
| 13 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.84 | 4:29 | 4:36 | 65.84 | | |
| 14 | | | | | | | Valve not open | | | | |
| 15 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.84 | 4:39 | 4:45 | 65.83 | | |
| 16 | ✓ | ✓ | ✓ | ✓ | | | | | | | Valve not closed/Sec |
| 17 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.30 | 8:56 | 9:00 | 65.31 | | 4 Bottles |
| 18 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.35 | 9:22 | 9:27 | 65.36 | | |
| 19 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.87 | 9:47 | 9:51 | 66.87 | | 3 Bottles |
| 20 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.91 | 10:10 | 10:15 | 66.93 | | |
| 21 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.98 | 10:33 | 10:37 | 66.97 | | Finish Zone |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

Oct 2/92

Total Volume : _____

FIELD DETERMINATIONS ( APPEARANCE, pH, S.C. , etc. ) _____

270788

Westbay Instruments Inc.

# Groundwater Sampling

## FIELD DATA SHEET

Project EL TORO Location — Depth 172' Date 10-02-92

Drillhole No. MW-6 Sampling Zone No. D Starting Time 11:20 Finishing Time

Technicians DMC

Water Level Inside MP Casing (Beginning of Session) Refer to zone E (End of Session) See zone C

Sampler Probe Preparation - See Sampling Plan Collection Bottle Preparation - See Sampling Plan

| SURFACE FUNCTION CHECKS | | | | | | SAMPLE COLLECTION CHECKS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Activation | Vacuum Check Valve Closed | Valve Open | Evacuate Container | Valve Closed | Water Level in MP (ft), m) | Valve Open Time | Valve Closed Time | Water Level in MP (ft), m) | Volume Retrieved (l) | Sample Container Type |
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.75 | 11:29 | 11:33 | 66.75 | | Parameters |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.84 | 2:32 | 2:36 | 66.85 | | VOA |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.92 | 2:54 | 2:57 | 66.92 | | Trial Run |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.96 | 3:21 | 3:23 | 66.96 | | Trial Run |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.02 | 15:38 | 15:41 | 67.03 | | Trial Run |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.08 | 3:57 | 4:00 | 67.09 | | Trial Run |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.15 | 4:15 | 4:18 | 67.16 | | Trial Run |
| 8 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.86 | 10:09 | 10:13 | 65.85 | | Oct 5/92 |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | 65.93 | 10:47 | 10:51 | 65.93 | | |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.0 | 11:21 | 11:25 | 66.0 | | |
| 11 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.08 | 11:54 | 11:58 | 66.09 | | |
| 12 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.14 | 12:20 | 12:24 | 66.16 | | |
| 13 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.24 | 12:42 | 12:46 | 66.22 | | |
| 14 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.36 | 14:28 | 14:34 | 66.35 | | |
| 15 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.42 | 14:55 | 14:59 | 66.43 | | |
| 16 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.50 | 15:26 | 15:30 | 66.50 | | |
| 17 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.57 | 15:33 | 15:37 | 66.56 | | |
| 18 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.58 | 15:57 | 16:03 | 66.58 | | |
| 19 | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | No sample collected |
| 20 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.74 | 8:39 | 843 | 66.72 | | Oct 6/92 |
| 21 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.78 | 9:04 | 9:04 | 66.78 | | |
| 22 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.84 | 9:31 | 9:35 | 66.83 | | |
| 23 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.88 | 9:55 | 9:59 | 66.88 | | |
| 24 | ✓ | ✓ | ✓ | ✓ | ✓ | 66.94 | 10:18 | 10:22 | 66.94 | | |
| 25 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.00 | 10:38 44 | 10:48 | 66.99 | | |

Total Volume :

FIELD DETERMINATIONS ( APPEARANCE, pH, S.C. , etc. )

270788

Westbay Instruments Inc.

# Groundwater Sampling

FIELD DATA SHEET

Project MCAS El Toro RI/FS Location Well 6 - Travelland (W.of) Depth 172 ft Date Oct 6/92

Drillhole No. 6 Sampling Zone No. D (172') Starting Time 8:00 oct 6/92 Finishing Time 1:30 Oct 6/92

Technicians DMc / M.V / J.L / Y.C.

Water Level Inside MP Casing (Beginning of Session) Refer to zone E (End of Session) Refer to zone C

Sampler Probe Preparation - See Sampling Plan Collection Bottle Preparation - See Sampling Plan

| SURFACE FUNCTION CHECKS | | | | | | SAMPLE COLLECTION CHECKS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Activation | Vacuum Check Valve Closed | Valve Open | Evacuate Container | Valve Closed | Water Level in MP (ft, m) | Valve Open Time | Valve Closed Time | Water Level in MP (ft, m) | Volume Retrieved (l) | Sample Container Type |
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.04 | 11:07 | 11:11 | 67.05 | | |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.10 | 11:29 | 11:33 | 67.10 | | |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.15 | 12:06 | 12:11 | 67.15 | | |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.21 | 1:02 | 1:06 | 67.22 | | |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

Total Volume :

FIELD DETERMINATIONS ( APPEARANCE, pH, S.C. , etc. )

270789

Westbay Instruments Inc.

# Groundwater Sampling

FIELD DATA SHEET

Project EL TORO Location — Depth 298 ft Date Oct 6/92

Drillhole No. MW-6 Sampling Zone No. C Starting Time 1:40 Finishing Time 10:15 oct. 7, 1992

Technicians DMc

Water Level Inside MP Casing (Beginning of Session) See Zone D (End of Session) See Zone B

Sampler Probe Preparation - See Sampling Plan Collection Bottle Preparation - See Sampling Plan

| SURFACE FUNCTION CHECKS | | | | | | SAMPLE COLLECTION CHECKS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Activation | Vacuum Check Valve Closed | Valve Open | Evacuate Container | Valve Closed | Water Level In MP (ft, m) | Valve Open Time | Valve Closed Time | Water Level In MP (ft, m) | Volume Retrieved (l) | Sample Container Type |
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.73 | 1:53 | 1:55 | 68.70 | | |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.31 | 2:13 | 1:16 | 68.31 | | |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.42 | 2:43 | 2:46 | 68.40 | | |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | ~~68.~~ 67.05 | 3:07 | 3:11 | 67.05 | | Sampled using 4 bottle |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.16 | 3:34 | 3:39 | 67.16 | | |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.27 | 4:00 | 4:04 | 67.27 | | |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.87 | 8:27 | 8:30 | 68.87 | | Oct 7, 92 |
| 8 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.93 | 8:52 | 8:55 | 68.93 | | |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | 69.00 | 9:13 | 9:16 | 69.01 | | |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | 69.07 | 9:40 | 9:43 | 69.07 | | |
| 11 | ✓ | ✓ | ✓ | ✓ | ✓ | 69.01 | 10:01 | 10:04 | 69.02 | | complete zone |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

Total Volume :

FIELD DETERMINATIONS ( APPEARANCE, pH, S.C. , etc. )

270780

Westbay Instruments Inc.

# Groundwater Sampling

## FIELD DATA SHEET

Project EL TORO Location — Depth 384 Ft. Date Oct. 7, 1992

Drillhole No. MW-6 Sampling Zone No. B Starting Time 10:30 Finishing Time 4:30

Technicians DMc

Water Level Inside MP Casing (Beginning of Session) See zone C (End of Session) See zone A

Sampler Probe Preparation - See Sampling Plan Collection Bottle Preparation - See Sampling Plan

| SURFACE FUNCTION CHECKS | | | | | | SAMPLE COLLECTION CHECKS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Run No. | Activation | Vacuum Check Valve Closed | Valve Open | Evacuate Container | Valve Closed | Water Level In MP (ft, m) | Valve Open Time | Valve Closed Time | Water Level In MP (ft, m) | Volume Retrieved (l) | Sample Container Type |
| 1 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.40 | 10:50 | 10:53 | 67.40 | | 4 Bottles |
| 2 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.49 | 11:20 | 11:23 | 67.41 | | |
| 3 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.64 | 11:59 | 12:03 | 67.64 | | |
| 4 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.83 | 1:32 | 1:36 | 67.83 | ~.9 | |
| 5 | ✓ | ✓ | ✓ | ✓ | ✓ | 67.98 | 2:02 | 2:06 | 68.00 | ~.9 | |
| 6 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.15 | 2:27 | 2:31 | 68.15 | ~.9 | |
| 7 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.30 | 2:54 | 2:58 | 68.29 | " | |
| 8 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.45 | 3:23 | 3:27 | 68.45 | " | |
| 9 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.57 | 3:48 | 3:52 | 68.57 | " | |
| 10 | ✓ | ✓ | ✓ | ✓ | ✓ | 68.69 | 4:13 | 4:15 | 71.68 | " | Inside $H_2O$ 10-8-92 |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

Total Volume : _____

FIELD DETERMINATIONS ( APPEARANCE, pH, S.C. , etc. ) _____

270789

# Appendix G2

## Completion Report
## MP System Monitoring Wells MW-6, MW-8, MW-9

# COMPLETION REPORT

**EL TORO**
**MARINE CORPS AIR STATION**
(Project No. LAO31980.PA.50)

**ORANGE COUNTY,**
**CALIFORNIA**

**MP SYSTEM MONITORING WELLS**
MW-6, MW-8, MW-9

Prepared for

**Beylik Drilling, Inc.**
751 E. Lambert Road
La Habra, CA 90631

Prepared by

**Westbay Instruments**
October 27, 1992
WB686-92

# CONTENTS:


| | | PAGE |
|---|---|---|
| 1 | INTRODUCTION | 1 |
| 2 | PREVIOUS ACTIVITIES | 1 |
| 3 | INSTALLATION | 1 |
| | 3.1 Final Preparation of Monitoring Well Design | 2 |
| | 3.2 Layout of MP System Casing Components | 2 |
| | 3.3 Lowering of MP System Casing Components | 2 |
| | 3.4 Inflation of MP System Casing Packers | 2 |
| | 3.5 Fluid Pressure Readings | 3 |
| 4 | QA TESTING | 3 |
| 5 | HYDRAULIC CONDUCTIVITY TESTING | 3 |
| 6 | PURGING | 3 |
| 7 | SAMPLING AND TRAINING | ~~4~~ 3 |
| 8 | TABLE 1 | |


* * * * * * * * * * * *


Appendix A: MP System Monitoring Well MW-9

Appendix B: MP System Monitoring Well MW-6

Appendix C: MP System Monitoring Well MW-8

## 1. INTRODUCTION

This report documents the technical services provided by Westbay Instruments under Beylik Drilling Inc. Purchase Order No. 04-2355. The Westbay MP System for groundwater monitoring was installed in monitoring wells MW 6, 8, and 9 (Project No. LA031980. PA. 50) in Orange Country, California. The monitoring well design which specified the depth and number of monitoring zones was provided by Beylik and confirmed by CH2M Hill.

## 2. PREVIOUS ACTIVITIES

Prior to installation of the MP System, the monitoring wells had been drilled by mud rotary. The monitoring zone intervals were chosen based on the geological and geophysical information available. A 4 inch nominal I.D. mild steel casing with stainless steel screens at the intended monitoring levels was lowered into the well. Each monitoring zone consists of a 10 ft long 4 inch I.D. stainless steel wire-wrapped screen with a 15 ft long section of stainless steel pipe above and a 10 ft long section of stainless steel pipe below the screen.

Layers of backfill materials were placed outside the steel pipe by Beylik. Clean sand was used as the filter pack opposite the screen sections. It was intended that this filter pack extend approximately 5 ft above and 5 ft below the ends of the screen section. Approximately 3 ft of fine sand was placed above the filter pack material. The backfill seal material was a 1:1 mix of sand and bentonite chips. All backfill materials were placed through a tremmie pipe. Following backfill placement, the monitoring zones were developed by swabbing and pumping at each screen interval.

On August 25, 1992, during the initial inflation of the packers in MW-9, it was determined that a packer had been incorrectly placed in the MP casing string. With approval from Westbay's North Vancouver office and after discussions with Beylik Drilling and CH2M Hill, the MP casing from well MW-9 was successfully removed. The casing was reconfigured and reinstalled in the correct position on August 26 to 28 as described below.

## 3. INSTALLATION

Westbay representatives Mr. David McEachern and Mr. Sam Watanabe were on site for all of the installation activities. Mr. Dave Larssen of Westbay was on site temporarily on August 26 and 27, 1992 and September 10 and 11, 1992.

The monitoring wells were installed on the dates listed below:

| Well # | Date |
|---|---|
| MW-9 | August 26 - 28, 1992 |
| MW-6 | August 28 - 29, 1992 |
| MW-8 | September 8, 1992 |

## 3.1 Final Preparation Of Monitoring Well Design

Drawings were prepared by Westbay showing an arrangement of MP casing components compatible with the steel casing and screens installed in the drillhole. One MP packer was positioned in the 10 ft long stainless steel pipe section below each well screen. The two MP packers positioned above each monitoring zone in a section of blank stainless steel casing provide a "Short QA Zone" intended for confirmation of hydraulic separation between adjacent monitoring zones.

MP measurement ports and pumping ports were positioned within each of the well screen sections. Additional measurement ports were positioned between the monitoring zones in "QA Zones" for QA testing purposes.

## 3.2 Layout of MP System Casing Components

The MP casing lengths and packers were laid out near the collar of the drillhole. The MP components were arranged in the order in which they were to be lowered according to the drawings. Each casing length was numbered sequentially from the bottom of the monitoring well, with the appropriate MP coupling attached to the casing top. The MP casing components were protected during shipment by plastic covers. Magnetic location collars were clamped to the MP casing 0.3 ft above those measurement ports located in a monitoring zone. Magnetic collars were not placed at the QA zone measurement ports.

## 3.3 Lowering of MP System Components

As each component was removed from the rack, the casing type, coupling type, and sequential numbers were checked against the Casing Installation Log. The component was then attached to the string being lowered into the drillhole.

Each joint was hydraulically tested by applying a nominal internal pressure of 100 psi for one minute. Test results were recorded against the Casing Installation Log. Geotextile filter sleeves were placed over each measurement port in a QA zone. Geotextile filters were not used on measurement ports in the monitoring zones. This procedure continued until all the MP System components had been placed in the drillhole.

The MP casing string was positioned in the well with the center of the top coupling nominally at ground surface. All depths on the installation logs are in feet below ground surface.

## 3.4 Inflation of MP System Casing Packers

The MP casing packers were inflated with water provided by Beylik Drilling. The gauge pressure and volume of water pumped were recorded at intervals and plotted for each packer. MP Packer Inflation Records for each of the packers installed are provided in the appendices. All of the packers inflated normally.

### 3.5 Fluid Pressure Readings

Fluid pressures were measured at each measurement port following the installation. The plotted results and the data sheets are attached in the appendices. The data is also available on the enclosed disk which is in MS-DOS format and the data can be viewed using spreadsheet software such as Lotus 1-2-3 or Quattro Pro.

## 4. QA TESTING

A series of QA tests were carried out at each of the blank pipe "QA" zones in the wells to observe the performance of the MP System packers. The QA zones were tested by first adjusting the water level in the MP casing to provide an excess head of 10 to 30 ft. Each QA zone was independently vented to the interior of the MP casing and any change in water level was noted. A stable water level during the test shows that the steel casing and MP packers in the QA zones are sealed.

The QA tests show that each "Short QA Zone" was sealing, thereby confirming hydraulic separation between each monitoring zone. The data from these tests is available.

## 5. HYDRAULIC CONDUCTIVITY TESTING

A variable head hydraulic conductivity test was conducted at each monitoring zone prior to purging. Preliminary values for hydraulic conductivity were calculated using the method described by Hvorslev (1951). The hydraulic conductivity test field results are summarized in Table 1. The data are included together with graphical calculation sheets in the appendices. All data and calculations are provided for information only and before use should be checked by an experienced hydrogeologist.

## 6. PURGING

Development of individual steel well screens had been carried out by Beylik Drilling prior to the MP installation. In addition, each monitoring zone was purged through the MP pumping port coupling. The purge criteria provided by CH2M Hill was to pump each zone for between 2 and 2 1/2 hours. Purging was conducted from September 11 to 18, 1992. The pumping logs for each monitoring zone are provided in the appendices. All zones were pumped for approximately two hours except zone number 5 in MW-9 which was purged for approximately five hours.

## 7. SAMPLING AND TRAINING

No sampling or training was performed during the installation activities. It is expected that the sampling and training may commence in late September or October, 1992.

dmco1.sam

TABLE 1

Summary of Hydraulic Conductivity Test Results

| Well # | Test Zone # | Depth (ft) | K(est)*(cm/sec) |
|---|---|---|---|
| 6 | 1 | (114) | 1.9 E-4 |
| 6 | 2 | (177) | 1.8 E-3 |
| 6 | 3 | (304) | 1.9 E-4 |
| 6 | 4 | (389) | 1.5 E-4 |
| 6 | 5 | (454) | 4.4 E-5 |
| 8 | 1 | (75) | 5.0 E-5 |
| 8 | 2 | (135) | 4.3 E-4 |
| 8 | 3 | (305) | N/A (>1.0 E-3) |
| 8 | 4 | (447) | 1.1 E-4 |
| 9 | 1 | (67) | 2.3 E-4 |
| 9 | 2 | (142) | N/A (>1.0 E-3) |
| 9 | 3 | (226) | 1.5 E-4 |
| 9 | 4 | (278) | 6.8 E-4 |
| 9 | 5 | (383) | 1.1 E-4 |
| 9 | 6 | (462) | 1.4 E-5 |

* Estimated hydraulic conductivity after Hvorslev (1951)

appen.

Appendix A (MW-6)

| | |
|---|---|
| Casing Installation Log | 5 pages |
| MP Packer Inflation Records | 14 pages |
| Hydraulic Conductivity Test Records | 5 pages |
| Hydraulic Conductivity Data (semi-log plots) | 2 pages |
| Pumping Log Records | 5 pages |
| Pressure Profile Data | 1 page |
| Graphical Summary of Fluid Pressures | 1 page |

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-6 Installed by: DMc

Hole Depth: 488 ft MP Depth: 477 ft Hole Diameter: 4" S. Steel Date Installed: Sept 8/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, ft | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 0 | | | 72 | | | | | |
| | MP casing | | 71 | | | | | |
| | 4" casing | | 70 | | | | | |
| | ≈1.0 ft | | 69 | | | | | |
| 20 | | | 68 | | | | | |
| | cement pad | | | | | | | |
| | | | 67 | | | | | |
| 40 | | | 66 | | | | | |
| | | | 65 | | | | | |
| 60 | | | 64 | | | | | |
| | | | 63 | | | | | |
| 80 | | | 62 | | | | | |
| | | | 61 | | | | | |
| | | | 60 | | | | | |
| 100 | | | 59 | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-6 Installed by: DMc

Hole Depth: 488 ft MP Depth: 477 ft Hole Diameter: 4" S. Steel Date Installed: Sept 8/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, ft | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 100 | | | | | | | | |
| | | 105 | 58 | | | | | |
| | | | MAG | | | | | |
| | | | 57 | | | | | |
| | | 115 | 56 | | | | | |
| 120 | | | 55 | | | | | |
| | | | 54 | | | | | |
| | | | 53 | | | | | |
| | | | 52 | | | | | |
| 140 | | | 51 | | | | | |
| | | | 50 | | | | | |
| | | | 49 | | | | | |
| | | | 48 | | | | | |
| | | | 47 | | | | | |
| 160 | | | 46 | | | | | |
| | | 168 | 45 | | | | | |
| | | | MAG | | | | | |
| | | | 44 | | | | | |
| | | 178 | 43 | | | | | |
| 180 | | | 42 | | | | | |
| | | | 41 | | | | | |
| | | | 40 | | | | | |
| 200 | | | 39 | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay

# MP System Casing Installation Log

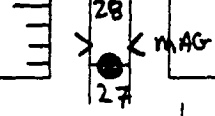
Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-6 Installed by: DMc

Hole Depth: 488 ft MP Depth: 477 ft Hole Diameter: 4" S. Steel Date Installed: Sept 8/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 200 | | | | | | | | |
| | | | 38 | | | | | |
| 220 | | | 37 | | | | | |
| | | | 36 | | | | | |
| 240 | | | 35 | | | | | |
| | | | 34 | | | | | |
| 260 | | | 33 | | | | | |
| | | | 32 | | | | | |
| 280 | | | 31 | | | | | |
| | | | 30 | | | | | |
| | | | 29 | | | | | |
| | | | 28 | | | | | |
| 300 | | | 27 | | | | | |




MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-6 Installed by: DMc

Hole Depth: 488 ft MP Depth: 477 ft Hole Diameter: 4" S. Steel Date Installed: Sept 8/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 300 | | | | | | | | |
| | | 305 | 26 | | | | | |
| | | | 25 | | | | | |
| | | | 24 | | | | | |
| 320 | | | | | | | | |
| | | | 23 | | | | | |
| | | | 22 | | | | | |
| 340 | | | | | | | | |
| | | | 21 | | | | | |
| | | | 20 | | | | | |
| 360 | | | | | | | | |
| | | | 19 | | | | | |
| | | | 18 | | | | | |
| | | | 17 | | | | | |
| 380 | | 380 | 16 | | | | | |
| | | | MAG 15 | | | | | |
| | | 390 | 14 | | | | | |
| | | | 13 | | | | | |
| 400 | | | 12 | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-6 Installed by: DMc

Hole Depth: 488 ft MP Depth: 477 ft Hole Diameter: 4" S. Steel Date Installed: Sept 8/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 400 | | | | | | | | |
| | | | 11 | | | | | |
| 420 | | | 10 | | | | | |
| | | | 9 | | | | | |
| | | | 8 | | | | | |
| 440 | | | 7 | | | | | |
| | | | 6 | | | | | |
| | | | 5 (MAG) | | | | | |
| | | | 4 | | | | | |
| 460 | | | 3 | | | | | |
| | | | 2 | | | | | |
| | | | 1 | | | | | |
| 480 | | | | | | | | |
| 500 | | | | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: ~~MW-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 3

Depth (ft.) ~~459~~ 464

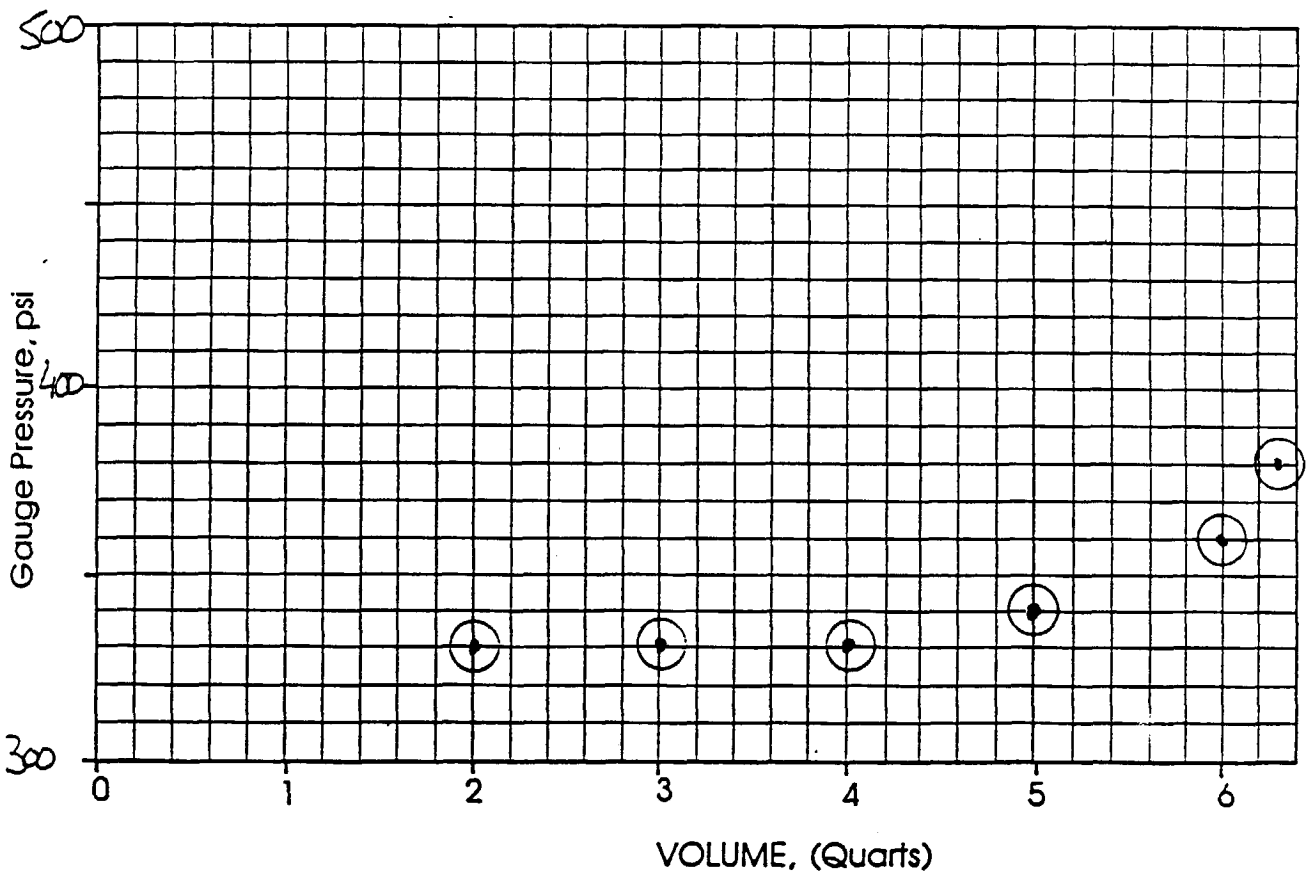
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

458 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 7 | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 340 | 360 | 380 | 400 | 460 | Ø | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: ~~MW-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 7

Depth (ft.) 444

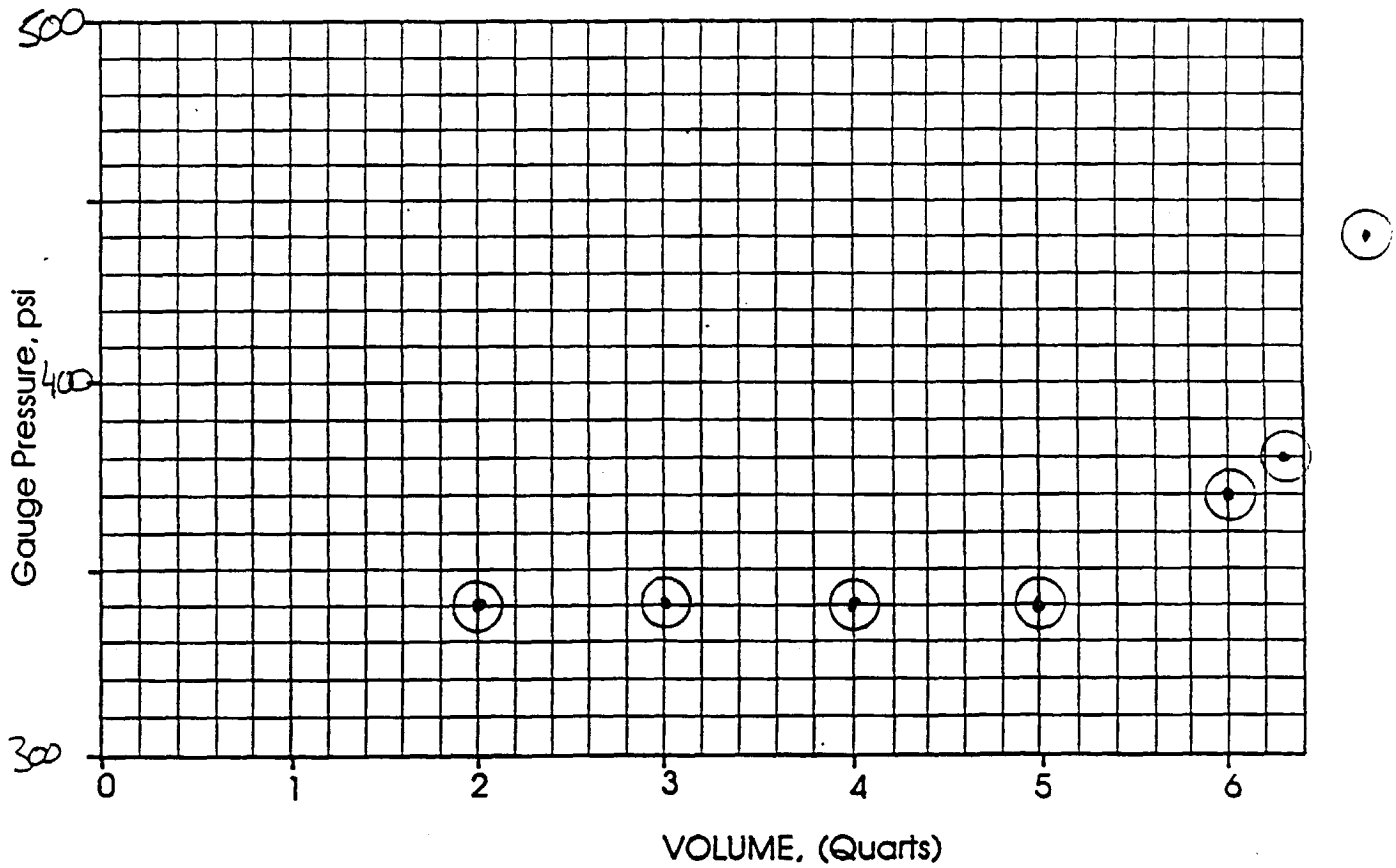
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈55

438 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 340 | 340 | 340 | 340 | 370 | 380 | 440 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 9

Depth (ft.) 434

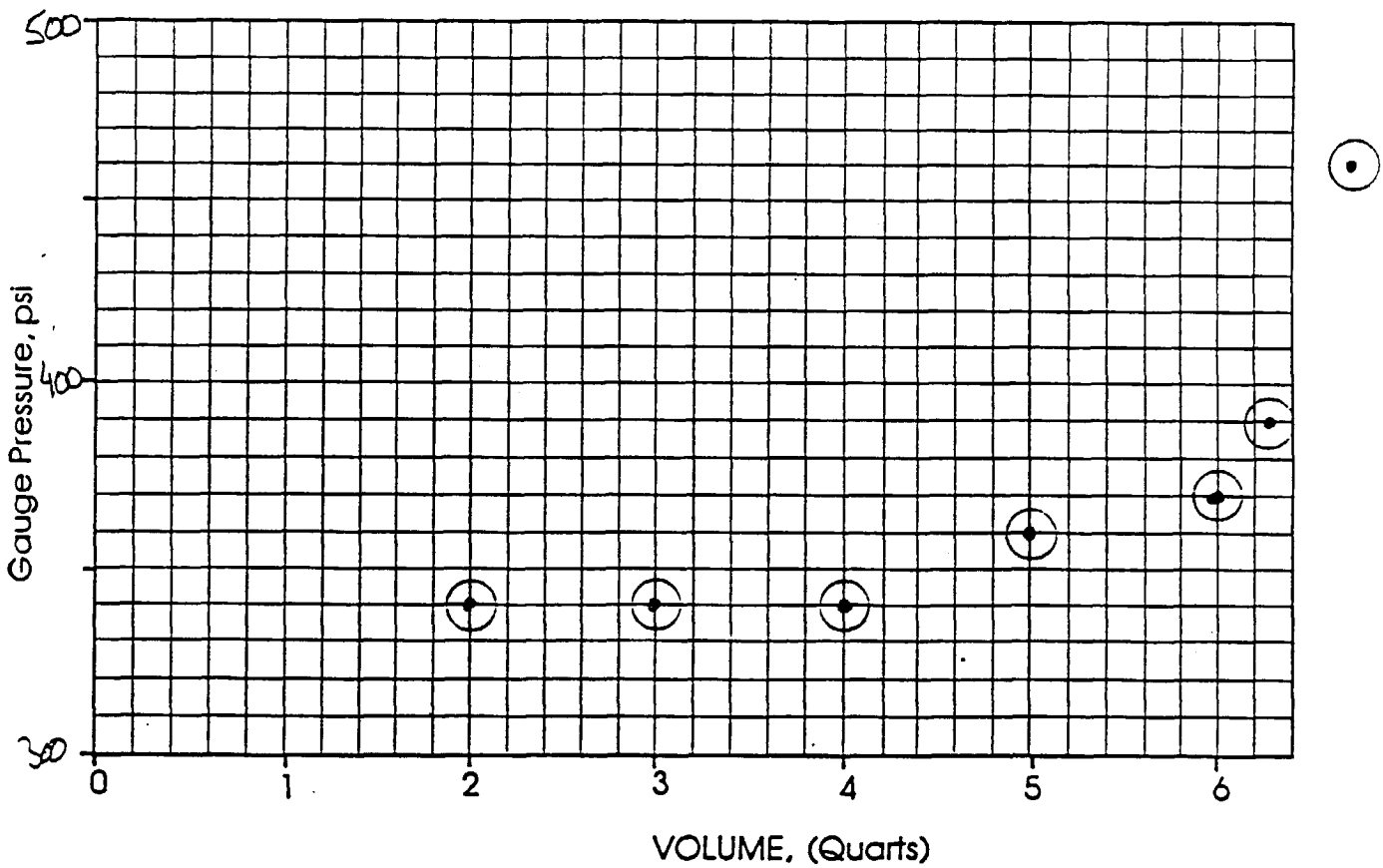
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

428 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 340 | 340 | 340 | 360 | 370 | 390 | 460 | ∅ | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 13

Depth (ft.) 394

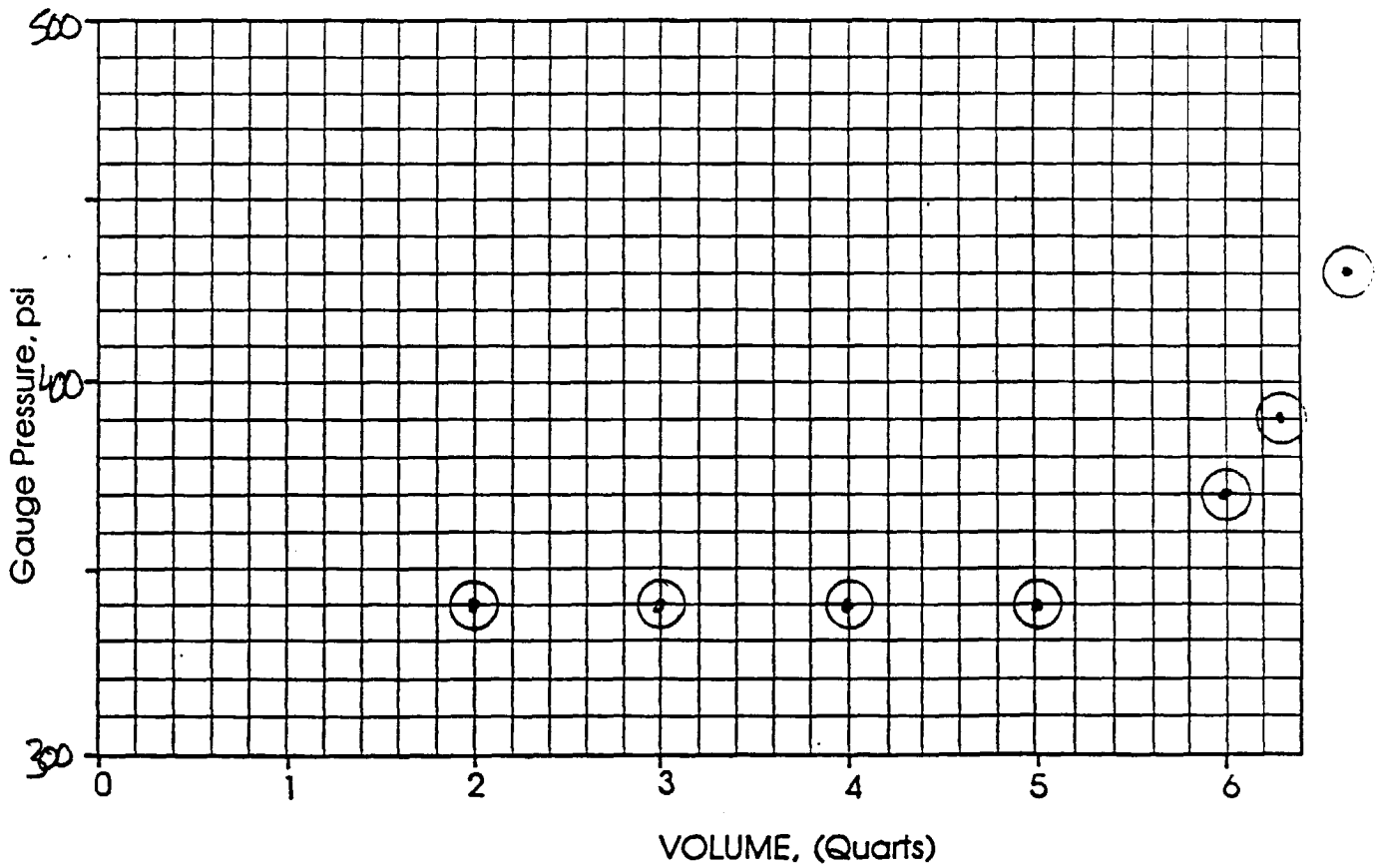
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 355

393 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 340 | 340 | 340 | 340 | 370 | 390 | 430 | ∅ | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: #WB 686

Date Completed:

Hole No.: ~~MW-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 17

Depth (ft.) 379

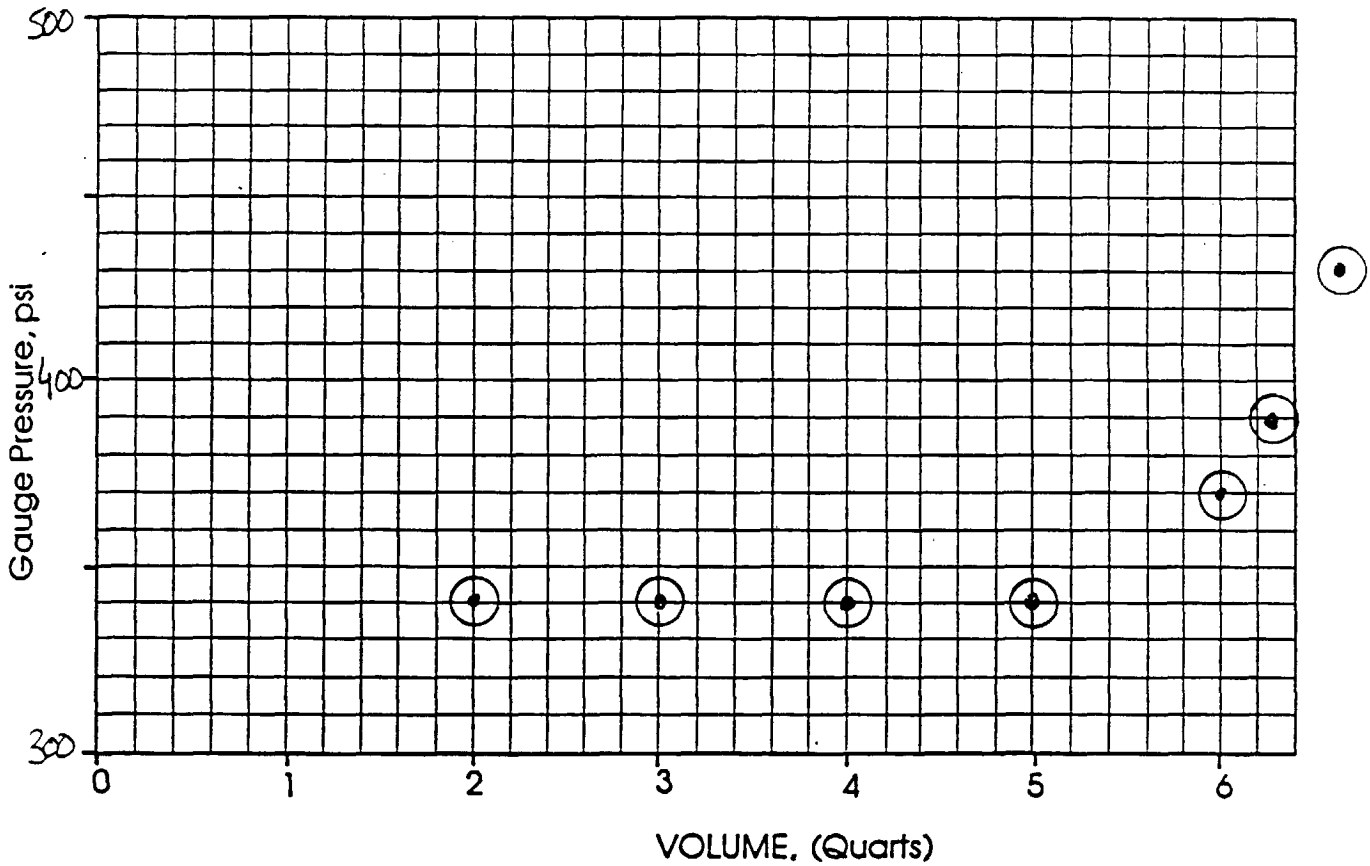
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈55

372 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 3 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 340 | 340 | 340 | 350 | 370 | 390 | 430 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 19

Depth (ft.) 369

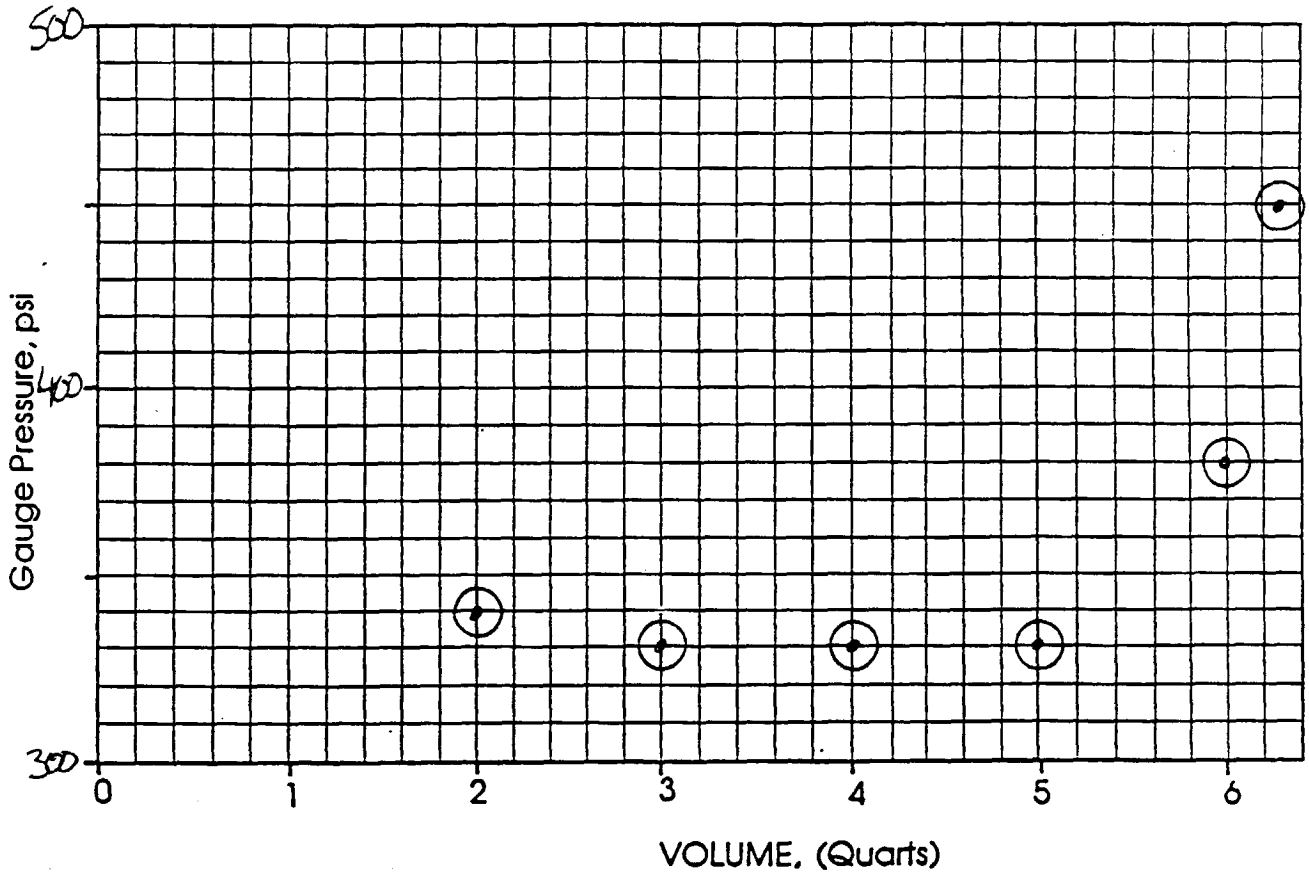
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

362 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 5 1/2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 340 | 330 | 330 | 330 | 380 | 450 | Ø | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMe

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 25

Depth (ft.) 317

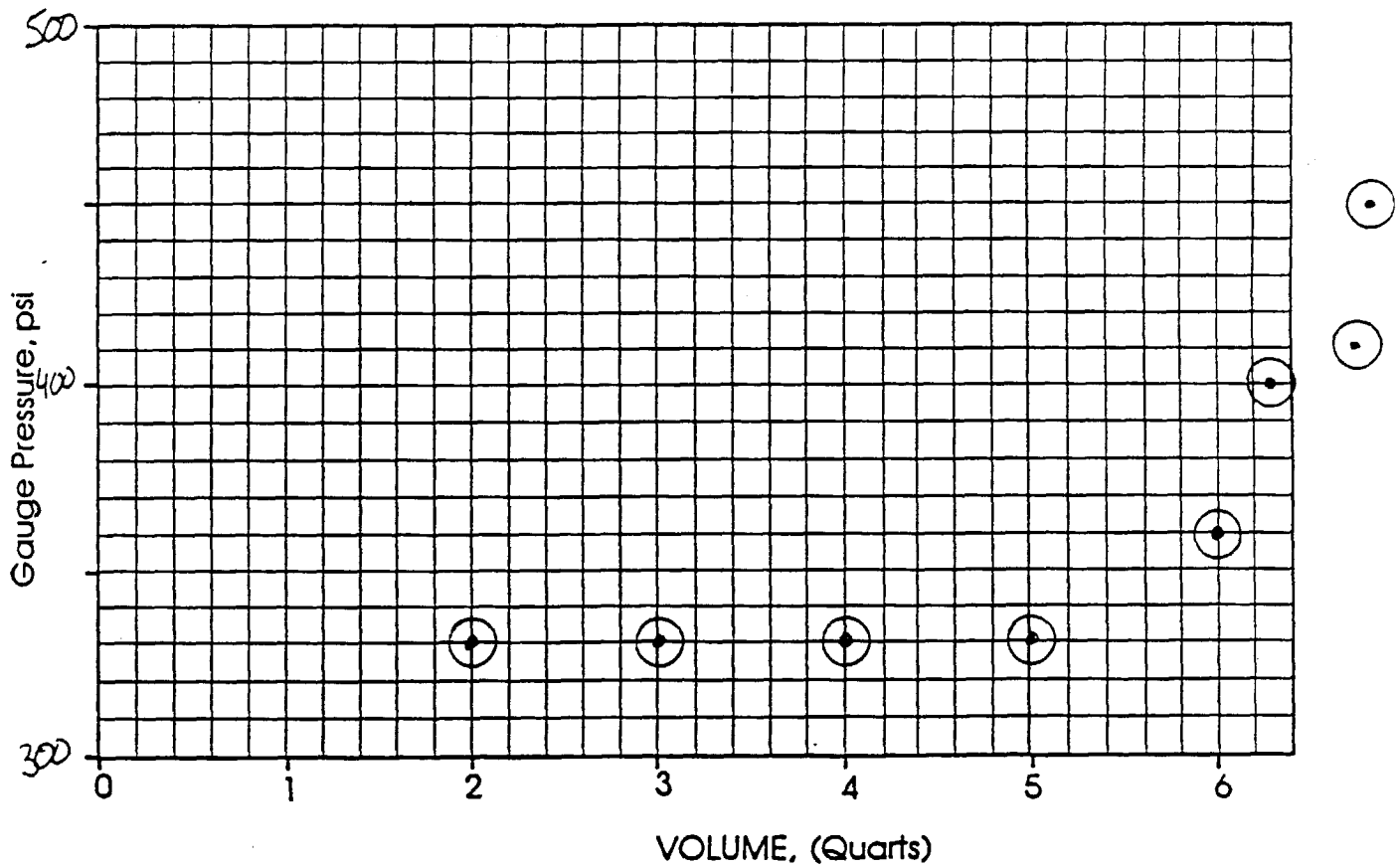
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

