BUILDING A BETTER WORLD

GROUNDWATER MODELING REPORT

GENERAL ELECTRIC PUERTO RICO INVESTMENT, INC.
PATILLAS, PUERTO RICO

Prepared For:

General Electric Energy

Prepared By:

MWH Americas, Inc.

September 2011

GROUNDWATER MODELING REPORT
GENERAL ELECTRIC PUERTO RICO INVESTMENT, INC.
PATILLAS, PUERTO RICO

FOR

General Electric Energy

Schenectady, New York

United States

Prepared By _____ September 21, 2011

Bradly Toth
Senior Scientist
MWH Americas, Inc.

Date

Reviewed By _____ September 21, 2011

Kim Kesler-Arnold
Principal Project Manager
MWH Americas, Inc

Date

EXECUTIVE SUMMARY

This Groundwater Modeling Report describes the activities performed to estimate groundwater quality downgradient of the General Electric (GE) Puerto Rico Investment facility (Site) located in Patillas, Puerto Rico. These activities were performed to predict the extent of volatile organic compounds (VOCs) in groundwater migrating from a former French sump located onsite. The French Sump was constructed at the facility in 1977 and was used for waste disposal until 1980. It was remediated and closed out in 1991.

The Site is located in an area underlain by interbedded sedimentary deposits of alluvium/colluvium to a depth of approximately 25 to 40 feet. Underlying the sedimentary deposits is weathered bedrock material (saprolite). Local groundwater flow is to the south-southwest toward the Rio Grande de Patillas, which the discharge area for the local groundwater. The Rio Grande de Patillas is considered a hydraulic barrier for groundwater flowing from the Site towards the south-southwest. The Quebrada Mamey is located approximately 400 feet southwest of the Site.

Activities performed during this effort included groundwater sampling, hydraulic conductivity testing, and fate-and-transport modeling.

The groundwater sampling results indicate that 1,1-dichloroethene (1,1-DCE) is the primary constituent of concern. The highest VOC concentrations was detected in the sample collected from well P-10A (770 micrograms per liter, µg/L), which is located onsite and downgradient of the former French sump. The 1,1-DCE concentration for the farthest downgradient monitoring well sampled (MW-20D, approximately 1,300 feet southwest of the former French sump) was 24 µg/L. These results exceed the maximum contaminant level (MCL) for 1,1-DCE (7 µg/L).

The results of the hydraulic conductivity tests indicate that the geometric mean for all the wells tested was 3.81×10^{-3} centimeters per second (cm/sec). The geometric mean for the three offsite wells (P-17D, P-19D, and P-20D) tested was 6.37×10^{-3}

cm/sec (18.06 ft/day). These results were used to develop the fate and transport model that was used to estimate the extent of 1,1-DCE in groundwater.

The results of the fate and transport modeling suggest that VOC-impacted groundwater extends south-southwest from the area immediately downgradient of the former French sump. Within the shallow zone of the alluvium/colluvium, VOCs in groundwater are observed as far as the Quebrada Mamey. In the deep zone of the alluvium/colluvium aquifer, VOC impacts appear to extend as far as the Rio Grande de Patillas (approximately 2,800 feet), based on the modeling results. The best-fit modeled concentration of 1,1-DCE that discharges to the Rio Grande de Patillas is 23 µg/L. This concentration is less than 10 times the MCL for 1,1-DCE (7 µg/L) and is considered an insignificant discharge to a surface water by USEPA.

TABLE OF CONTENTS

SECTION		PAGE
1.0	INTRODUCTION	1-1
2.0	PROJECT BACKGROUND	2-1
3.0	SITE DESCRIPTION	3-3
3.1	SITE GEOLOGY	3-3
3.2	SITE HYDROGEOLOGY	3-3
3.3	HISTORICAL CONSTITUENTS IN GROUNDWATER	3-4
4.0	FIELD ACTIVITIES	4-1
4.1	DEPTH TO GROUNDWATER MEASUREMENTS	4-1
4.2	GROUNDWATER SAMPLING PROCEDURES AND ANALYSIS	4-2
4.3	HYDRAULIC CONDUCTIVITY (SLUG) TESTING PROCEDURES	4-4
4.4	INVESTIGATIVE DERIVED WASTE MANAGEMENT	4-5
5.0	GROUNDWATER MONITORING RESULTS	5-1
5.1	GROUNDWATER ELEVATIONS	5-1
5.2	GROUNDWATER SAMPLE RESULTS	5-1
5.3	HYDRAULIC CONDUCTIVITY (SLUG) TESTING RESULTS	5-2
6.0	GROUNDWATER FATE AND TRANSPORT MODELING	6-4
6.1	MODEL DEVELOPMENT	6-4
6.2	MODEL RESULTS	6-6
7.0	SUMMARY	7-1
8.0	REFERENCES	8-1

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Site Map
Figure 3a Shallow Groundwater Surface Map – June 2009
Figure 3b Deep Groundwater Surface Map – June 2009
Figure 4 Groundwater Sample Results – June 2009
Figure 5 Extent of VOCs in Groundwater – June 2009

LIST OF TABLES

Table 1 Groundwater Elevation Data – June 2009
Table 2 Groundwater Sample Results – June 2009
Table 3 Historical Groundwater Sample Results

LIST OF APPENDICES

Appendix A Field Sampling Records
Appendix B Analytical Data Package
Appendix C Aquifer Testing Results
Appendix D Groundwater Modeling Inputs and Results

ACRONYMS AND ABBREVIATIONS

1,1,1-TCA	1,1,1-Trichloroethane
1,1,2-TCA	1,1,2-Trichloroethane
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethene
1,2-DCA	1,2-Dichloroethane
amsl	above mean sea level
bgs	below ground surface
cDCE	cis-1-2-dichloroethene
CMS	Corrective Measures Study
COC	compounds of concern
DO	dissolved oxygen
EI	Environmental Indicator
foc	Fraction of organic carbon
ft/year	feet per year
GE	General Electric Energy
GRPA	Governmental Performance Results Act
HCL	hydrochloric acid
i	Hydraulic gradient
K	Hydraulic conductivity
Koc	Organic carbon partitioning coefficient
MCL	Maximum Contaminant Level
n	Effective porosity
ORP	oxidation reduction potential
PPE	personal protection equipment
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SOP	standard operating procedure
SWMU	Solid Waste Management Unit
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds
µg/l	micrograms per liter
αx, αy, αz	Dispersion (latitudinal, longitudinal, vertical)
λ	First-order decay rate constant
ρb	Soil bulk density

1.0 INTRODUCTION

This Groundwater Modeling Report describes the activities performed to estimate groundwater quality downgradient of the General Electric (GE) Puerto Rico Investment facility (Site) located in Patillas, Puerto Rico. These activities were performed to predict the extent of impacted groundwater migrating from a former French sump located onsite. The French Sump was constructed at the facility in 1977 and was used for waste disposal until 1980. It was remediated and closed out in 1991.