307 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 7 | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 340 | 360 | 400 | 410 | 450 | Ø | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: JMC

Location: WB-686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 29

Depth (ft.) 294

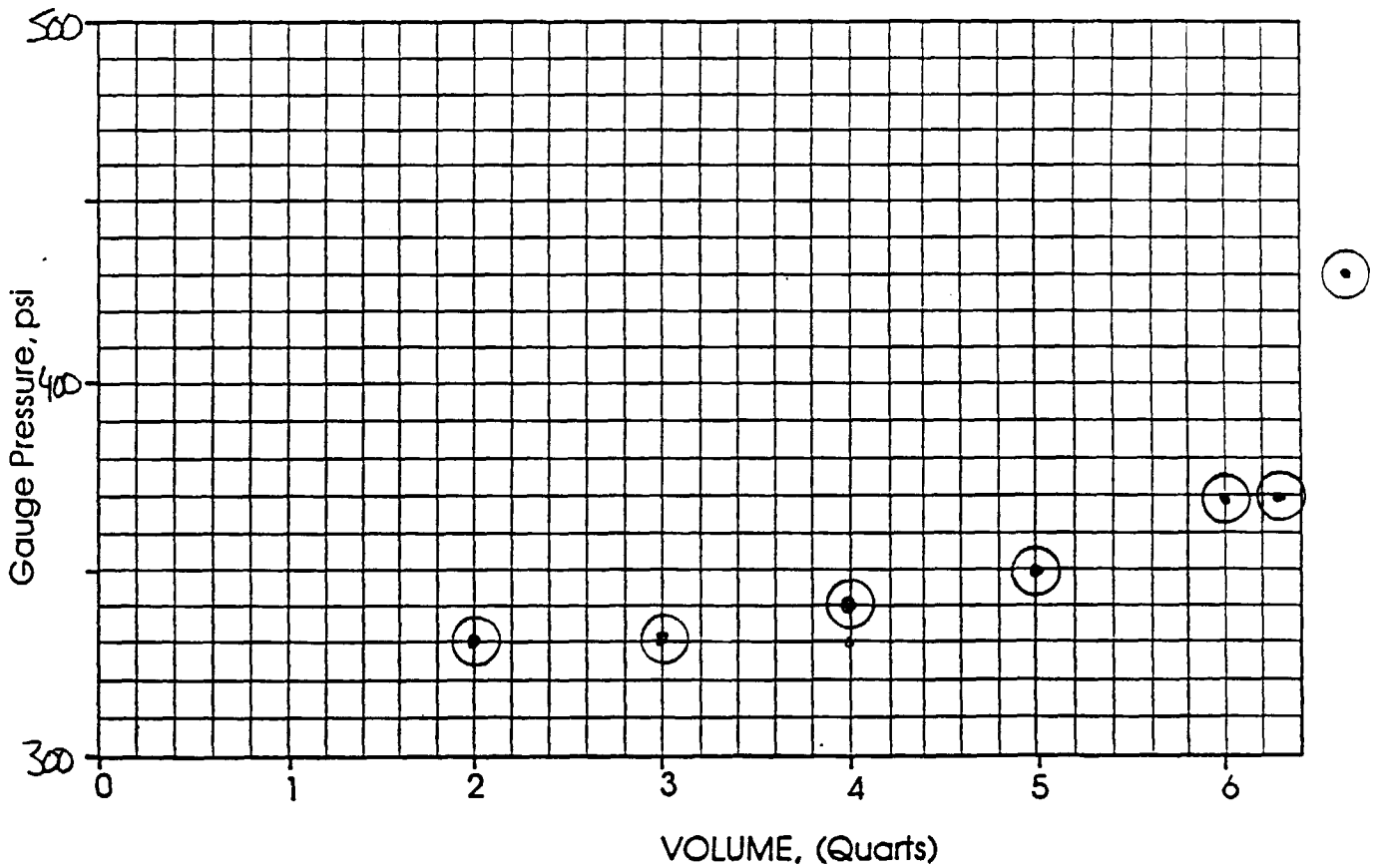
Inflation Tool Setting (psi) 2

Depth to Water Table (ft.) ≈55

287 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 340 | 350 | 370 | 370 | 430 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Recora

Project: EL TORO

Completed By: [illegible]

Location: WB-686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 31

Depth (ft.) 284

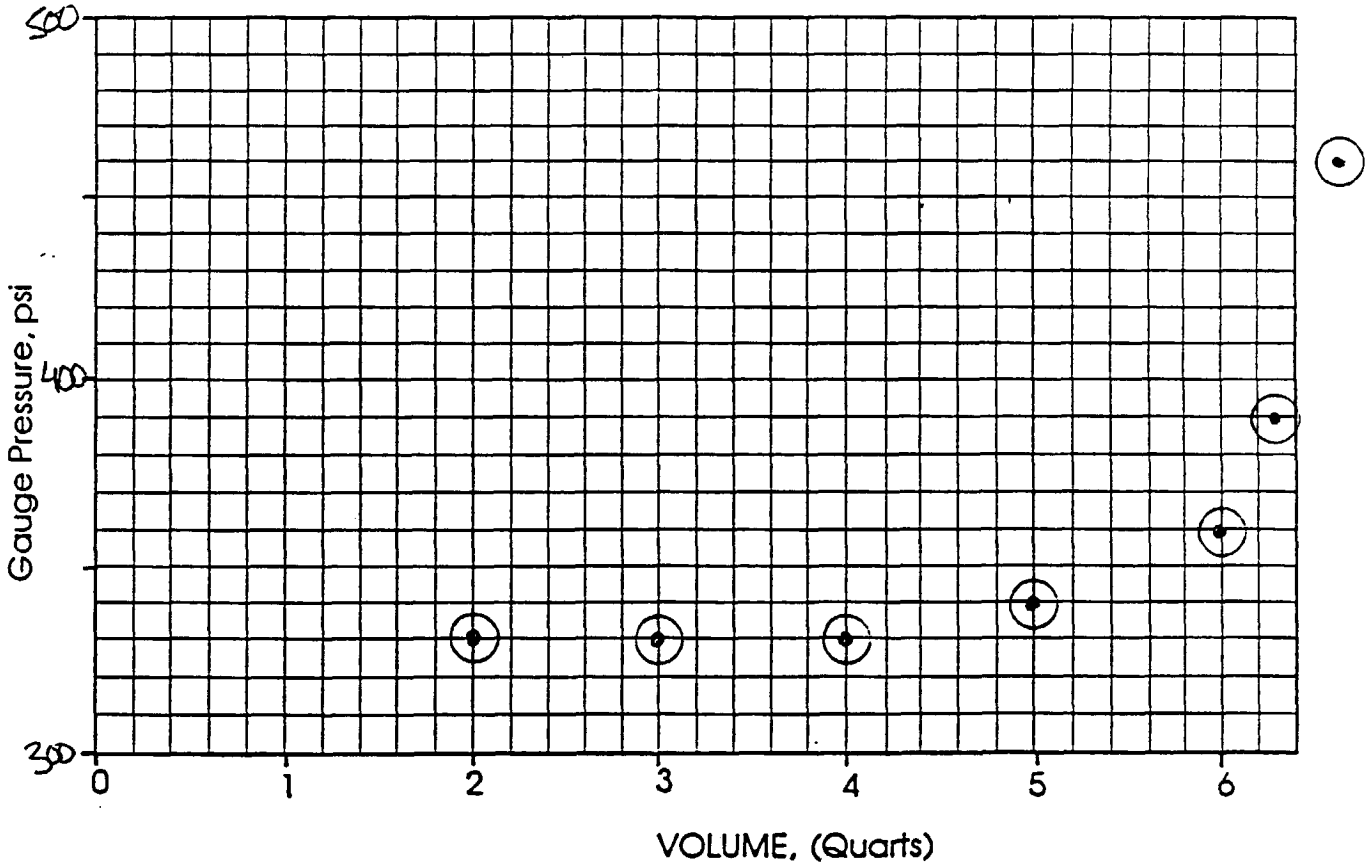
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

277 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 5 3/4 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 340 | 360 | 390 | 460 | ∅ | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMe

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ WW 686

Date Inflated: Aug 29/92

Packer No.: 42

Depth (ft.) 187

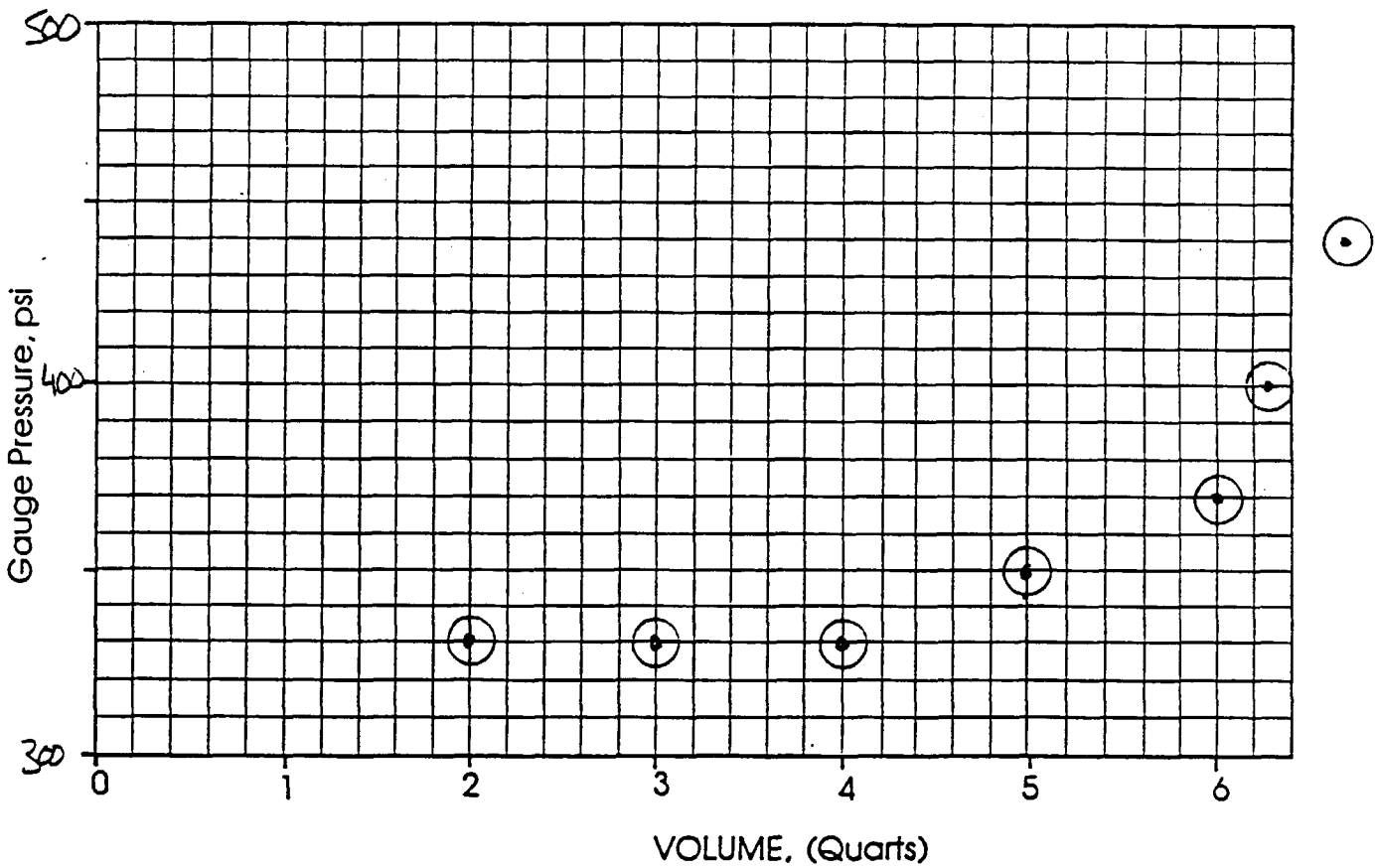
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

179 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 5 3/4 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 350 | 370 | 400 | 440 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 46

Depth (ft.) 167

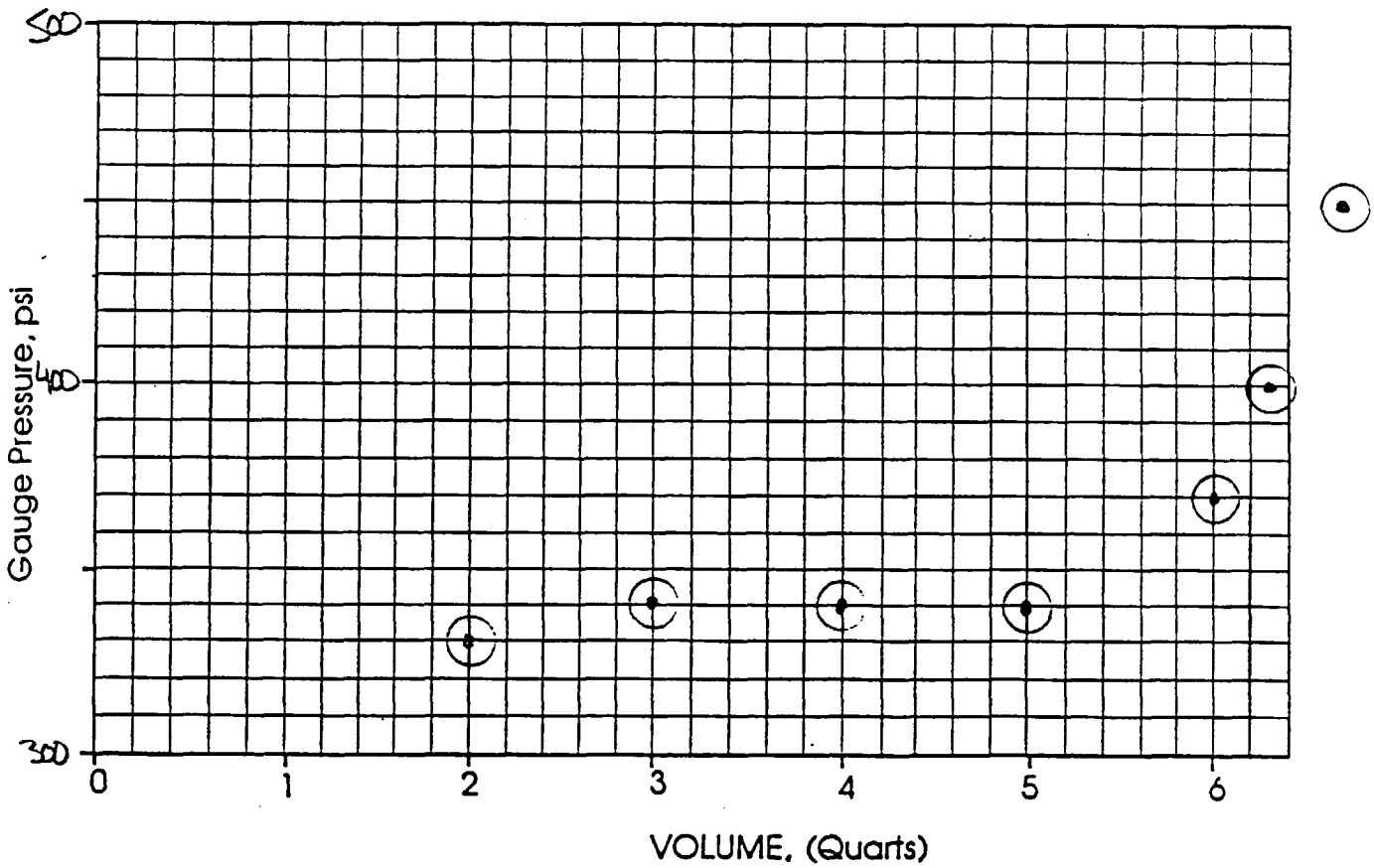
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈55

160 ft.

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 340 | 340 | 340 | 370 | 400 | 450 | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 48

Depth (ft.) 157

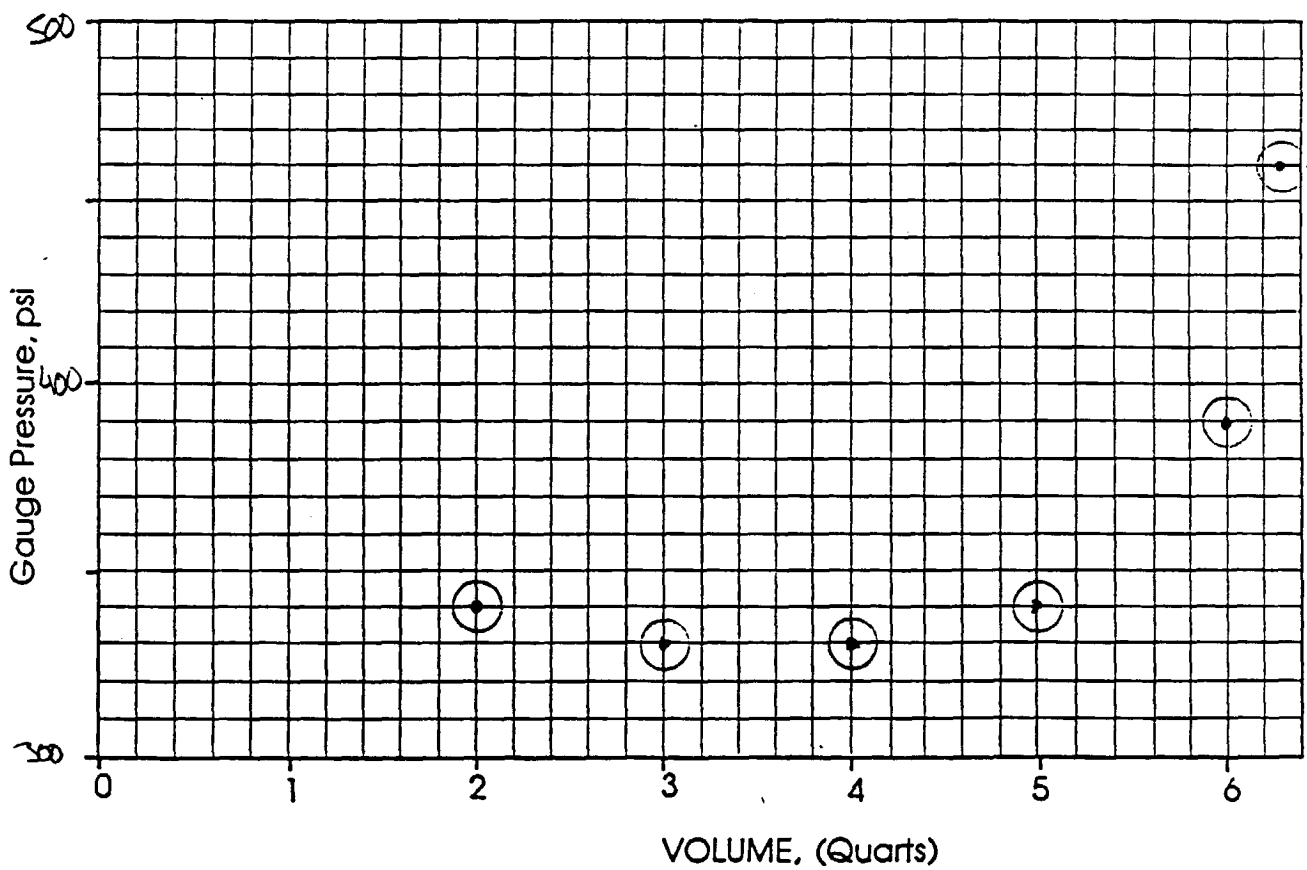
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

150 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 5 1/2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 340 | 330 | 330 | 340 | 390 | 460 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: ~~MW-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 55

Depth (ft.) 124

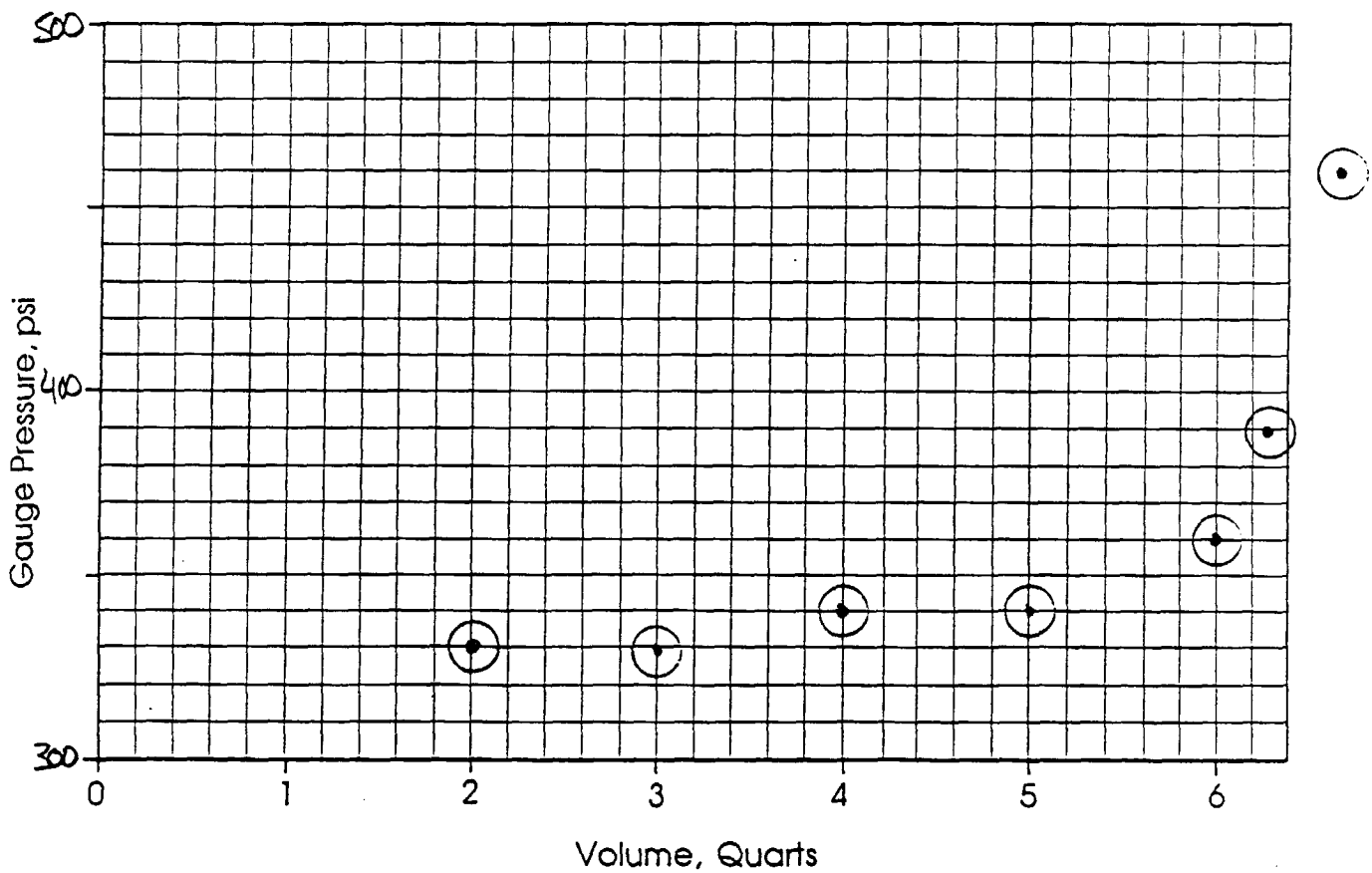
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

117 ft

| Volume (Quarts) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 5 3/4 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure (PSI) | 330 | 330 | 340 | 340 | 360 | 390 | 460 | Ø | | |

Plot of Gauge Pressure (PSI) vs. Volume (Quarts)




14/06/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: D. Mc

Location: WB 686

Date Completed:

Hole No.: ~~MP-6~~ MW-6

Date Inflated: Aug 29/92

Packer No.: 59

Depth (ft.) 114

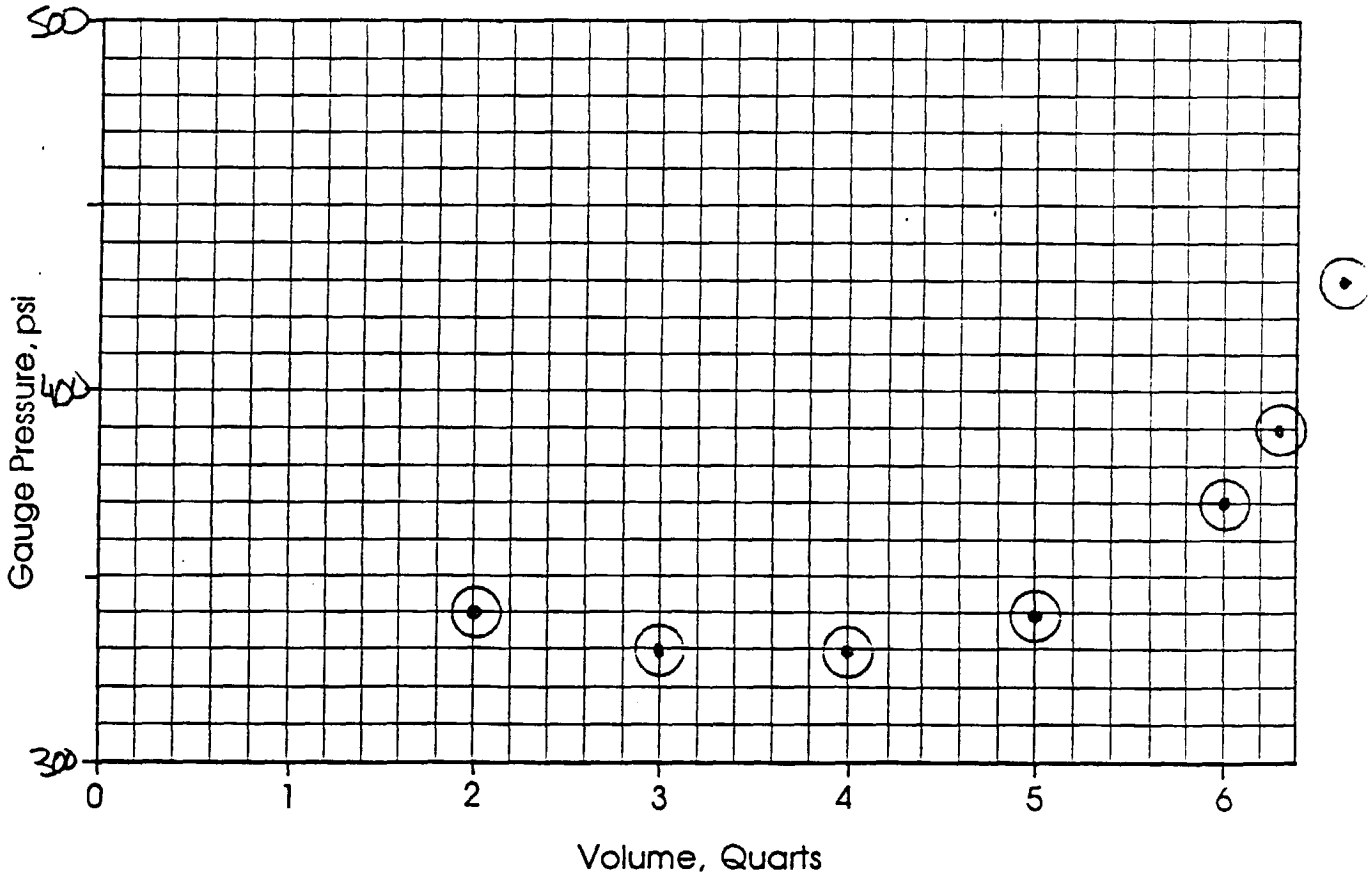
Inflation Tool Setting (psi) 270

Depth to Water Table (ft.) ≈ 55

97 ft

| Volume (Quarts) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure (PSI) | 340 | 330 | 330 | 340 | 370 | 390 | 430 | | | |

Plot of Gauge Pressure (PSI) vs. Volume (Quarts)




14/06/90

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: top of MP
Probe Type: WLT
Date: Sept 14/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-6
Height MP Casing above Ground Sfc:
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: ≈ 1' above cement pad
Riser Diameter (d): 38 ~~in.~~ cm
Test Zone No.: 1
Test Type: slug test.
Test Zone Diameter: 29.4 cm
Test Zone Interval: 109'
Operator: Dale
Test Zone Length (L): 24' (705.6 cm) design
Initial Head Difference($H_0$): 19.55
Initial Test Reading (h): 31.75
Calculated Hydraulic Conductivity (k):
Analysis Method:
Static Water Level in Test Zone: 51.30 ft. ~~m~~ ~~psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m~~ ~~psi~~ | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 8:42 | | 0 | 31.75 | 1.00 | | 3 | | 50.75 | |
| | | 10 | 41.4 | .51 | | 4 | | 51.10 | |
| | | 20 | 43.2 | .41 | | 5 | | 51.20 | |
| | | 30 | 44.44 | .35 | | 6 | | 51.25 | |
| | | 40 | 45.8 | .28 | | 7 | | 51.30 | |
| | | 50 | 46.8 | .23 | | 8 | | 51.30 | |
| | | 60 | 47.5 | .194 | | 9 | | 51.30 | |
| | | 75 | 48.3 | .153 | | | | | |
| | | 90 | 48.9 | .123 | | | | | |
| | | 120 | 49.85 | | | | | | |
| | | 150 | 50.45 | | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: Top of MP
Probe Type: WLT
Date: Sept 14/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-6
Height MP Casing above Ground Sfc:
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: ~1 ft above cement pad
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 2
Test Type: slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 173'
Operator: JMC
Test Zone Length (L): 24' (705.6 cm) design
Initial Head Difference($H_0$): 15.80'
Initial Test Reading (h): 35.45
Calculated Hydraulic Conductivity (k):
Analysis Method:
Static Water Level in Test Zone: 51.5 ft. ~~m psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| Sept 14/92 | | 0 | 35.45 | 1.00 | | | | | |
| 11:00 | | | | | | | | | |
| | | 10 | 49.9 | .085 | | | | | |
| | | | | | | | | | |
| | | 20 | 51.25 | .016 | | | | | |
| | | | | | | | | | |
| | | 30 | 51.45 | | | | | | |
| | | | | | | | | | |
| | | 40 | 51.50 | | | | | | |
| | | | | | | | | | |
| | | 50 | 51.50 | | | | | | |
| | | | | | | | | | |
| | | 60 | 51.50 | | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: TOP of MP
Probe Type: WLT
Date: Sept 14/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-6
Height MP Casing above Ground Sfc:
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: ≈1 ft above cement pad
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 3
Test Type: slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 299'
Operator: DMc
Test Zone Length (L): 24' (705.6 cm) design
Initial Head Difference($H_0$): 36.75
Initial Test Reading (h): 43.35
Calculated Hydraulic Conductivity (k):
Analysis Method:
Static Water Level in Test Zone: ft. ~~m psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m psi~~ | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m psi~~ | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 12:45 | | 0 | 43.35 | 1.00 | | | 180 | 79.35 | |
| | | 10 | 65.55 | .40 | | | 240 | 79.65 | |
| | | 20 | 70.2 | .27 | | | 300 | 79.80 | |
| | | 30 | 73.3 | .185 | | | 360 | 79.95 | |
| | | 40 | 74.9 | .140 | | | 420 | 80.00 | |
| | | 50 | 76.0 | .112 | | | 480 | 80.05 | |
| | | 60 | 76.8 | .090 | | | 540 | 80.10 | |
| | | 75 | 77.6 | | 12:55 | | 600 | 80.10 | |
| | | 90 | 78.2 | .052 | | | | | |
| | | 120 | 78.8 | .035 | | | | | |
| | | 150 | 79.1 | | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: Top of MP
Probe Type: WLT
Date: Sept 14/92
Job No.: 868
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-6
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: ≈1ft above cement pad
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 4
Test Type: slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 384'
Operator: DMC
Test Zone Length (L): 24' (706 cm) design
Initial Head Difference($H_0$): 31.25
Initial Test Reading (h): 140.20
Calculated Hydraulic Conductivity (k):
Analysis Method:
Static Water Level in Test Zone: 108.95 ft. ~~m~~ ~~psi~~.
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m~~ ~~psi~~ | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 140.20 | 1.00 | | | 240 | 118.3 | .30 |
| | | 10 | 135.0 | .83 | | | 300 | 116.3 | |
| | | 20 | 133.3 | | | | 360 | 114.9 | .190 |
| | | 35 | 131.7 | .73 | | | 420 | 113.9 | |
| | | 45 | 130.45 | | | | 480 | 112.9 | .126 |
| | | 60 | 128.8 | .64 | | | 540 | 112.2 | |
| | | 75 | 127.2 | | | | 600 | 111.6 | |
| | | 90 | 126.2 | .55 | | | | | |
| | | 120 | 124.4 | .49 | | | 720 | 110.9 | |
| | | 150 | 122.4 | .43 | | | 900 | 110.3 | |
| | | 180 | 120.6 | | | | ∞ | 108.95 | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

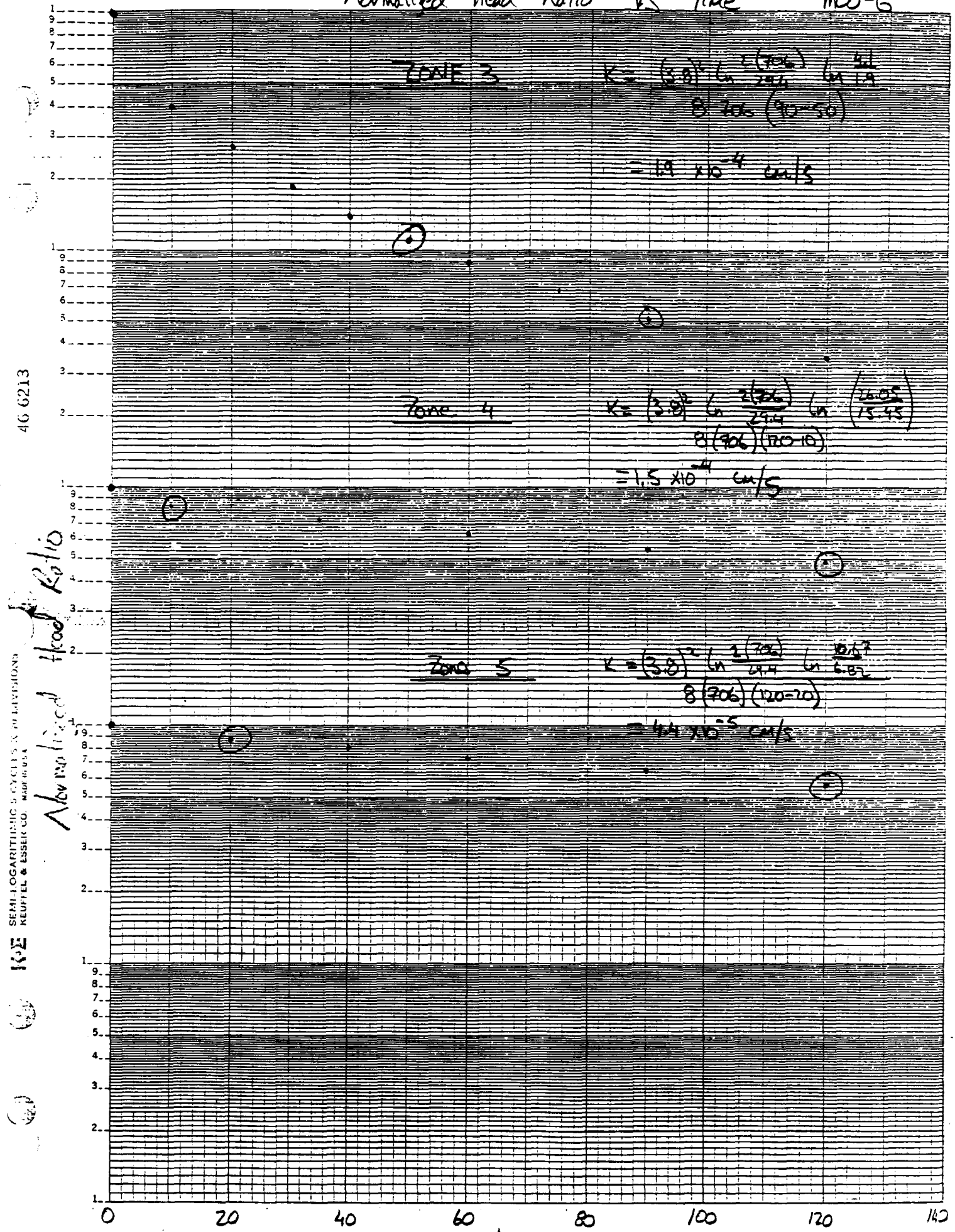
## Field Data Sheet

Datum: Top of MP
Probe Type: WLT
Date: SEPT 18/92
Job No.: 656
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-6
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: ≈ 1 ft above cement pad
Riser Diameter (d): 38 ~~in.~~ cm
Test Zone No.: 5
Test Type: slug
Test Zone Diameter: 29.4
Test Zone Interval: 449'
Operator: DMC
Test Zone Length (L): 24' (706 cm) design
Initial Head Difference($H_0$):
Initial Test Reading (h): 95.35
Calculated Hydraulic Conductivity (k):
Analysis Method:
Static Water Level in Test Zone: 83.33 ft. ~~m~~ ~~psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 2:48 | | 0 | 95.35 | 1.00 | | 3 | | 88.55 | |
| | | 10 | 94.5 | | | 4 | | 87.32 | .33 |
| | | 20 | 94.00 | .89 | | 5 | | 86.44 | |
| | | 30 | 93.75 | | | 6 | | 85.70 | .197 |
| | | 40 | 93.03 | .81 | 2:55 | 7 | | 85.13 | |
| | | 50 | 92.60 | | 2:56 | 8 | | 84.71 | .115 |
| 2:49 | | 60 | 92.19 | .74 | | ∞ | | 83.33 | |
| | | 70 | 91.75 | | | | | | |
| | | 90 | 91.10 | .65 | | | | | |
| 2:50 | | 120 | 90.15 | | | | | | |
| | | 150 | 89.35 | .50 | | | | | |

*Readings uncorrected for variations in Barometric Pressure

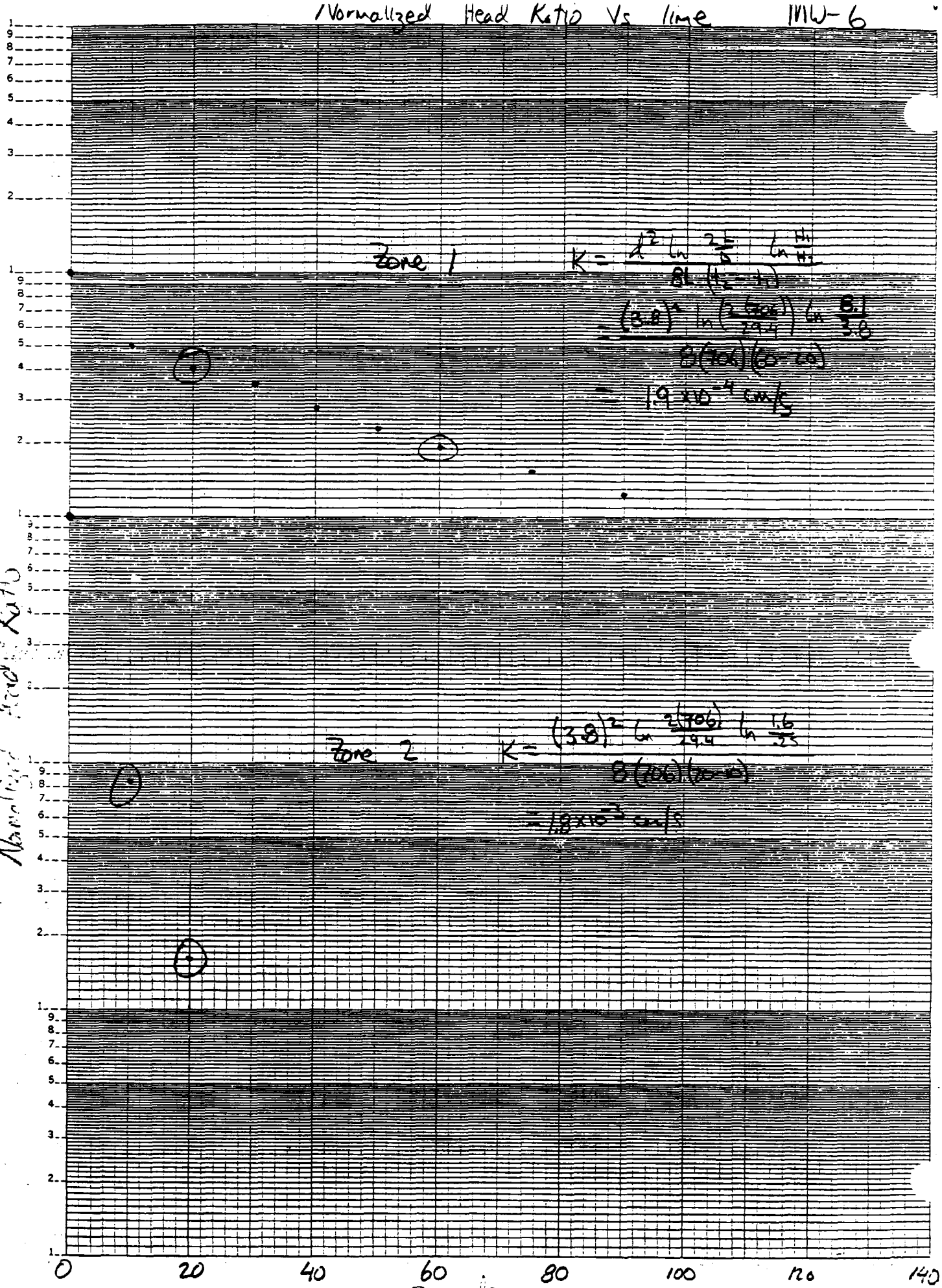
Normalized Head Ratio VS time MW-6




46 6213

K&E SEMI-LOGARITHMIC 3 CYCLES X 10 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

Normalized Head Ratio Vs time MW-6




46 6213
K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylic
Job No.: 686
Project/Location: EL TORO
Technician(s): DMC
Borehole No.: MW-6
Date: Sept 12
Drill Type: —
Drill Fluid: Mud

Zone No.: 1
Interval Length: —
Hole Size: —
Interval Depth: 1141'
Elevation Head (wrt G.S.): ≈ 50'

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 14/92 8:20 Closed: Sept 14/92 10:38
Pump Type: Waterra

**Pumping History**

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 14 | 9:05 | — | - | ≈ 1 gpm | | Clear |
| | 9:45 | ≈ 50 | ≈ 50 | | | clear |
| | 10:07 | 50 | ≈100 | | | [illegible] |
| | | | | | | [illegible] Natural level |
| | | | | | | reading |

Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Bey lik
Job No.: 686
Project/Location: EL TORO
Technician(s): DMC
Borehole No.: MW-6
Date: Sept 14/92
Drill Type: —
Drill Fluid: Mud
Zone No.: 2
Interval Length: —
Hole Size: —
Interval Depth: 177 ft
Elevation Head (wrt G.S.): ≈50 ft

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 14/92
Closed: Sept 14/92 1:00
Pump Type: Waterra

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 14/92 | 11:10 | — | — | ≈ 1.5 l/min | | Clear |
| | | | | | | |
| | 11:23 | ≈ 40 | ≈ 40 | | | clear |
| | 11:40 | ≈ 40 | ≈ 80 | | | [illegible] |
| | 11:54 | ≈ 45 | ≈ 125 | | | Clear |
| | | | | | | [illegible] |
| | | | | | | [illegible] |
| | [illegible] | | | | | [illegible] |
| | | | | | | 43 3 P-port [illegible] |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylik
Job No.: 686
Project/Location: EL TORO
Technician(s): DMc
Borehole No.: MW-6
Date: Sept 14
Drill Type: —
Drill Fluid: Mud

Zone No.: 3
Interval Length: —
Hole Size: —
Interval Depth: 304 ft
Elevation Head (wrt G.S.): ≈50

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 14/92 12:45 Closed: Sept 14/92 4:10
Pump Type: Waterra

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 14/92 | 1:25 | ~ | — | ≈ ½ g/m | | |
| | 1:35 | ≈15 | | | | T = 25 μ = 1350 Clear |
| | 1:40 | ≈20 | | | | T = 25 μ = 1200 Mixed [illegible] |
| | 2:05 | ≈40 | ≈40 | ≈ ½ g/m | | T = 25 μ = 1100 less [illegible] |
| | 2:30 | ≈15 | | ≈ ⅓ g/m | | check foot valve/lower [illegible] |
| | 2:45 | ≈15 | | | | Start Pumping |
| | 3:30 | ≈20 | | | | |
| | 3:50 | ≈25 | ≈65 gallons | | | DTW ≈157' |
| | 4:10 | | | | | DTW 140.35 port closed |
| | 4:12 | | | | | |

Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Bay lite
Job No.: 686
Project/Location:
Technician(s): DMC
Borehole No.: MW-6
Date: Sept 15/92
Drill Type:
Drill Fluid:

Zone No.: 4
Interval Length:
Hole Size:
Interval Depth:
Elevation Head (wrt G.S.):

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept [illegible] 5 PM Closed: Sept 15/92 10:00
Pump Type:

**Pumping History**

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 15/9 | 7:35 | — | — | ≈ ½ gpm | | clear |
| | 8:00 | ≈25 | | ≈ ½ gpm | | very silty |
| | 8:20 | ≈50 | ≈50 | | | |
| | 8:45 | ≈30 | ≈80 | | | stop pumping |
| | | | | | | |
| | 9:10 | | | | | P-port closed |
| | | | | | | |
| | 9:13 | | | | | 110.53' [illegible] |
| | 9:19 | | | | | 95.02 [illegible] |
| | | | | | | |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylik
Job No.: 686
Project/Location: EL TORO
Technician(s): /SW
Borehole No.: MW-6
Date: sept. 18/92
Drill Type: –
Drill Fluid: mud

Zone No.: 5
Interval Length: —
Hole Size: —
Interval Depth: 452
Elevation Head (wrt G.S.): ≈50

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 18/92 2:48 pm
Closed: Sept 18/92 4:40 pm
Pump Type: Waterra

## Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 18/92 | 15:15 | 0 | | | | cloudy |
| | 15:35 | ≈ 35 | | | | light brown |
| | 15:40 | ≈ 40 | ≈ 40 | | | brown |
| | 15:45 | ≈ 45 | | | | became [illegible] brown |
| | 15:55 | ≈ 25 | ≈ 65 | | | light brown [illegible] clear |
| | 16:05 | | ≈ 70 | | | clear |
| | 16:15 | ≈ 40 | ≈ 110 | | | |
| | 16:20 | 15 | ≈ 95 | | | clear |
| | | | End. | | | |
| | 16:40 | | | close port | | / add H2O |
| | 16:50 | | | | | 68.17 |
| | | | | | | |
| | | | | | | 71.00' |
| | | | | | | w/o d/c Tool |
| | | | | | | |
| | 17:20 | | | | | locked box & |
| | | | | | | left site |
| | | | | | | |
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| | | | | | | |

Apparent Transmissivity: T =

MOSDAX Data Report (c) WESTBAY INSTRUMENTS 1990-1992

Date Of Report: Mon Oct 26 12:03:55 1992

Company Name: Westbay Instruments Inc.
Project Name: EL TORO
Well ID: MW-6
Well Description:
Well Elevation: 0.00 (ft.)

Probe Information

Logical Probe-1 - Serial #: 1031 - Description:

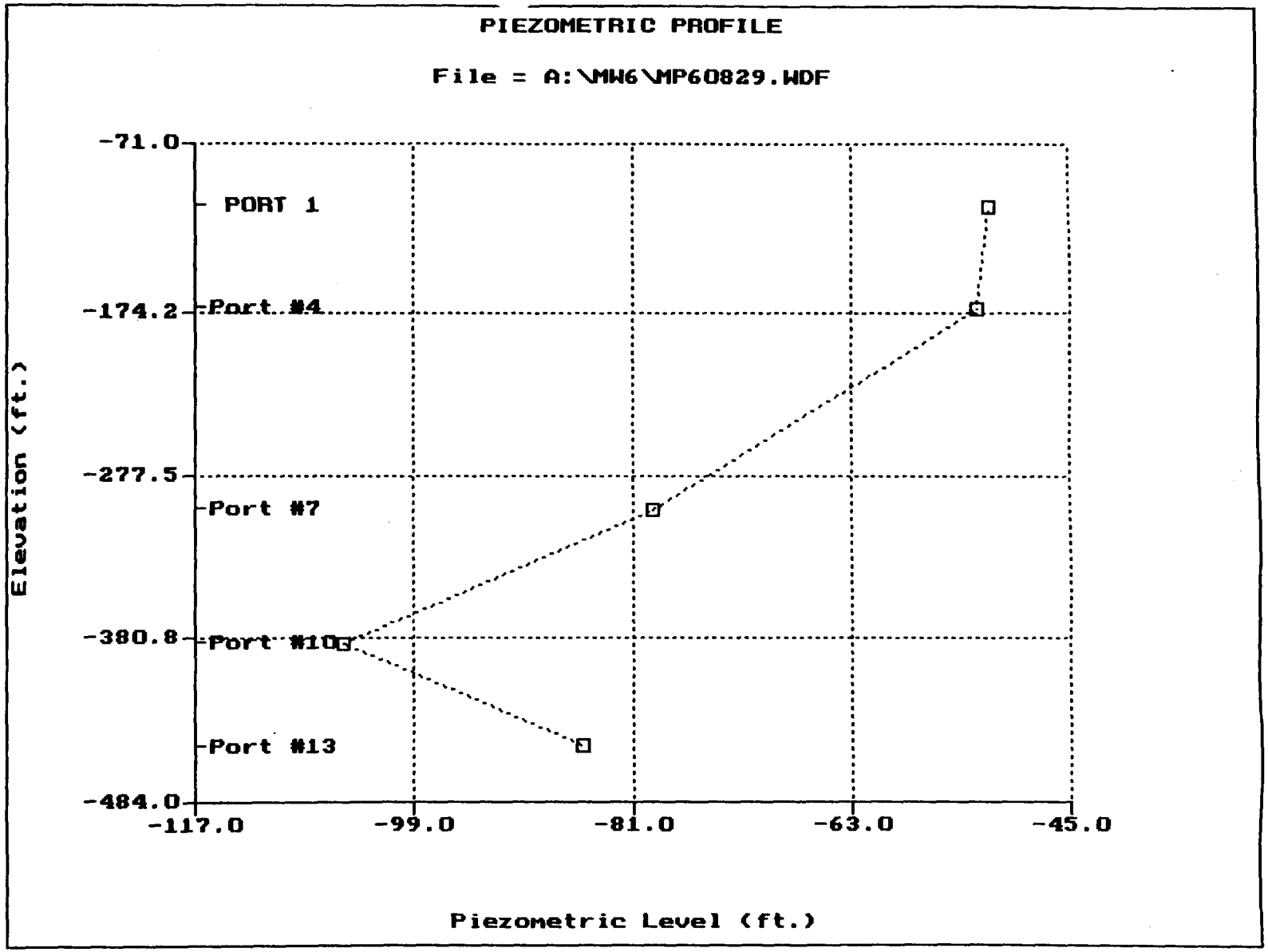
Port Information

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Port #:00 - Description | ATMOSPHERIC | - Depth | 0.0 | (ft.) | - ACF | 1.0 |
| Port #:01 - Description | PORT 1 | - Depth | 109.0 | (ft.) | - ACF | 1.0 |
| Port #:02 - Description | Port #2 | - Depth | 124.0 | (ft.) | - ACF | 1.0 |
| Port #:03 - Description | Port #3 | - Depth | 157.0 | (ft.) | - ACF | 1.0 |
| Port #:04 - Description | Port #4 | - Depth | 172.0 | (ft.) | - ACF | 1.0 |
| Port #:05 - Description | Port #5 | - Depth | 187.0 | (ft.) | - ACF | 1.0 |
| Port #:06 - Description | Port #6 | - Depth | 284.0 | (ft.) | - ACF | 1.0 |
| Port #:07 - Description | Port #7 | - Depth | 299.0 | (ft.) | - ACF | 1.0 |
| Port #:08 - Description | Port #8 | - Depth | 314.0 | (ft.) | - ACF | 1.0 |
| Port #:09 - Description | PORT #9 | - Depth | 369.0 | (ft.) | - ACF | 1.0 |
| Port #:10 - Description | Port #10 | - Depth | 384.0 | (ft.) | - ACF | 1.0 |
| Port #:11 - Description | Port #11 | - Depth | 399.0 | (ft.) | - ACF | 1.0 |
| Port #:12 - Description | Port #12 | - Depth | 434.0 | (ft.) | - ACF | 1.0 |
| Port #:13 - Description | Port #13 | - Depth | 449.0 | (ft.) | - ACF | 1.0 |
| Port #:14 - Description | Port #14 | - Depth | 464.0 | (ft.) | - ACF | 1.0 |

MOSDAX Data Report - PAGE 01

| TIME DATE | PORT DESCRIPTION | PIEZ P (ft.) | DEPTH (ft.) |
|---|---|---|---|
| t Aug 29 12:21:14 1992 | ATMOSPHERIC | -84.63 | ATMOS |
| at Aug 29 12:29:27 1992 | Port #13 | -85.08 | 449.00 |
| at Aug 29 12:32:49 1992 | Port #12 | 114.29 | 434.00 |
| t Aug 29 12:37:24 1992 | Port #11 | -104.93 | 399.00 |
| t Aug 29 12:39:18 1992 | Port #10 | -104.86 | 384.00 |
| at Aug 29 12:41:43 1992 | PORT #9 | -113.11 | 369.00 |
| t Aug 29 12:44:22 1992 | Port #8 | -85.49 | 314.00 |
| t Aug 29 12:45:50 1992 | Port #7 | -79.31 | 299.00 |
| at Aug 29 12:48:39 1992 | Port #6 | -90.93 | 284.00 |
| t Aug 29 12:50:51 1992 | Port #5 | -64.68 | 187.00 |
| t Aug 29 12:52:44 1992 | Port #4 | -52.48 | 172.00 |
| at Aug 29 12:54:31 1992 | Port #3 | -98.99 | 157.00 |
| at Aug 29 12:57:41 1992 | Port #2 | -81.76 | 124.00 |
| t Aug 29 12:59:41 1992 | PORT 1 | -51.55 | 109.00 |

MW-6


PIEZOMETRIC PROFILE
File = A:\MW6\MP60829.WDF
-71.0
-174.2
-277.5
-380.8
-484.0
PORT 1
Port #4
Port #7
Port #10
Port #13
Elevation (ft.)
-117.0
-99.0
-81.0
-63.0
-45.0
Piezometric Level (ft.)

Appendix B (MW-8)

| | |
|---|---|
| Casing Installation Log | 5 pages |
| MP Packer Inflation Records | 13 pages |
| Hydraulic Conductivity Test Records | 4 pages |
| Hydraulic Conductivity Data (semi-log plots) | 2 pages |
| Pumping Log Records | 4 pages |
| Pressure Profile Data | 1 page |
| Graphical Summary of Fluid Pressures | 1 page |

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-8 Installed by: DMc

Hole Depth: 495 ft MP Depth: 484 ft Hole Diameter: 4" S. Steel Date Installed: Aug 28/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 0 | midpoint of coupling #65 level with cement pad. | | 65 | | | | | |
| | | | 64 | | | | | |
| | MP Casing | | | | | | | |
| | 4" Steel | | 63 | | | | | |
| 20 | cement pad | | | | | | | |
| | | | 62 | | | | | |
| | | | 61 | | | | | |
| 40 | | | | | | | | |
| | | | 60 | | | | | |
| | | | S9 | | | | | |
| 60 | | | S8 | | | | | |
| | Zone 1 | | S7 | | | | | |
| | | | Mag | | | | | |
| | | | S6 | | | | | |
| | | | S5 | | | | | |
| 80 | | | S4 | | | | | |
| | | | S3 | | | | | |
| 100 | | | | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-8 Installed by: DMc

Hole Depth: 495 ft MP Depth: 484 ft Hole Diameter: 4" S. Steel Date Installed: Aug 28/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 100 | | | 52 | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | 50 | | | | | |
| 120 | | | | | | | | |
| | | | 49 | | | | | |
| | | | 48 | | | | | |
| | Zone 2 | | > < mag | | | | | |
| | | | 47 | | | | | |
| | | | 46 | | | | | |
| 140 | | | | | | | | |
| | | | 45 | | | | | |
| | | | 44 | | | | | |
| | | | 43 | | | | | |
| 160 | | | | | | | | |
| | | | 42 | | | | | |
| | | | | | | | | |
| | | | 41 | | | | | |
| 180 | | | | | | | | |
| | | | 40 | | | | | |
| | | | | | | | | |
| | | | 39 | | | | | |
| 200 | | | | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-8 Installed by: DMc

Hole Depth: 495 ft MP Depth: 484 ft Hole Diameter: 4" S. Steel Date Installed: Aug 28/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 200 | | | 38 | | | | | |
| | | | | | | | | |
| | | | 37 | | | | | |
| | | | | | | | | |
| 220 | | | 36 | | | | | |
| | | | | | | | | |
| | | | 35 | | | | | |
| | | | | | | | | |
| 240 | | | 34 | | | | | |
| | | | | | | | | |
| | | | 33 | | | | | |
| | | | | | | | | |
| 260 | | | 32 | | | | | |
| | | | | | | | | |
| | | | 31 | | | | | |
| | | | | | | | | |
| 280 | | | 30 | | | | | |
| | | | 29 | | | | | |
| | | | 28 | | | | | |
| | | | 27 | | | | | |
| 300 | | | Mag | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-8 Installed by: DMc

Hole Depth: 495 ft MP Depth: 484 ft Hole Diameter: 4" S. Steel Date Installed: Aug 28/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 300 | Zone 3 | | 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12 | | | | | |
| 320 | | | | | | | | |
| 340 | | | | | | | | |
| 360 | | | | | | | | |
| 380 | Abandoned Zone | | | | | | | |
| 400 | | | | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-8 Installed by: DMc

Hole Depth: 495 ft MP Depth: 484 ft Hole Diameter: 4" S. Steel Date Installed: Aug 28/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 400 | | | | | | | | |
| | | | 11 | | | | | |
| | | | 10 | | | | | |
| 420 | | | | | | | | |
| | | | 9 | | | | | |
| | | | 8 | | | | | |
| | | | 7 | | | | | |
| | | | 6 | | | | | |
| 440 | | | 5 (mag) | | | | | |
| | Zone 4 | | 4 | | | | | |
| | | | 3 | | | | | |
| 460 | | | 2 | | | | | |
| | | | 1 | | | | | |
| 480 | | | | | | | | |
| 500 | | | | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 68

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 8/92

Packer No.: 3

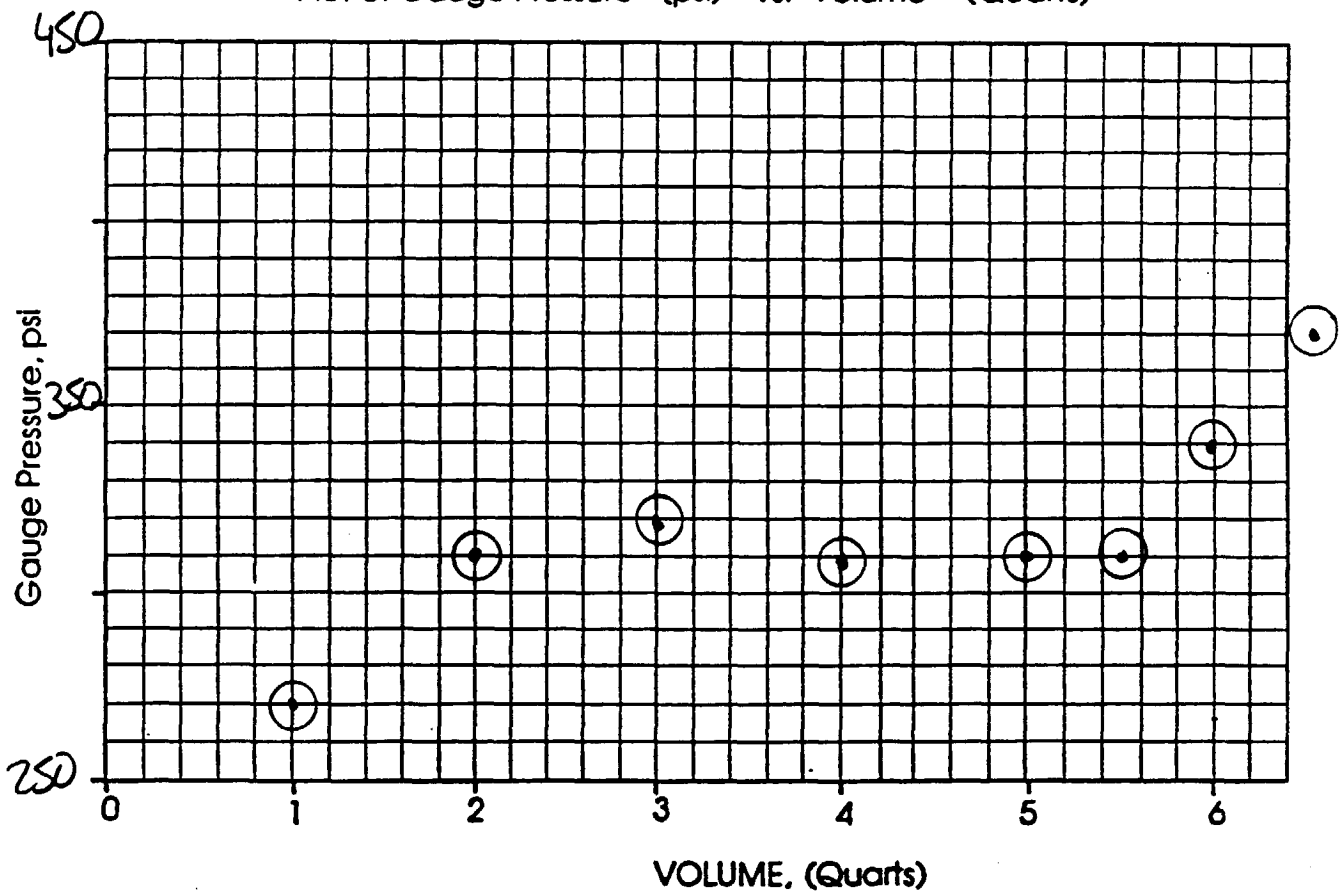
Depth (ft.) 457"

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 1 | 2 | 3 | 4 | 5 | 5½ / 6 | 6½ 10 / 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 270 | 310 | 320 | 10 310 | 5 310 | 310 / 340 8 | 370 / ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: [illegible]

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 7

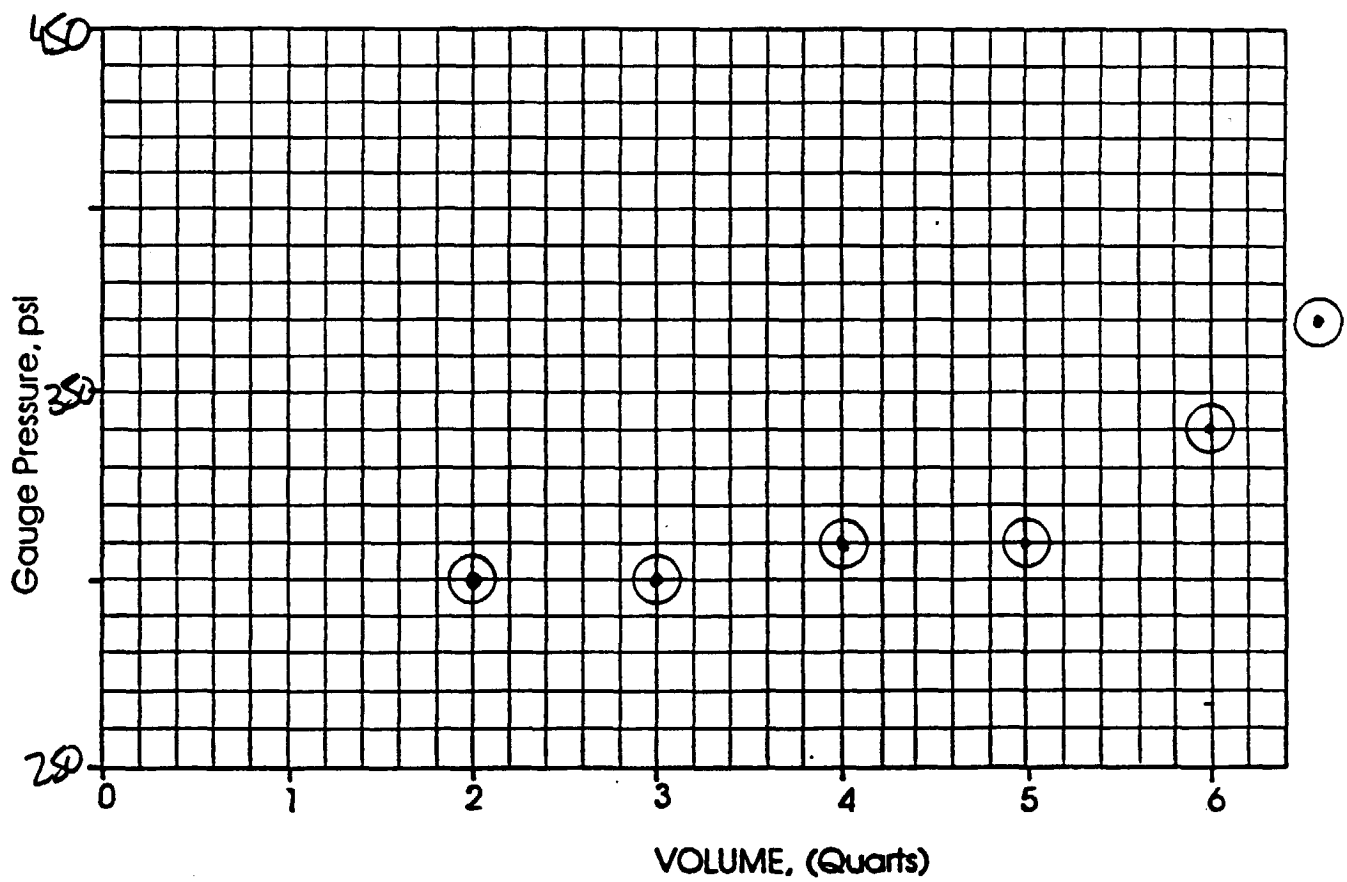
Depth (ft.) 437

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume Quarts | 8 2 | 2 3 | 10 4 | 3 5 | 6 | 3 6½ | 5¾ | | | |
| Pressure Psi | 300 | 300 | 310 | 310 | 340 | 370 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: [illegible] 69[illegible]

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 9

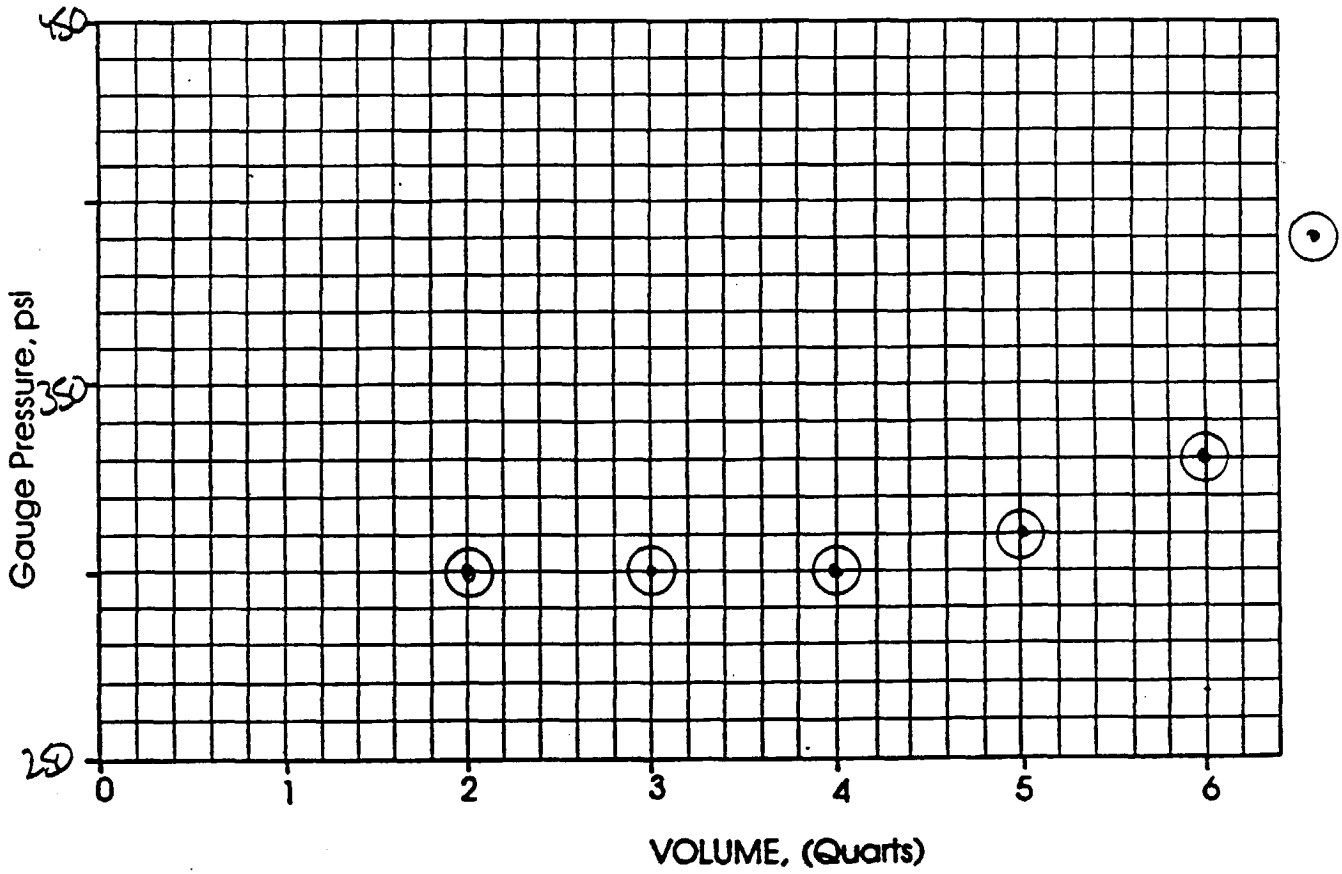
Depth (ft.) 427

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume Quarts | 10 2 | 3 | 4 | 5 5 | 12 6 | 8 6½ | 5¾ | | | |
| Pressure Psi | 300 | 300 | 300 | 310 | 330 | 390 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB [illegible]

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 14

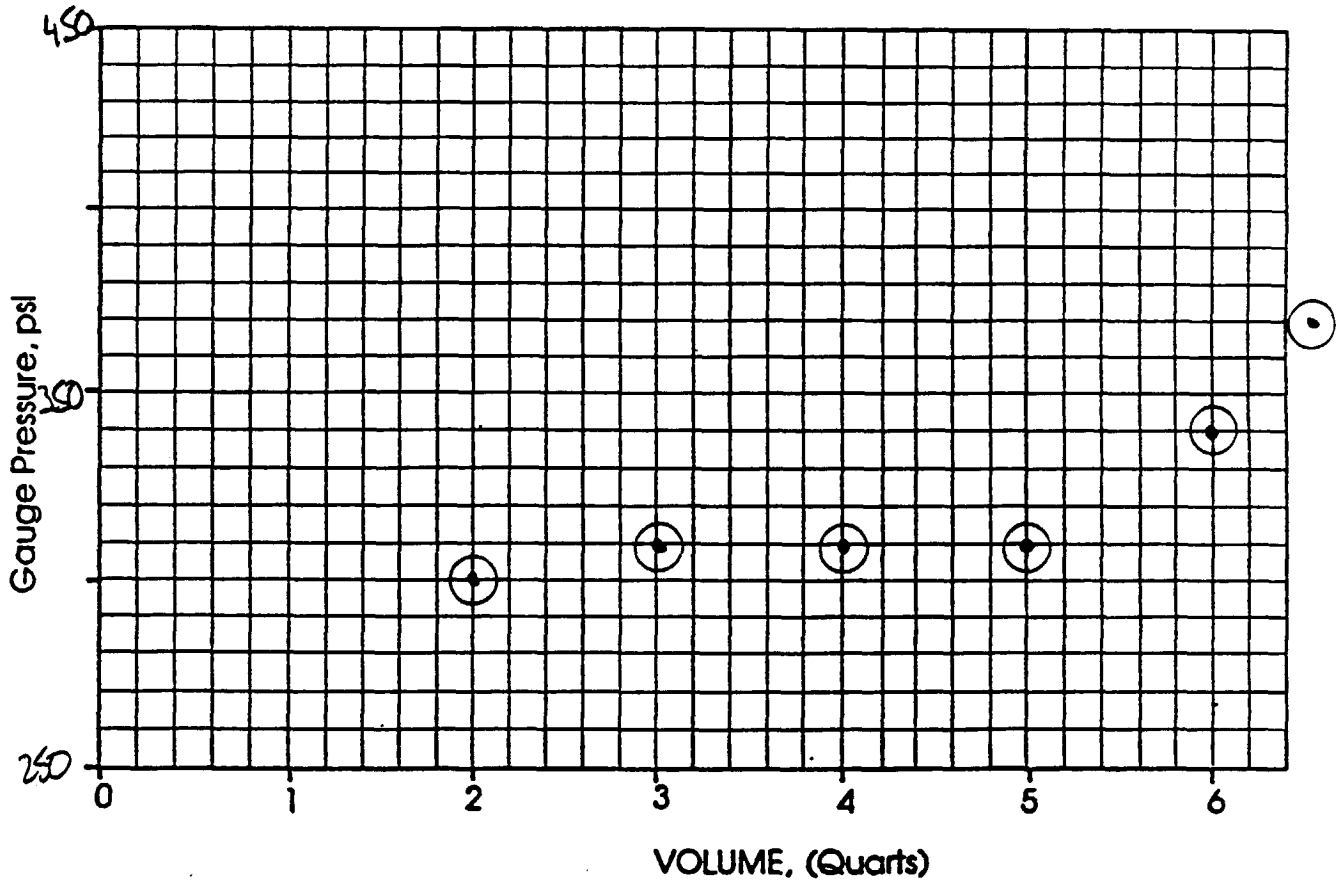
Depth (ft.) 377

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6½ | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 310 | 310 | 310 | 310 | 370 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WL-656

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 17

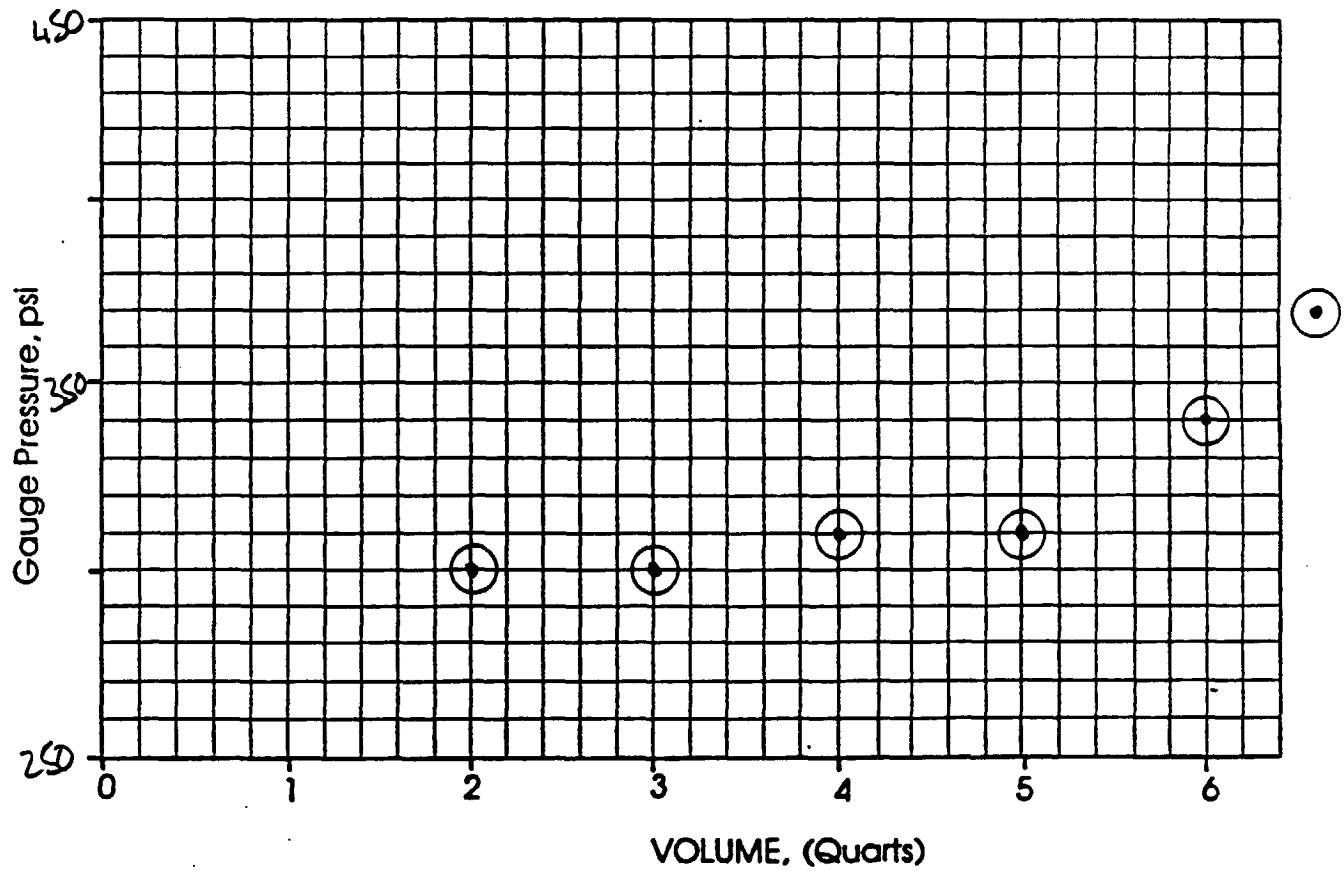
Depth (ft.) 367

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6½ | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 300 | 310 | 310 | 340 | 370 | ϕ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: [illegible]

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 24

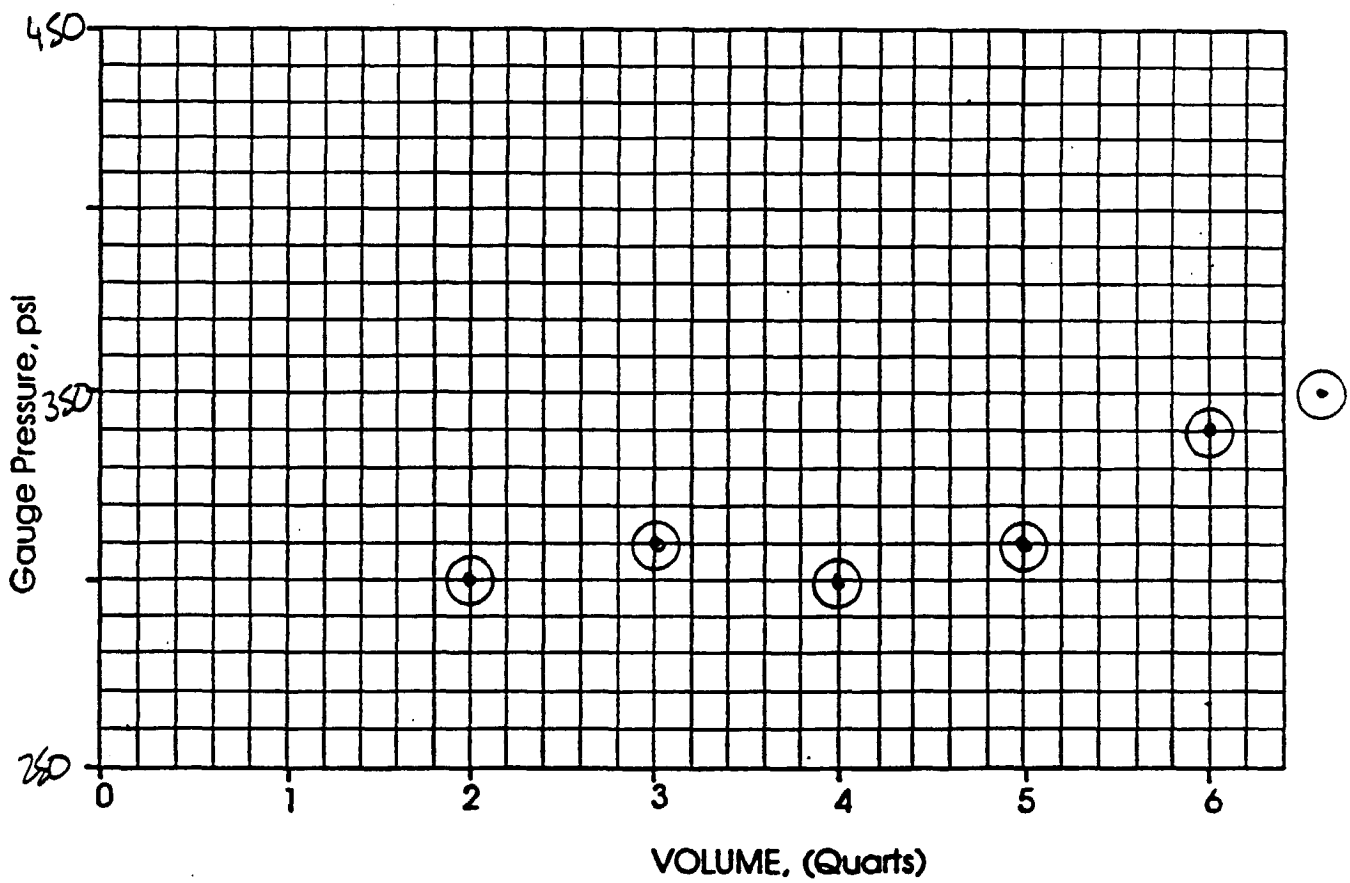
Depth (ft.) 315

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume Quarts | 2 (12) | 3 (6) | 4 | 5 (10) | 6 | 6½ (8) | 6¾ (9) | 6 | | |
| Pressure Psi | 300 | 310 | 300 | 310 | 340 | 350 | 380 | ∅ | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB 686

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 28

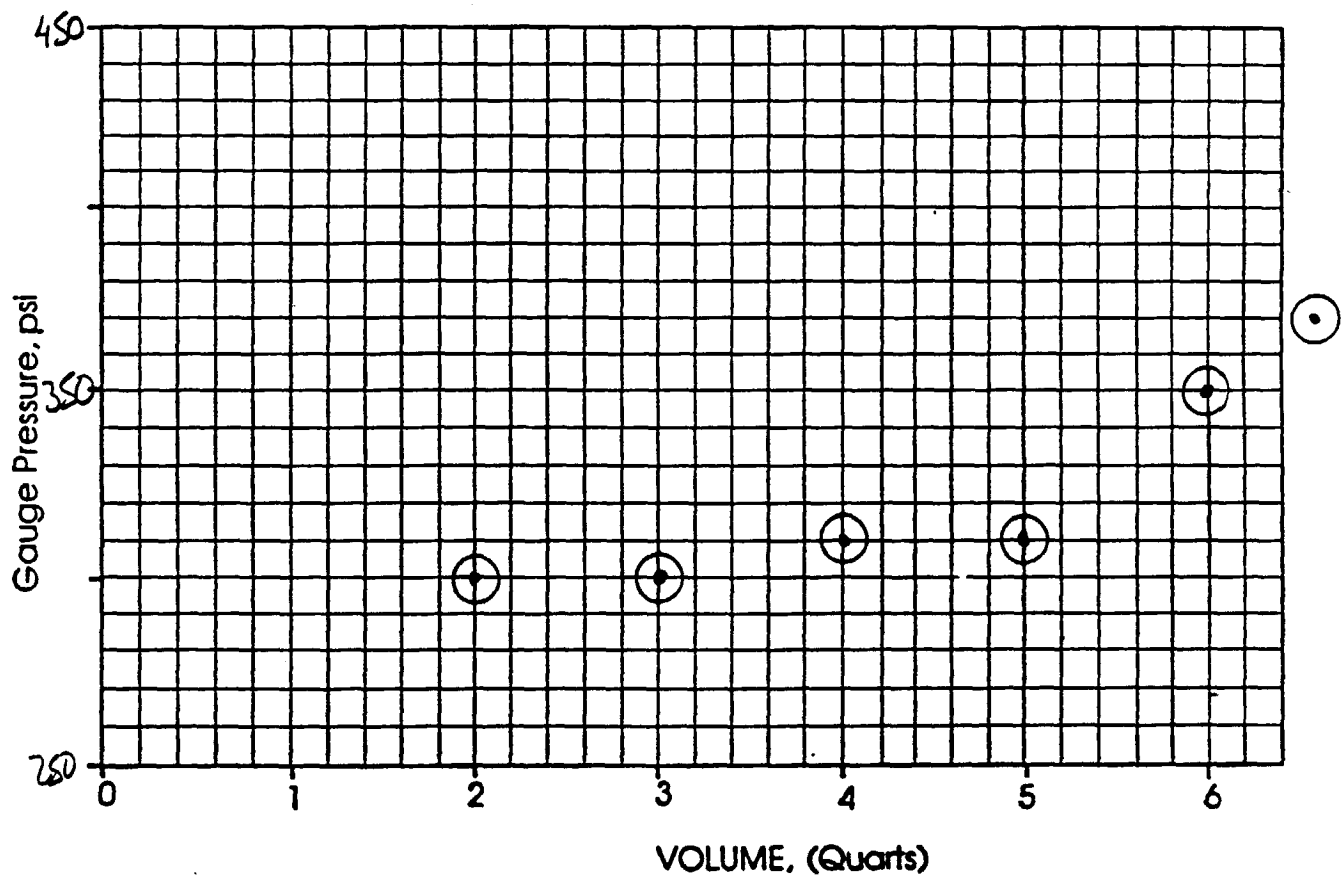
Depth (ft.) 295

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 (9) | 3 (6) | 4 (10) | 5 (7) | 6 (8) | 6½ (13) | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 300 | 310 | 310 | 350 | 370 | Ø | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 656

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 30

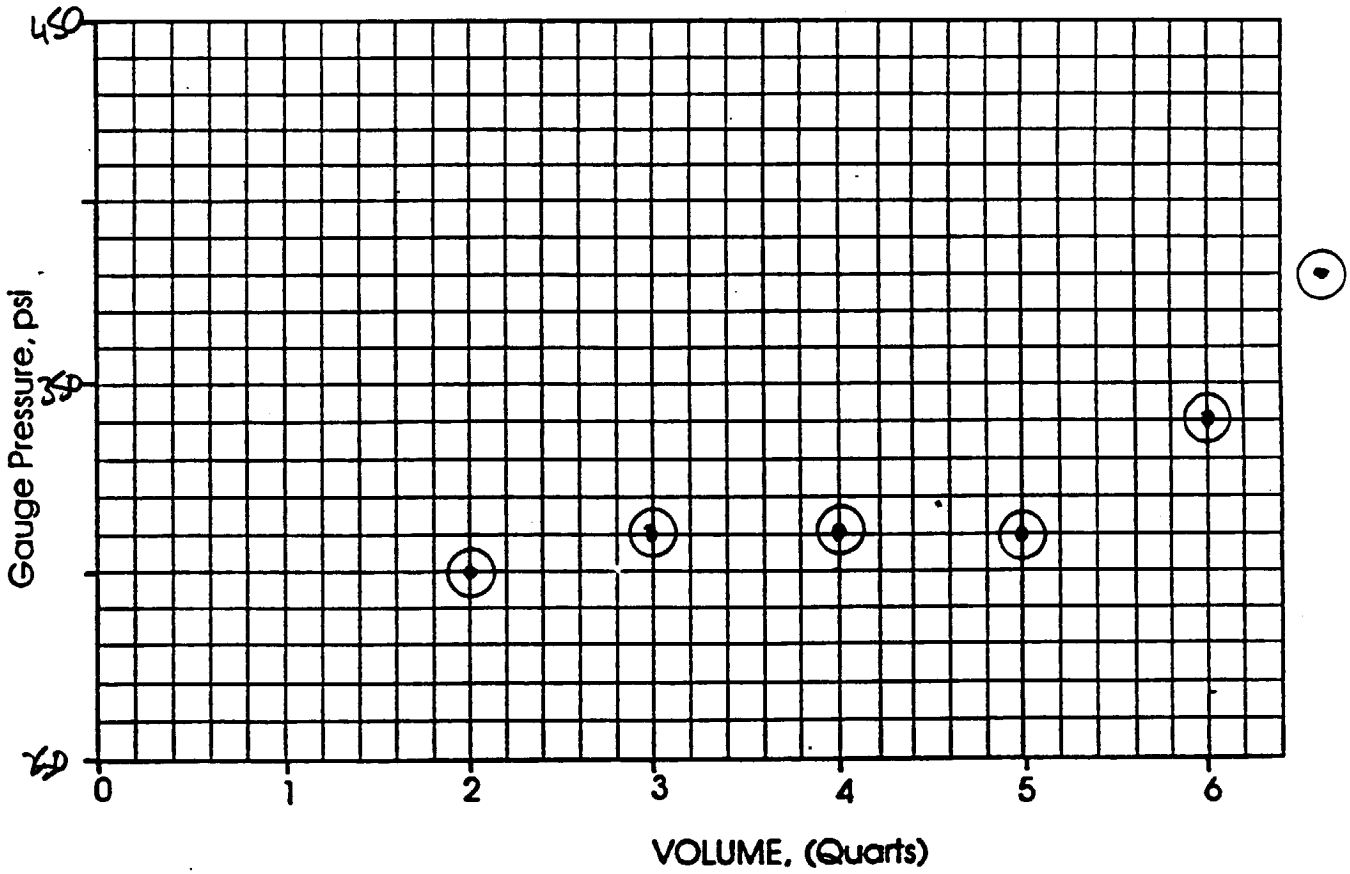
Depth (ft.) 285

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6½ | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 310 | 310 | 310 | 340 | 380 | ø | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/98

Packer No.: 45

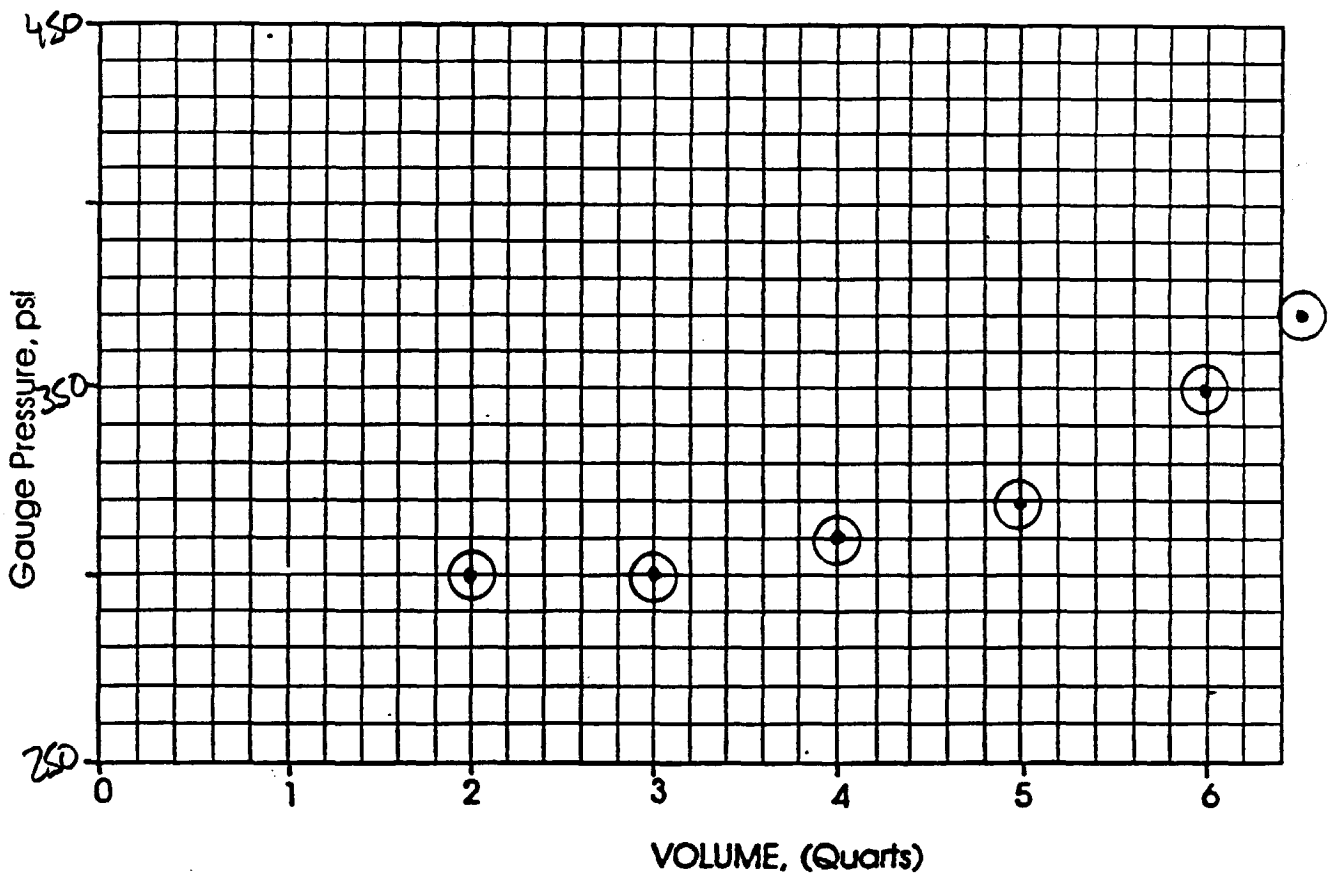
Depth (ft.) 145

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6½ | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 300 | 310 | 320 | 350 | 370 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WR 6?/