During this effort, MWH performed the following activities:

- Measuring groundwater elevations from the existing onsite and accessible offsite monitoring wells.
- Groundwater sampling and analysis to provide recent groundwater quality data onsite and offsite.
- Hydraulic conductivity testing at selected wells to provide data to support the modeling effort
- Fate and transport modeling to estimate the downgradient extent of 1,1-dichloroethene (DCE) in groundwater.

These activities were performed in accordance with the *Groundwater Modeling Work Plan* (MWH, December 2007), which was approved by U.S. Environmental Protection Agency (USEPA) in March 2009. The intent of the modeling effort was to provide the information necessary for USEPA to complete the Governmental Performance Results Act (GRPA) Environmental Indicator (EI) CA-750 “Migration of Contaminated Groundwater Under Control” for the Site. The provisions for obtaining “Migration of Contaminated Groundwater Under Control” include:

- A demonstration that the migration of impacted groundwater has stabilized and that monitoring will be conducted to confirm that impacted groundwater will remain within the original area of impacted groundwater.

- A demonstration that the discharge of impacted groundwater into surface water will be insignificant (i.e., the maximum concentration of each constituent discharging into surface water is less than 10 times the appropriate groundwater level).

This report consists of seven sections, including an introduction to the report and project in Section 1. Section 2 presents a discussion of the project background, and Section 3 describes the site geology, hydrogeology, and historical extent of constituents in groundwater. Section 4 discusses the procedures used during field activities. The results for the groundwater monitoring and modeling are presented in Sections 5 and 6, respectively, and a discussion of the results is presented in Section 7.

2.0 PROJECT BACKGROUND

The Site is located on the southeastern coast of Puerto Rico at Road #3, Km 122.9, Patillas, Puerto Rico. The Site location is shown on ***Figure 1***. The Site covers approximately 7.8 acres. From November 1974 to March 1987, GE (operating as Caribe General Electric Products) manufactured and assembled electro-mechanical products. A French Sump was constructed at the facility in 1977 and was used for waste disposal until 1980. The Site was idle from 1987 to 1993, when no manufacturing operations were conducted. Since 1993, GE has used the facility for warehousing and assembly operations under the current name of GE Puerto Rico Investment, Inc.

In October 1990, soils in and adjacent to the former French Sump were excavated, stabilized and shipped to a Resource Conservation and Recovery Act (RCRA)-approved landfill. The United Stated Environmental Protection Agency (USEPA) accepted the closure of the sump as complete in March 1991. The impacted groundwater that is the subject of this investigation is associated with the former French Sump and extends south-southwest from the facility to an area of a flood plain of the Rio Grande de Patillas.

Investigation of the groundwater impacts in the area of the French Sump began in 1989 as part of a RCRA Facility Investigation (RFI). Eleven onsite monitoring wells were installed adjacent to and downgradient of the former French Sump. Five monitoring wells were also installed offsite to assess groundwater quality. Of the total 16 wells, one onsite well (P-4A) was abandoned; one offsite well (P-12) cannot be located and was presumably destroyed; and four offsite wells (P-13S, P-13D, P-14S, and P-14D) have had their access permission rescinded.

The *RFI Report* (SEC, 1991) was submitted to the USEPA in 1991. Quarterly groundwater sampling was conducted from 1991 through 1999. Volatile organic compounds (VOCs), namely 1,1,1-trichloroethane (1,1,1-TCA) and 1,1-DCE, were identified in the RFI Report as the constituents of concern (COCs) in groundwater within the alluvial/colluvial aquifer beneath the Site. The extent of 1,1,1-TCA does

not extend offsite. However, the extent of 1,1-DCE impacted groundwater extends offsite to the south-southwest, which is generally consistent with the direction of apparent groundwater flow.

In 2003, GE installed six additional monitoring wells offsite to determine the extent of the 1,1-DCE in groundwater. The results of this investigation were provided to USEPA in a *Supplemental RFI Report* (EarthTech, 2005). USEPA's response to this *Supplemental RFI Report* stated that the information was not sufficient to determine the extent of impacted groundwater and therefore the CA-750 determination could not be completed. At the time of the Supplemental RFI, the farthest downgradient wells (P-13S/D and P-14S/D) had not been sampled for nine years, and access to these wells had been rescinded. From 1991 through 1996, these wells were sampled eight times and VOCs were not detected.

In 2006, GE installed an additional monitoring well cluster (P-20S and P-20D) to further delineate the extent of 1,1-DCE in groundwater. Analytical results from the shallow well (P-20S) did not show the presence of 1,1-DCE. However, groundwater samples from the deeper well (P-20D) indicated 1,1-DCE downgradient and offsite at a concentration of 37 to 44 micrograms per liter (µg/l), which is greater than its Maximum Contaminant Level (MCL) of 7 µg/l.

Based on these results, the USEPA requested that GE pursue access to additional downgradient properties to install monitoring wells to further define the extent of the 1,1-DCE in groundwater. GE intended to install these proposed wells downgradient of P-20S/D and upgradient of P-13S/D and P-14S/S. Although numerous attempts were made by GE, access was not granted to the properties, and the wells could not be installed. As a result, GE and USEPA agreed that the project should move forward and that a fate and transport model should be used to estimate the extent of 1,1-DCE in groundwater. The output of the model would provide the necessary information to make the CA-750 determination.

3.0 SITE DESCRIPTION

3.1 SITE GEOLOGY

The Site is located on the edge of a coastal plain approximately one-half mile northeast of the Rio Grande de Patillas. The area is underlain by interbedded sedimentary deposits of alluvium/colluvium to a depth of approximately 25 to 40 feet. Underlying the sedimentary deposits is weathered bedrock material (saprolite). The saprolite consists primarily of silty fine-grained sand and clayey silt and generally continues to depths of approximately 90 to 100 feet. The saprolite appears to have retained the relict rock structure of the underlying crystalline bedrock.

In general, the alluvial deposits consist of interbedded well-graded and poorly-graded sands. Some strata contain higher amounts of silt and clay. The sandy deposits range in thickness from as little as 6 feet at the northern Site boundary to as great as 26 feet west of the Site. In some areas the colluvial deposits contain gravel, cobbles, and large boulders. Three discontinuous lenses have been identified beneath the Site that consist primarily of low plasticity silts.

3.2 SITE HYDROGEOLOGY

Two hydrogeologic units are present beneath the Site. In the onsite area, the alluvium/colluvium and saprolite underlying the Site create an aquifer approximately 90 feet thick. Although the alluvium/colluvium and saprolite units are hydraulically connected to create one aquifer, they differ in geologic and hydrologic properties and are described separately.

The alluvium/colluvium materials make up the upper hydrogeologic unit. The three discontinuous lenses of low plasticity silt present in the sedimentary deposits act on a local scale as semi-confining beds. Groundwater occurs under water table conditions in this zone and is directly recharged by infiltration from precipitation.

Wells onsite and offsite were installed in shallow and deep zones of the alluvium/colluvium aquifer. The shallow zone wells are screened across the water

table and range in depth from 13 to 26 feet below ground surface (bgs), and the deep zone wells range in depth from 35 to 73 feet bgs.

Local groundwater flow is to the south-southwest toward the Rio Grande de Patillas, the discharge area for the local groundwater. The Rio Grande de Patillas is considered a hydraulic barrier for groundwater flowing from the Site towards the south-southwest. The Quebrada Mamey is located approximately 400 feet southwest of the Site. Depending on flow and the amount of precipitation, this surface water feature acts as either a discharge point or recharge source for shallow groundwater.

3.3 HISTORICAL CONSTITUENTS IN GROUNDWATER

Although the French sump was removed in 1990, residual groundwater impacts were noted during the RFI and the Supplemental RFI. The constituents of concern associated with the former French Sump include VOCs. The primary VOCs of concern have historically included 1,1,1-TCA and 1,1-DCE. The extent of groundwater impacted by 1,1,1-TCA does not extend off of GE's property. The extent of groundwater impacted by 1,1-DCE extends offsite (south-southwest) towards the Quebrada Mamey and Rio Grande de Patillas. Sample results from June 2004 for 1,1-DCE ranged from non-detect to 1,230 µg/L. The highest offsite sample result for 1,1-DCE was 110 µg/L (P-17D, located approximately 250 feet southwest of the Site). VOC concentrations for samples collected near the former French sump have decreased to non-detectable or near non-detectable levels for 10 years.

4.0 FIELD ACTIVITIES

The main objective of the field activities described in this report was to collect recent physical and chemical data for the development of the groundwater model that will be used to support a CA-750 determination for the Site. This specifically includes estimating the extent of the 1,1-DCE in groundwater at the Site. As previously described, access to install and sample monitoring wells downgradient of the Site could not be obtained; therefore, the use of a groundwater fate and transport model was approved by USEPA for the purposes of estimating the downgradient extent of the 1,1-DCE in offsite groundwater. The following field activities were conducted to support the development and calibration of the groundwater model:

- Measuring groundwater elevations from onsite and accessible offsite monitoring wells.
- Collecting groundwater samples from monitoring wells for laboratory analysis.
- Performing slug testing of five monitoring wells to estimate the hydraulic conductivity of the aquifer materials.

These activities were performed by MWH during the week of June 15, 2009. The procedures used during these activities are described in the following sections.

4.1 DEPTH TO GROUNDWATER MEASUREMENTS

Depth to groundwater measurements were collected from onsite and accessible offsite monitoring wells. Offsite wells P-13S, P-13D, P-14S, and P-14D were not measured because the property owner would not allow access to the wells.

Groundwater depths were measured by using a decontaminated water-level meter to record the depth-to-water below a surveyed reference point (top of well casing). The water level meter was slowly lowered into the monitoring well until the meter was activated (as indicated by an audible tone). The depth-to-water reading was

then measured at 30 second intervals until two consecutive readings were identical. This measurement was then recorded in the field notebook.

4.2 GROUNDWATER SAMPLING PROCEDURES AND ANALYSIS

The following 15 monitoring wells were sampled during this field event: P-4, P-7, P-7A, P-9, P-10A, P-11, P-15DD, P-16S, P-17D, P-18S, P-18D, P-19S, P-19D, P-20S, and P-20D. Well locations are indicated on ***Figure 2***. Although planned for sampling, monitoring well P-8 did not contain sufficient water; and therefore, a groundwater sample could not be collected from this well.

The groundwater samples were collected in accordance with the USEA Region II *Groundwater Sampling Procedure – Low Stress (Low Flow) Purging and Sampling*. For each monitoring well, the following sequence of activities was performed:

- The depth-to-water was measured in the monitoring well.
- The well was then purged using a submersible bladder pump with a new disposable bladder and unused, disposable discharge tubing.
- The following indicator parameters were measured using an in-line water quality meter: pH, specific conductivity, temperature, dissolved oxygen (DO), turbidity, and oxidation-reduction potential (ORP). Parameters were recorded every three to five minutes until they had stabilized for three consecutive readings.
- The depth-to-water in the monitoring well was monitored to ensure that drawdown did not exceed 0.3 feet and the water level in the well was stable prior to sampling.
- After the parameters had stabilized, the in-line measuring device was disconnected and the groundwater sample was collected directly from the discharge tubing.

- Groundwater samples were collected in laboratory-supplied vials, which were pre-preserved with hydrochloric acid (HCl).

Field sampling records for each well are presented in ***Appendix A***. The sample bottles were labeled with date, time, sample identification, analytical parameters, and the sampler's initials, and immediately placed on ice in a cooler. The cooler was maintained under chain-of-custody until arrival at the laboratory.

The following quality assurance/quality control (QA/QC) samples were collected during this event:

- Two field duplicates samples:

  Dup-01 – duplicate of P-7A
  Dup-02 – duplicate of P-19D

- Two field blank samples collected from the submersible sampling pump:

  FB-01
  FB-02

- One matrix spike/matrix spike duplicate (MS/MSD) from well P-18D

- One trip blank

Groundwater and QA/QC samples were analyzed for VOCs by USEPA Method SW846 8260B for the Appendix IX list of compounds by Lancaster Laboratories, Inc. of Lancaster, Pennsylvania. The groundwater analytical data were certified by a Puerto Rican Chemist and validated in accordance with the USEPA Region II Standard Operating Procedure (SOP) HW-6 – CLP Organics Data Review and Preliminary Review. The data were found to be acceptable for use without significant qualification. The complete analytical data package is presented in ***Appendix B***.