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 49

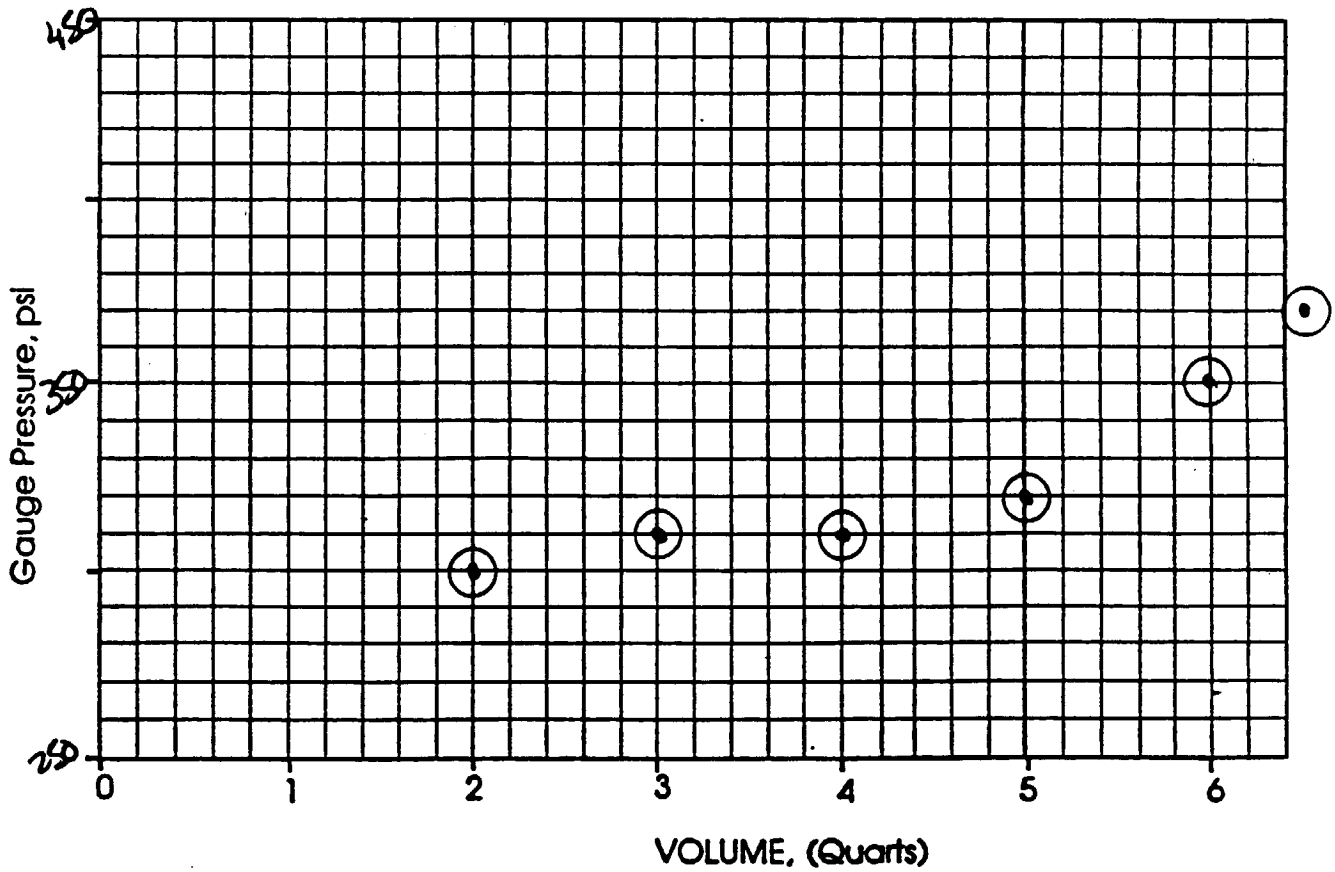
Depth (ft.) 125

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6½ | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 310 | 310 | 320 | 350 | 370 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: [illegible]

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: 51

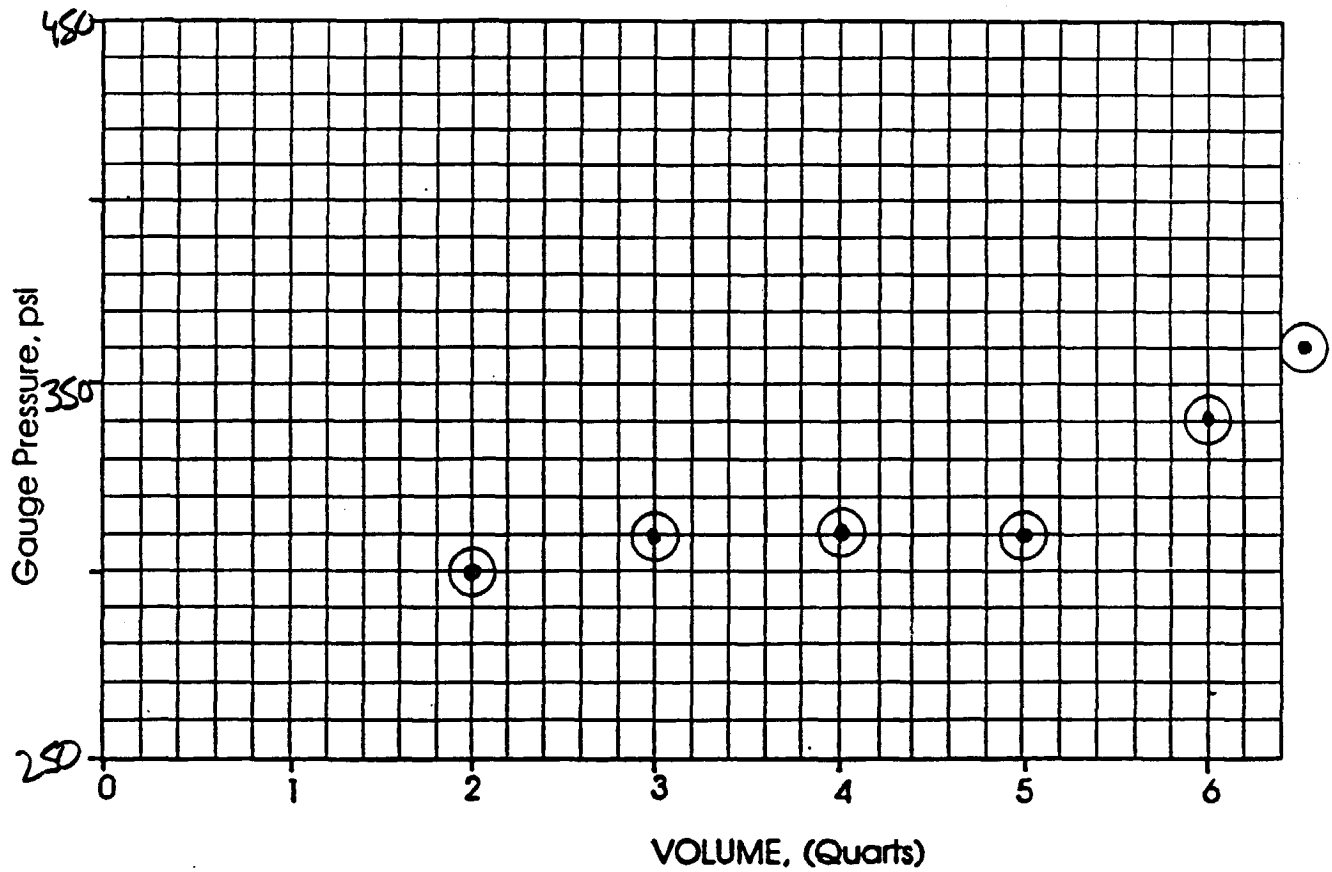
Depth (ft.) 115

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 (6) | 3 (2) | 4 (6) | 5 (12) | 6 | 6½ (12) | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 310 | 310 | 310 | 340 | 360 | Ø | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: LRS 65

Date Completed:

Hole No.: MW-8

Date Inflated: Sept 9/92

Packer No.: SS

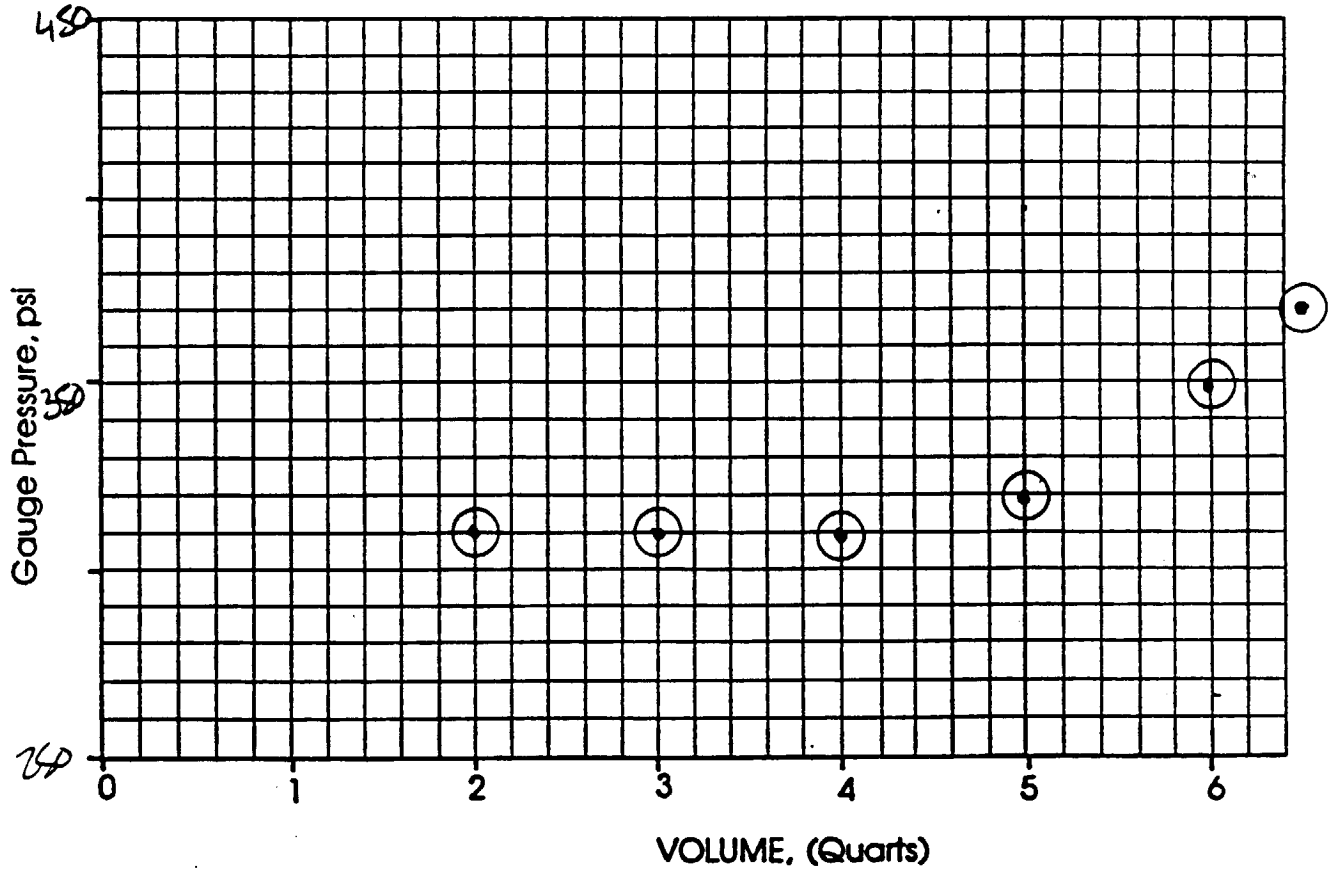
Depth (ft.) 80

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume Quarts | 2 (1) | 3 (6) | 4 (12) | 5 (7) | 6 | 6½ (5) | 5¾ | | | |
| Pressure Psi | 310 | 310 | 310 | 320 | 350 | 370 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: LOB LSG

Date Completed:

Hole No.: MW 8

Date Inflated: Sept 9/92

Packer No.: 59

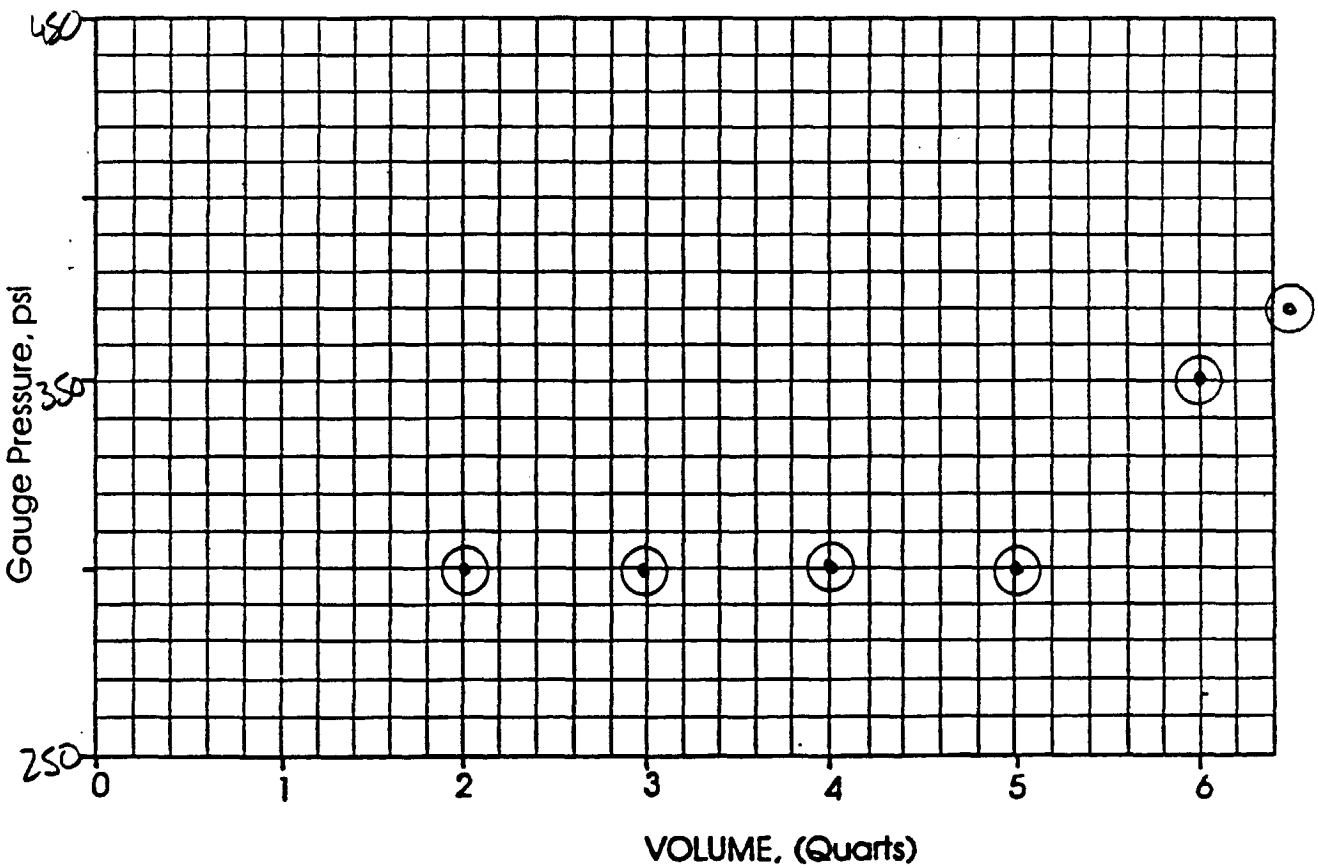
Depth (ft.) 60

Inflation Tool Setting (psi) 240

Depth to Water Table (ft.) 65

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6½ | 5¾ | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 300 | 310 | 310 | 310 | 350 | 370 | ∅ | | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 2 ft stick up
Probe Type: WLT
Date: Sept 12/97
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-8
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: El Toro
Elev. top of MP Casing: —
Riser Diameter (d): 38 ~~in.~~ cm
Test Zone No.: 1
Test Type: Slug
Test Zone Diameter: 29.4
Test Zone Interval: 75 ft
Operator: DMc
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$): 20.1 ft
Initial Test Reading (h): 27.74
Calculated Hydraulic Conductivity (k): $50 \times 10^{-5}$ cm/s
Analysis Method: Hvorslev
Static Water Level in Test Zone: 47.8 ft. m psi.
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 27.7 | 1.00 | 180 | | | 44.15 | .182 |
| | | | | | 240 | | | 44.80 | .144 |
| | | 10 | 39.5 | .41 | 300 | | | 45.45 | .117 |
| | | | | | 360 | | | 45.95 | .092 |
| | | 20 | 40.05 | .39 | 420 | | | 46.30 | .075 |
| | | | | | 480 | | | 46.60 | .060 |
| | | 30 | 40.50 | .36 | 540 | | | 46.80 | .050 |
| | | | | | 600 | | | 47.00 | .040 |
| | | 40 | 40.95 | .34 | 720 | | | 47.25 | .027 |
| | | | | | 900 | | | 47.55 | .012 |
| | | 50 | 41.35 | .31 | ∞ | | | 47.80 | — |
| | | | | | | | | | |
| | | 60 | 41.65 | .31 | | | | | |
| | | | | | | | | | |
| | | 75 | 42.05 | .29 | | | | | |
| | | | | | | | | | |
| | | 90 | 42.40 | .27 | | | | | |
| | | | | | | | | | |
| | | 120 | 43.10 | .23 | | | | | |
| | | | | | | | | | |
| | | 150 | 43.65 | .206 | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 2' Stick up
Probe Type: WLT
Date: Sept 12/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-8
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: —
Riser Diameter (d): 38 in/ cm
Test Zone No.: 2
Test Type: Slug
Test Zone Diameter:
Test Zone Interval: 135 ft
Operator: J. Ne
Test Zone Length (L):
Initial Head Difference($H_0$): 3.63
Initial Test Reading (h): 50.40
Calculated Hydraulic Conductivity (k): $4.3 \times 10^{-4}$ cm/s
Analysis Method: Hvorslev
Static Water Level in Test Zone: 46.77 ft. m psi.
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 50.40 | 1.00 | 100 | | | 46.80 | |
| | | 10 | 48.2 | .39 | 120 | | | 46.78 | |
| | | | | | 150 | | | 46.78 | |
| | | 25 | 47.3 | .146 | | | | | |
| | | 30 | 47.2 | .118 | 180 | | | 46.77 | |
| | | 40 | 47.04 | .074 | 210 | | | 46.77 | |
| | | 50 | 46.95 | .050 | 240 | | | 46.77 | |
| | | 60 | 46.89 | .033 | | | | | |
| | | 70 | 46.84 | .019 | | | | | |
| | | 80 | 46.82 | .014 | | | | | |
| | | 90 | 46.81 | .011 | | | | | |

*Readings uncorrected for variations in Barometric Pressure

19/06/90

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 2 ft stick up
Probe Type: WLT
Date: Sept 12/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-8
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: El Toro
Elev. top of MP Casing: —
Riser Diameter (d): 38 ~~in.~~ cm
Test Zone No.: 3
Test Type: Slug
Test Zone Diameter:
Test Zone Interval: 305 ft
Operator: DMC
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$): 18.3
Initial Test Reading (h): 49.04
Calculated Hydraulic Conductivity (k): N/A.
Analysis Method: N/A.
Static Water Level in Test Zone: 67.3 ft. m psi.
Comments: K value too fast to record

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 49.04 | 1.00 | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | 15 | 66.8 | .082 | | | | | |
| | | | | | | | | | |
| | | 25 | 67.3 | — | | | | | |
| | | 30 | 67.3 | — | | | | | |
| | | | | | | | | | |
| | | 40 | 67.3 | — | | | | | |
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*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

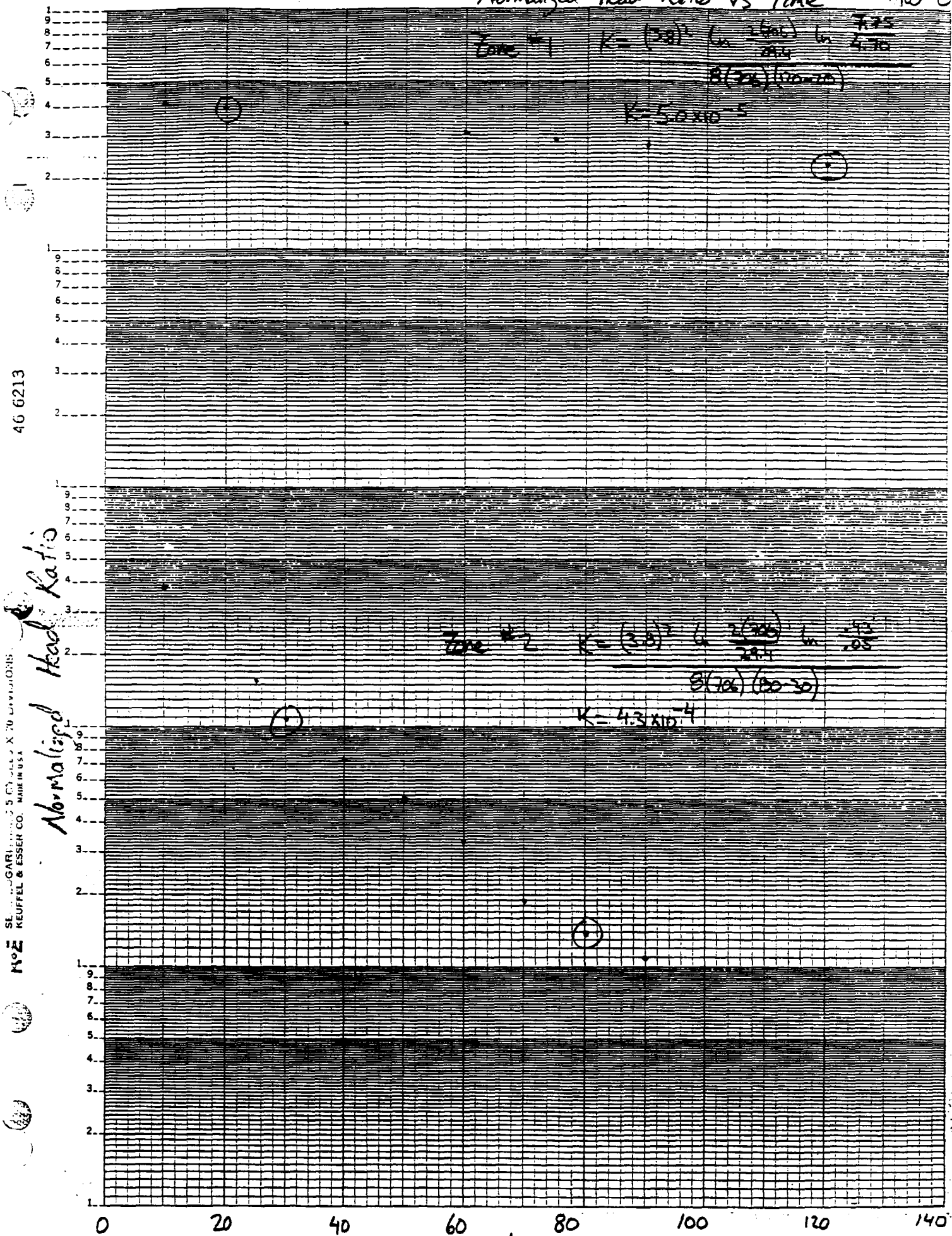
## Field Data Sheet

Datum: 17 ft stick up
Probe Type: WL Tape
Date: Sept 11/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-8
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: El Toro
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 in. cm
Test Zone No.: Zone 4
Test Type: Slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 447
Operator: AMC
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$): 40.78 ft
Initial Test Reading (h): 29.42
Calculated Hydraulic Conductivity (k): $1.1 \times 10^{-4}$ cm/s
Analysis Method: Hvorslev
Static Water Level in Test Zone: 70.2 ft. ~~m~~ ~~psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 29.42 | 1.00 | | | | | |
| | | 10 | 41.0 | .72 | | | | | |
| | | 15 | 43 | .67 | | | | | |
| | | 20 | 44.5 | .63 | | | | | |
| | | 30 | 45.8 | .60 | | | | | |
| | | 35 | 47.0 | .57 | | | | | |
| | | 40 | 48.5 | .53 | | | | | |
| | | 45 | 51.3 | .46 | | | | | |
| | | 60 | 53.8 | .40 | | | | | |
| | | 75 | 56.3 | .34 | | | | | |
| | | 90 | 58.5 | .29 | | | | | |
| | | 105 | 60.80 | .23 | | | | | |
| | | | | | | | | | |
| | | ∞ | 70.2 | — | | | | | |

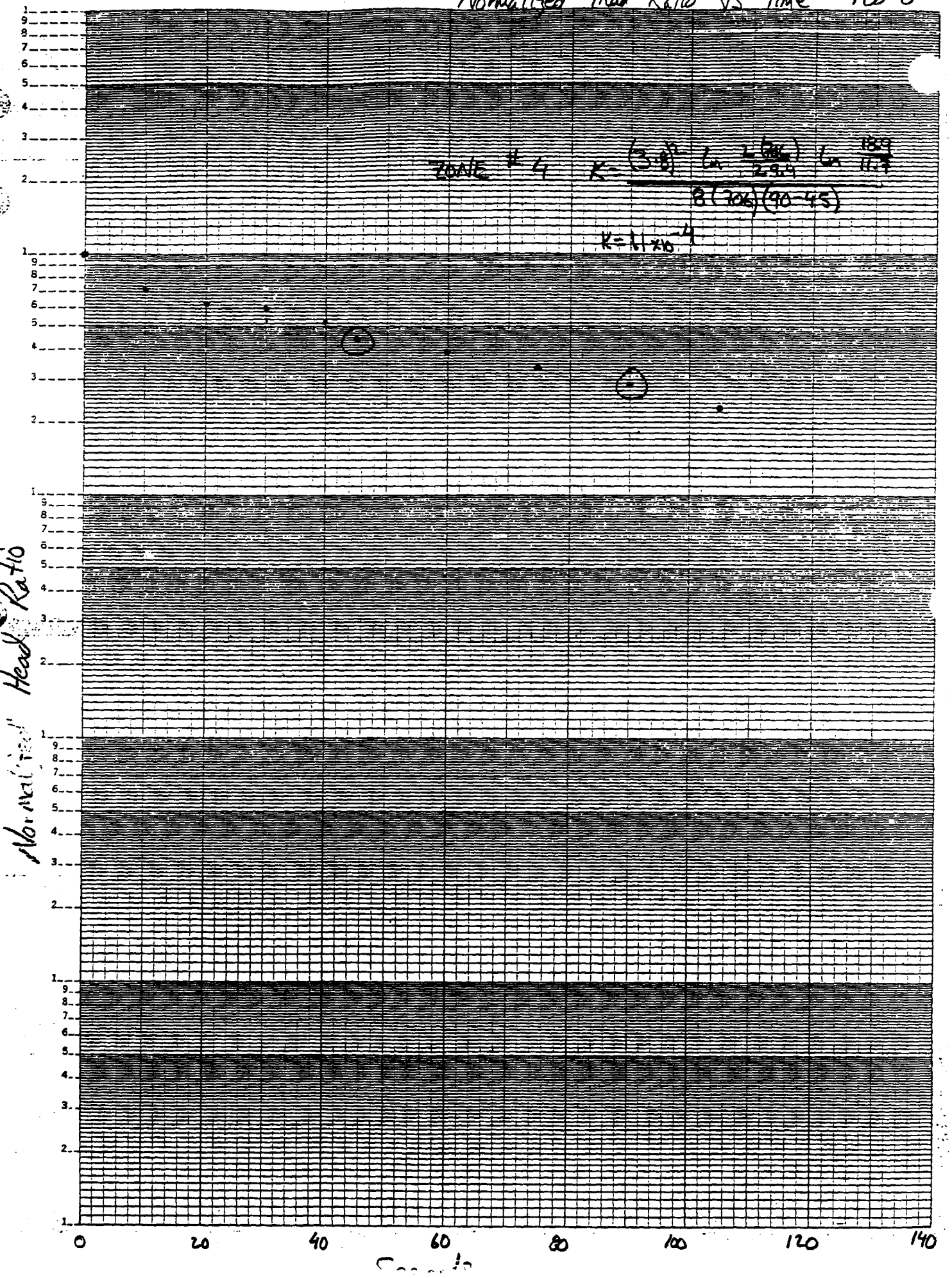
*Readings uncorrected for variations in Barometric Pressure

Normalized Head Ratio Vs Time MW-E




46 6213
K+E SEMI-LOGARITHMIC 5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

Normalized Head Ratio Vs Time MW-8



184

Westbay Instruments Inc.

PUMPING LOG
MP System Pumping Ports

Client: Beylik
Job No.: 686
Project/Location: EL TORO
Technician(s): DMc
Borehole No.: MP-8
Date: Sept 12/92
Drill Type: —
Drill Fluid: Mud

Zone No.: 1
Interval Length: —
Hole Size: —
Interval Depth: 75'
Elevation Head (wrt G.S.): ≈46 ft

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 12/92 3 PM Closed: Sept 12/92 5:30 PM
Pump Type: Waterra

## Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 12/92 | 3:35 | — | — | ≈ 1/4 gal/min | | clear |
| Sept 12/92 | 5:00 | 25 gal | 25 gal | ≈ 1/2 gal/min | | All clear |
| | | | | | | |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylik
Job No.: 686
Project/Location: EL TORO
Technician(s): DMC
Borehole No.: MP-8
Date: Sept 12/92
Drill Type: —
Drill Fluid: Mud
Zone No.: 2
Interval Length: —
Hole Size: —
Interval Depth: 135'
Elevation Head (wrt G.S.): ≈ 47'

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 12/92 12:00 Closed: Sept 12/92 2 PM
Pump Type: Waterra

**Pumping History**

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 12 | 12:45 | — | — | ≈ ½ gal/min | | Clear |
| | 1:30 | ≈25 | | ≈ 1½ gal/min | | increased Submergence/rate |
| | 1:45 | ≈50 | ≈50 | ≈ " | | clear |
| | 2:00 | ≈20 | ≈70 | " | | clear |
| | | | | | | |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylik
Job No.: 868
Project/Location: EL TORO
Technician(s): DMC
Borehole No.: MP-8
Date: Sept 12/92
Drill Type: —
Drill Fluid: Mud
Zone No.: 3
Interval Length: —
Hole Size: —
Interval Depth: 305'
Elevation Head (wrt G.S.): ≈ 65

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 12/92 8AM Closed: Sept 12 11:30 Am
Pump Type: Waterra

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 8 | 8:50 | — | — | | | Clear |
| | 9:34 | ≈ 55 | ≈ 55 | | | light brownish then clear |
| | 9:54 | | | | | chain grip on the hose |
| | 10:01 | | | | | retightening. |
| | | | | | | getting clear, |
| | 10:12 | ≈55 | ≈ 110 | | | |
| | 10:40 | ≈ 45 | ≈155 | | | rate: 5.0 gal/4.5 min |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylik
Job No.: 686
Project/Location: EL TORO
Technician(s): DMC
Borehole No.: MP-8
Date: Sept 11/92
Drill Type:
Drill Fluid: Mud Rotary
Zone No.: 4
Interval Length: 10'
Hole Size:
Interval Depth: 439'-429'
Elevation Head (wrt G.S.): ~65

Recommended Minimum Extraction: 2 hours
Date/Time Pumping Port Opened: Sept 11/92 2PM Closed: Sept 11/92 5:30PM
Pump Type: Waterra

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 11/92 | 3:05 | — | — | ≈ 1.7 g/min | | |
| | 3:09 | — | — | | | water flowing |
| | 3:22 | | ≈30 gal | | | dark frothy water |
| | 3:40 | 55 | 3.55 gal | | | dark |
| | 4:15 | 55 | ≈110 gal | | | light |
| | 4:45 | 55 | ≈165 gal | | | clear |
| | 5:10 | 50 | ≈215 gal | | | clear |
| | | | | | | |
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Apparent Transmissivity: T =

OSDAX Data Report (c) WESTBAY INSTRUMENTS 1990-1992

ate Of Report: Fri Oct 23 15:28:59 1992

mpany Name: Westbay Instruments Inc.
roject Name: EL TORO
ell ID: ~~MP-8~~ MW-8
ell Description:
ell Elevation: 0.00 (ft.)

Probe Information

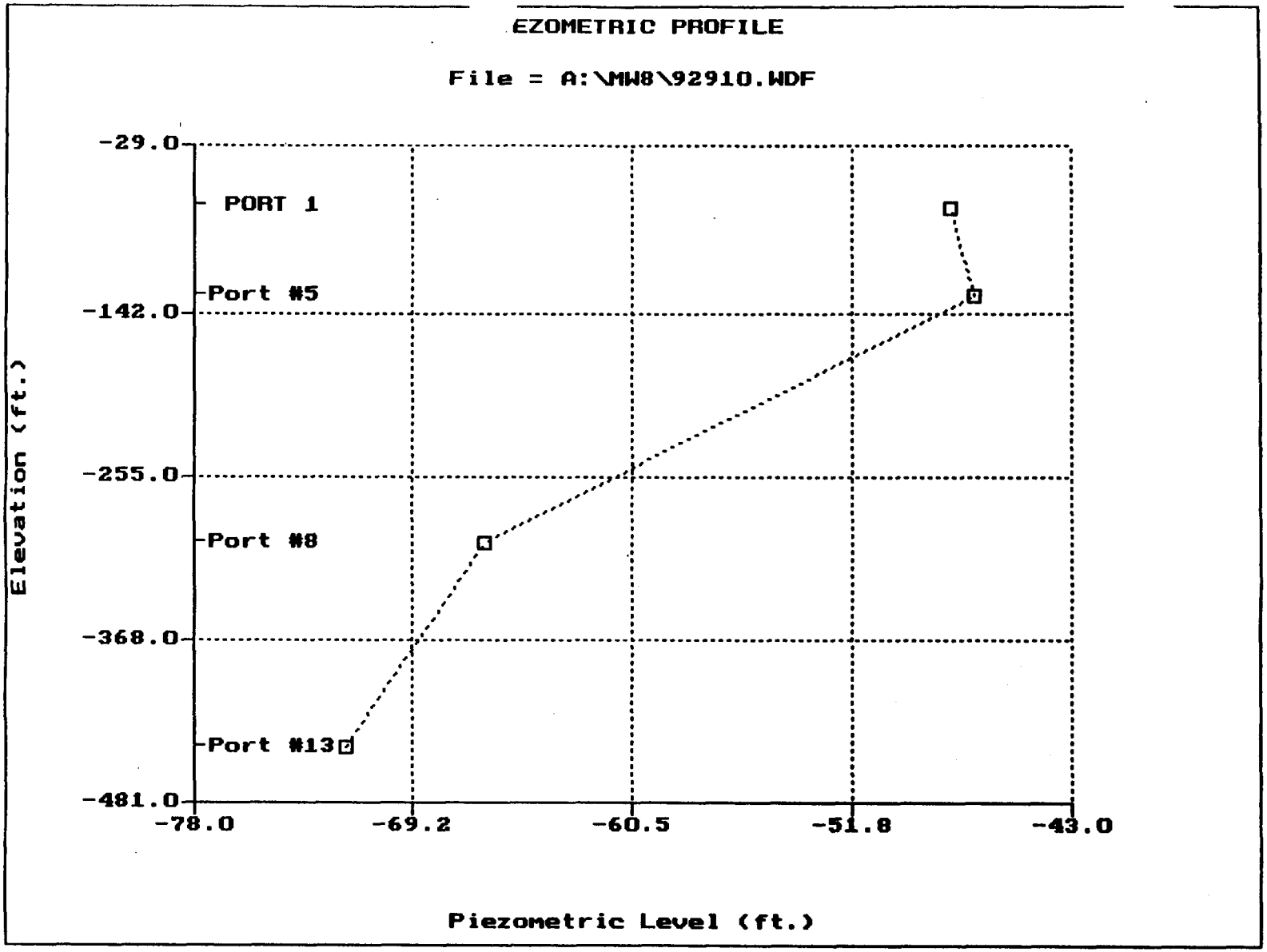
ogical Probe-1 - Serial #: 1031 - Description:

Port Information

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ort #:00 | - Description | ATMOSPHERIC | - Depth | 0.0 | (ft.) | - ACF | 1.0 |
| ort #:01 | - Description | PORT 1 | - Depth | 70.0 | (ft.) | - ACF | 1.0 |
| ort #:02 | - Description | Port #2 | - Depth | 80.0 | (ft.) | - ACF | 1.0 |
| ort #:03 | - Description | Port #3 | - Depth | 115.0 | (ft.) | - ACF | 1.0 |
| ort #:04 | - Description | Port #4 | - Depth | 125.0 | (ft.) | - ACF | 1.0 |
| ort #:05 | - Description | Port #5 | - Depth | 130.0 | (ft.) | - ACF | 1.0 |
| ort #:06 | - Description | Port #6 | - Depth | 145.0 | (ft.) | - ACF | 1.0 |
| ort #:07 | - Description | Port #7 | - Depth | 285.0 | (ft.) | - ACF | 1.0 |
| ort #:08 | - Description | Port #8 | - Depth | 300.0 | (ft.) | - ACF | 1.0 |
| ort #:09 | - Description | PORT #9 | - Depth | 315.0 | (ft.) | - ACF | 1.0 |
| ort #:10 | - Description | Port #10 | - Depth | 367.0 | (ft.) | - ACF | 1.0 |
| ort #:11 | - Description | Port #11 | - Depth | 377.0 | (ft.) | - ACF | 1.0 |
| ort #:12 | - Description | Port #12 | - Depth | 427.0 | (ft.) | - ACF | 1.0 |
| t #:13 | - Description | Port #13 | - Depth | 442.0 | (ft.) | - ACF | 1.0 |
| t #:14 | - Description | Port #14 | - Depth | 457.0 | (ft.) | - ACF | 1.0 |

MOSDAX Data Report - PAGE 01

| TIME DATE | PORT DESCRIPTION | PIEZ P (ft.) | DEPTH (ft.) |
|---|---|---|---|
| u Sep 10 07:11:18 1992 | Port #14 | -70.79 | 457.00 |
| u Sep 10 07:18:58 1992 | Port #13 | -71.90 | 442.00 |
| u Sep 10 07:23:42 1992 | Port #12 | -132.99 | 427.00 |
| u Sep 10 07:32:41 1992 | Port #11 | -71.10 | 377.00 |
| u Sep 10 07:34:58 1992 | Port #10 | -101.26 | 367.00 |
| u Sep 10 07:42:09 1992 | PORT #9 | -66.46 | 315.00 |
| u Sep 10 07:47:55 1992 | Port #8 | -66.43 | 300.00 |
| u Sep 10 07:52:21 1992 | Port #7 | -88.62 | 285.00 |
| u Sep 10 08:00:25 1992 | Port #6 | -54.03 | 145.00 |
| u Sep 10 08:05:01 1992 | Port #5 | -46.82 | 130.00 |
| u Sep 10 08:07:56 1992 | Port #4 | -46.89 | 125.00 |
| u Sep 10 08:11:09 1992 | Port #3 | -55.40 | 115.00 |
| u Sep 10 08:17:31 1992 | Port #2 | -50.97 | 080.00 |
| u Sep 10 08:25:37 1992 | PORT 1 | -47.79 | 070.00 |


EZOMETRIC PROFILE
File = A:\MW8\92910.WDF
-29.0
PORT 1
Port #5
-142.0
-255.0
Port #8
-368.0
Port #13
-481.0
-78.0
-69.2
-60.5
-51.8
-43.0
Elevation (ft.)
Piezometric Level (ft.)

Appendix C (MW-9)

| | |
|---|---|
| Casing Installation Log | 5 pages |
| MP Packer Inflation Records | 17 pages |
| Hydraulic Conductivity Test Records | 6 pages |
| Hydraulic Conductivity Data (semi-log plots) | 3 pages |
| Pumping Log Records | 6 pages |
| Pressure Profile Data | 1 page |
| Graphical Summary of Fluid Pressures | 1 page |

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-9 Installed by: DMc

Hole Depth: ≈ 502.9 ft MP Depth: 482 ft Hole Diameter: 4" S. Steel Date Installed: Aug 27/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, ft | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 0 | Ground Surface; Coupling #74 at surface | | 74, 73 | | | | | |
| | | | 72 | | | | | |
| | | | 71 | | | | | |
| 20 | 4" steel casing | | 70 | | | | | |
| | | | 69 | | | | | |
| 40 | | | 68 | | | | | |
| | | | 67 | | | | | |
| 60 | Zone 1 | | 66, Mag, 65, 64 | | | | | |
| | | | 63 | | | | | |
| 80 | | | 62 | | | | | |
| | | | 61 | | | | | |
| 100 | | | 60 | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-9 Installed by: DMC

Hole Depth: ≈ 502.9 ft MP Depth: 482 ft Hole Diameter: 4" S. Steel Date Installed: Aug 27/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 100 | | | | | | | | |
| | | | S9 | | | | | |
| | | | | | | | | |
| 120 | | | S8 | | | | | |
| | | | S7 | | | | | |
| | | | S6 | | | | | |
| | | | S5 | | | | | |
| | Zone 2 | | Mag S4 | | | | | |
| 140 | | | S3 | | | | | |
| | | | S2 | | | | | |
| | | | S1 | | | | | |
| 160 | | | S0 | | | | | |
| | | | 49 | | | | | |
| | | | 48 | | | | | |
| 180 | | | 47 | | | | | |
| | | | 46 | | | | | |
| 200 | | | 45 | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-9 Installed by: DMc

Hole Depth: ≈ 502.9 ft MP Depth: 482 ft Hole Diameter: 4" S. Steel Date Installed: Aug 27/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 200 | | | | | | | | |
| | | | 44 | | | | | |
| | | | 43 | | | | | |
| | | | 42 | | | | | |
| 220 | | | | | | | | |
| | Zone 3 | | 41 | | | | | |
| | | | Mag | | | | | |
| | | | 40 | | | | | |
| | | | 39 | | | | | |
| | | | 38 | | | | | |
| 240 | | | | | | | | |
| | | | 37 | | | | | |
| | | | 36 | | | | | |
| | | | 35 | | | | | |
| 260 | | | 34 | | | | | |
| | | | 33 | | | | | |
| | | | 32 | | | | | |
| | Zone 4 | | Mag | | | | | |
| | | | 31 | | | | | |
| 280 | | | 30 | | | | | |
| | | | 29 | | | | | |
| | | | 28 | | | | | |
| 300 | | | 27 | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-9 Installed by: DMc

Hole Depth: ≈ 502.9 ft MP Depth: 482 ft Hole Diameter: 4" S. Steel Date Installed: Aug 27/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth, | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 300 | | | | | | | | |
| | | | 26 | | | | | |
| 320 | | | 25 | | | | | |
| | | | 24 | | | | | |
| 340 | | | 23 | | | | | |
| | | | 22 | | | | | |
| 360 | | | 21 | | | | | |
| | | | 20 | | | | | |
| | | | 19 | | | | | |
| | | | 18 | | | | | |
| 380 | Zone 5 | | 17 Mag | | | | | |
| | | | 16 | | | | | |
| | | | 15 | | | | | |
| | | | 14 | | | | | |
| 400 | | | | | | | | |

MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay



# MP System Casing Installation Log

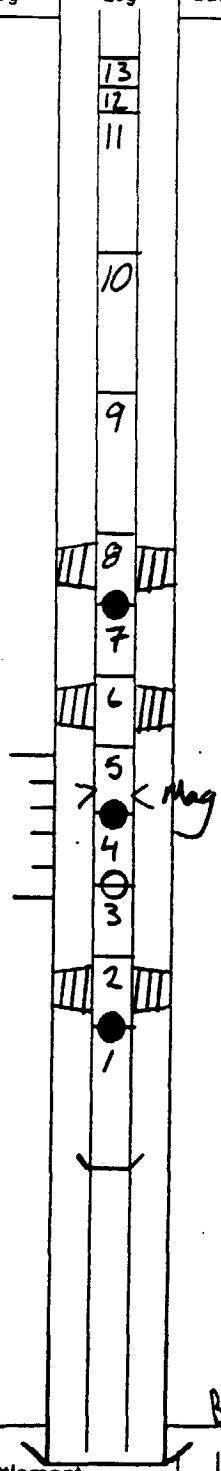
Project: EL TORO WB Ref: 686

Location: — Hole No.: MW-9 Installed by: DMc

Hole Depth: ≈ 502.9 ft MP Depth: 482 ft Hole Diameter: 4" S. Steel Date Installed: Aug 27/92

Measurement Datum: Ground Surface Datum Elevation: — Date Drawn: —

| Depth. | Geological Description | Geologic Log | MP Casing Log | Serial No. Batch No. | Final Packer Pres./Volume | Comments | Joint Tests Test | Joint Tests Pass |
|---|---|---|---|---|---|---|---|---|
| 400 | | | 13, 12, 11 | | | | | |
| 420 | | | 10 | | | | | |
| | | | 9 | | | | | |
| 440 | | | 8, 7, 6 | | | | | |
| 460 | Zone 6 | | 5, 4, 3, 2, 1 | | | | | |
| 480 | | | | | | | | |
| 500 | | | | | | Bottom of 4" casing 502.9 ft | | |




MP Casing | MP Packer | Settlement Casing | Measurement Port Coupling | Pumping Port Coupling | Regular Coupling

18/06/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WR 636

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 27/92

Packer No.: 2

Depth( m / ft ) 472

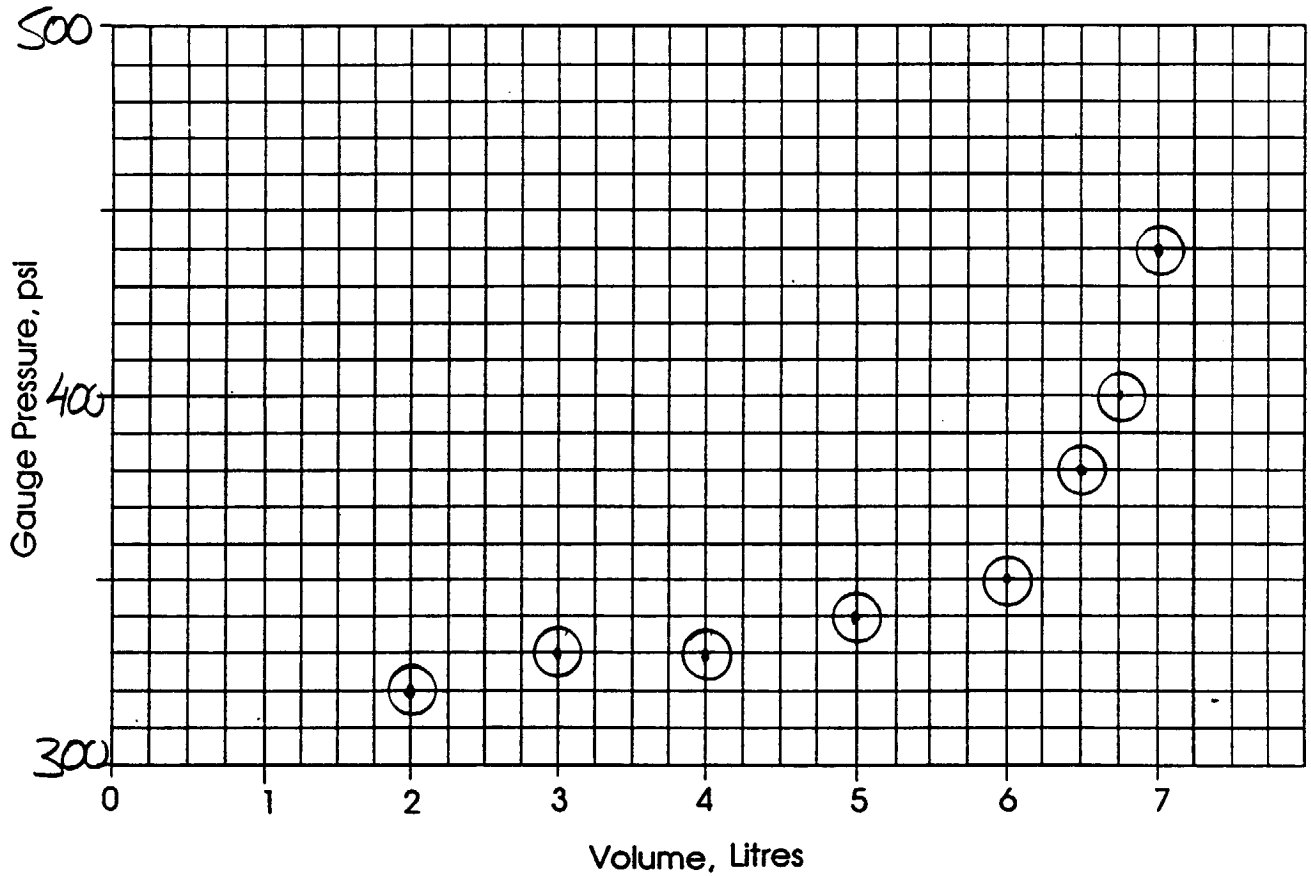
Inflation Tool Setting ( psi ) 250 psi

Depth to Standing Water ( m / ft ) ≈ 51
- open hole

Counter 467

| Volume (Litres) | 1 9 | 2 11 | 3 | 4 | 5 8 | 5½ 7 | 6 5 | 6½ 6 | 6¾ | 7 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 270 | 320 | 330 | 330 | 340 | 340 | 350 | 380 | 400 | 440 | ∅ |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 696

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 28/92 / Aug 29/92

Packer No.: 6

Depth (ft.) 447

Inflation Tool Setting (psi) 260

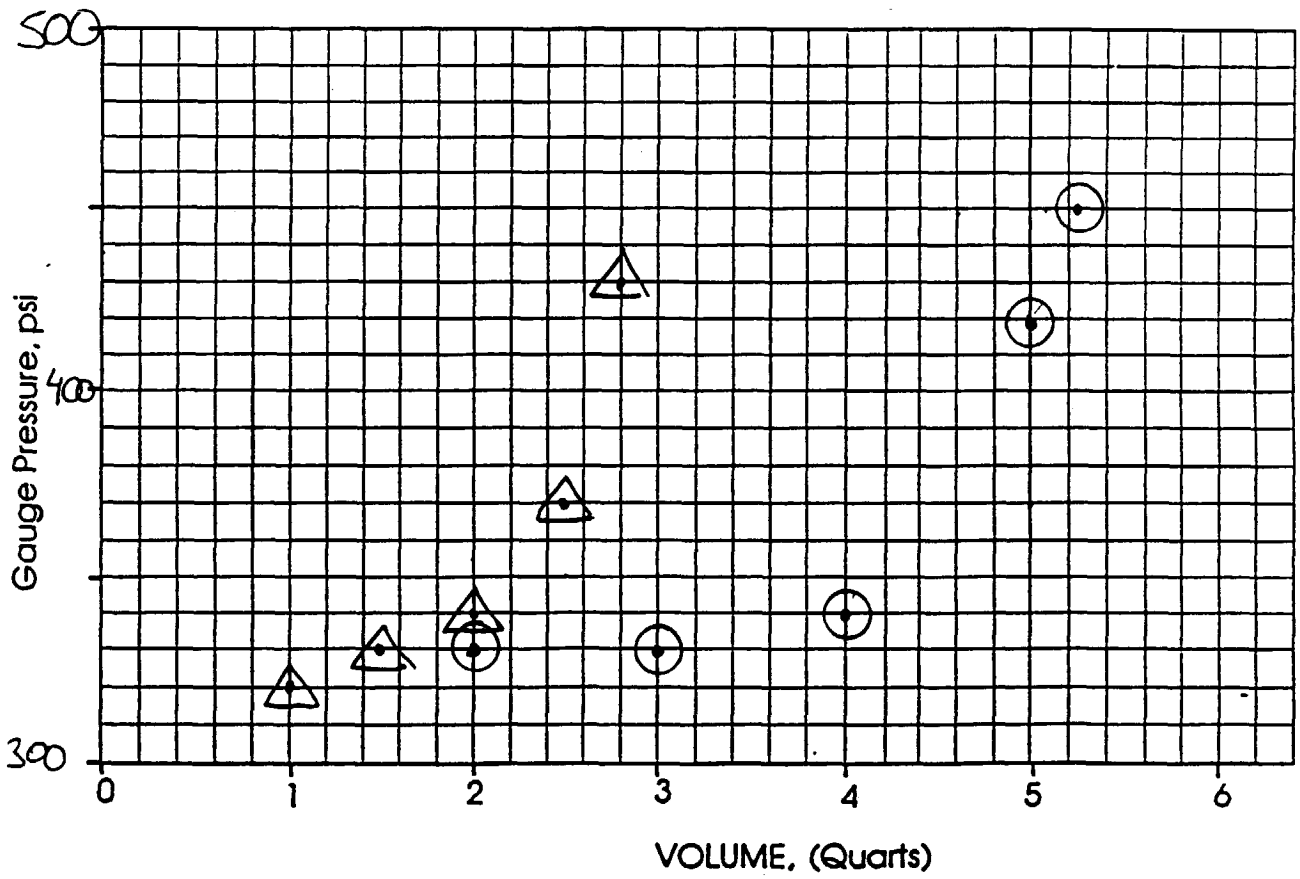
Depth to Water Table (ft.) ≈ 51

Tool 260 psi

Aug 28 → | ← Aug 29

| Volume Quarts | 2 | 3 | 4 | 5 | 5 1/4 | 4 1/4 | 1 | 1 1/2 | 2 | 2 1/2 | 2 7/8 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 340 | 420 | 450 | ∅ | 320 | 330 | 340 | 390 | 430 | ∅ |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB636

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 27/92

Packer No.: 8

Depth( m / ft ) 442

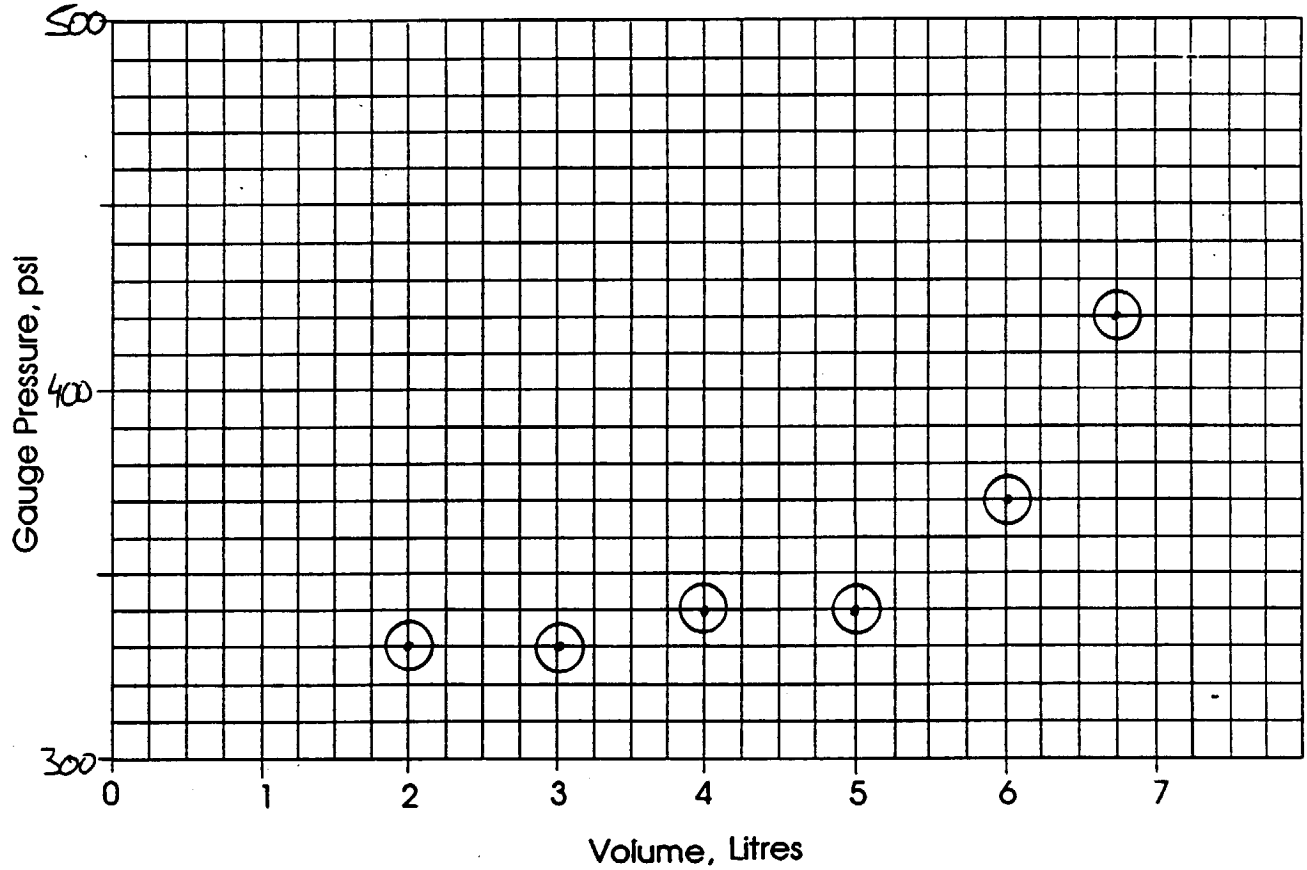
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≃ 51
- open hole

437 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6¾ | 6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 330 | 330 | 340 | 340 | 370 | 420 | Ø | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 6&6

Date Completed:

Hole No.: NW ~~MP~~-9

Date Inflated: Aug 27/92

Packer No.: 15

Depth( m / ft ) 393

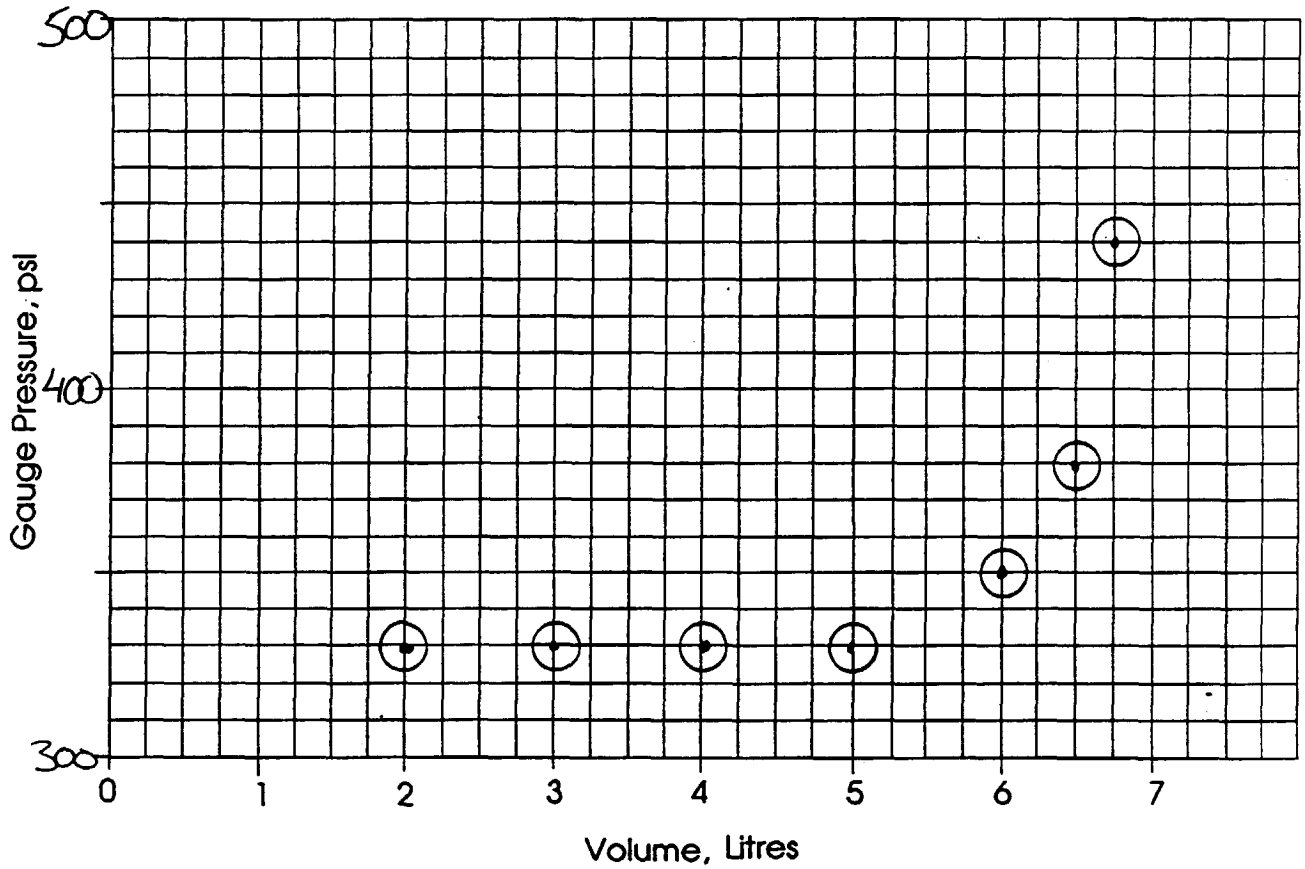
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≈ 51
- open hole

387

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6½ | 6¾ | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 330 | 330 | 330 | 330 | 350 | 380 | 440 | Ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 27/92

Packer No.: 19

Depth( ~~m~~ / ft ) 373

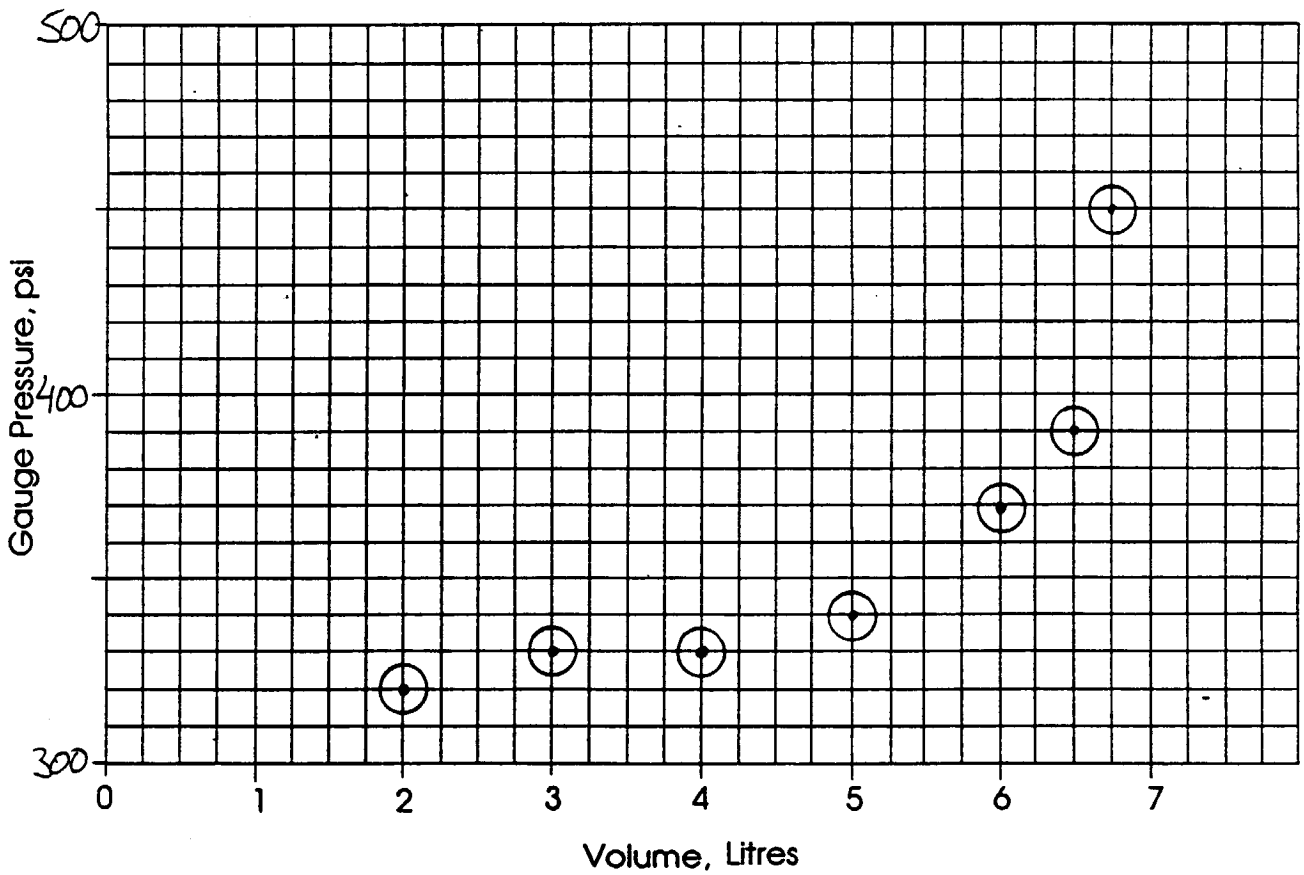
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≈ 51
- open hole

367 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6½ | 6¾ | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 320 | 330 | 330 | 340 | 370 | 390 | 450 | Ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 68L

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 27/92

Packer No.: 21

Depth( ~~m~~ / ft ) 363

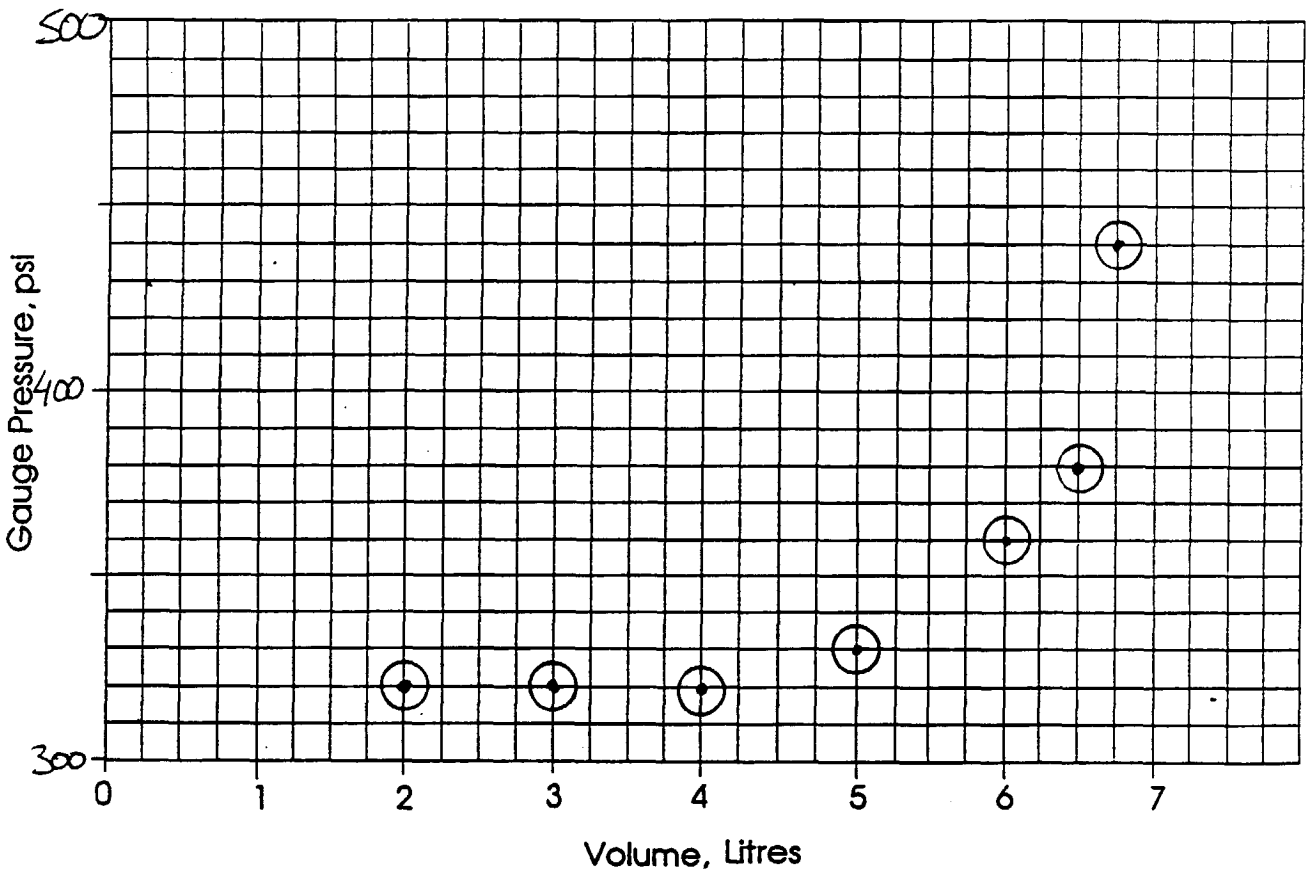
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≈ 51
- open hole

357

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6½ | 6¾ | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 320 | 320 | 320 | 330 | 360 | 380 | 440 | Ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WP 68h

Date Completed:

Hole No.: MW 9

Date Inflated: Aug 27/92

Packer No.: 29

Depth( m/ft ) 288

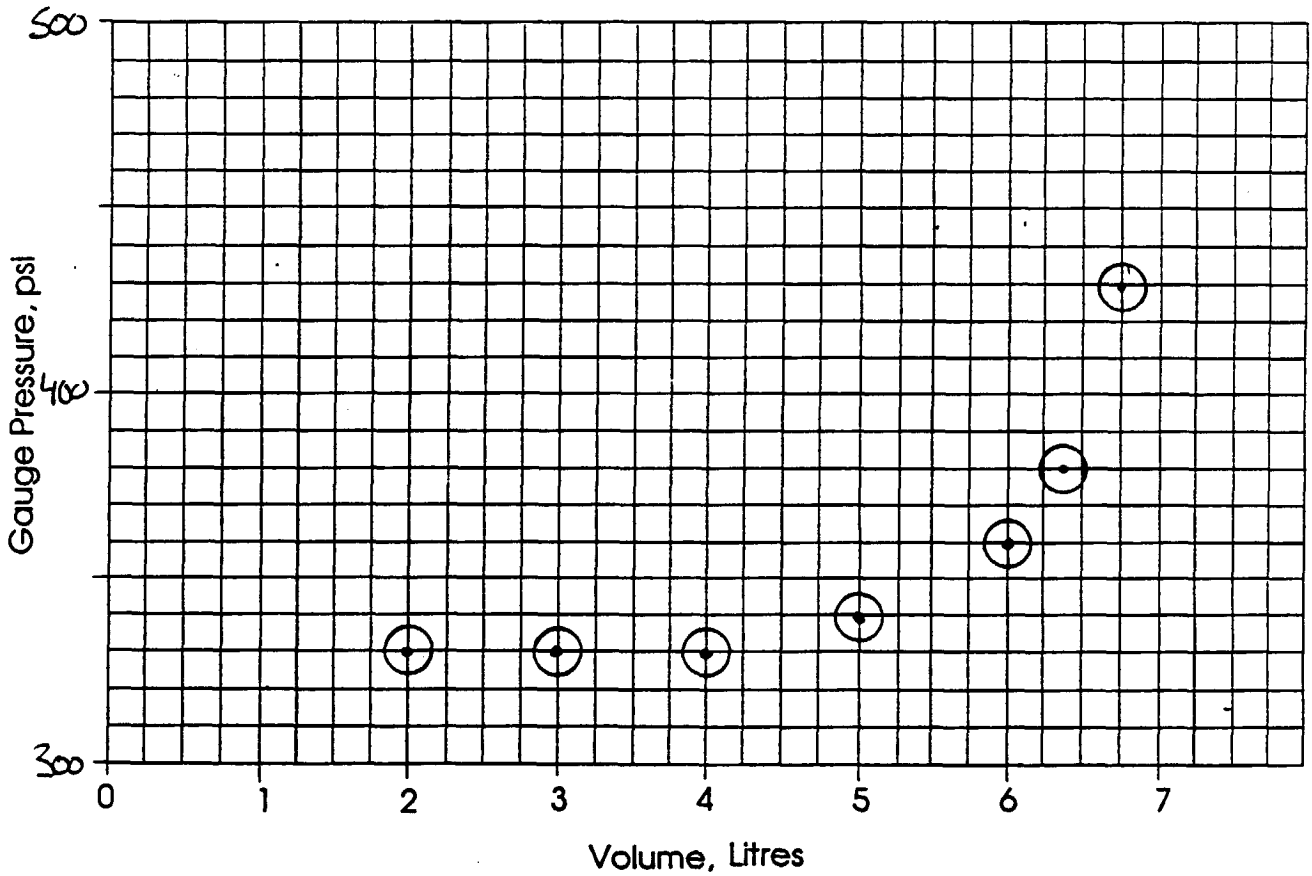
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( m/ft ) ≈ 51
- open hole

281 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 330 | 330 | 330 | 340 | 360 | 380 | 430 | Ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 27/92

Packer No.: 33

Depth( ~~m~~ / ft ) 268

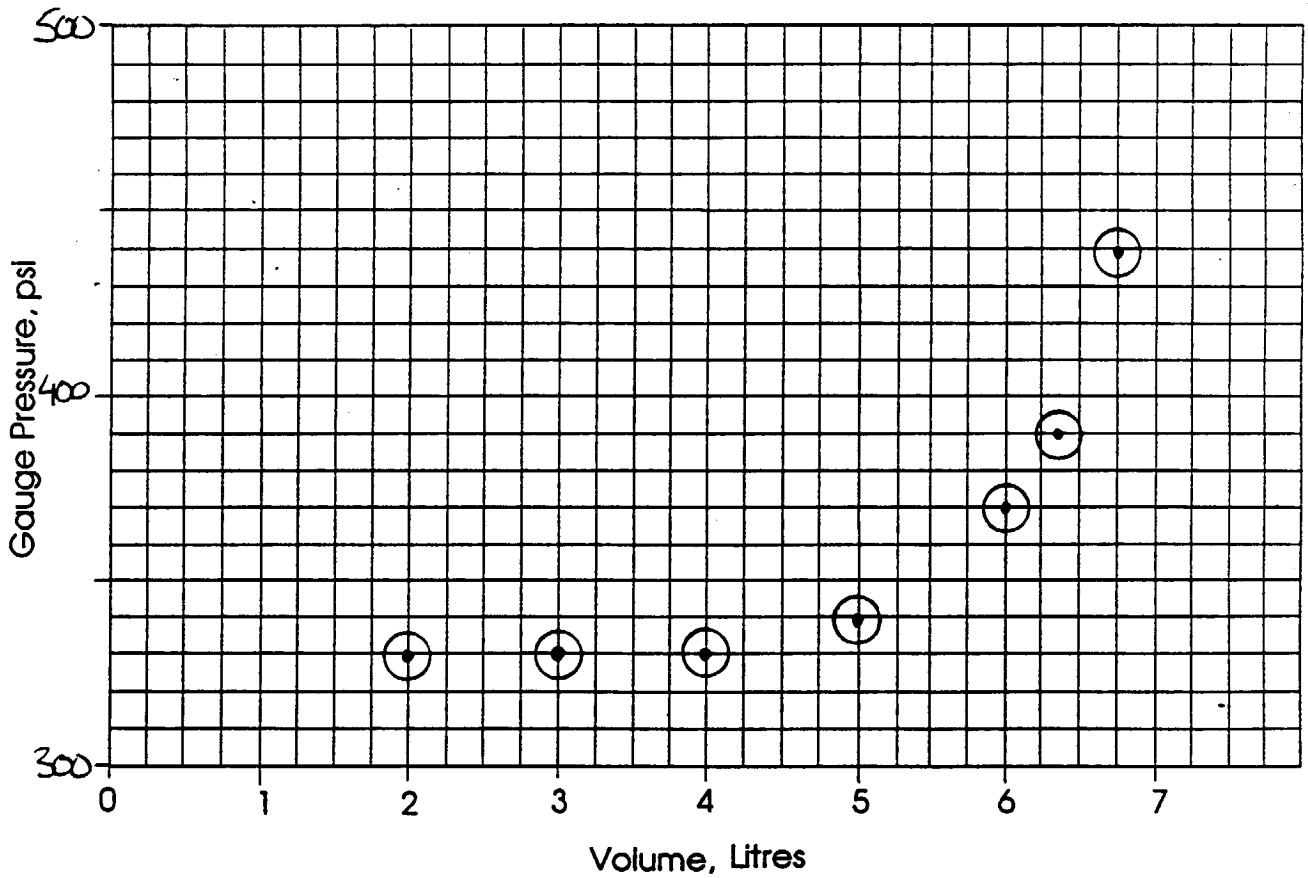
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≈ 51
- open hole

261 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 330 | 330 | 330 | 340 | 370 | 390 | 440 | Ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB-621

Date Completed:

Hole No.: MW 9

Date Inflated: Aug 27/92

Packer No.: 35

Depth( ~~m~~ / ft ) 258

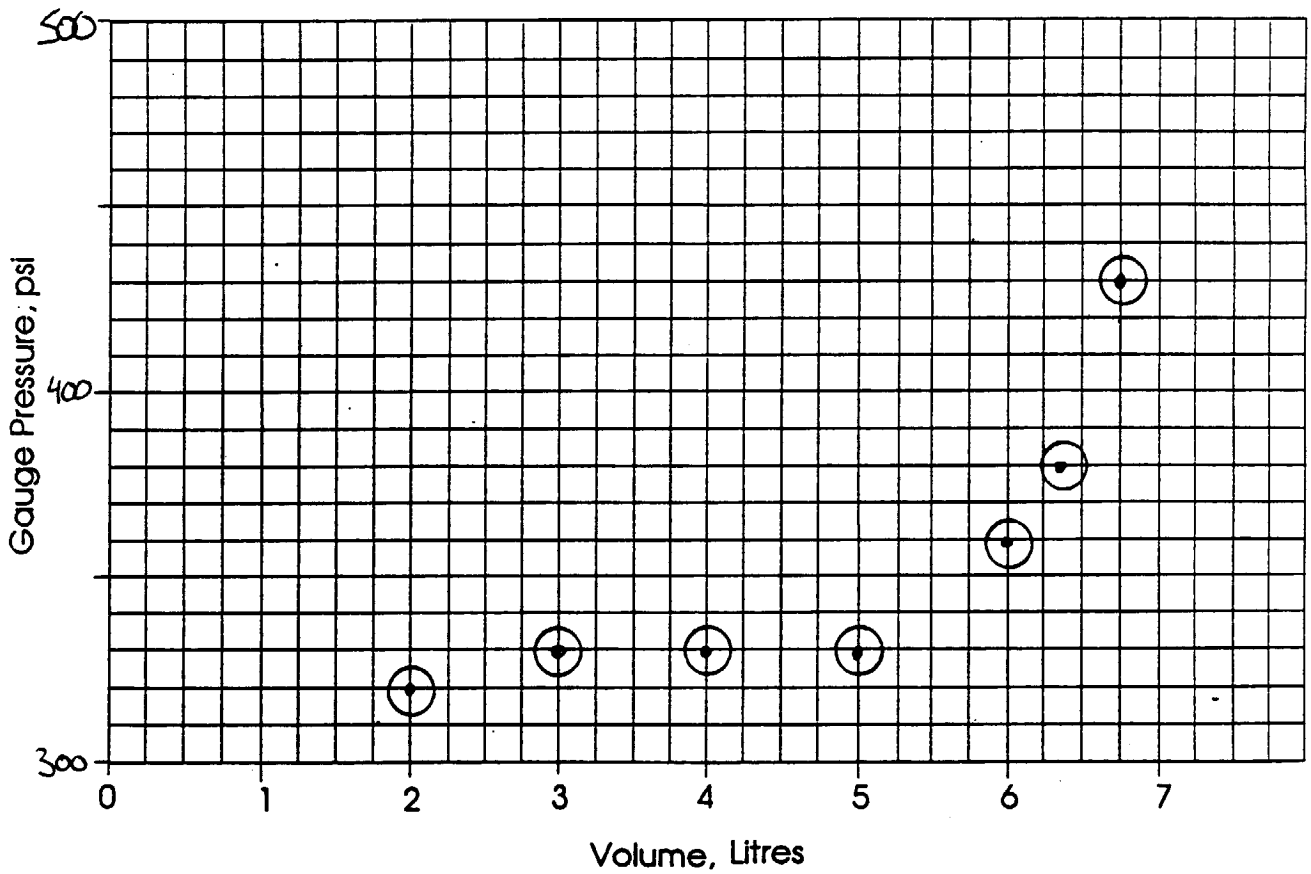
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≈51 - open hole

251 ft

| | 1 | 4 | 2 | 11 | 3 | 7 | 8 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
| Pressure ( PSI ) | 320 | 330 | 330 | 330 | 360 | 380 | 430 | ∅ | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: JMc

Location: WB 636

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 27/92

Packer No.: 38

Depth( ~~m~~ / ft ) 241

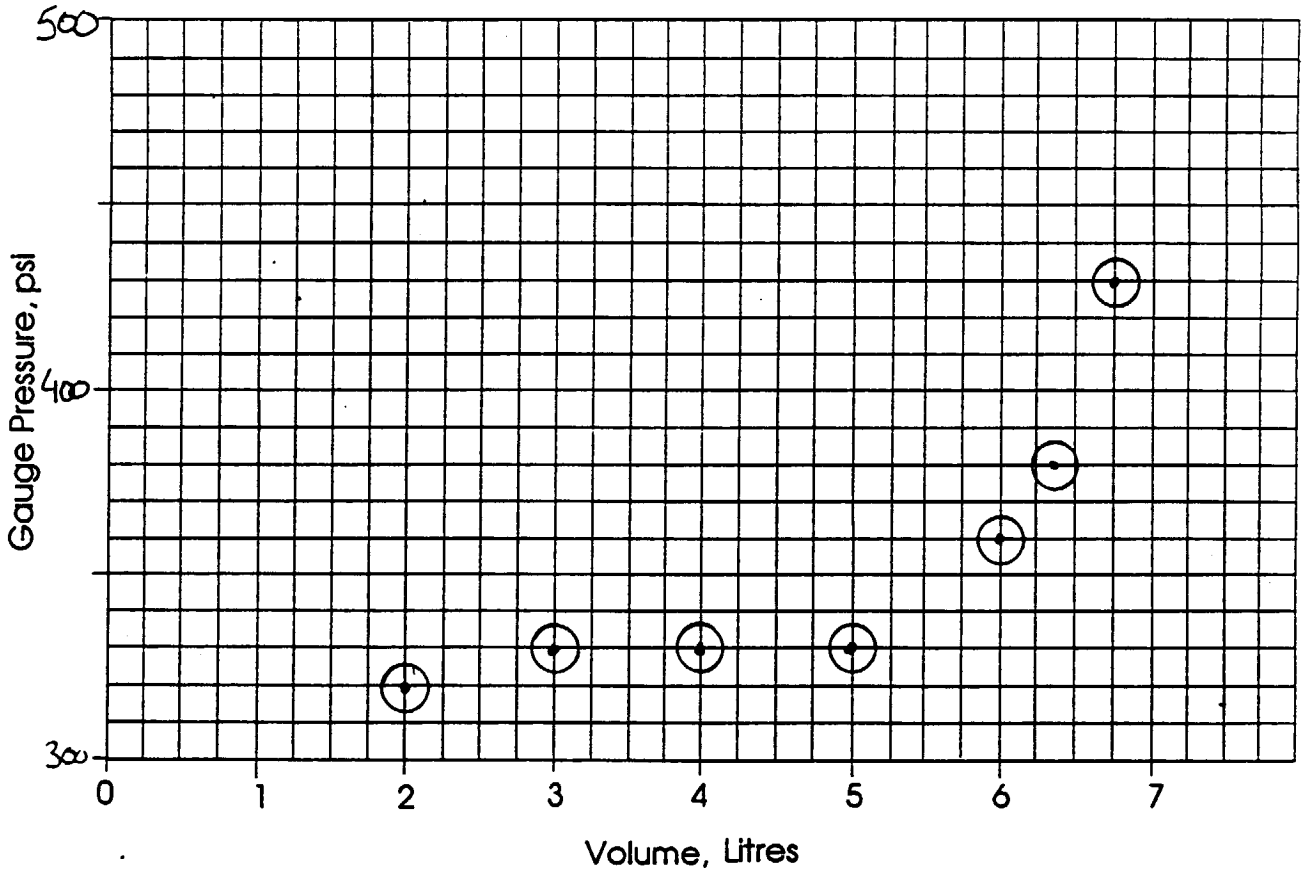
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≅ 51
- open hole

234 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 320 | 330 | 330 | 330 | 360 | 380 | 430 | ∅ | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: MW 9

Date Inflated: Aug 27/92

Packer No.: 42

Depth( ~~m~~ / ft ) 221

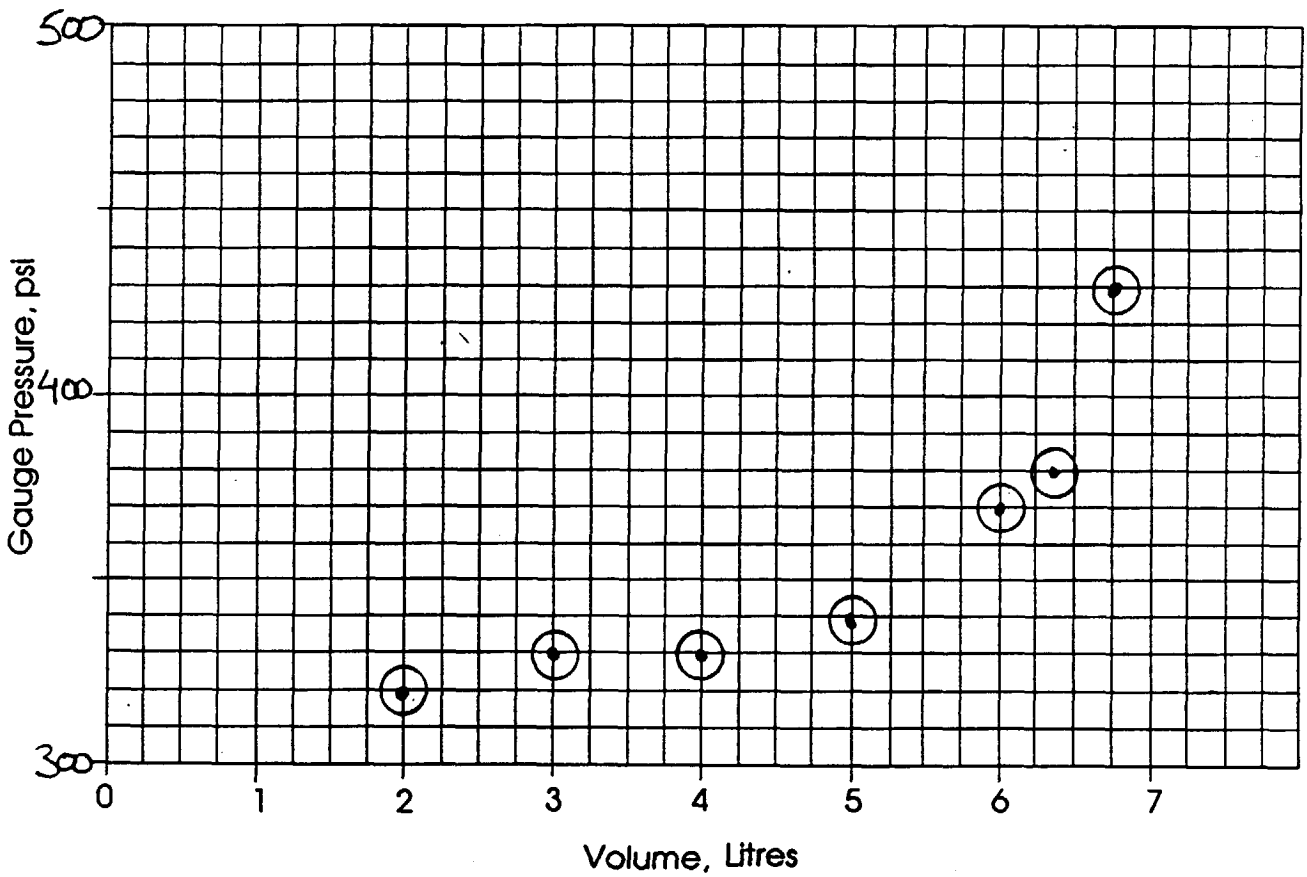
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) ≈ 51
- open hole

214 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 320 | 330 | 330 | 340 | 370 | 380 | 430 | ∅ | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 686

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 28/92

Packer No.: 44

Depth( ~~m~~ / ft ) 211

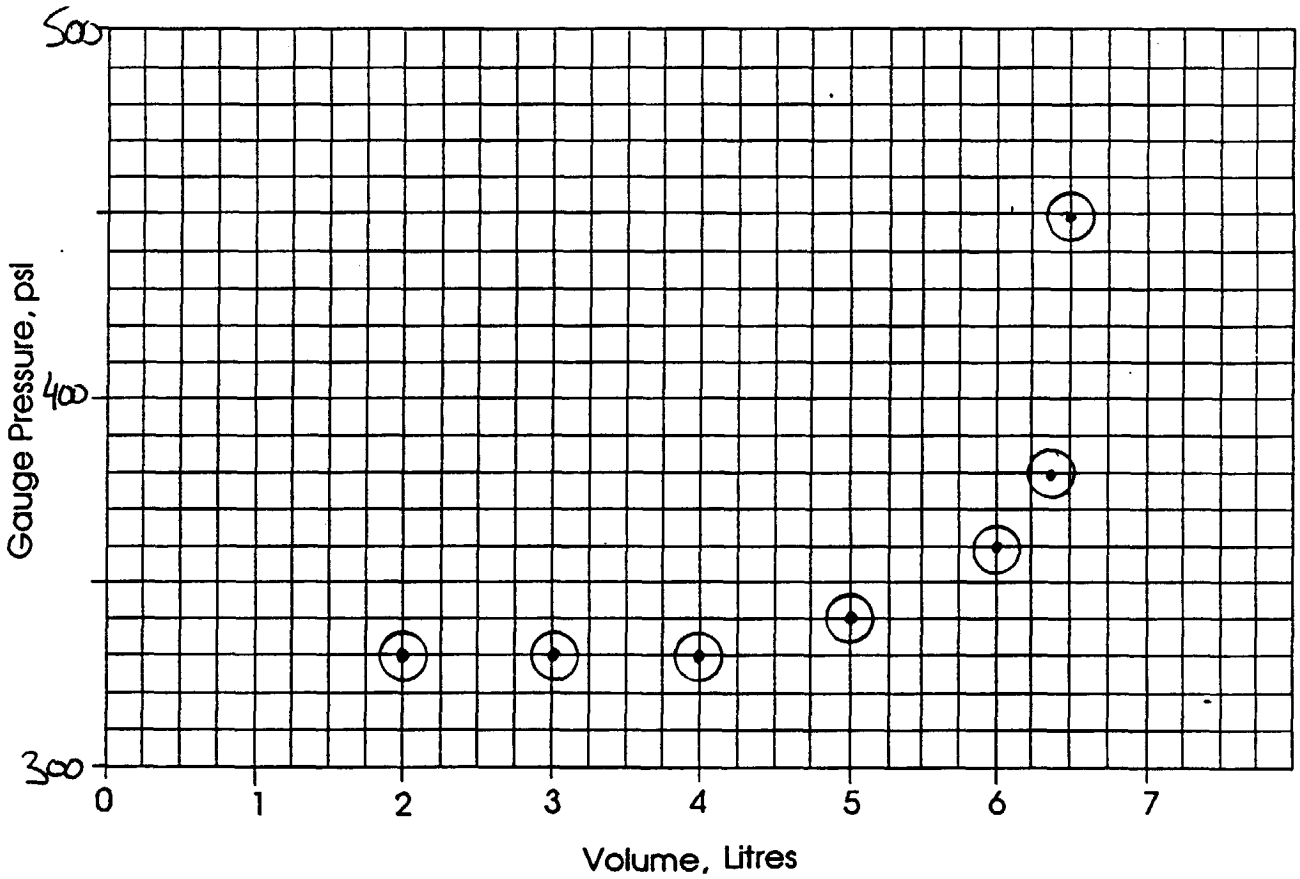
Inflation Tool Setting ( psi ) 250

Depth to Standing Water ( ~~m~~ / ft ) - open hole 51

207 ft

| Volume (Litres) | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 330 | 330 | 330 | 340 | 360 | 380 | 450 | Ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 696

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 29/92

Packer No.: 52

Depth (ft.) 152

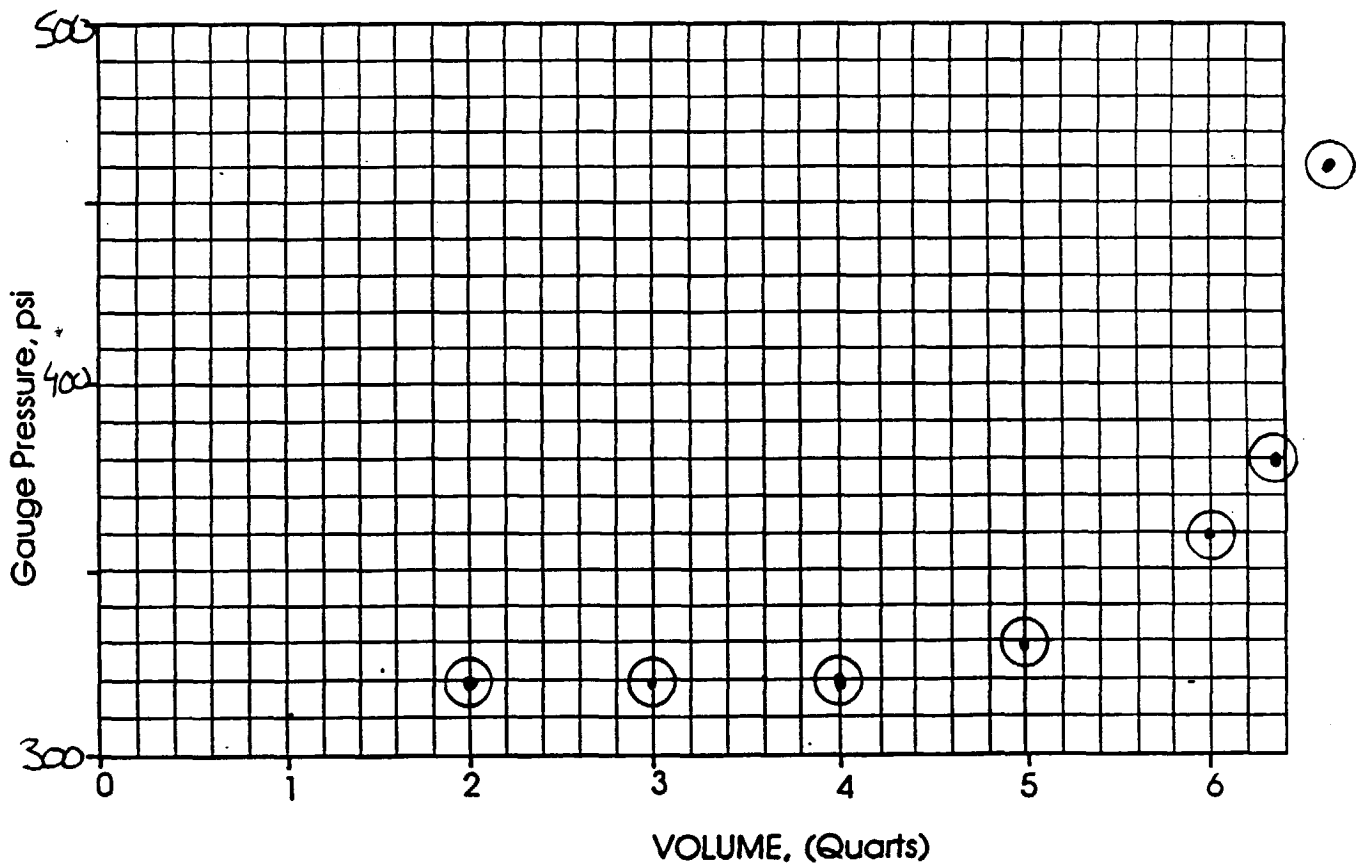
Inflation Tool Setting (psi) 260

Depth to Water Table (ft.) ≈ 51

147 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 320 | 320 | 320 | 330 | 360 | 380 | 460 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB-696