Groundwater samples were collected using a bladder pump and dedicated, disposable tubing. The bladder pump was decontaminated before and between each use with an Alconox® wash and distilled water rinse. A new bladder and new tubing were used for each well.

4.3 HYDRAULIC CONDUCTIVITY (SLUG) TESTING PROCEDURES

Hydraulic conductivity testing was performed at five deep-zone monitoring wells (P-10A, P-15DD, P-17D, P-19D, and P-20D) to estimate the hydraulic conductivity of the alluvium/colluvium aquifer. The hydraulic conductivity testing (slug test method) was performed in accordance with ASTM D 4044-96. The activities performed for each test included the following:

- Prior to each test, the depth to water ("static level") and total depth in the test well was measured using a water-level meter.
- A pressure transducer/data logger was inserted into the test well to record the change in groundwater levels.
- A head change was induced by introducing a 7-foot-long stainless steel "slug" into the test well above the transducer, resulting in an increase and then a decrease in head inside the well. This enabled performance of a falling-head (slug in) test.
- When the groundwater level in the test well had recovered to at least 80 percent of its static level, the slug was then removed, resulting in a decrease and then an increase in head inside the well. This enabled performance of a rising-head (slug out) test.
- The groundwater level was then recorded until it has returned to at least 80 percent of its static level.
- A preliminary analysis of the test data was performed in the field to ensure that the data collected was adequate or if the test should be rerun. Up to three tests were performed at each well for reproducibility.

The resulting groundwater level responses were then downloaded from the transducer. The data were reduced and imported into AQTESOLV™ Pro Version 3.5

and evaluated using the Bouwer-Rice (1976) solution method. These calculations and a summary of the results are presented in ***Appendix C***.

Down-hole equipment used for slug testing was decontaminated before and between each monitoring well using an Alconox® wash and distilled water rinse.

4.4 INVESTIGATIVE DERIVED WASTE MANAGEMENT

Purge water and decontamination liquids were collected in 5-gallon buckets and transferred to a 55-gallon drum located onsite. The drum of IDW was staged at a secure area on the GE facility. The drum was sampled for VOCs and the results indicated that the IDW was characteristically non-hazardous. GE plans to dispose of the IDW using Clean Harbors Caribe, Inc. All used personal protective equipment (PPE) was collected in trash bags and disposed of as general refuse.

5.0 GROUNDWATER MONITORING RESULTS

5.1 GROUNDWATER ELEVATIONS

The depth to groundwater measurements and groundwater elevations for June 2009 are presented in ***Table 1***. Groundwater is generally encountered 5 to 15 feet below ground surface, or 27 to 58 feet above mean sea level (amsl). Groundwater elevation contours for the shallow and deep aquifers are presented in ***Figure 3a*** and ***Figure 3b***, respectively. Based on these contours the groundwater flow direction is generally southwest, towards the Quebrada Mamey and the Rio Grande de Patillas. The horizontal gradient for the shallow aquifer onsite is 0.0237 vertical feet per horizontal foot (ft/ft). The horizontal gradient for the deep aquifer offsite is 0.0112 ft/ft. The vertical gradient between these two aquifers is approximately 0.13 downward onsite and approximately 0.46 downward offsite.

5.2 GROUNDWATER SAMPLE RESULTS

Groundwater sample results are presented in ***Table 2*** with the detected sample results posted in ***Figure 4***. The following table summarizes the results for the compounds that were detected during the June 2009 sampling event (15 samples were collected). Concentrations are reported in micrograms per liter (µg/L).

Compound	Number of Detections	Lowest Detected Result	Highest Detected Result	MCL	# Detections Above MCL
1,1,1-Trichloroethane (1,1,1-TCA)	2	0.8	8	200	0
1,1,2-Trichloroethane (1,1,2-TCA)	1	0.8	0.8	5	0
1,1-Dichloroethane (1,1-DCA)	7	1	21	Not Available	-
1,1-Dichloroethene (1,1-DCE)	12	2	770	7	7
1,2-Dichloroethane (1,2-DCA)	1	2	2	5	0
Chloroform	4	0.8	2	70	0
Trichlorofluoromethane	1	3	3	70	0

As shown on the summary table, 1,1-DCA and 1,1-DCE were the most commonly detected VOCs. The highest VOC concentrations (primarily 1,1-DCA and 1,1-DCE) were detected in the sample collected from well P-10A, which is located onsite and downgradient of the former French sump. The 1,1-DCE concentration for the farthest downgradient monitoring well sampled (MW-20D, approximately 1,300 feet southwest of the former French sump) was 24 µg/L. The approximate extent of 1,1-DCE in groundwater (based on the recent sample results) is presented ***Figure 5***. As shown in this figure, the extent of 1,1-DCE in the deep zone is not defined by the downgradient monitoring wells. As noted previously, wells located farther downgradient (P-13S/D and P-14S/D, as shown on ***Figure 2***) could not be sampled because the property owner denied access to the wells. From 1991 through 1996, these wells did not contain VOCs at detectable levels.

The historical sample results for constituents of concern in groundwater within the alluvial/colluvial aquifer are presented in ***Table 3***. The results obtained during this monitoring event indicate decreased 1,1-DCE concentrations in monitoring wells P-15DD, P-17D, P-18D, and P-20D. Concentrations in other wells remained generally stable and consistent with historical results.

5.3 HYDRAULIC CONDUCTIVITY (SLUG) TESTING RESULTS

The calculation and results of the hydraulic conductivity testing are presented in ***Appendix C***. A geometric mean conductivity for each well was calculated from the three rising and three falling head tests (six total tests). The results for each well are summarized in the following table.

Well ID	Screen Interval (feet bgs)	Soil Type	Geometric Mean Hydraulic Conductivity	
			Centimeters per Second (cm/sec)	Feet per Day (ft/day)
P-10A	37 – 48	Poorly graded sand with gravel	3.72×10^{-4}	1.05
P-15DD	68 – 73	Fractured diorite	8.34×10^{-3}	23.63
P-17D	50 – 60	Poorly graded sand with silt	2.70×10^{-3}	7.66
P-19D	25 – 35	Sand with clay and gravel	5.22×10^{-3}	14.80
P-20D	40 – 50	Sand, silty clay, gravelly sand	1.83×10^{-2}	51.95

The geometric mean for all the wells tested was 3.81×10^{-3} cm/sec (10.79 ft/day). The geometric mean for the three offsite wells (P-17D, P-19D, and P-20D) tested was 6.37×10^{-3} cm/sec (18.06 ft/day).