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 28/92

Packer No.: 56

Depth (ft.) 132

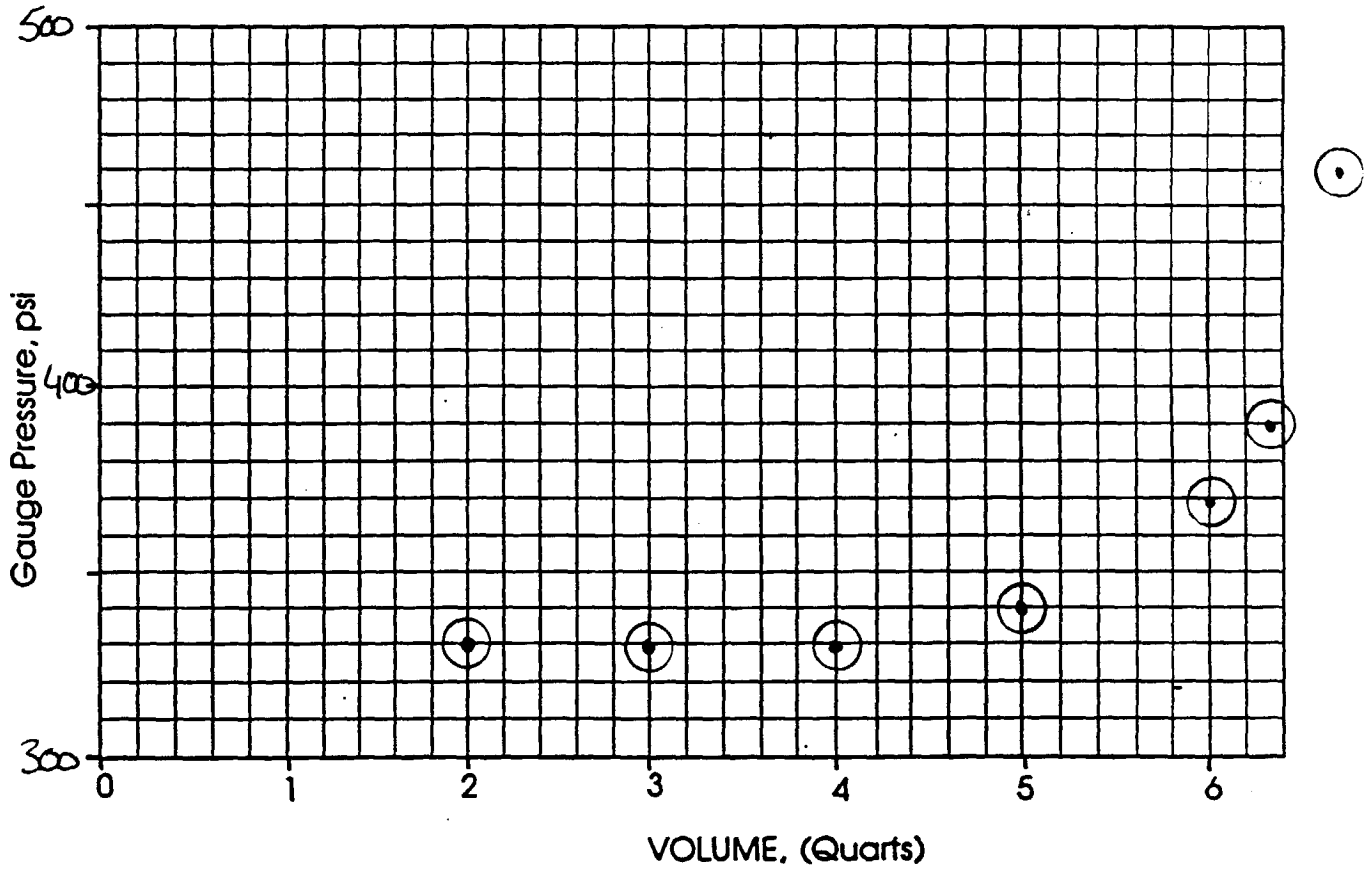
Inflation Tool Setting (psi) 260

Depth to Water Table (ft.) ≈51

127 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 340 | 370 | 390 | 460 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMC

Location: WB 696

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 28/92

Packer No.: 58

Depth (ft.) 122

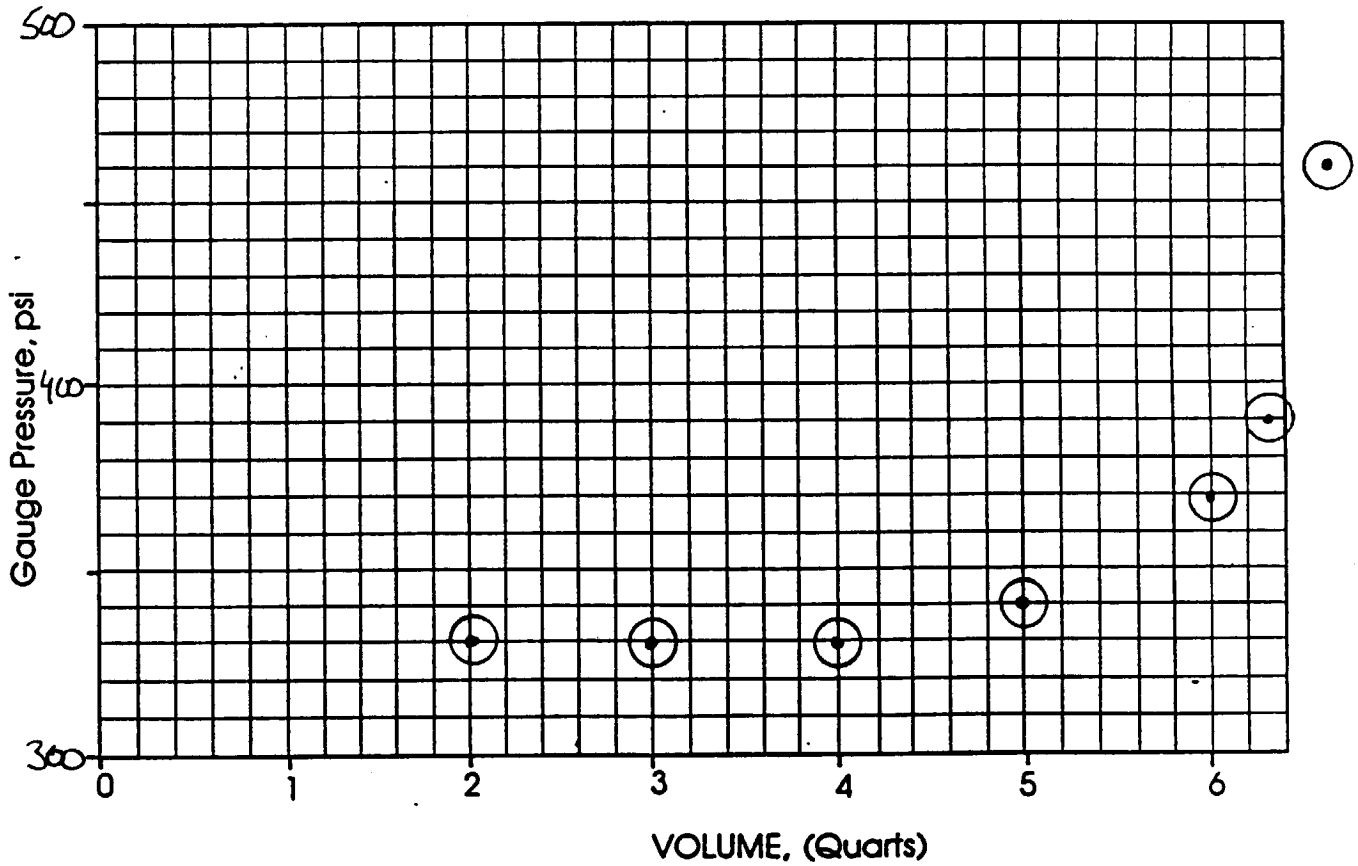
Inflation Tool Setting (psi) 260

Depth to Water Table (ft.) ≈ 51'

117 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 340 | 370 | 390 | 460 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 60L

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 28/92

Packer No.: 63

Depth (ft.) 77

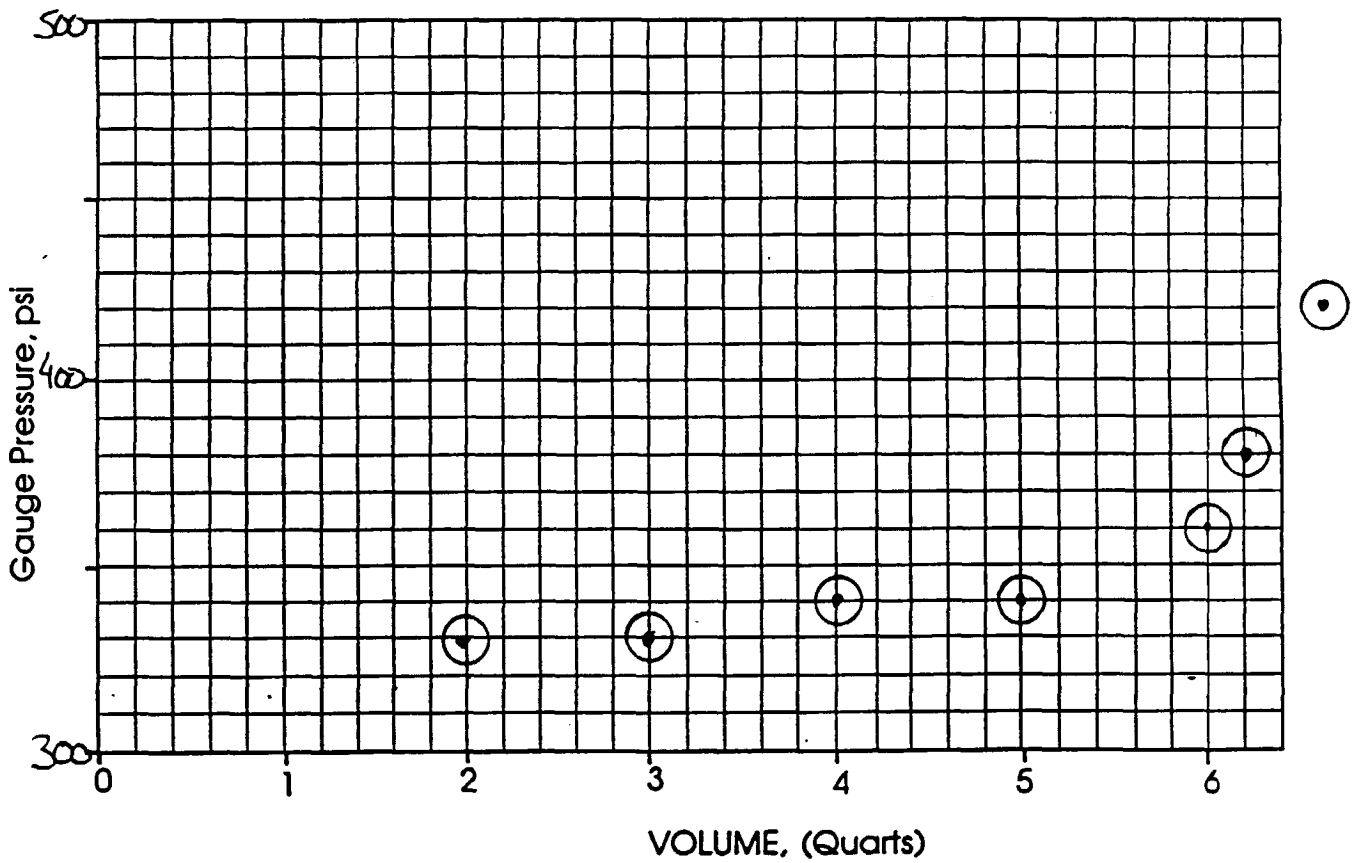
Inflation Tool Setting (psi) 260

Depth to Water Table (ft.) ≈ 51'

72 ft

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 1/4 | 6 3/4 | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 340 | 340 | 360 | 380 | 420 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



Westbay Instruments Inc.

# MP Packer Inflation Record

Project: EL TORO

Completed By: DMc

Location: WB 6E's

Date Completed:

Hole No.: MW-9

Date Inflated: Aug 28/92

Packer No.: 67

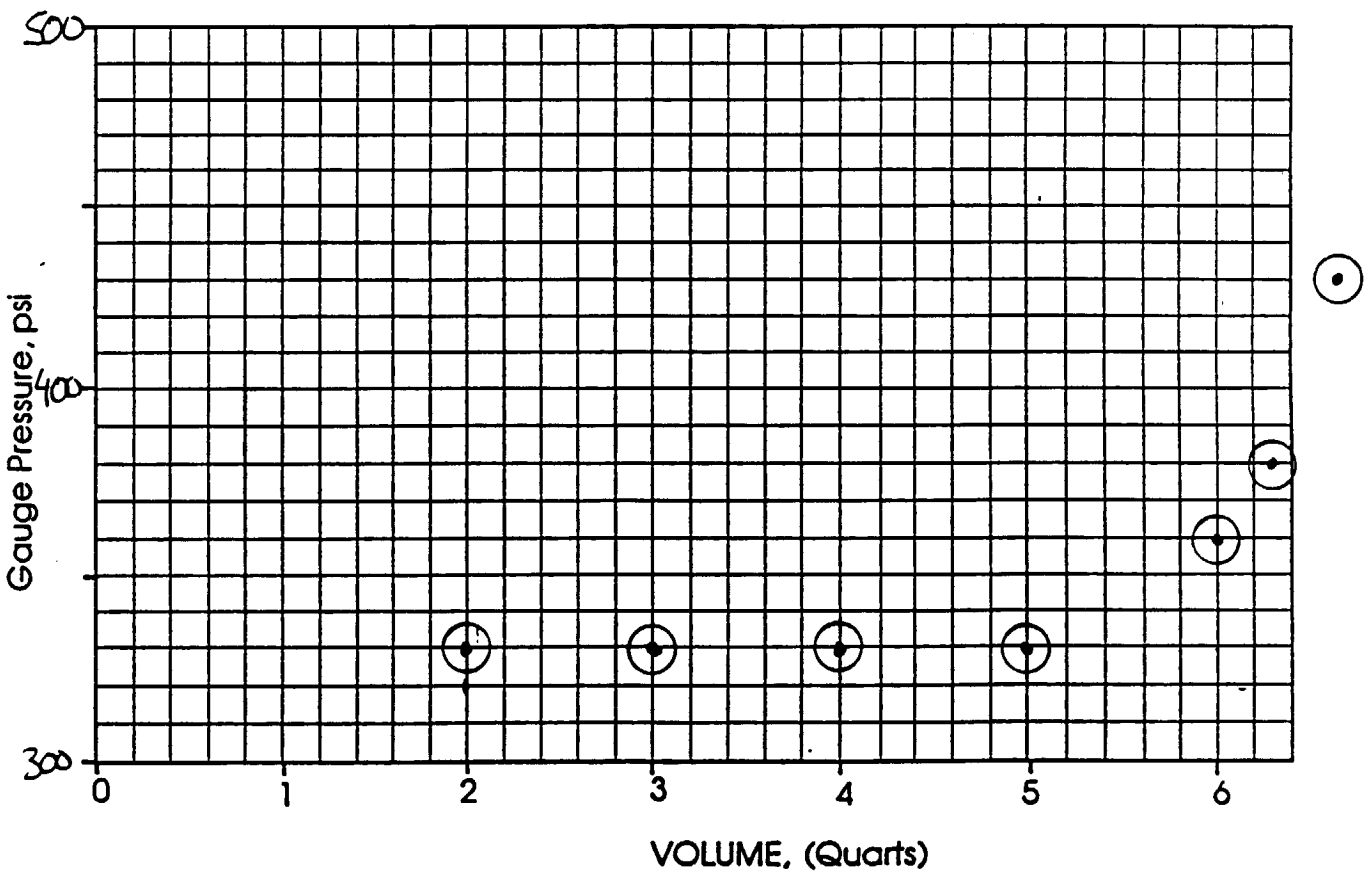
Depth (ft.) 57

Inflation Tool Setting (psi) 260

Depth to Water Table (ft.) ≈ 51

| Volume Quarts | 2 | 3 | 4 | 5 | 6 | 6 3/8 | 6 3/4 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure Psi | 330 | 330 | 330 | 330 | 360 | 380 | 430 | Ø | | |

Plot of Gauge Pressure (psi) vs. Volume (Quarts)



# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 1 ft sub
Probe Type: WLT
Date: Sept 18/92
Job No.: 696
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-9
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 in. cm
Test Zone No.: 1
Test Type: slug
Test Zone Diameter: 29.4
Test Zone Interval: 67'
Operator: DMc
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$): 16.62
Initial Test Reading (h): 35.83'
Calculated Hydraulic Conductivity (k):
Analysis Method: Hvorslev
Static Water Level in Test Zone: 52.45 ft. ~~m psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m psi~~ | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 10:15 | | 0 | 35.83 | 1.00 | 10:18 | 3 | | [illegible] | — |
| | | | | | | | | | |
| | | 10 | 49.9 | .153 | 10:19 | 4 | | 52.45 | — |
| | | 15 | 50.25 | | | | | | |
| | | 20 | 50.55 | .132 | 10:20 | 5 | | 52.45 | — |
| | | | | | | | | | |
| | | 30 | 50.95 | .090 | | | | | |
| | | | | | | | | | |
| | | 40 | 51.25 | .072 | | | | | |
| | | | | | | | | | |
| | | 50 | 51.55 | .054 | | | | | |
| | | | | | | | | | |
| 10:16 | | 60 | 51.70 | .045 | | | | | |
| | | | | | | | | | |
| | | 70 | 51.80 | .039 | | | | | |
| | | | | | | | | | |
| | | 90 | 52.00 | .027 | | | | | |
| | | | | | | | | | |
| 10:17 | | 120 | 52.20 | .015 | | | | | |
| | | | | | | | | | |
| | | 150 | 52.30 | — | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 1 ft sub
Probe Type: WLT
Date: Sept 19/91
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-9
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: El Toro
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 2
Test Type: slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 142'
Operator: NMc
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$): 18.40
Initial Test Reading (h): 34.
Calculated Hydraulic Conductivity (k): N/A
Analysis Method: K Value too fast to monitor
Static Water Level in Test Zone: 52.40 ft ~~m~~ ~~psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m~~ ~~psi~~ | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 7:50 | | 0 | 34.00 | | | | | | |
| | | | | | | | | | |
| | | 10 | 53. | | | | | | |
| | | | | | | | | | |
| | | 20 | [illegible] | | | | | | |
| | | | | | | | | | |
| | | 30 | 52.40 | | | | | | |
| | | | | | | | | | |
| | | 40 | 52.40 | | | | | | |
| | | | | | | | | | |
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| | | | | | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 1' Sub
Probe Type: WLT
Date: Sept 17/92
Job No.: 696
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-9
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: El Toro
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 3
Test Type: Slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 226'
Operator: DMC/SW
Test Zone Length (L): 24' (706cm)
Initial Head Difference($H_o$): 8.98'
Initial Test Reading (h): 43.66
Calculated Hydraulic Conductivity (k):
Analysis Method: Hvorslev
Static Water Level in Test Zone: 52.64 ft. ~~m~~ ~~psi~~.
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m~~ ~~psi~~ | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m~~ ~~psi~~ | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 43.66 | 1.00 | | 3 | | 51.6 | — |
| | | | | | | 4 | | 51.95 | — |
| | | 10 | 45.9 | .75 | | 5 | | 52.15 | — |
| | | | | | | 6 | | 52.64 | — |
| | | 20 | 46.8 | .65 | | | | | |
| | | | | | | | | | |
| | | 30 | 47.7 | .55 | | | | | |
| | | | | | | | | | |
| | | 40 | 48.3 | .48 | | | | | |
| | | | | | | | | | |
| | | 50 | 48.8 | .43 | | | | | |
| | | | | | | | | | |
| | | 60 | 49.2 | .38 | | | | | |
| | | | | | | | | | |
| | | 70 | 49.6 | .34 | | | | | |
| | | | | | | | | | |
| | | 90 | 50.2 | .27 | | | | | |
| | | | | | | | | | |
| | | 120 | 50.8 | .205 | | | | | |
| | | | | | | | | | |
| | | 150 | 51.3 | — | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: 1 ft sub
Probe Type: WLT
Date: Sept 17/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-9
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 4
Test Type: Slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 278'
Operator: DMc
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_o$): 10.2
Initial Test Reading (h): 65.30
Calculated Hydraulic Conductivity (k):
Analysis Method: Hvorslev
Static Water Level in Test Zone: 54.1 ft. ~~m psi~~
Comments:

| Clock Time | Elapsed Time min. | Elapsed Time sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | Elapsed Time sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 12:58 | | 0 | 65.30 | 1.00 | | | | | |
| | | | | | | | | | |
| | | 10 | 59.90 | .57 | | | | | |
| | | 15 | 58.6 | .44 | | | | | |
| | | 20 | 57.2 | .30 | | | | | |
| | | | | | | | | | |
| | | 30 | 55.6 | .147 | | | | | |
| | | | | | | | | | |
| | | 40 | 54.7 | .059 | | | | | |
| | | | | | | | | | |
| | | 50 | 54.5 | .039 | | | | | |
| | | | | | | | | | |
| | | 60 | 54.3 | .020 | | | | | |
| | | | | | | | | | |
| | | 70 | 54.2 | .010 | | | | | |
| | | | | | | | | | |
| | | 90 | 54.15 | | | | | | |
| | | | | | | | | | |
| 1:00 | | 120 | 54.1 | | | | | | |
| | | | | | | | | | |
| | | 150 | 54.1 | — | | | | | |

*Readings uncorrected for variations in Barometric Pressure

# Westbay Hydraulic Conductivity Test

## Field Data Sheet

Datum: +1 ft Sub
Probe Type: WLT
Date: Sept 16 92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW 9
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 5
Test Type: Slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 383'
Operator: RMC
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$): 14.69
Initial Test Reading (h): 71.94
Calculated Hydraulic Conductivity (k):
Analysis Method: Hvorslev
Static Water Level in Test Zone: 57.25 ft. ~~m~~ ~~psi~~
Comments:

| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| 6 | | 0 | 71.94 | 1.00 | | 3 | | 60.60 | |
| | | | | | | 4 | | 59.65 | |
| | | 10 | 67.3 | .68 | 6:06 | 5 | | 59.05 | |
| | | | | | | | | | |
| | | 20 | 66.2 | .61 | | ∞ | | 57.25 | — |
| | | | | | | | | | |
| | | 30 | 65.3 | .55 | | | | | |
| | | | | | | | | | |
| | | 40 | 64.5 | .49 | | | | | |
| | | | | | | | | | |
| | | 50 | 64.0 | .46 | | | | | |
| | | | | | | | | | |
| | | 60 | 63.55 | .43 | | | | | |
| | | | | | | | | | |
| | | 70 | 63.20 | .41 | | | | | |
| | | | | | | | | | |
| | | 90 | 62.75 | .37 | | | | | |
| | | | | | | | | | |
| | | 120 | 61.95 | .32 | | | | | |
| | | | | | | | | | |
| | | 150 | 61.20 | .27 | | | | | |

*Readings uncorrected for variations in Barometric Pressure

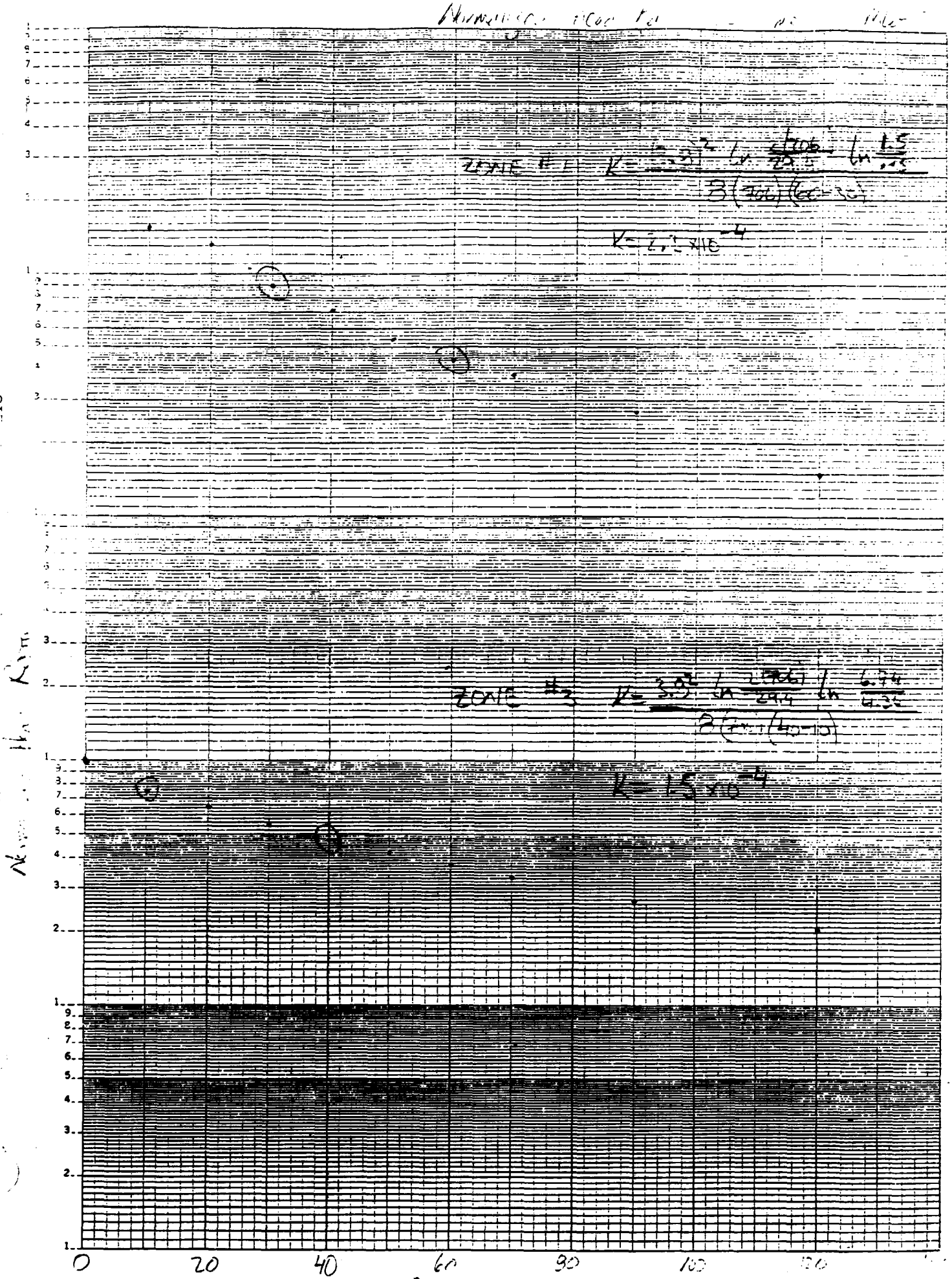
# Westbay Hydraulic Conductivity Test

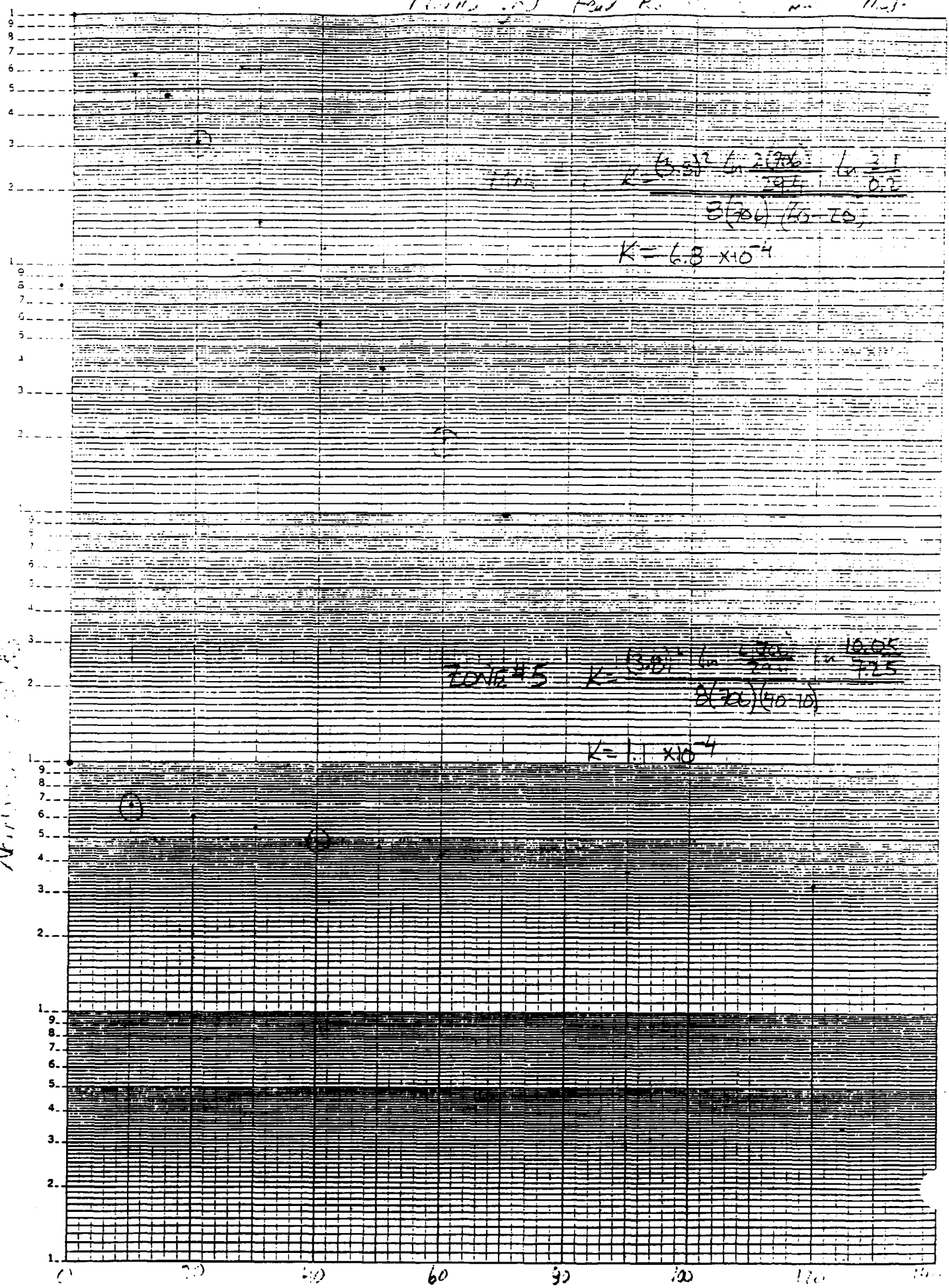
## Field Data Sheet

Datum: 1 ft sub
Probe Type: WLT
Date: Sept 16/92
Job No.: 686
Elev. Ground Sfc: —
Serial No.: —
Monitoring Well No.: MW-9
Height MP Casing above Ground Sfc: —
Range: 0 to — psi
Project: EL TORO
Elev. top of MP Casing: —
Riser Diameter (d): 3.8 ~~in.~~ cm
Test Zone No.: 6
Test Type: Slug
Test Zone Diameter: 29.4 cm
Test Zone Interval: 462'
Operator: DMC
Test Zone Length (L): 24' (706 cm)
Initial Head Difference($H_0$):
Initial Test Reading (h): 32.51
Calculated Hydraulic Conductivity (k):
Analysis Method:
Static Water Level in Test Zone: 57.13 ft. ~~m psi~~
Comments:

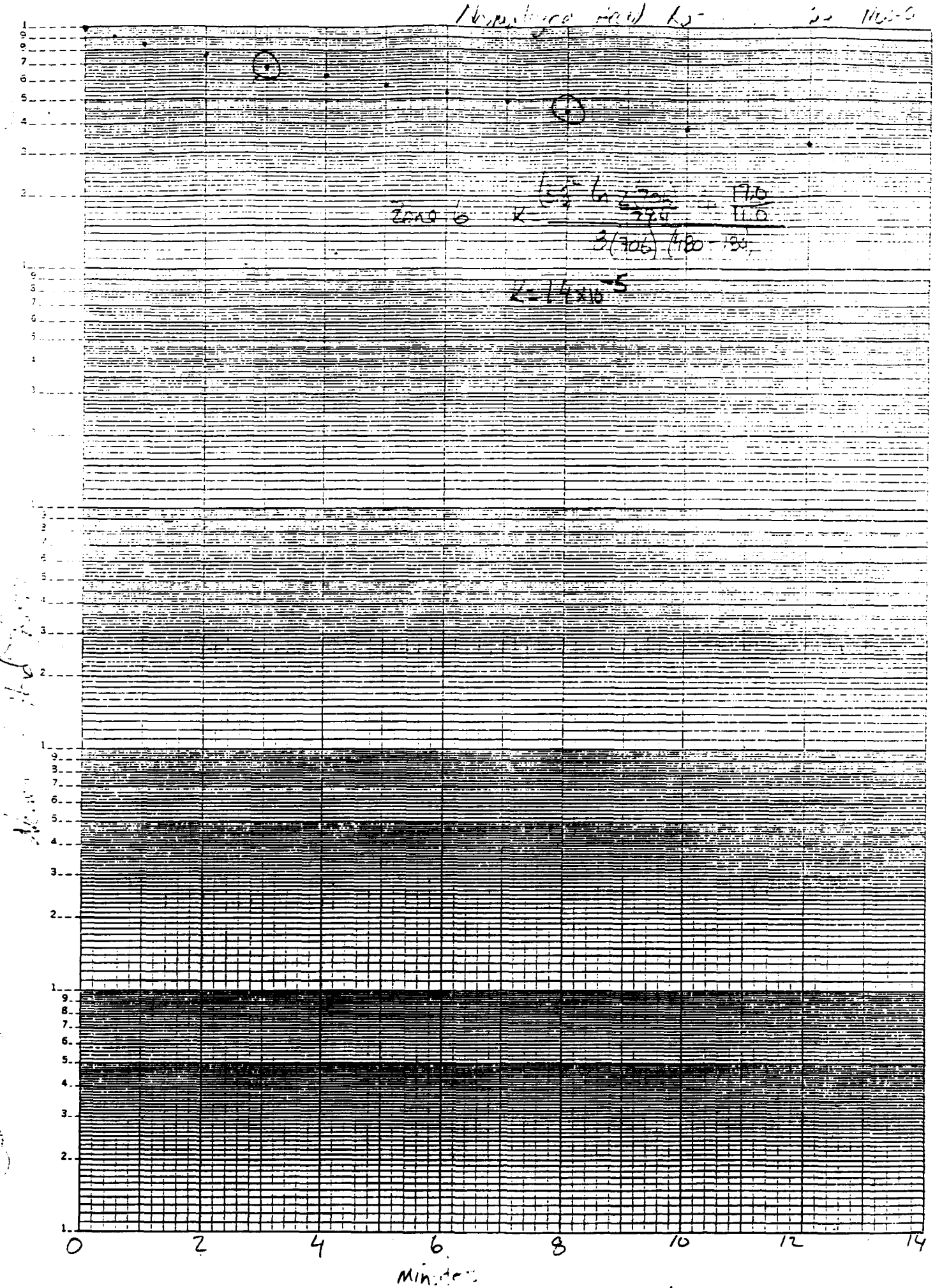
| Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. ~~m psi~~ | Normalized Test Readings | Clock Time | Elapsed Time min. | sec. | Test Readings* (h) ft. m psi | Normalized Test Readings |
|---|---|---|---|---|---|---|---|---|---|
| Sept 16/92 1:10 | | 0 | 32.51 | 1.00 | | 3 | | 40.15 | .69 |
| | | 10 | 33.9 | .94 | | 4 | | 41.75 | .63 |
| | | 20 | 34.25 | .93 | | 5 | | 43.05 | .57 |
| | | 30 | 34.8 | .91 | | 6 | | 44.15 | .53 |
| | | 40 | 35.35 | .89 | | 7 | | 45.20 | .49 |
| | | 50 | 35.75 | .87 | | 8 | | 46.15 | .45 |
| | | 60 | 36.20 | .85 | | 10 | | 47.75 | .38 |
| | | 70 | 36.65 | .83 | | 12 | | 49.10 | .33 |
| | | 90 | 37.30 | .81 | 1:25 | 15 | | 50.75 | .26 |
| | | 120 | 38.40 | .76 | | ∞ | | 57.13 | |
| | | 150 | 39.30 | .72 | | | | | |

*Readings uncorrected for variations in Barometric Pressure


ZONE #1
K = 2.1 x 10^-4
ZONE #2
K = 1.5 x 10^-4
0
20
40
60
80
100
120




46 0213
K+E SEMI-LOGARITHMIC 3 CYCLES X 10 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.


Zero 6
$K = \frac{\frac{1}{2} \ln \frac{2.3}{2.0} + \frac{19.0}{11.0}}{3(706)(480 - 130)}$
$K = 14 \times 10^{-5}$
0
2
4
6
8
10
12
14
Minutes

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Bay/TK
Job No.: 686
Project/Location: EL TORO
Technician(s): /S.W
Borehole No.: MW-9
Date: Sept. 18/92
Drill Type: —
Drill Fluid: mud

Zone No.: 1
Interval Length:
Hole Size:
Interval Depth: 67'
Elevation Head (wrt G.S.):

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 18/92 10:15 am
Closed:
Pump Type: waterra

80 [illegible]

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept. 18/92 | 10:30 | 0 | | ≈ | | |
| | 11:17 | ≈ 40 | ≈ 40 | | | cloudy, no sediment |
| | 12:05 | ≈ 40 | ≈ 80 | ≈ 0.9 gal/min | | slightly cloudy |
| | 12:15 | 10 | ≈ 90 | | | |
| | | | | End of pumping | | |
| | | | | | | |
| | | | | | | |
| | | | | | | 52.60' WLT |
| | 12:38 | | | | | 45.85' add H2O |
| | | | | | | 45.60 |
| | 12:44 | | | | | o/c tool out |
| | | | | | | |
| | | | | | WLT | 45.49' w/o 1.0' stickup |
| | | | | | | top of MP casing |
| | | | | | | |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Rocky
Project/Location: El Toro
Borehole No.: MW-7
Drill Type: —
Drill Fluid: Mud

Job No.: 696
Technician(s): [illegible]
Date: Sept [illegible]

Zone No.: 2
Hole Size: —
Elevation Head (wrt G.S.): [illegible]

Interval Length:
Interval Depth: 143

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 18/92 7:30 Closed:
Pump Type: Waterra

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 18 | 8:00 | - | - | ≈ 2.5/min | | clear |
| | 8:20 | ≈ 50 | ≈ 50 | | | clear |
| | 8:40 | ≈ 45 | ≈ 95 | | | clear |
| | 8:50 | ≈ 20 | ≈ 115 | | | clear. |
| | | | stop pumping | | | |
| | | | | | | [illegible] |
| | 9:04 | | | | | 52.62' WL |
| | | | | | | add $H_2O$ |
| | 9:55 | | | | | 45.65 |
| | 10:00 | | | | | 45.59 |
| | | | | | | |
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Apparent Transmissivity: T =

3 of 6

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Beylik
Job No.: 686
Project/Location:
Technician(s): SW/DMC
Borehole No.: MW-9
Date: Sept 17/92
Drill Type:
Drill Fluid:

Zone No.: 3
Interval Length:
Hole Size:
Interval Depth: 231
Elevation Head(wrt G.S.): ≈ 53 ft

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sep 17/92 3:15 Closed: Sept 17/92 5:20
Pump Type: Waterra

### Pumping History

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 17 | 3:25 | — | — | ≈ 1 gpm | | cloudy |
| | 4:00 | ≈ 35 | ≈ 35 | | | clear / to cloudy |
| | 4:25 | 0 | ≈ 53 | | | clear, [illegible] |
| | 4:52 | ≈ 17 | ≈ 72 | | | clear |
| | | | | | | end of pump |
| | | | | | | |
| | | | | | | P-PORT close |
| | | | | | | |
| | | | | | | WLT [illegible] |
| | | | | | | add H2O |
| | | | | | | new WLT 33.35' |
| | | | | | | 3 min — — |
| | | | | | | after remove tool |
| | | | | | | WLT = 35.37' |
| | | | | | | |
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Apparent Transmissivity: T =

4 3 6

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Baylik
Job No.: 696
Project/Location: EL toro
Technician(s): DMC
Borehole No.: MW-9
Date: Sept 17/92
Drill Type: —
Drill Fluid: Mud
Zone No.: 4
Interval Length:
Hole Size:
Interval Depth: 278'
Elevation Head (wrt G.S.): 253 ft
Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 17/92 12:45 Closed: Sept 17/92 3:00
Pump Type: Waterra

**Pumping History**

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 17 | 1:00 | — | — | ≈ 2 g/m | | cloudy |
| | 1:25 | 50 | 50 | —"— | | cloudy |
| | 1:48 | 50 | 100 | —"— | | slightly cloudy |
| | 2:12 | 50 | 150 | —"— | | |
| | 2:35 | 50 | 200 | " | | Slightly cloudy |
| | | | | | | |
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Apparent Transmissivity: T =

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: [illegible]
Project/Location: El [illegible]
Borehole No.: MW-7
Drill Type:
Drill Fluid: Mud

Job No.: [illegible]
Technician(s): [illegible]
Date: Sept [illegible]

Zone No.: 5
Hole Size:
Elevation Head (wrt G.S.): ≈ 57 [illegible]

Interval Length:
Interval Depth: [illegible]

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 16/91 5:00 Closed:
Pump Type: [illegible]

**Pumping History**

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 16 | 7:30 | — | — | [illegible] | | clear |
| | 8:30 | ≈ 25 | | | | slightly cloudy |
| | 8:45 | ≈ 30 | | | | more cloudy (milky colour) |
| | 8:55 | ≈ 35 | | | | light grey |
| | 9:30 | ≈ 45 | | | | grey, some fine sand |
| | 9:40 | ≈ 50 | ≈ 50 | | | transfer to 500 gal. tank |
| | 10:30 | ≈ 20 | | | | become light grey |
| | 10:50 | ≈ 25 | | | | |
| | 11:20 | ≈ 45 | ≈ 95 | | | transfer to 500 gal. tank |
| | 12:30 | ≈ 25 | ≈ 120 | | | cloudy |
| | | | | | | |
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**Apparent Transmissivity: T =**

Westbay Instruments Inc.

# PUMPING LOG
## MP System Pumping Ports

Client: Bechtel
Job No.: 686
Project/Location: EL TORO
Technician(s): DMc
Borehole No.: MW-9
Date:
Drill Type:
Drill Fluid: Mud
Zone No.: 6
Interval Length:
Hole Size:
Interval Depth: 467 ft
Elevation Head(wrt G.S.): ≈55 ft

Recommended Minimum Extraction:
Date/Time Pumping Port Opened: Sept 16 / 2:00 Closed: Sept 16/92 5:35
Pump Type: Waterra

**Pumping History**

| Date | Time | Volume Pumped | Cumulative Volume | Pumping Rate | ΔH | Comments |
|---|---|---|---|---|---|---|
| Sept 16 | 2:50 | — | — | ≈ 1/4 g/m | | clear |
| | 4:50 | ≈ 20g | 20g | ≈ 1/4 g/min | | clear |
| | 5:30 | ≈ 25g | 25g | ≈ 1/4 g/m | | clear |
| | | | | | | |
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**Apparent Transmissivity:** T =

MOSDAX Data Report
(c) WESTBAY INSTRUMENTS 1990-1992

Date Of Report: Fri Oct 23 14:38:16 1992
Company Name: Westbay Instruments Inc.
Project Name: EL TORO
Well ID: MW-9
Well Description:
Well Elevation: 0.00 (ft.)

Probe Information

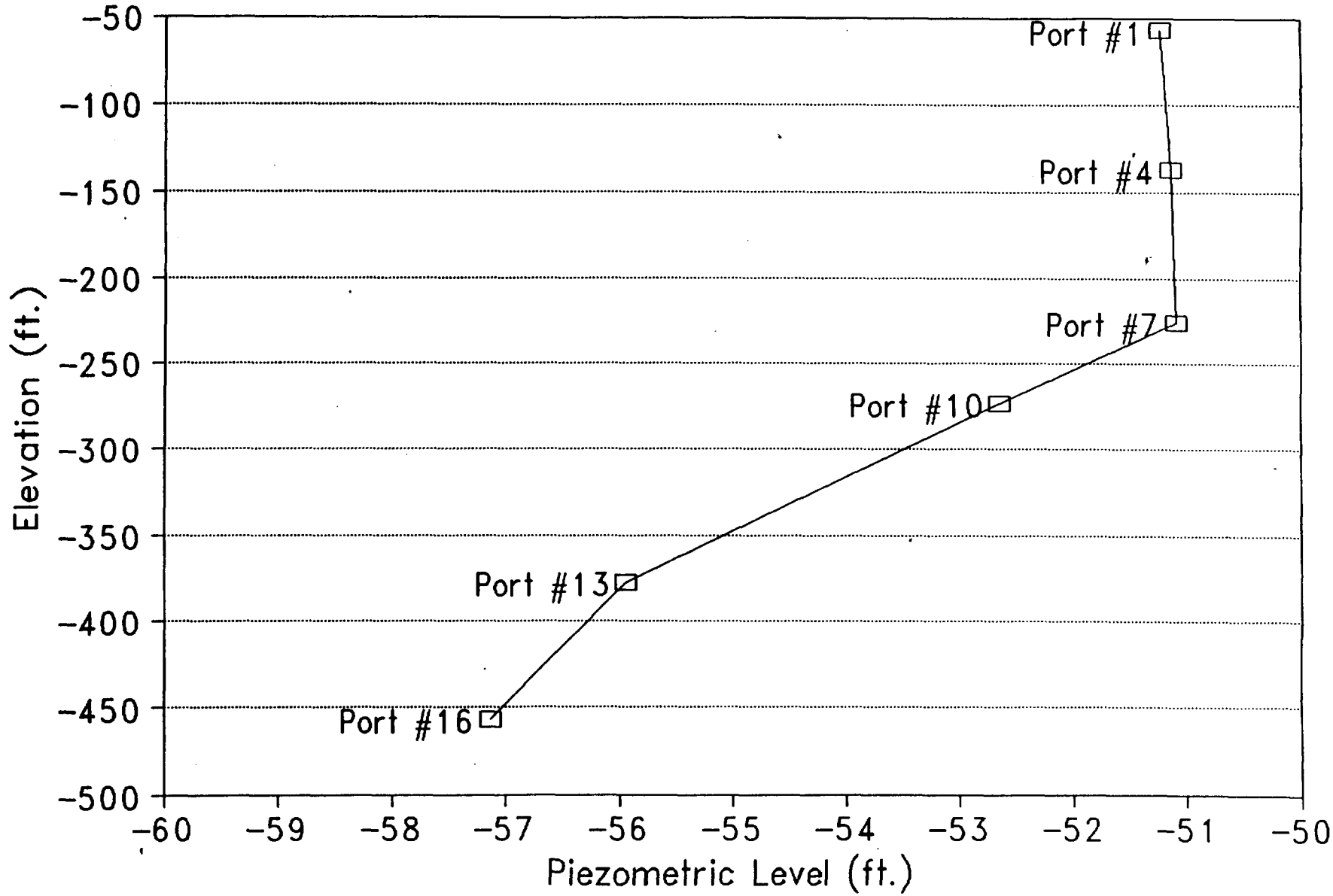
Logical Probe-1 - Serial #: 1031 - Description:

Port Information

| | | | | |
|---|---|---|---|---|
| Port #:00 - Description | ATMOSPHERIC - Depth | 0.0 | (ft. |
| Port #:01 - Description | PORT 1 - Depth | 57.0 | (ft. |
| Port #:02 - Description | Port #2 - Depth | 72.0 | (ft. |
| Port #:03 - Description | Port #3 - Depth | 122.0 | (ft. |
| Port #:04 - Description | Port #4 - Depth | 137.0 | (ft. |
| Port #:05 - Description | Port #5 - Depth | 152.0 | (ft. |
| Port #:06 - Description | Port #6 - Depth | 211.0 | (ft. |
| Port #:07 - Description | Port #7 - Depth | 226.0 | (ft. |
| Port #:08 - Description | Port #8 - Depth | 241.0 | (ft. |
| Port #:09 - Description | PORT #9 - Depth | 258.0 | (ft. |
| Port #:10 - Description | Port #10 - Depth | 273.0 | (ft. |
| Port #:11 - Description | Port #11 - Depth | 288.0 | (ft. |
| Port #:12 - Description | Port #12 - Depth | 363.0 | (ft. |
| Port #:13 - Description | Port #13 - Depth | 378.0 | (ft. |
| Port #:14 - Description | Port #14 - Depth | 393.0 | (ft. |
| Port #:15 - Description | Port #15 - Depth | 442.0 | (ft. |
| Port #:16 - Description | Port #16 - Depth | 457.0 | (ft. |
| Port #:17 - Description | Port #17 - Depth | 472.0 | (ft. |

| TIME DATE | PORT DESCRIPTION | PIEZ P (ft.) | DEPTH (ft.) |
|---|---|---|---|
| Thu Sep 10 16:09:23 1992 | Port #17 | -55.90 | 472.00 |
| Thu Sep 10 16:11:27 1992 | Port #16 | -57.13 | 457.00 |
| Thu Sep 10 16:13:24 1992 | Port #15 | -25.57 | 442.00 |
| Thu Sep 10 16:17:23 1992 | Port #14 | -54.65 | 393.00 |
| Thu Sep 10 16:19:33 1992 | Port #13 | -55.95 | 378.00 |
| Thu Sep 10 16:21:25 1992 | Port #12 | -55.73 | 363.00 |
| Thu Sep 10 16:24:16 1992 | Port #11 | -52.11 | 288.00 |
| Thu Sep 10 16:26:06 1992 | Port #10 | -52.64 | 273.00 |
| Thu Sep 10 16:27:29 1992 | Port #9 | -74.61 | 258.00 |
| Thu Sep 10 16:29:15 1992 | Port #8 | -52.07 | 241.00 |
| Thu Sep 10 16:31:02 1992 | Port #7 | -51.10 | 226.00 |
| Thu Sep 10 16:33:24 1992 | Port #6 | -59.74 | 211.00 |
| Thu Sep 10 16:37:05 1992 | Port #5 | -50.59 | 152.00 |
| Thu Sep 10 16:39:20 1992 | Port #4 | -51.15 | 137.00 |
| Thu Sep 10 16:41:03 1992 | Port #3 | -62.00 | 122.00 |
| Thu Sep 10 16:43:34 1992 | Port #2 | -50.53 | 72.00 |
| Thu Sep 10 16:45:26 1992 | Port #1 | -51.24 | 57.00 |

# PIEZOMETRIC PROFILE
file = A:\mw9\920910.wdf



# Appendix G3

## Completion Report
## MP System Monitoring Well MW-10

# COMPLETION REPORT

**EL TORO**
**MARINE CORPS AIR STATION**
(Project No. LAO31980.PA.50)

**ORANGE COUNTY,**
**CALIFORNIA**

**MP SYSTEM MONITORING WELL MW-10**

Prepared for

**Beylik Drilling, Inc.**
751 E. Lambert Road
La Habra, CA 90631

Prepared by

**Westbay Instruments**
January 27, 1993
WB686-92

Westbay Instruments Inc.

# CONTENTS:


| | | PAGE |
|---|---|---|
| 1 | INTRODUCTION | 1 |
| 2 | PREVIOUS ACTIVITIES | 1 |
| 3 | INSTALLATION | 1 |
| | 3.1 Final Preparation of Monitoring Well Design | 1 |
| | 3.2 Layout of MP System Casing Components | 2 |
| | 3.3 Lowering of MP System Casing Components | 2 |
| | 3.4 Inflation of MP System Casing Packers | 2 |
| | 3.5 Fluid Pressure Readings | 2 |
| 4 | QA TESTING | 2 |
| 5 | HYDRAULIC CONDUCTIVITY TESTING | 3 |
| 6 | PURGING | 3 |
| 7 | SAMPLING AND TRAINING | 3 |
| | TABLE 1- Summary of Hydraulic Conductivity Tests | |
| | FIGURE 1 - Piezometric Profile | |

* * * * * * * * * * * *

APPENDIX A

## 1. INTRODUCTION

This report documents the technical services provided by Westbay Instruments under Beylik Drilling Inc. Purchase Order No. 04-2355. The Westbay MP System for groundwater monitoring was installed in monitoring well MW-10 (Project No. LA031980. PA. 50) in Orange Country, California. The monitoring well design, which specified the depth and number of monitoring zones, was provided by Beylik and confirmed by CH2M Hill.

## 2. PREVIOUS ACTIVITIES

Prior to installation of the MP System, the monitoring well had been drilled by conventional mud rotary techniques. The monitoring zone intervals were chosen by CH2MHill based on the geological and geophysical information available. A nominal 4 inch I.D. mild steel casing with stainless steel screens at the intended monitoring levels was lowered into the well. Each monitoring zone consists of a 10 ft long 4 inch I.D. stainless steel wire-wrapped screen with a 15 ft long section of stainless steel pipe above and a 10 ft long section of stainless steel pipe below the screen.

Layers of backfill materials were placed outside the steel pipe by Beylik. Clean sand was used as the filter pack opposite the screen sections. It was intended that the filter pack extend approximately 5 ft above and 5 ft below the ends of the screen section. Approximately 3 ft of fine sand was placed above and below the filter pack material. The backfill seal material was a 1:1 mix of sand and bentonite chips. All backfill materials were placed through a tremmie pipe. Following backfill placement, the monitoring zones were developed by swabbing and pumping at each screen interval.

## 3. INSTALLATION

Westbay representatives Mr. David McEachern and Mr. Dave Mercer were on site for the installation of MW-10 from January 7 to 13, 1993.

### 3.1 Final Preparation Of Monitoring Well Design

Drawings were prepared by Westbay showing an arrangement of MP casing components compatible with the steel casing and screens installed in the drillhole. One MP packer was positioned in the 10 ft long stainless steel pipe section below each well screen. The two MP packers positioned above each monitoring zone in the 15 ft section of blank stainless steel casing provide a "Short QA Zone" intended for confirmation of hydraulic separation between adjacent monitoring zones.

MP measurement ports and pumping ports were positioned within each of the well screen sections. Additional measurement ports were positioned between the monitoring zones in "QA Zones" for QA testing purposes.

## 3.2 Layout of MP System Casing Components

The MP casing lengths and packers were laid out near the collar of the drillhole. The MP components were arranged in the order in which they were to be lowered according to the drawings. Each casing length was numbered sequentially from the bottom of the monitoring well, with the appropriate MP coupling attached to the casing top. The protective plastic shipping covers were removed from the casing components. Magnetic location collars were clamped to the MP casing 0.3 ft above those measurement ports located in a monitoring zone. Magnetic collars were not placed at the QA zone measurement ports.

## 3.3 Lowering of MP System Components

As each component was removed from the rack, the casing type, coupling type, and sequential numbers were checked against the Casing Installation Log. The component was then attached to the string being lowered into the drillhole.

Each joint was hydraulically tested by applying a nominal internal pressure of 100 psi for approximately one minute. Test results are recorded on the the Casing Installation Log. Geotextile filter sleeves were placed over the measurement ports in each QA zone. Geotextile filters were not used on measurement ports in the monitoring zones. This procedure continued until all the MP System components had been placed in the drillhole.

The MP casing string was positioned in the well with the top coupling nominally at ground surface. All depths on the installation logs are in feet below ground surface. A copy of the Casing Installation Log is included in Appendix A.

## 3.4 Inflation of MP System Casing Packers

The MP casing packers were inflated with water provided by Beylik Drilling. The gauge pressure and volume of water pumped were recorded at intervals and plotted for each packer. MP Packer Inflation Records for each of the packers installed are provided in Appendix A. All of the packers inflated normally.

## 3.5 Fluid Pressure Readings

Fluid pressures were measured at each measurement port following the installation. The results are plotted on Figure 1. The data sheets are attached in Appendix A.

# 4. QA TESTING

A series of QA tests were carried out at each of the blank pipe "QA" zones in the wells to observe the performance of the MP System packers. The QA zones were tested by first adjusting the water level in the MP casing to provide an excess head of 10 to 30 ft. Each QA zone was independently vented to the interior of the MP casing and any change

in water level was noted. A stable water level during the test shows that the steel casing and MP packers in the QA zones are sealed.

The QA tests show that each "Short QA Zone" between monitoring zones was sealing, thereby confirming hydraulic separation between each monitoring zone. The data from these tests is available.

## 5. HYDRAULIC CONDUCTIVITY TESTING

A variable head hydraulic conductivity test was conducted at each monitoring zone prior to purging. Preliminary values for hydraulic conductivity were calculated using the method described by Hvorslev (1951). The hydraulic conductivity test field results are summarized in Table 1. The data are included together with graphical calculation sheets in Appendix A. All data, calculations and plots are provided for information only and before use should be checked by an experienced hydrogeologist.

## 6. PURGING

Development of individual steel well screens had been carried out by Beylik Drilling prior to the MP installation. In addition, each monitoring zone was purged through the MP pumping port coupling. The purge criteria was to pump each zone until stable parameters were obtained by CH2M Hill . Purging was conducted from January 11 to 13, 1993. The pumping logs for each monitoring zone are provided in Appendix A.

## 7. SAMPLING

No sampling was performed during the installation activities. It is expected that the sampling will be performed by Beylik in January 1993.

686dmc3.sam

TABLE 1

Summary of Hydraulic Conductivity Test Results MW-10

| Test Zone # | Depth (ft) | K(est)*(cm/sec) |
|---|---|---|
| A | (222) | 5 E-4 |
| B | (432) | 6 E-5 |
| C | (567) | 5 E-5 |
| D | (755) | 9 E-5 |
| E | (889) | 6 E-5 |
| F | (1020) | 2 E-4 |

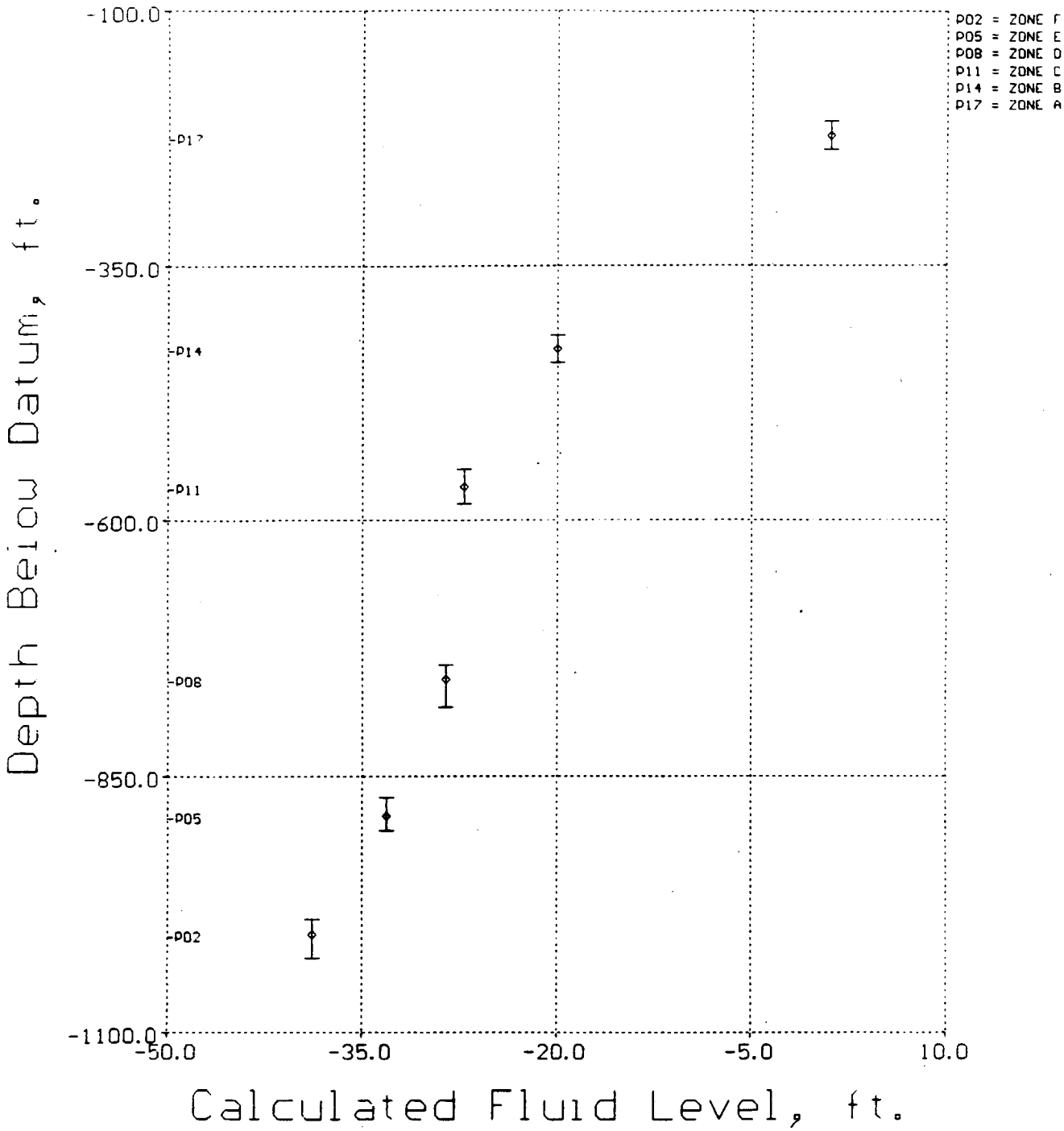
* Estimated hydraulic conductivity after Hvorslev (1951)

appen.

# PIEZOMETRIC PROFILE WELL: MW 10

Client: Beylik Drilling Inc.
Profile Date: Sat Jan 09 15:41:56 1993
Comment: Sampling Zones

Site: MCAS El Toro
Description:
Datum: Ground Surface




FILE: PMW10
Plot By: DGM
Checked By: DLC
Project: WB686

DIRECT-P
Date: JAN 25/93
Date: JAN 26/93
FIGURE: 1

Westbay Instruments Inc.

# APPENDIX A: MW-10, EL TORO


| | |
|---|---|
| Report of Well, El Toro, MW-10 | 1 page |
| Legend of Well, El Toro, MW-10 | 1 page |
| Casing Installation Log | 11 pages |
| MP Packer Inflation Records | 19 pages |
| Hydraulic Conductivity Test Records | 6 pages |
| Plots of Normalized Head Ratio Vs. Time | 3 pages |
| Pumping Logs | 6 pages |
| MOSDAX Data Report | 1 page |

# Westbay Instruments Inc.

507 E. Third Steet, North Vancouver, B.C., Canada V7L 1G4
Phone: [604] 984-4215 / [In U.S.] [800] 663-8770 / Fax [604] 984-3538

## Report of Well

# El Toro MW10

FOR: Beylik Drilling Inc.
DESCRIPTION: 4-inch steel cased well
DESIGNED BY: DGM/WB686
WELL INFORMATION:

DEPTH: 1050.00 ft. TOP OF MP: 0.00 ft. ELEVATION: 0.00 ft.
WELL USING: Nominal Lengths

## COMPONENTS

| DESCRIPTION | PART NUMBER | QUANTITY |
|---|---|---|
| MP38 END CAP | 0223 | 001 |
| MP38 CASING 2 FT. | 0225F02 | 010 |
| MP38 CASING 10 FT. | 0225F10 | 078 |
| MP38 PACKER STIFFENED | 0237F05 | 018 |
| MP38 CASING 5 FT. | 0225F05 | 030 |
| MP38 REGULAR COUPLING | 0221 | 112 |
| MP38 MEASUREMENT PORT | 0222 | 018 |
| MP38 PUMPING PORT | 0224 | 006 |

Legend of Well

# El Toro MW10

## MP 38 Casing

END CAP

CASING 2 FT.

CASING 10 FT.

PACKER W/STFNR

CASING 5 FT.

MAG COLLAR

## Couplings

MEASURE PORT

PUMP PORT

## Backfill

GROUT

BENTONITE SAND

SAND FINE

SAND COARSE

## Steel Well Casing

MILD STEEL PIPE

STAINLESS PIPE

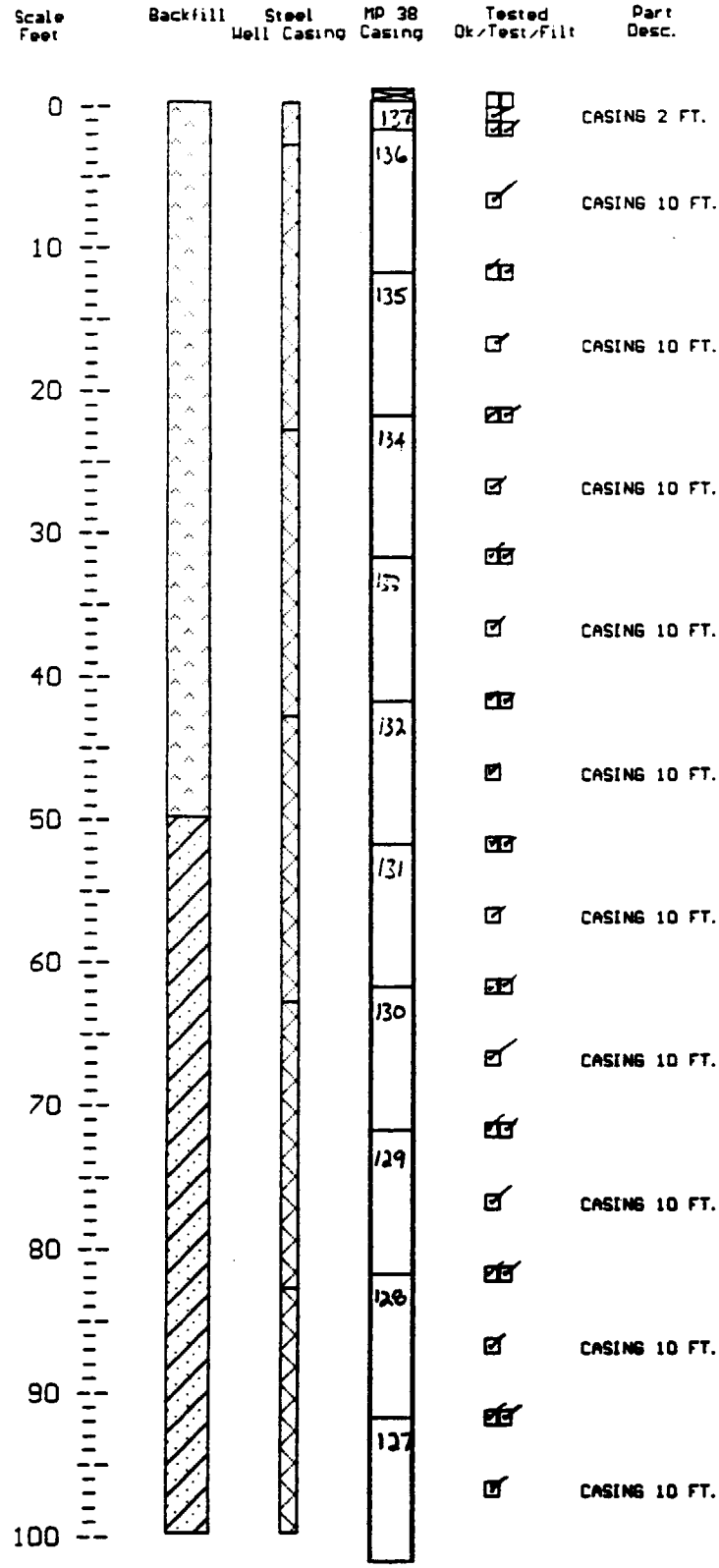
SCREEN

FOR: Beylik Drilling Inc.
DESCRIPTION: 4-inch steel cased well
DESIGNED BY: DGM/WB686
WELL INFORMATION:

NOTES:

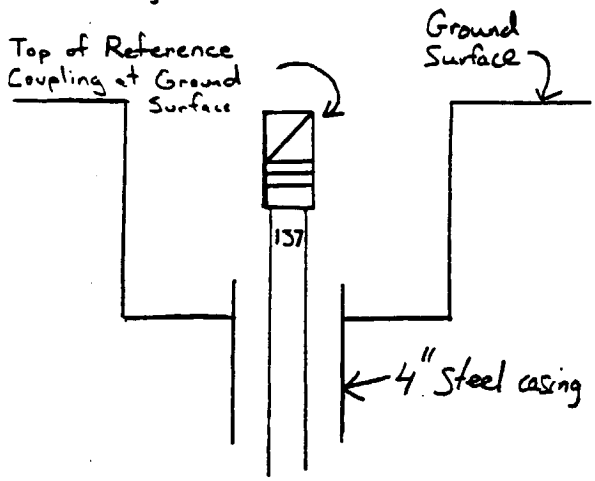
El Toro MW10

# Casing Installation Log




Casing string positioned so that the top of a coupling placed on top of 2 ft casing #137 will be at ground surface.

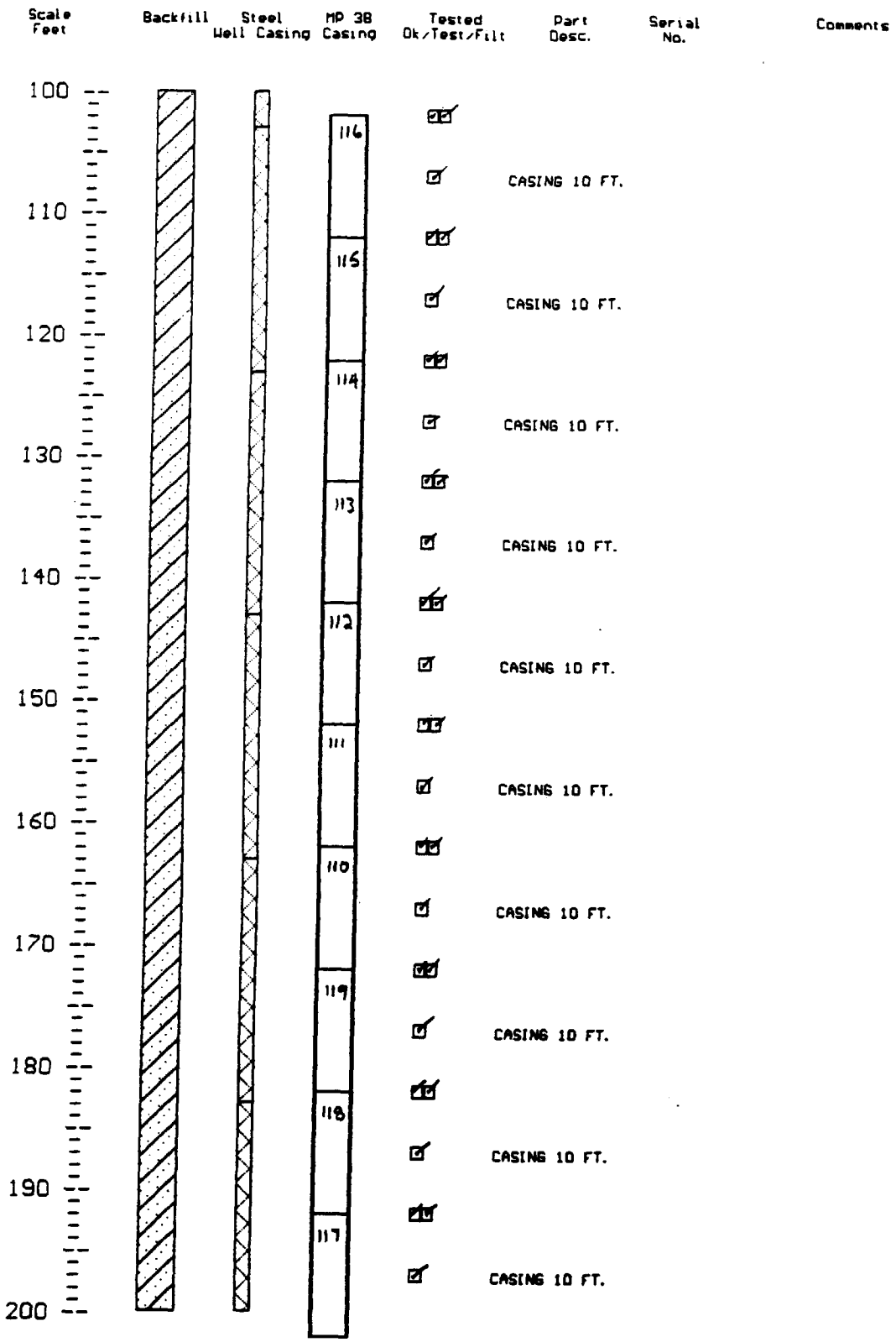
Geotextile filters placed over all measurement ports in QA zones



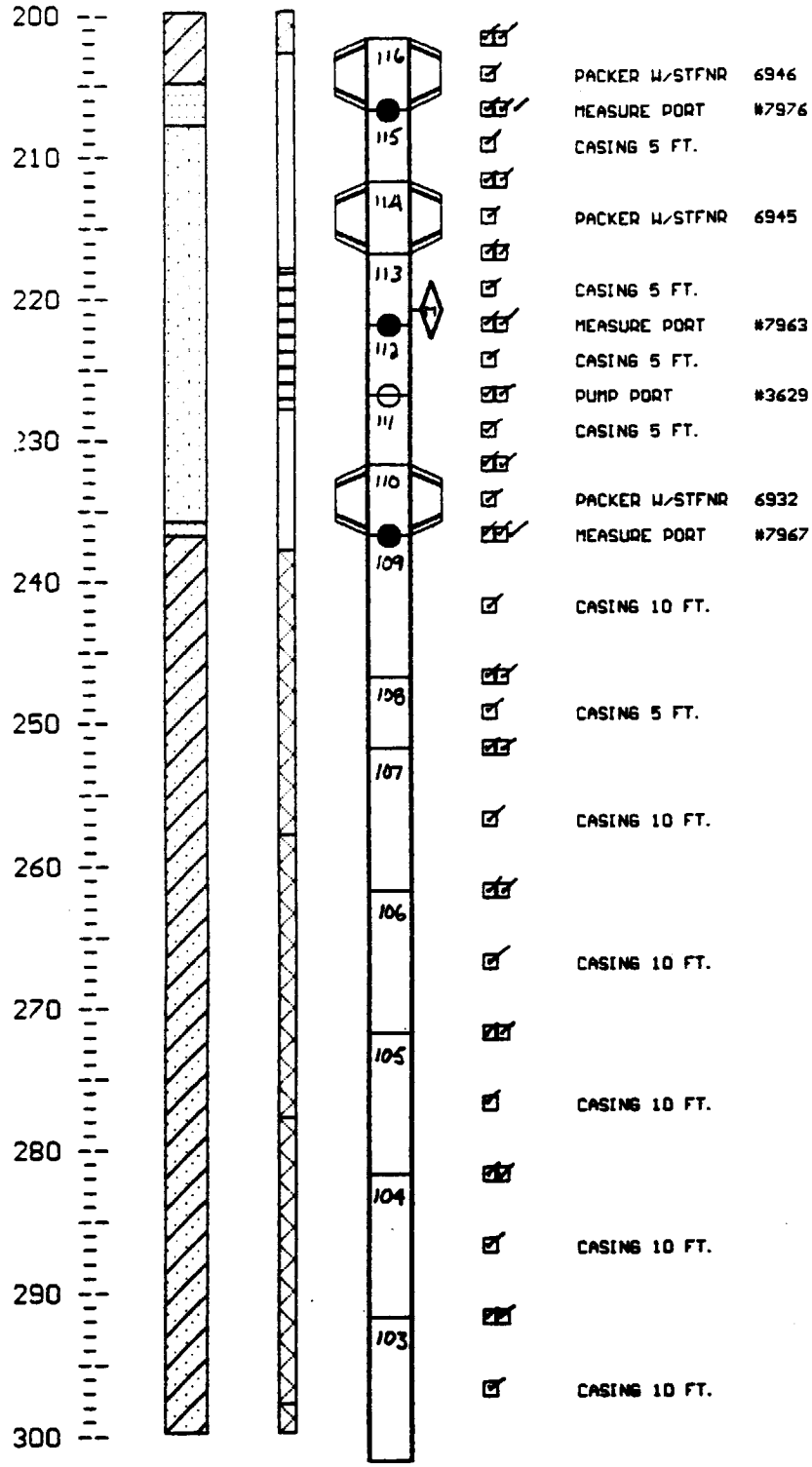

Approximate Vault Dimensions: 12-inch diameter round vault, 1 foot deep. 4-inch steel casing sticks up approximately 3-inches above vault floor.

Reference coupling removed and an MP38 end cap placed on top of casing section #137 while well not in use.

El Toro MW10

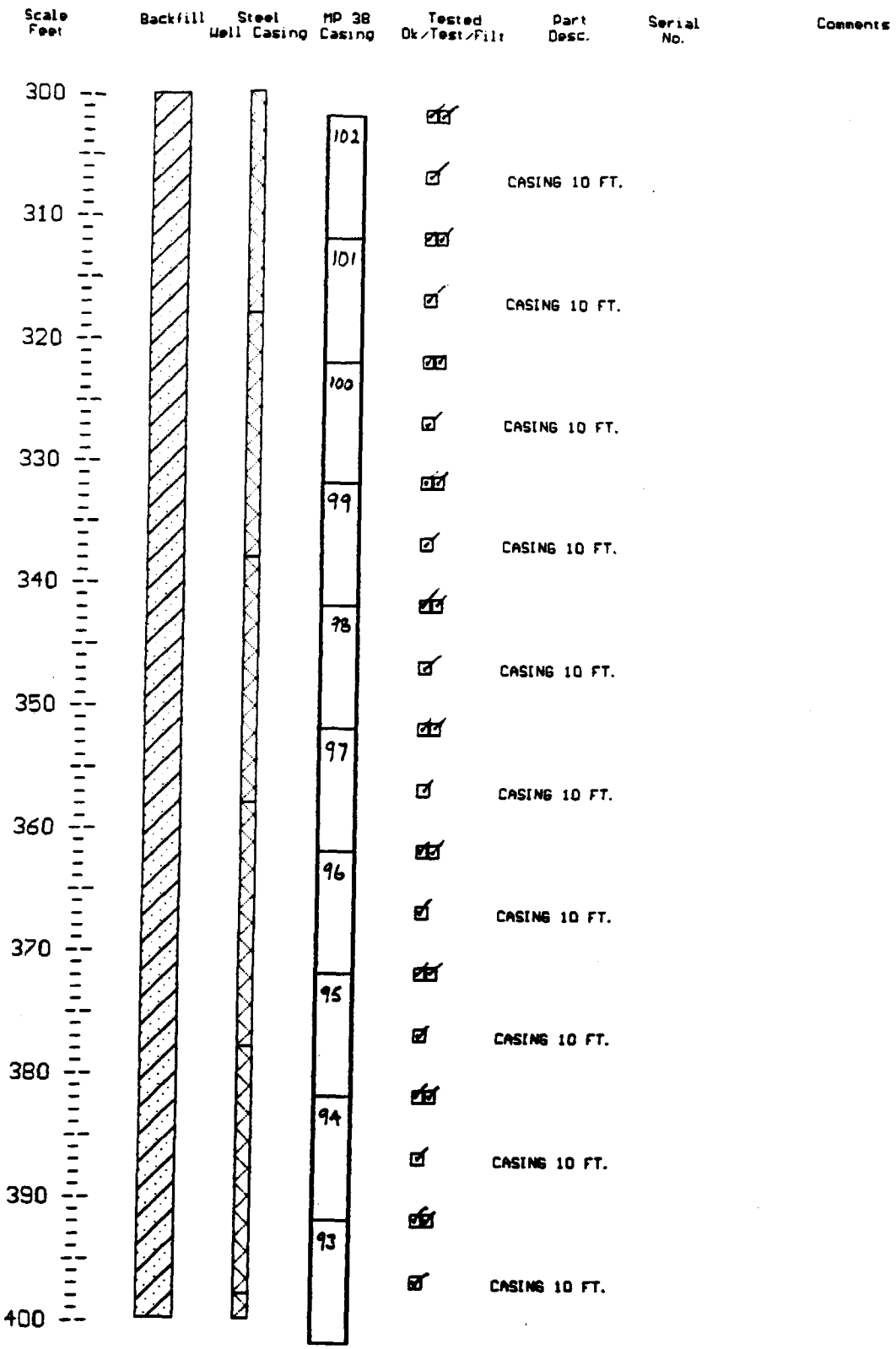

Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
100
110
120
130
140
150
160
170
180
190
200
116
115
114
113
112
111
110
119
118
117
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.

El Toro MW10

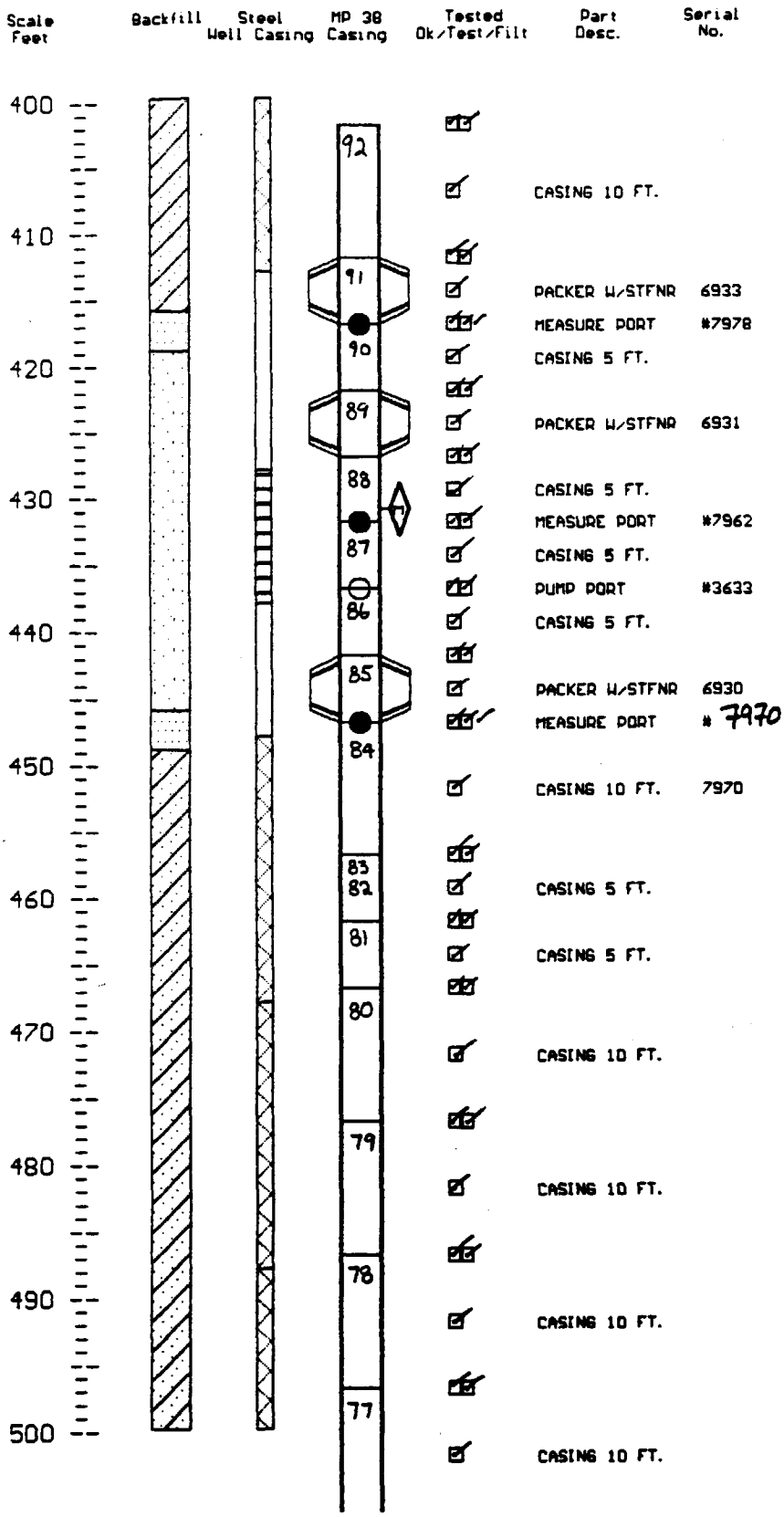



zone A

El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
300
310
320
330
340
350
360
370
380
390
400
102
101
100
99
98
97
96
95
94
93
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.

El Toro MW10

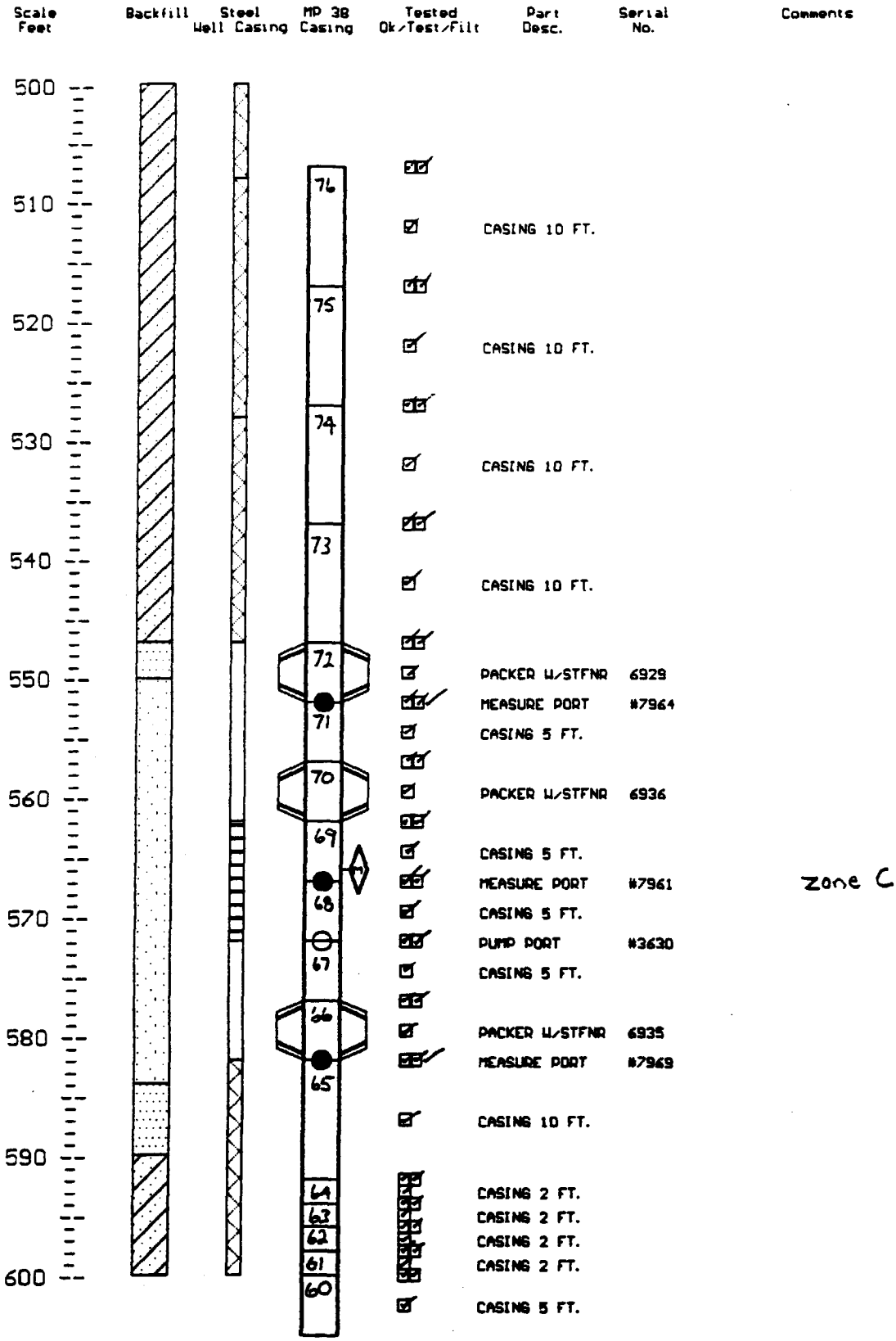



Comments

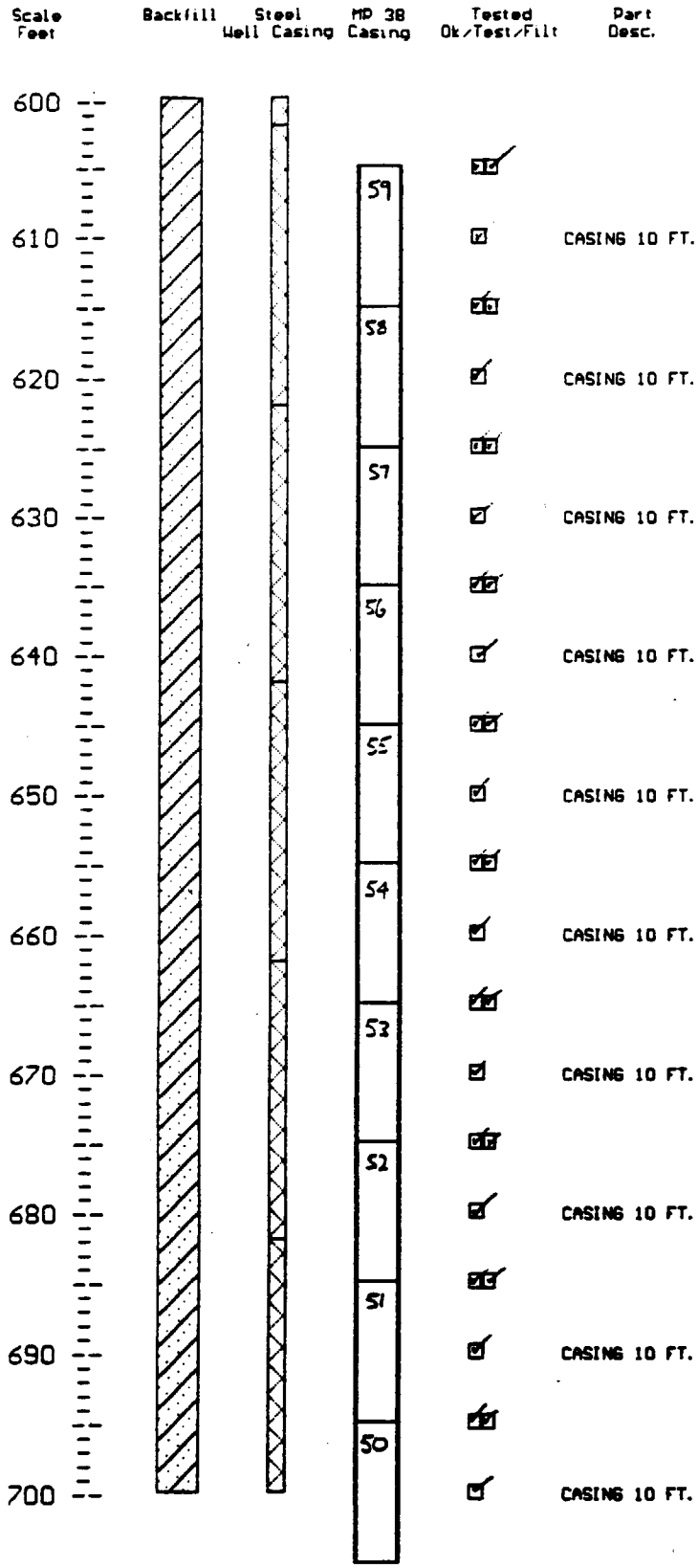
zone B

Jan 8, 1993
5 ft casing section substituted for two 2ft sections to position all components below this point one foot lower the the original design. Design change approved by Sylvia Ross of CH2M Hill.
DGM

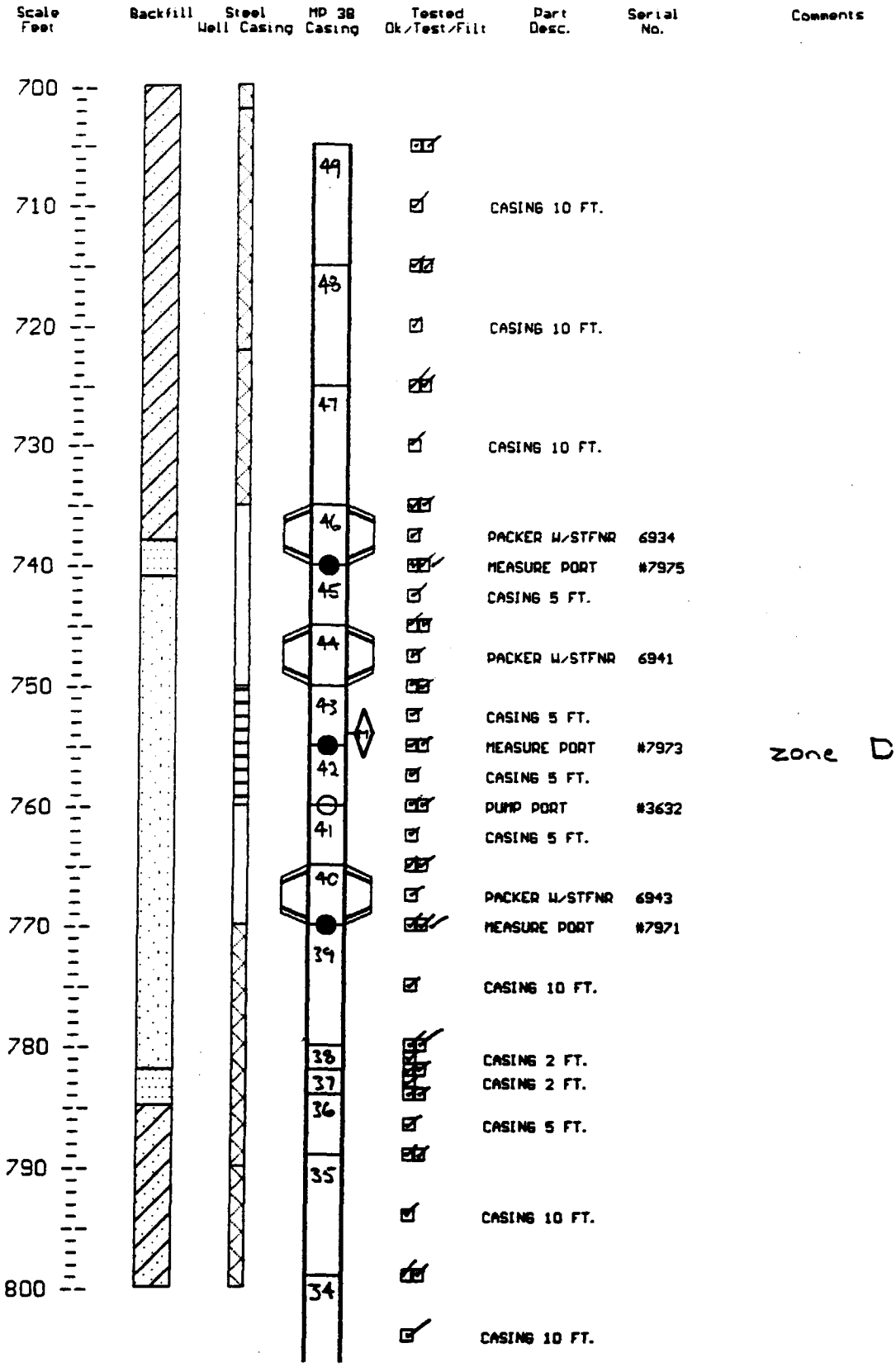
El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 3B Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
500
510
520
530
540
550
560
570
580
590
600
76
75
74
73
72
71
70
69
68
67
66
65
64
63
62
61
60
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
PACKER W/STFNR 6929
MEASURE PORT #7964
CASING 5 FT.
PACKER W/STFNR 6936
CASING 5 FT.
MEASURE PORT #7961
CASING 5 FT.
PUMP PORT #3630
CASING 5 FT.
PACKER W/STFNR 6935
MEASURE PORT #7969
CASING 10 FT.
CASING 2 FT.
CASING 2 FT.
CASING 2 FT.
CASING 2 FT.
CASING 5 FT.
Zone C

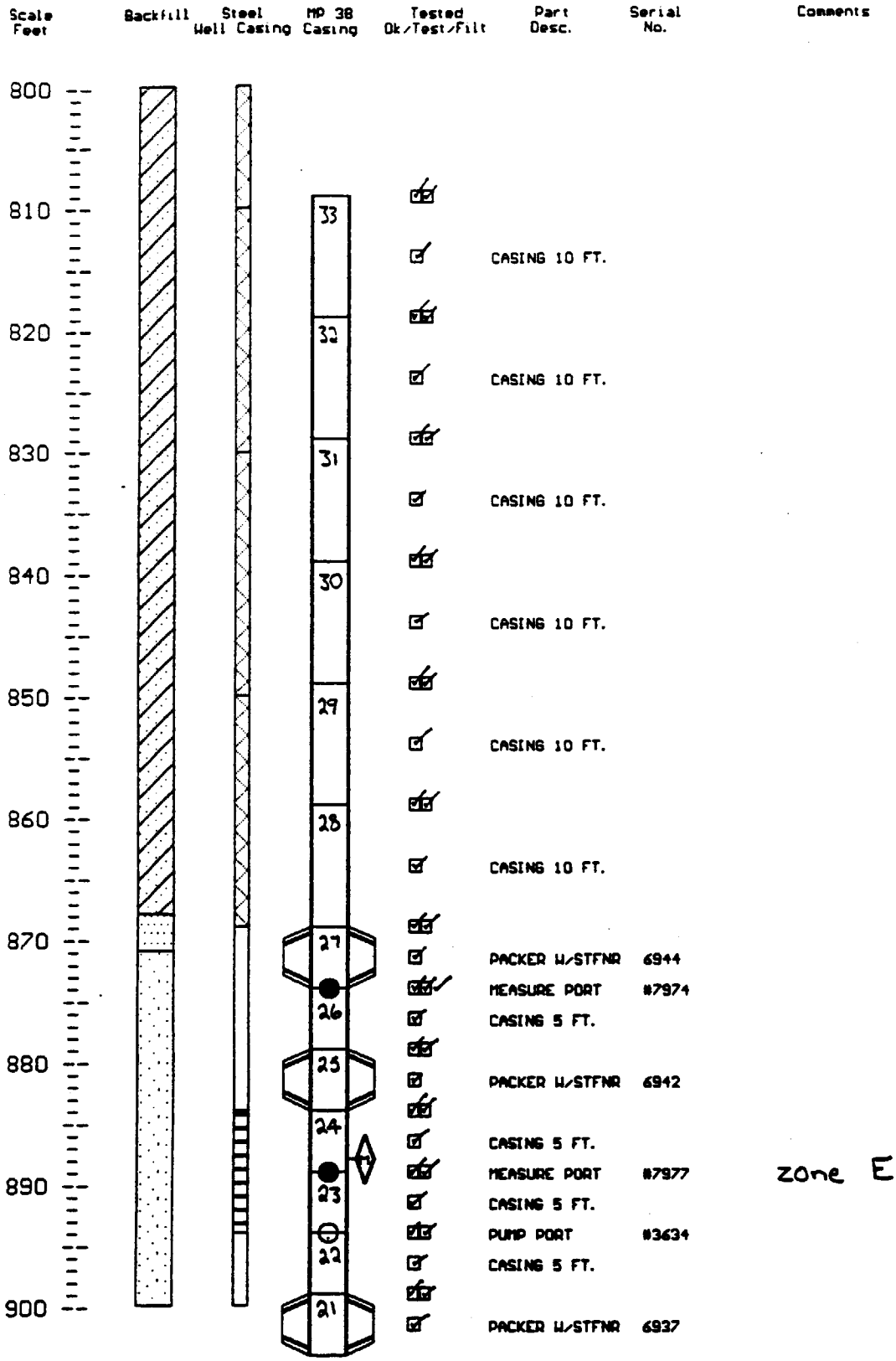
El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
600
610
620
630
640
650
660
670
680
690
700
59
58
57
56
55
54
53
52
51
50
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.