6.0 GROUNDWATER FATE AND TRANSPORT MODELING

The groundwater fate and transport model BIOCHLOR Version 2.2 (USEPA, 2002) was used to estimate the downgradient extent of 1,1-DCE in the deep groundwater zone. BIOCHLOR is a screening model developed by USEPA that simulates natural attenuation of dissolved VOCs. BIOCHLOR can be used to simulate VOC transport with or without decay or VOC transport with biodegradation.

6.1 MODEL DEVELOPMENT

The model was developed using available site-specific information gathered from previous and recent investigations conducted at the Site. Where site-specific data were not available, applicable literature values were used for soil types representative of the geologic materials at the Site.

The following site-specific data were used in the modeling:

- Horizontal hydraulic gradient (i) - Obtained from the June 2009 groundwater elevation measurements:

  Onsite: 0.0237 (shallow)

  Offsite: 0.0112 (deep)

- VOC concentrations for groundwater – Based on samples collected from monitoring wells during the June 2009 sampling event. The 1,1-DCE source concentration was estimated using sample results from P-10A (770 µg/L). Based on relatively stable historical data, the concentration from this well was treated as a continuous source in the model. The 1,1-DCE concentration obtained from the downgradient well (P-17D) was used to calibrate the model.

- Hydraulic conductivity (K) – Estimated from the June 2009 hydraulic conductivity testing (***Appendix C***). The K for the deep zone offsite is 6.37 x 10^{-3} cm/sec, based on the 2009 hydraulic conductivity testing.

- Source thickness – 60 feet (source: estimated based on historical well boring logs)

- Source width – 30 feet (source: interpreted width of impacted groundwater at monitoring well P-10A; based on estimated dispersion and 2009 sampling results)

- Longitudinal dispersivity – 200 feet (source: estimated based on inferred 1,1-DCE travel distance and model calibrations)

- First-order decay rate constant (λ) – Because historical VOC data do not indicate significant biological decay (e.g., breakdown products have not been observed), the first-order decay rate constant was set as zero (i.e., the model assumes no biodegradation).

Model parameters that were obtained from literature sources include:

- Effective porosity (n) – 0.2 (source: estimated for sand/gravel from Wiedemeier, et al., 1998)

- Organic carbon partitioning coefficient (K_{oc}) – 65 liters per kilogram (source: *Basics of Pump and Treat Groundwater Remediation Technology*, USEPA, March 1990)

- Soil bulk density (ρ_b) – 2.0 grams per milliliter (source: Supplemental RFI, EarthTech, 2005)

- Fraction of organic carbon (f_{oc}) – 0.003 (source: estimation based on soil type; approximately three times the BIOCHLOR default value (0.001), but approximately one-third the value referenced in the 1991 RFI (0.01).

- Retardation factor – calculated from foc and ρ_b – 2.95

These input data, along with the results from each modeling run, are presented in ***Appendix D***. A sensitivity analysis of the input parameters was performed by

modifying the source width, dispersivity, and retardation factor. These parameters were determined to be the most sensitive for this analytical model. The results of the sensitivity analysis were then used to model reasonable scenarios that would result in the minimum and maximum migration of 1,1-DCE. The input data that were changed for each modeling run are summarized in the following section.

6.2 MODEL RESULTS

The input data and results of each modeling scenario are summarized in the table below and are presented in ***Appendix D***. The modeled 1,1-DCE concentrations presented in the following table represent the estimated concentration at the Rio Grande de Patillas, which is considered the downgradient hydraulic boundary.

Model Run	Model Description	Input Parameters			Modeled 1,1-DCE Concentration at Hydraulic Boundary (µg/L)
		Longitudinal Dispersivity (ft)	Retardation Factor	Source Width (ft)	
#1	Best-fit estimation of 1,1-DCE travel distance; the input data that resulted in the best model calibration were used.	200	2.95	30	23
#2	Minimum 1,1-DCE travel distance; increased dispersivity and decreased source width.	400	2.95	15	8
#3	Maximum 1,1-DCE travel distance; decreased dispersivity and decreased retardation.	33	1.65	60	134

The results of this model indicate that the 1,1-DCE concentration in groundwater is estimated to be 23 µg/L at the downgradient hydraulic boundary (Rio Grande de Patillas), which is approximately 2,800 feet southwest of P-10A. This conclusion is based on ***Model Run #1***, which is the best-fit estimation of 1,1-DCE in groundwater. The modeled 1,1-DCE concentration of 23 µg/L is less than 10 times the MCL for

1,1-DCE (7 µg/L) and is considered by USEPA to be an "insignificant" discharge to a surface water (*RCRA Corrective Action, Environmental Indicator (EI) RCRIS code (CA750), Migration of Contaminated Groundwater Under Control*, USEPA). Environmental Indicator guidance can be found on the USEPA website at http://www.epa.gov/osw/hazard/correctiveaction/eis/index.htm.

Based on the results of the minimum and maximum migration scenarios models (***Model Run #2*** and ***Model Run #3***, respectively), the modeled concentration of 1,1-DCE in groundwater ranges from approximately 8 to 134 µg/L at the Rio Grande de Patillas. Although these modeled concentrations provide a concentration range based on the potential variability associated the most sensitive input data, these modeled concentrations do not correlate with empirical data. For example, ***Model Run #2*** appears to underestimate the observed conditions. The modeled concentration at P-17D (28 µg/L) using ***Model Run #2*** is approximately three times less than the observed concentration (75 µg/L). Conversely, the 1,1,-DCE concentration observed in the farthest downgradient well (P-20D, June 2009) was 24 µg/L, which is nine times less than modeled concentration at this location for ***Model Run #3*** (maximum migration scenario). Therefore, ***Model Run #3*** is an over-estimation of actual site conditions.

Therefore, although ***Model Runs #2*** and ***#3*** provide an idea of the variability in 1,1-DCE concentrations that might be observed if the inputs were different than those used for ***Model Run #1***, ***Model Run #1*** appears to be the best representation of site conditions based on information available to date.

7.0 SUMMARY

Based on the recent groundwater monitoring results and historical results, the migration of impacted groundwater appears to have stabilized. The concentrations of VOCs in the wells sampled during this event are consistent with historical concentrations, and concentrations have decreased in many wells.

The results of the fate and transport modeling suggest that VOC-impacted groundwater extends south-southwest from the area immediately downgradient of the former French sump. Within the shallow zone of the alluvium/colluvium, VOCs in groundwater are observed as far as the Quebrada Mamey. In the deep zone of the alluvium/colluvium aquifer, VOC impacts appear to extend as far as the Rio Grande de Patillas, based on the modeling results. Historical groundwater monitoring of P-13D and P-14D (the wells closest to the Rio Grande de Patillas which are currently not accessible) indicated no detectable VOCs in these wells for the period July 1991 through July 1996. The best-fit modeled concentration of 1,1-DCE that discharges to the Rio Grande de Patillas is 23 µg/L. This concentration is less than 10 times the MCL for 1,1-DCE (7 µg/L) and is considered an insignificant discharge to a surface water by USEPA.

Based on these results, GE is currently planning to perform one year of quarterly groundwater monitoring. This effort will further verify that impacted groundwater has remained within the horizontal and vertical extent of the existing area of impacted groundwater. After one year, GE will evaluate the situation and discuss with USEPA an approach for future groundwater monitoring.

8.0 REFERENCES

Groundwater Modeling Work Plan, MWH, December 2007

Remedial Facility Investigation Report, SEC, 1991

Supplemental Remedial Facility Investigation Report, EarthTech, 2005

The Bouwer and Rice Slug Test – An Update, Bouwer, 1989

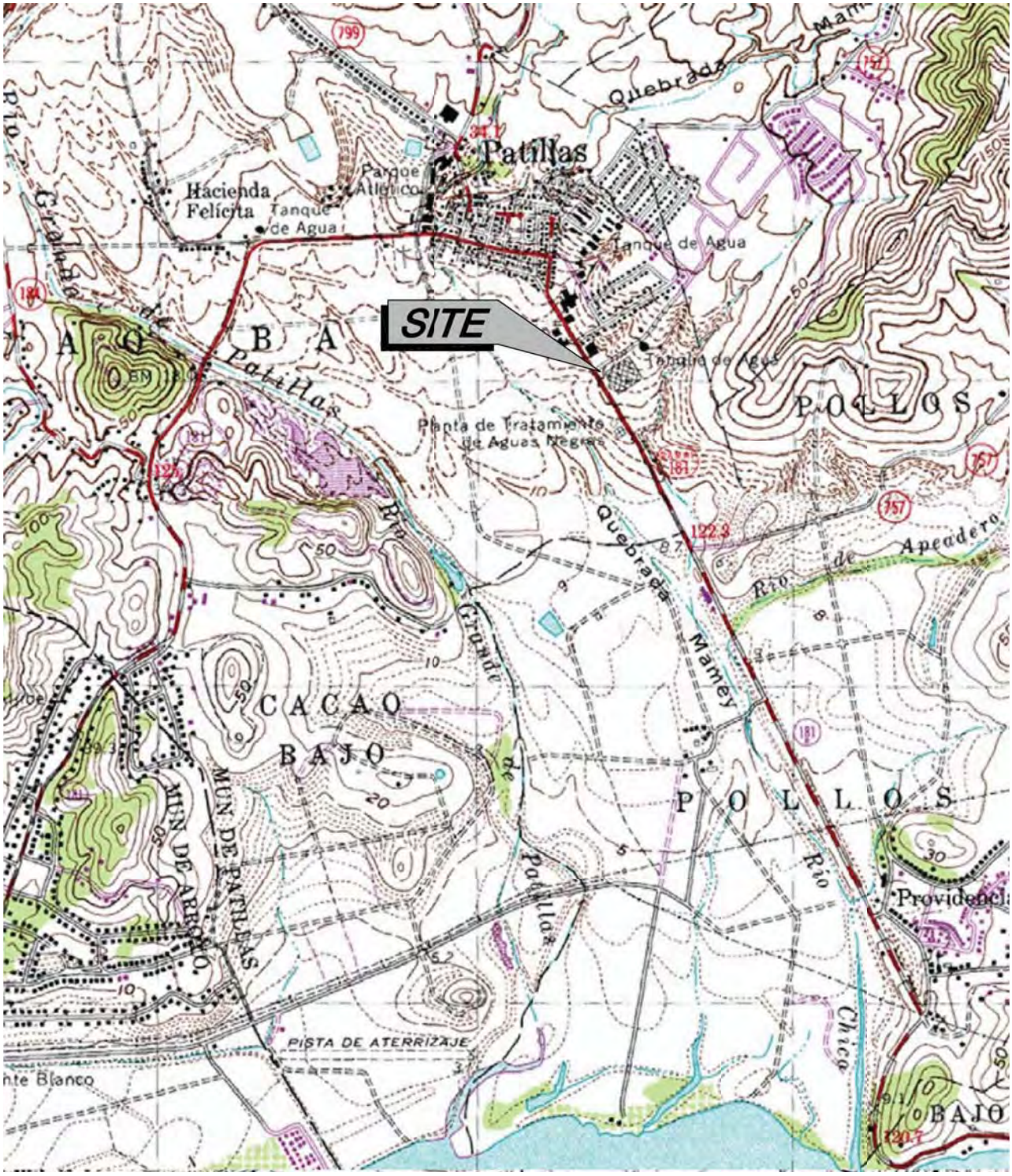
Basics of Pump and Treat Groundwater Remediation Technology, USEPA, March 1990

BIOCHLOR Version 2.2, (USEPA, 2002)

RCRA Corrective Action, Environmental Indicator (EI) RCRIS code (CA750), Migration of Contaminated Groundwater Under Control, USEPA, 1999. http://www.epa.gov/osw/hazard/correctiveaction/eis/index.htm

Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water, U.S. EPA Office of Research and Development, National Risk Management Research Laboratory, Report No. EPA/600/R-98/128, Wiedemeier, et al., 1998

FIGURES



Source:
U.S.G.S. 7.5 minute quadrangle of Patillas, Puerto Rico, Dated 1977, photorevised 1982.