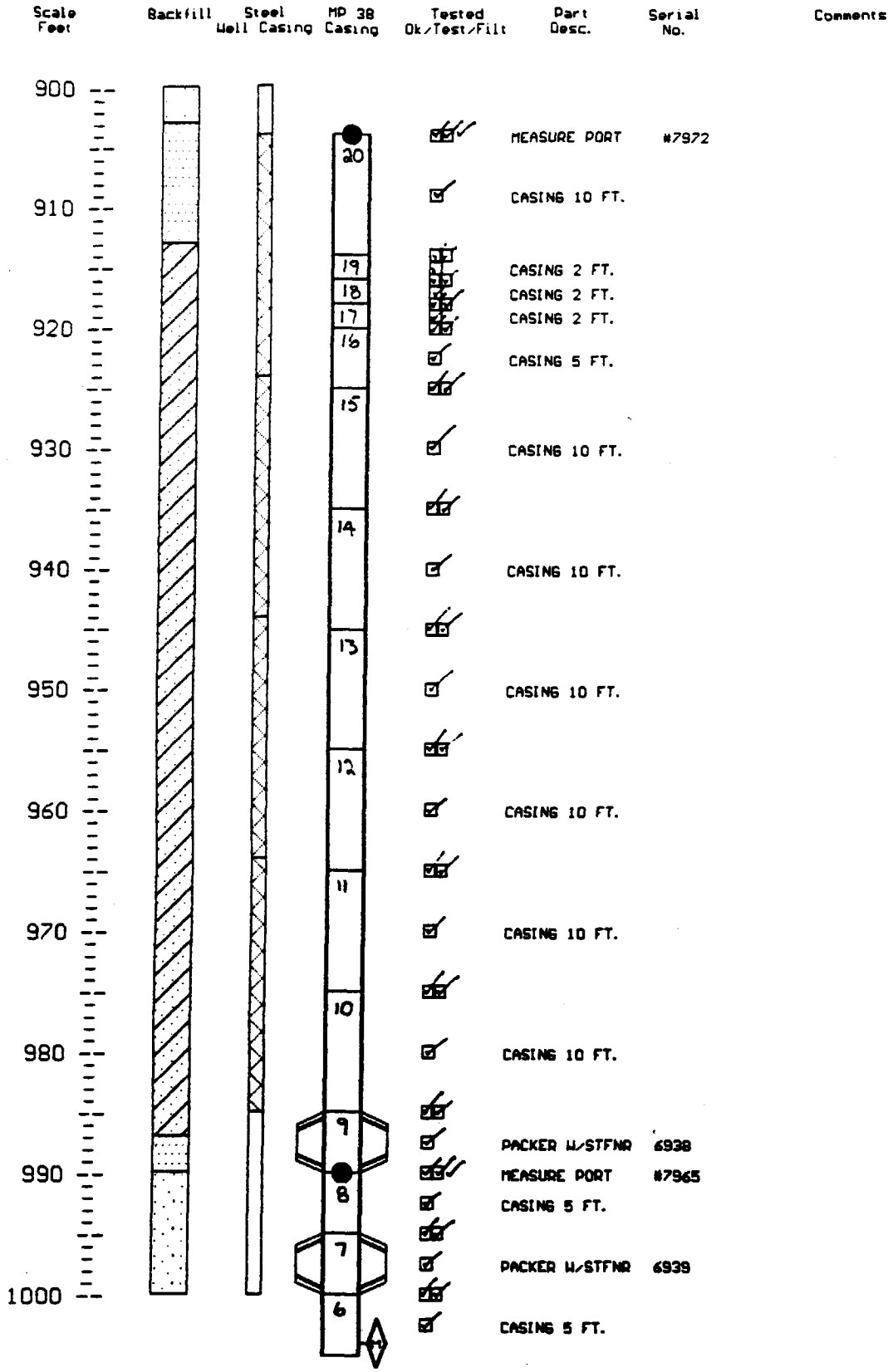
# El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
700
710
720
730
740
750
760
770
780
790
800
49
48
47
46
45
44
43
42
41
40
39
38
37
36
35
34
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
PACKER W/STFNR 6934
MEASURE PORT #7975
CASING 5 FT.
PACKER W/STFNR 6941
CASING 5 FT.
MEASURE PORT #7973
CASING 5 FT.
PUMP PORT #3632
CASING 5 FT.
PACKER W/STFNR 6943
MEASURE PORT #7971
CASING 10 FT.
CASING 2 FT.
CASING 2 FT.
CASING 5 FT.
CASING 10 FT.
CASING 10 FT.
zone D

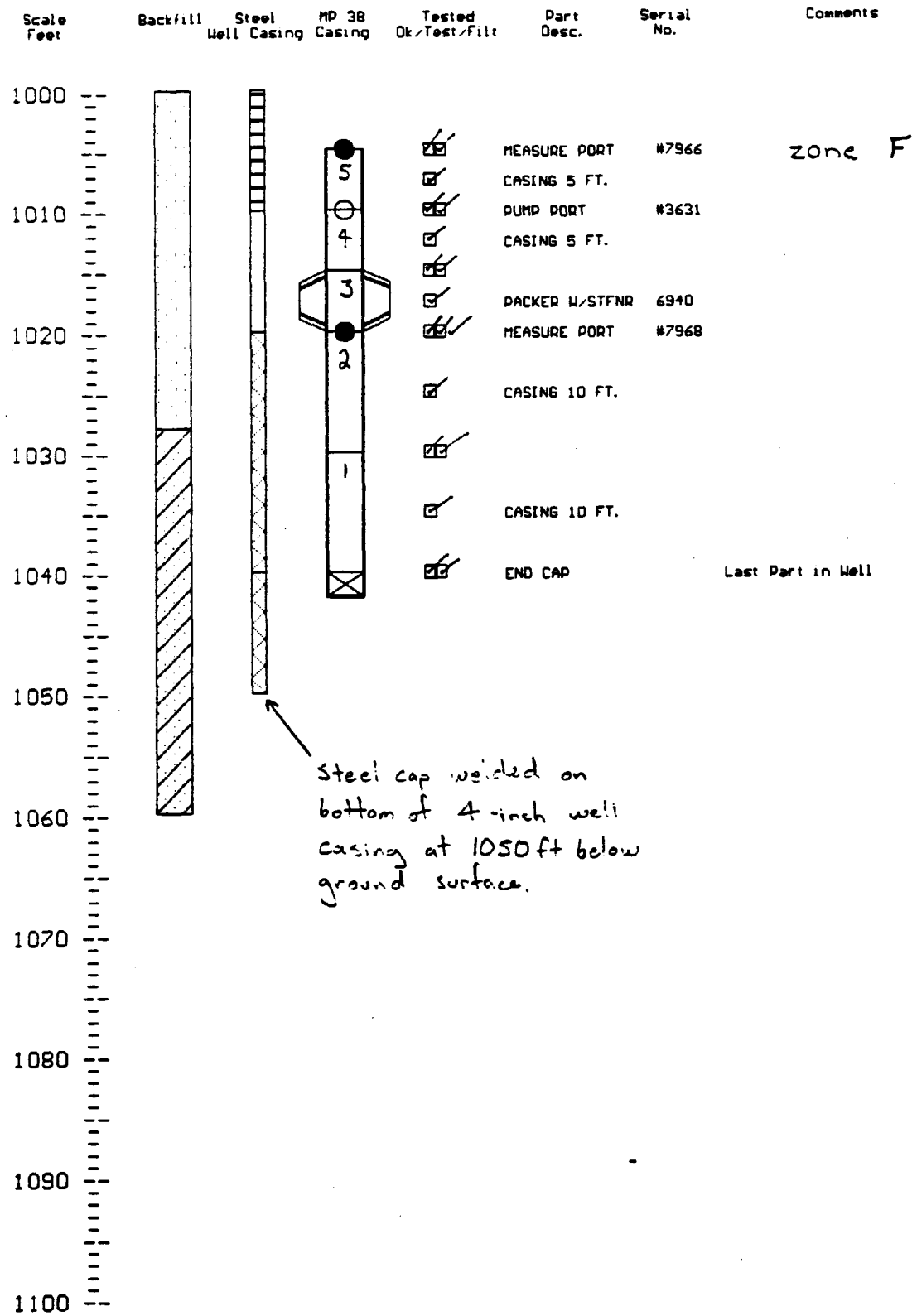
# El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
800
810
820
830
840
850
860
870
880
890
900
33
32
31
30
29
28
27
26
25
24
23
22
21
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
PACKER W/STFNR 6944
MEASURE PORT #7974
CASING 5 FT.
PACKER W/STFNR 6942
CASING 5 FT.
MEASURE PORT #7977
CASING 5 FT.
PUMP PORT #3634
CASING 5 FT.
PACKER W/STFNR 6937
zone E

# El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
900
910
920
930
940
950
960
970
980
990
1000
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
MEASURE PORT #7972
CASING 10 FT.
CASING 2 FT.
CASING 2 FT.
CASING 2 FT.
CASING 5 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
CASING 10 FT.
PACKER W/STFNR 6938
MEASURE PORT #7965
CASING 5 FT.
PACKER W/STFNR 6939
CASING 5 FT.

El Toro MW10


Scale Feet
Backfill
Steel Well Casing
MP 38 Casing
Tested Ok/Test/Filt
Part Desc.
Serial No.
Comments
1000
1010
1020
1030
1040
1050
1060
1070
1080
1090
1100
5
4
3
2
1
MEASURE PORT #7966
zone F
CASING 5 FT.
PUMP PORT #3631
CASING 5 FT.
PACKER W/STFNR 6940
MEASURE PORT #7968
CASING 10 FT.
CASING 10 FT.
END CAP
Last Part in Well
Steel cap welded on bottom of 4-inch well casing at 1050 ft below ground surface.

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMC

Location: EL Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 2 1993

Packer No.: Blank wall

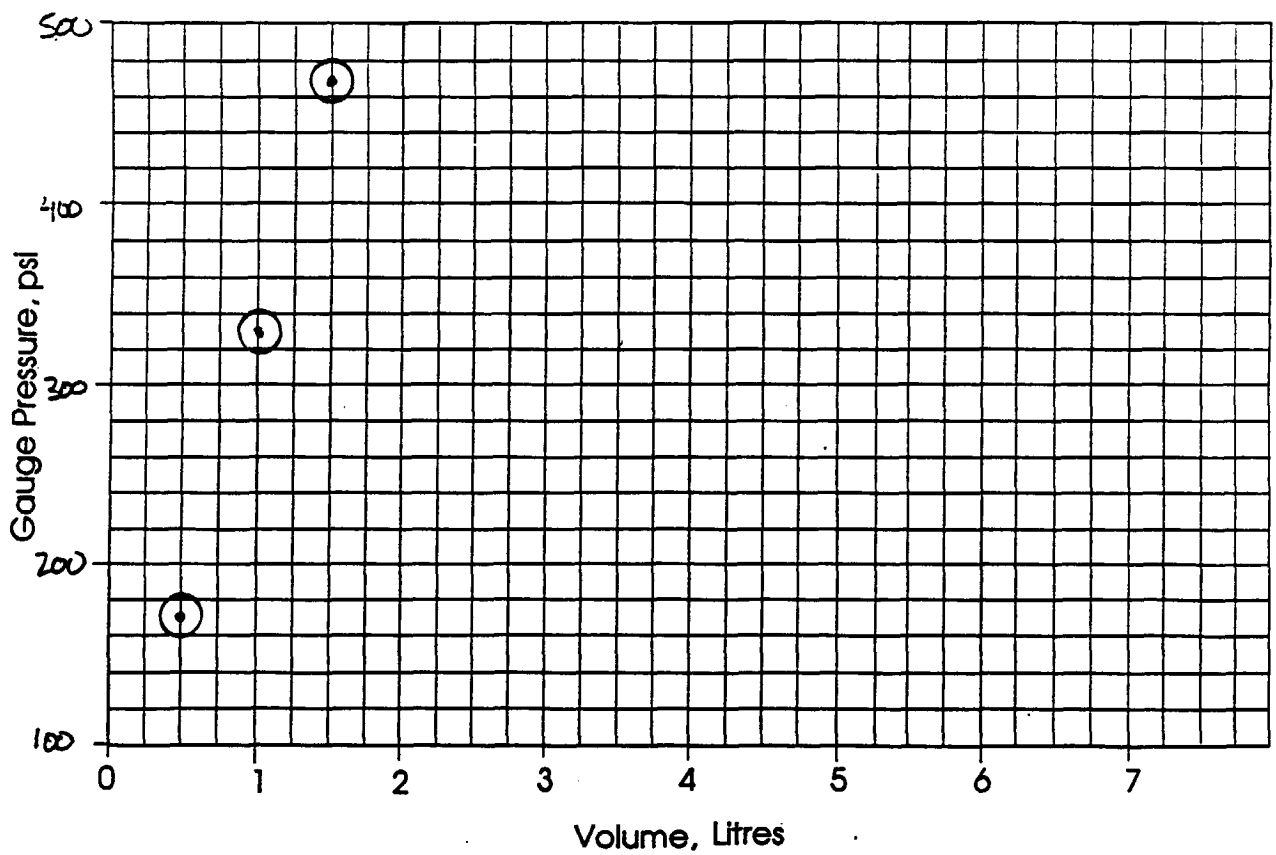
Depth( m / ft ) B.O.H.

Inflation Tool Setting ( psi ) 300 PSI

Depth to Standing Water ( ~~m~~ / ft ) 6.0
- open hole

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 1 ½ | 3 1 | 9 1½ | 4 2 | ½ | | | | | |
| Pressure ( PSI ) | 170 | 330 | 470 | 570 | ∅ | | | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMC

Location: El Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/93

Packer No.: 2

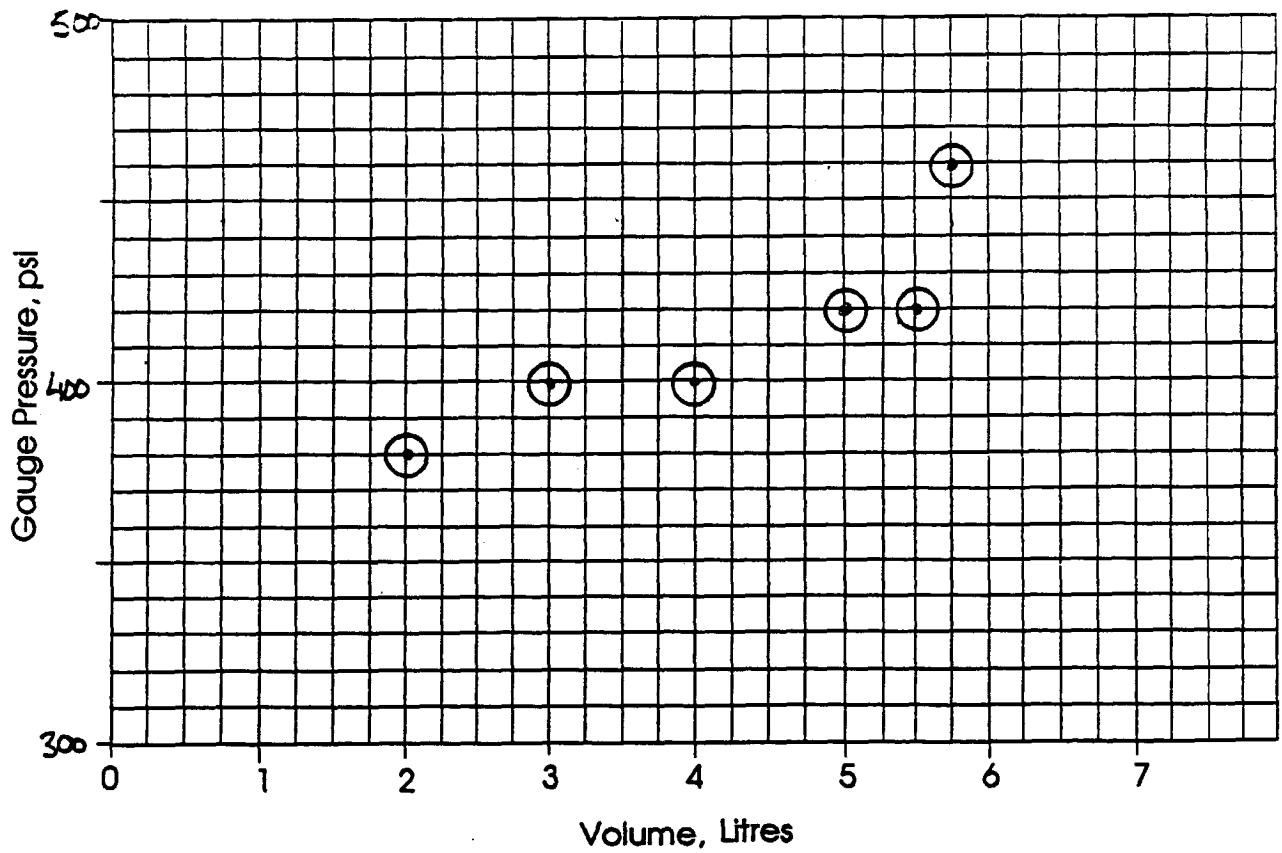
Depth( ~~m~~ / ft ) 1020

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( ~~m~~ / ft ) 6.2
- open hole

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 11<br>2 | 10<br>3 | 8<br>4 | 2<br>5 | 4<br>5½ | 7<br>6 | 3<br>5 | | | |
| Pressure ( PSI ) | 380 | 400 | 400 | 420 | 420 | 460 | Ø | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMc

Location: EL Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/93

Packer No.: 6

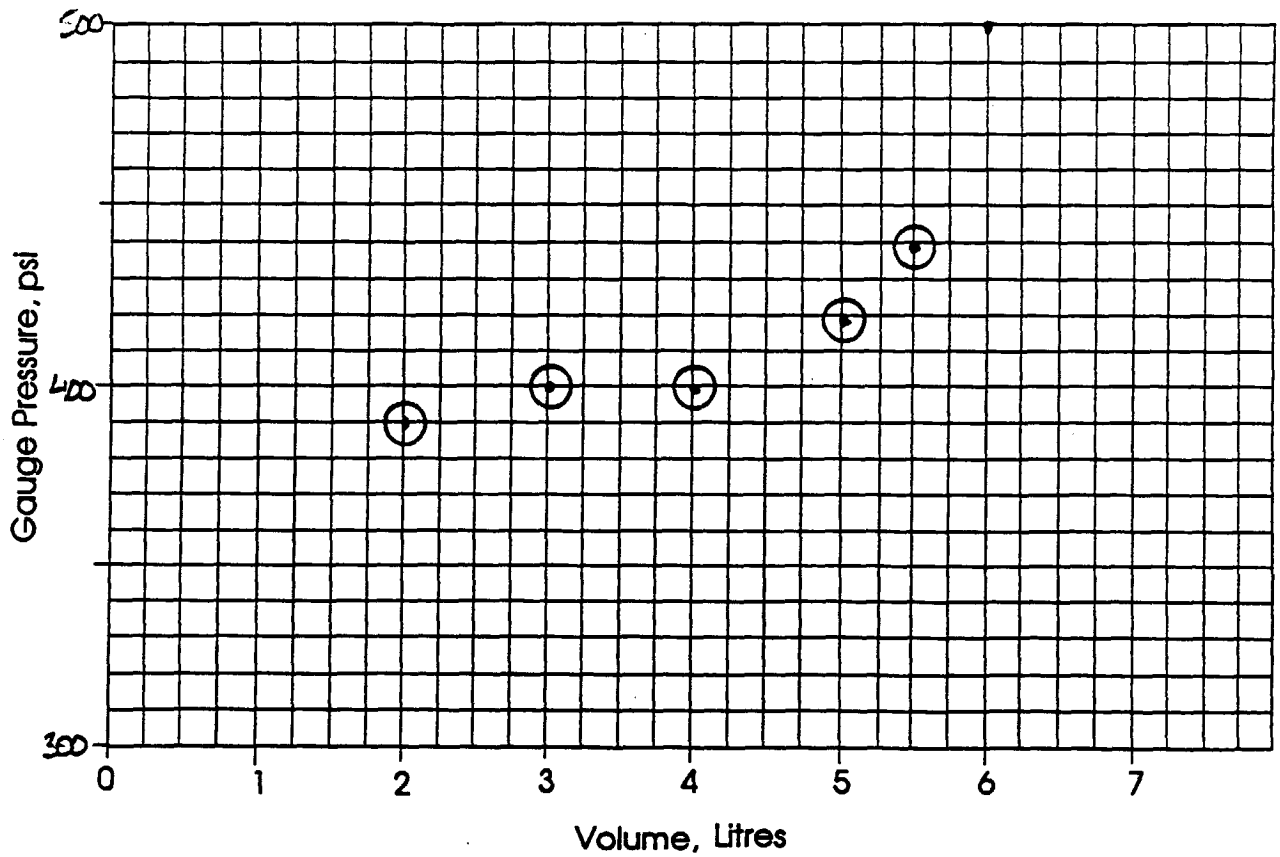
Depth( m / ft ) 1000

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( m / ft ) 6.0
- open hole

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 1 2 | 9 3 | 5 4 | 1 5 | 5 5½ | 10 6 | 4¾ | | | |
| Pressure ( PSI ) | 390 | 400 | 410 | 420 | 440 | 500 | ∅ | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMc

Location: El Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/03

Packer No.: 8

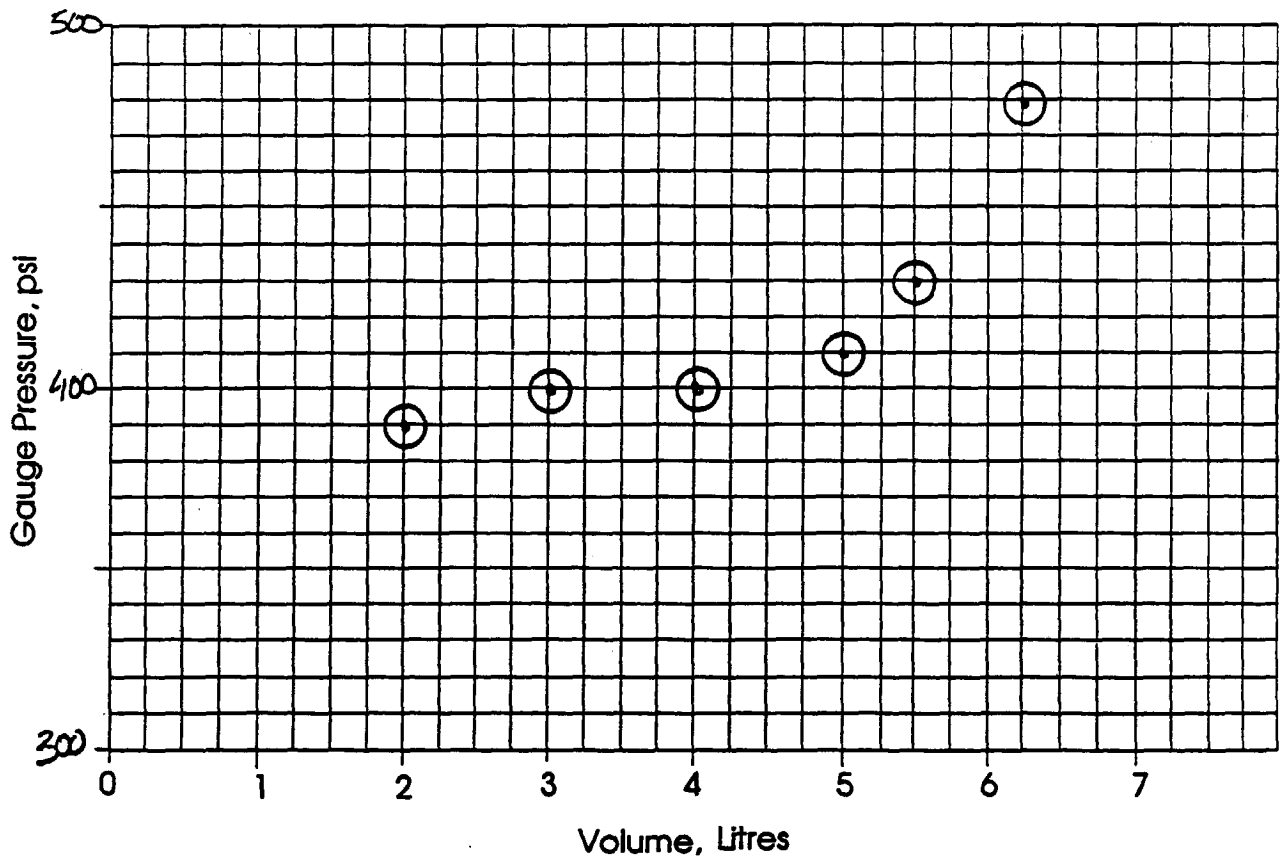
Depth( ~~m~~ / ft ) 990

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( ~~m~~ / ft ) [illegible]
- open hole

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 5 2 | 1 3 | 9 4 | 3 5 | 6 5½ | 11 6 | 4 3½ | | | |
| Pressure ( PSI ) | 390 | 400 | 400 | 410 | 430 | 480 | Ø | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/00

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMc

Location: El Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/93

Packer No.: 20

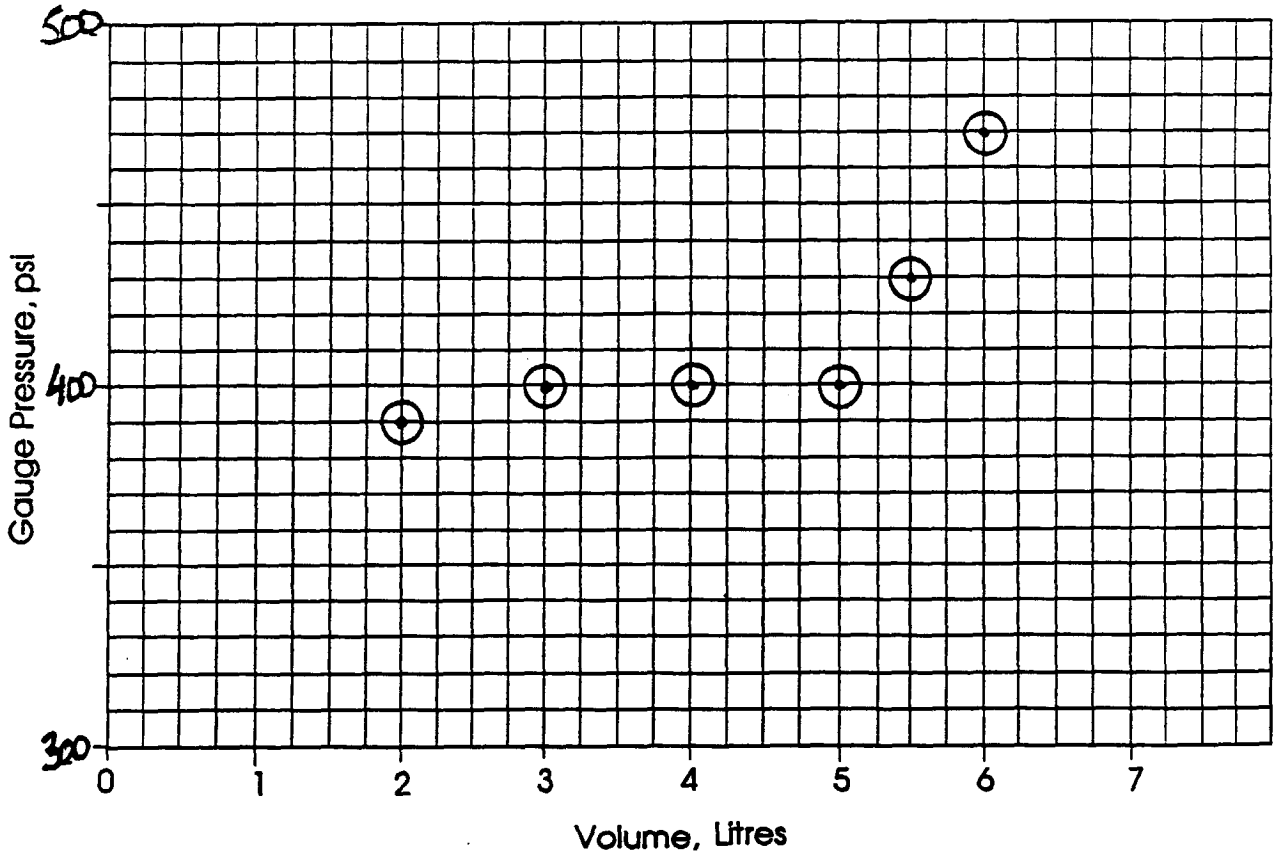
Depth( ~~m~~ / ft ) 904

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( ~~m~~ / ft ) 6.0
- open hole

| Volume (Litres) | 2 (11) | 3 (10) | 4 (5) | 5 (10) | 5½ (6) | 6 (9) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 390 | 400 | 400 | 400 | 430 | 470 | Ø | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMc

Location: EL Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/93

Packer No.: 24

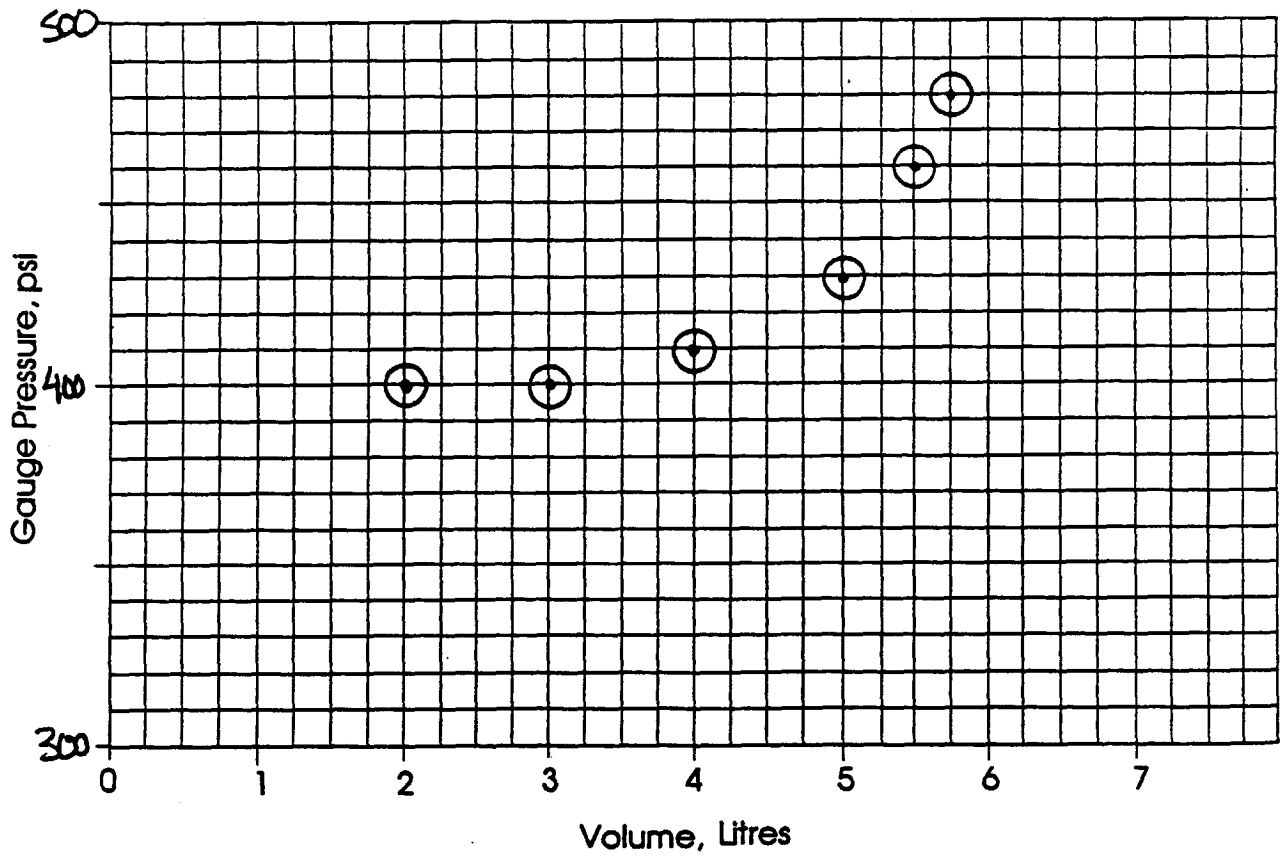
Depth( m / ft ) 884

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( m / ft ) 6.0
- open hole

| Volume (Litres) | 2 | 3 | 4 | 5 | 5 1/2 | 5 3/4 | 5 1/2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 400 | 400 | 410 | 430 | 460 | 480 | Ø | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: DMc

Location: El Toro MCAS

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/93

Packer No.: 26

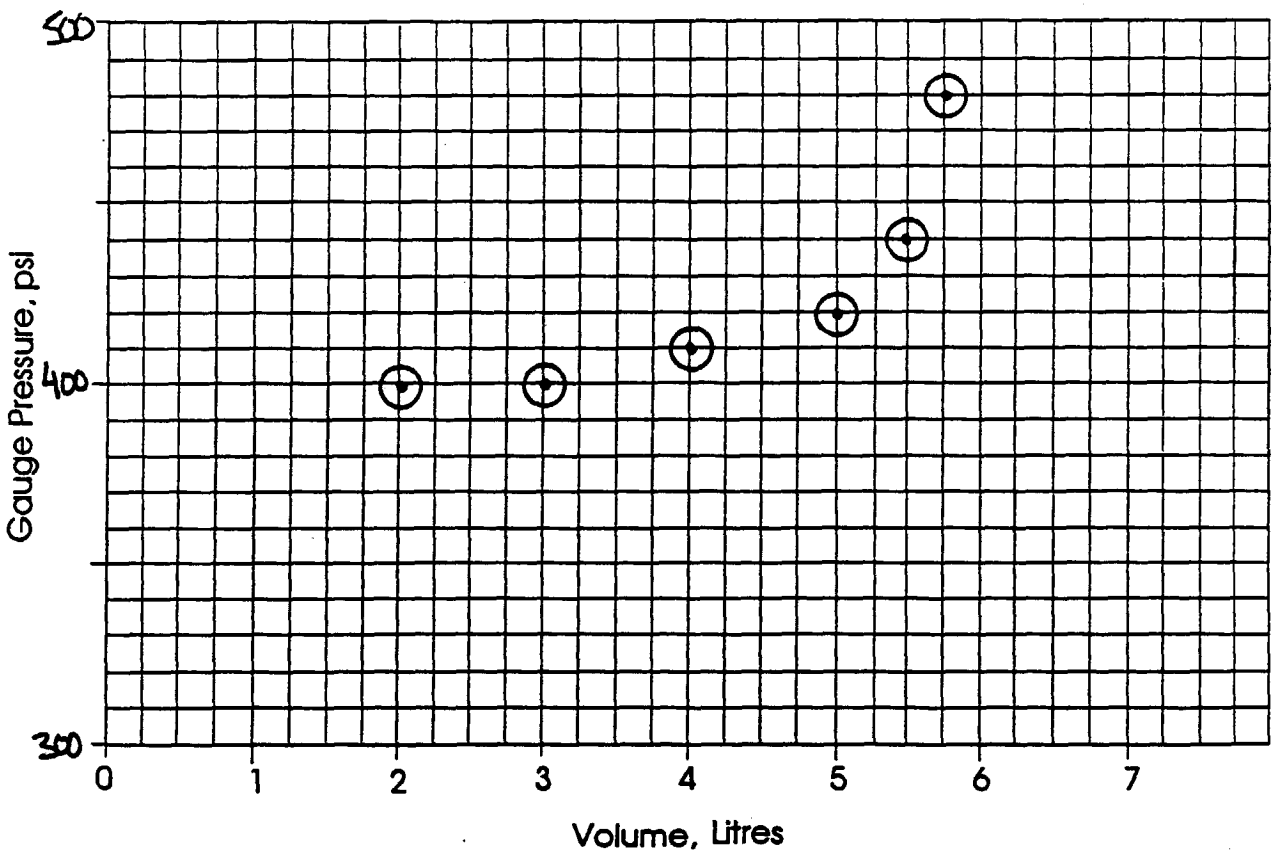
Depth( ~~m~~ / ft ) 874

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( ~~m~~ / ft ) 6.0
- open hole

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 2 (1) | 3 (12) | 4 (6) | 5 (12) | 5½ (4) | 5¾ (9) | 4½ | | | |
| Pressure ( PSI ) | 400 | 400 | 410 | 420 | 440 | 480 | ∅ | | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Location: El Toro MCAS

Hole No.: MW-10

Packer No.: 39

Inflation Tool Setting ( psi ) 320

Completed By: DMc

Date Completed: —

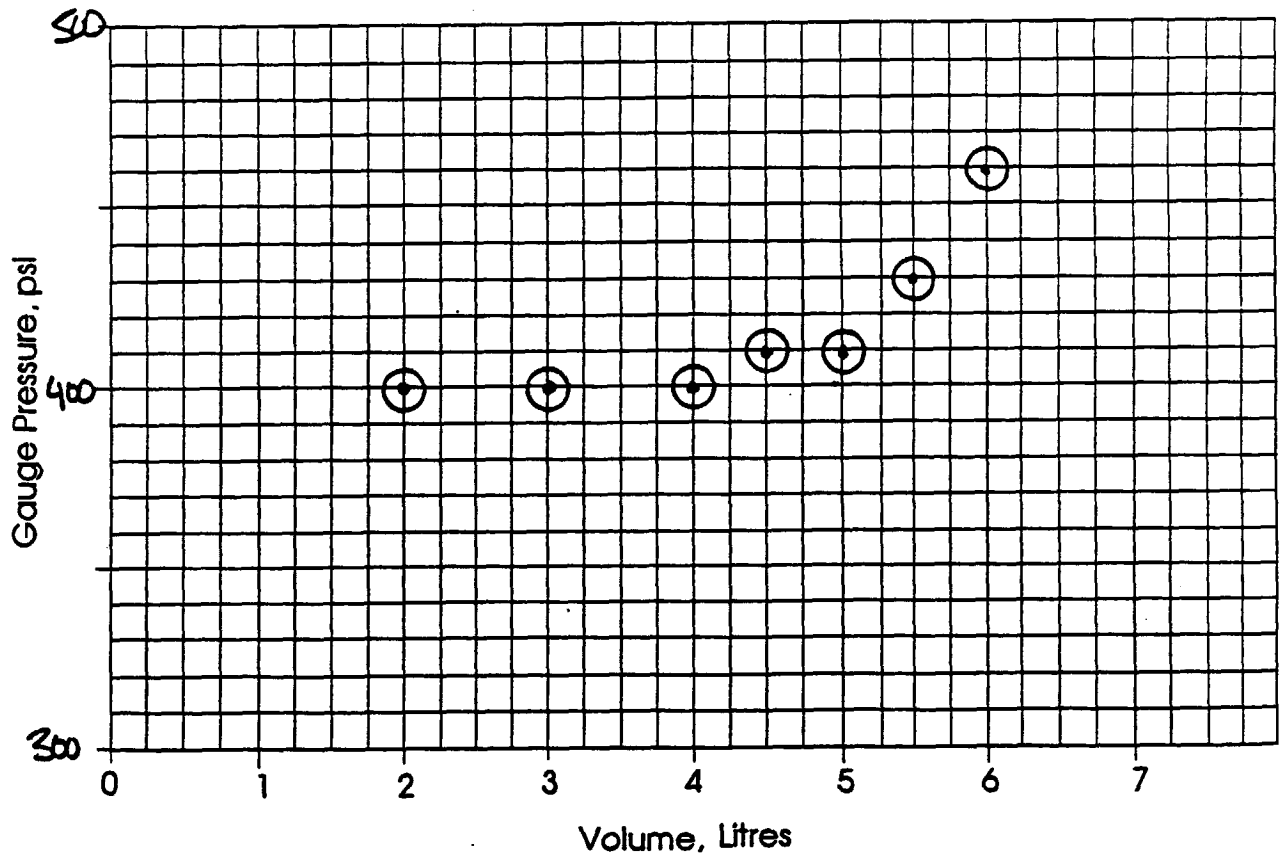
Date Inflated: Jan 9/93

Depth( m / ft ) 770

Depth to Standing Water ( m / ft ) 6.0
- open hole

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Volume (Litres) | 2 (10) | 3 (5) | 4 (12) | 4½ (4) | 5 (8) | 5½ (12) | 6 (3) | 4 3/4 | | |
| Pressure ( PSI ) | 400 | 400 | 400 | 410 | 410 | 450 | 460 | ø | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90

Westbay

# MP Packer Inflation Record

Project: Beylik

Completed By: LMC

Location: El Toro

Date Completed: —

Hole No.: MW-10

Date Inflated: Jan 9/92

Packer No.: 43

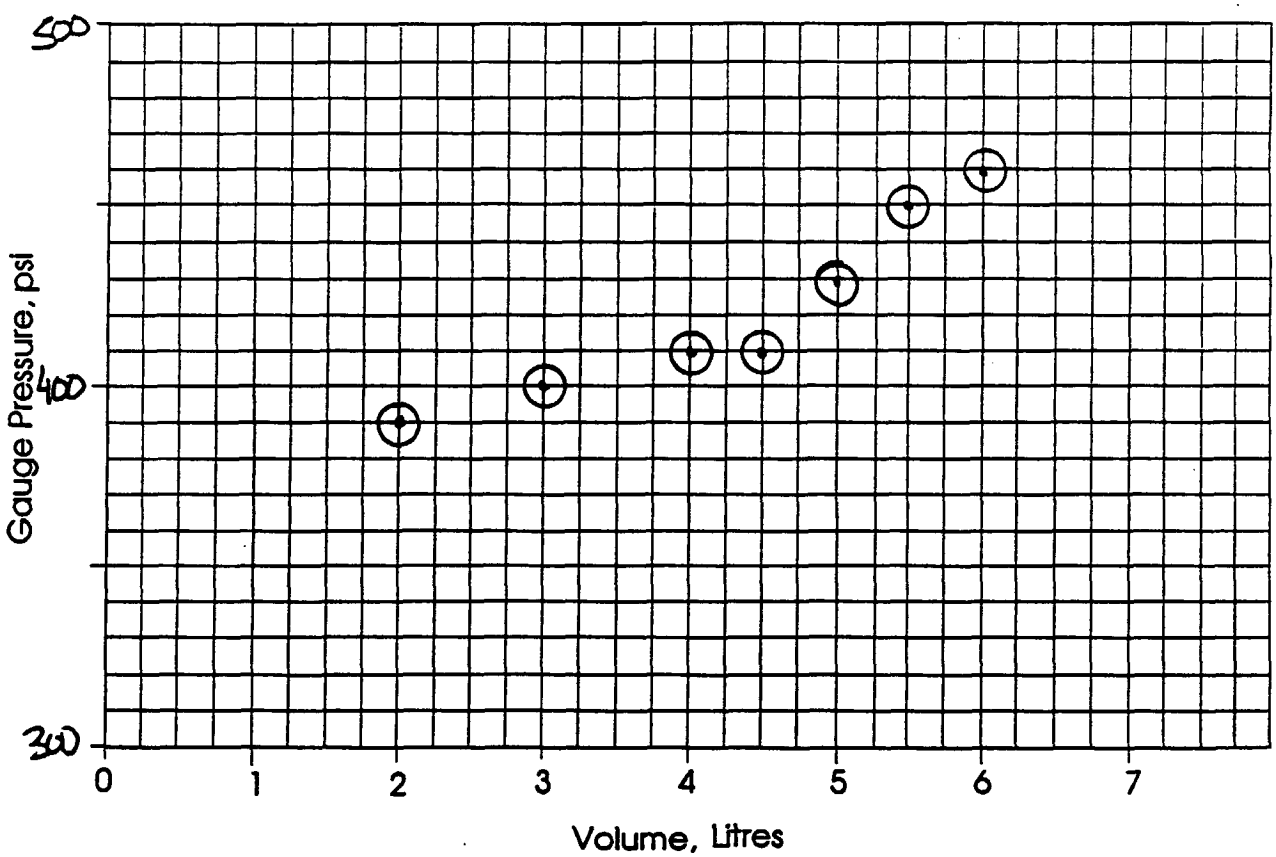
Depth( ~~m~~ / ft ) 750

Inflation Tool Setting ( psi ) 320

Depth to Standing Water ( ~~m~~ / ft ) 6.0
- open hole

| Volume (Litres) | 2 (12) | 3 | 4 (6) | 4½ (12) | 5 (8) | 5½ (1) | 5¾ (4) | 4¾ | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Pressure ( PSI ) | 390 | 400 | 410 | 410 | 430 | 450 | 460 | ∅ | | |

Plot of Gauge Pressure ( PSI ) vs. Volume ( L )




30/10/90