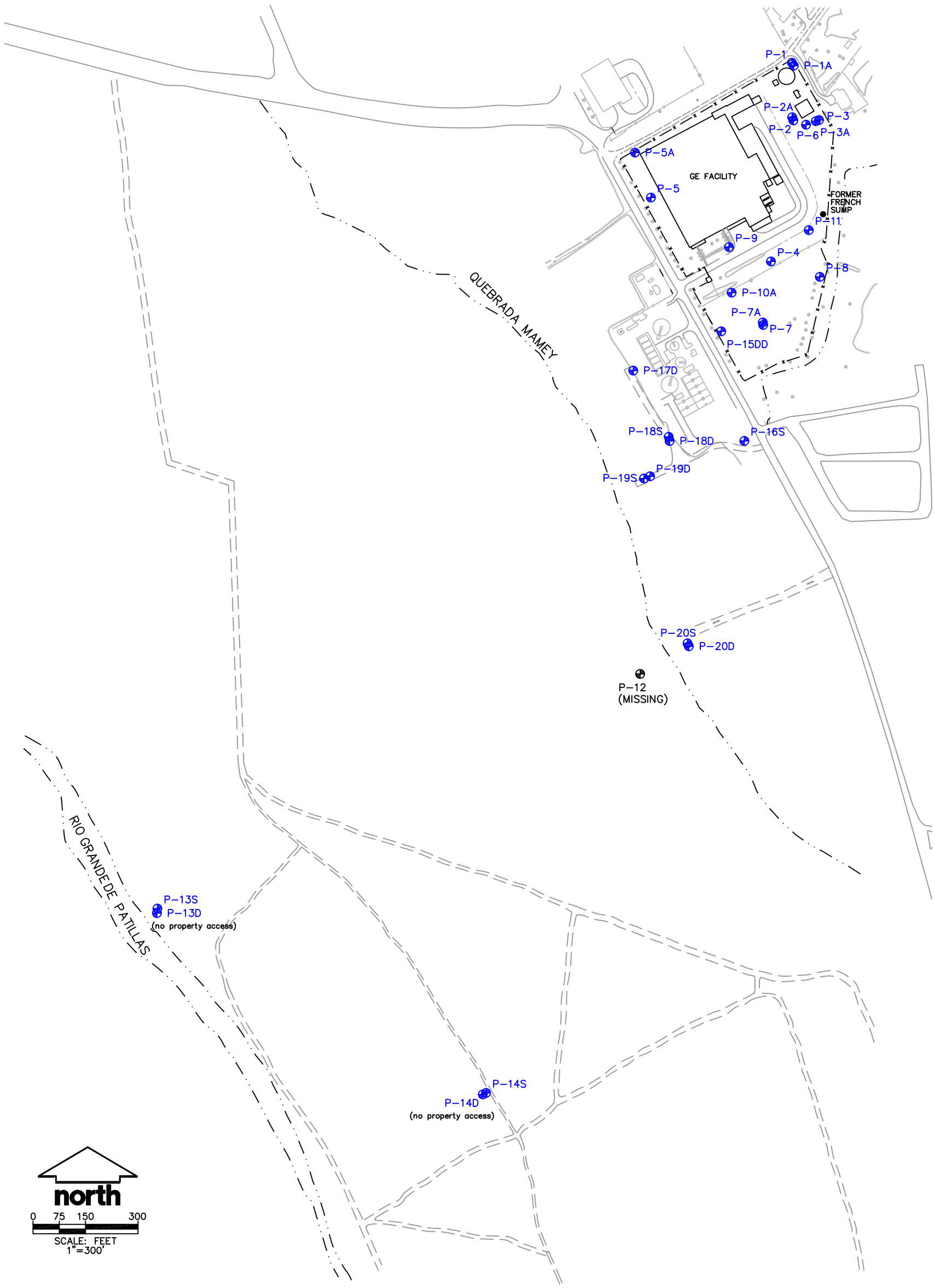
north

GE Puerto Rico Investment Inc.
Patillas, Puerto Rico

Site Location Map

Figure 1

MWH



LEGEND

- RIVER/STREAMS
- TREE COVER
- FENCE
- BUILDING
- MONITORING WELL

GE Puerto Rico Investment, Inc.
Patillas, Puerto Rico

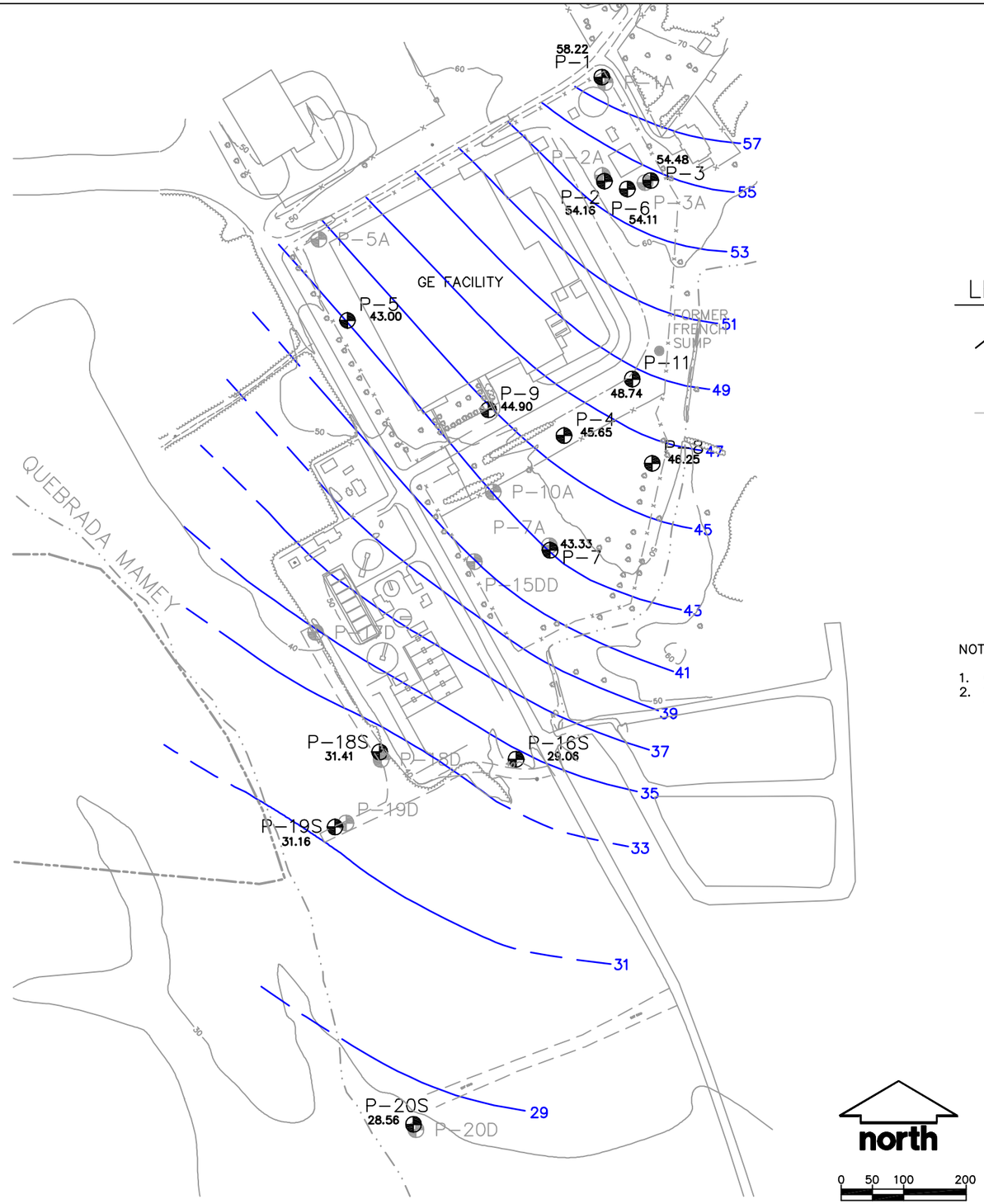
Site Map

FIGURE 2

MWH

Drawn By & Date: BRT, 6/5/09 | Approved By & Date: BRT | Revised By & Date: | Approved By & Date:

J:\Jobs\01a_400 General Electric Energy\72 - PATILLAS Puerto Rico\05 - CADD\CADD - NEW Basemap\Patillas Basemap 6-05-09.dwg Aug/13/09



LEGEND

- RIVER/STREAMS
- TREE COVER
- FENCE
- BUILDING
- MONITORING WELL (NOT USED FOR CONTOURING)
- MONITORING WELL
- 29 — EQUIPOTENTIAL CONTOUR, DASHED WHERE INFERRED
- 28.56 — WATER TABLE ELEVATION (FEET ABOVE SEA LEVEL)

NOTES:

1. CONTOUR INTERVAL = 2 FEET
2. WATER LEVEL AT WELL P-16S WAS ANOMALOUS, AND THEREFORE NOT USED

General Electric Puerto Rico Investment
Patillas, Puerto Rico

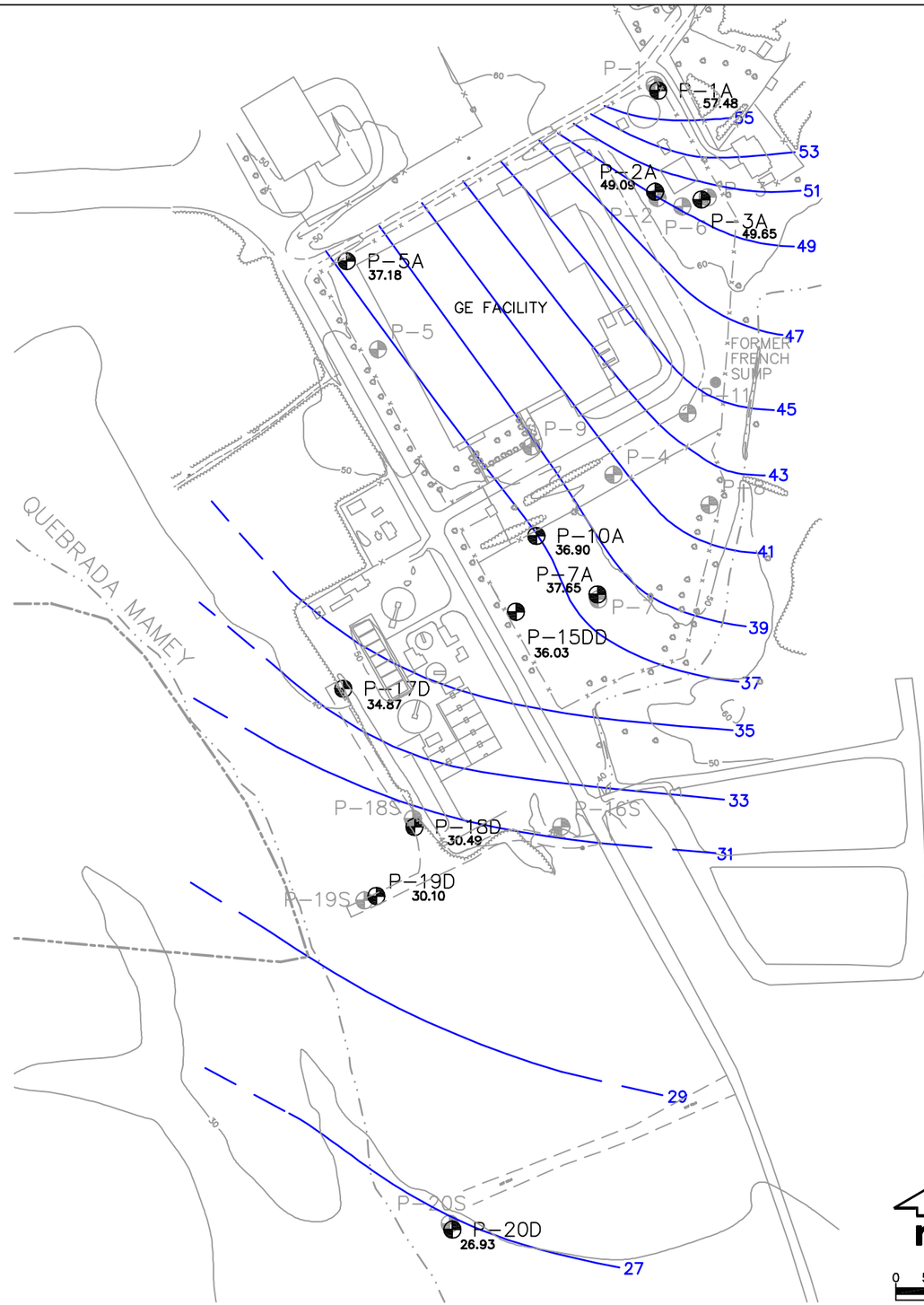
Shallow Groundwater Surface Map
June 2009

FIGURE 3a

MWH

Drawn By & Date: DM 7/15/09 | Approved By & Date: | Revised By & Date: ATF 7/23/09 | Approved By & Date:

J:\01a_400 General Electric Energy\72 - PATILLAS Puerto Rico\05 - CADD\Quarterly GW Mon\June 09\Patillas GW - Shallow - June 2009.dwg Aug/19/09



LEGEND

	RIVER/STREAMS
	TREE COVER
—x—	FENCE
	BUILDING
	MONITORING WELL (NOT USED FOR CONTOURING)
	MONITORING WELL
27	EQUIPOTENTIAL CONTOUR, DASHED WHERE INFERRED
26.93	WATER TABLE ELEVATION (FEET ABOVE SEA LEVEL)

NOTES:

1. CONTOUR INTERVAL = 2 FEET

north

0 50 100 200

SCALE: FEET
1"=200'

General Electric Puerto Rico Investment
Patillas, Puerto Rico

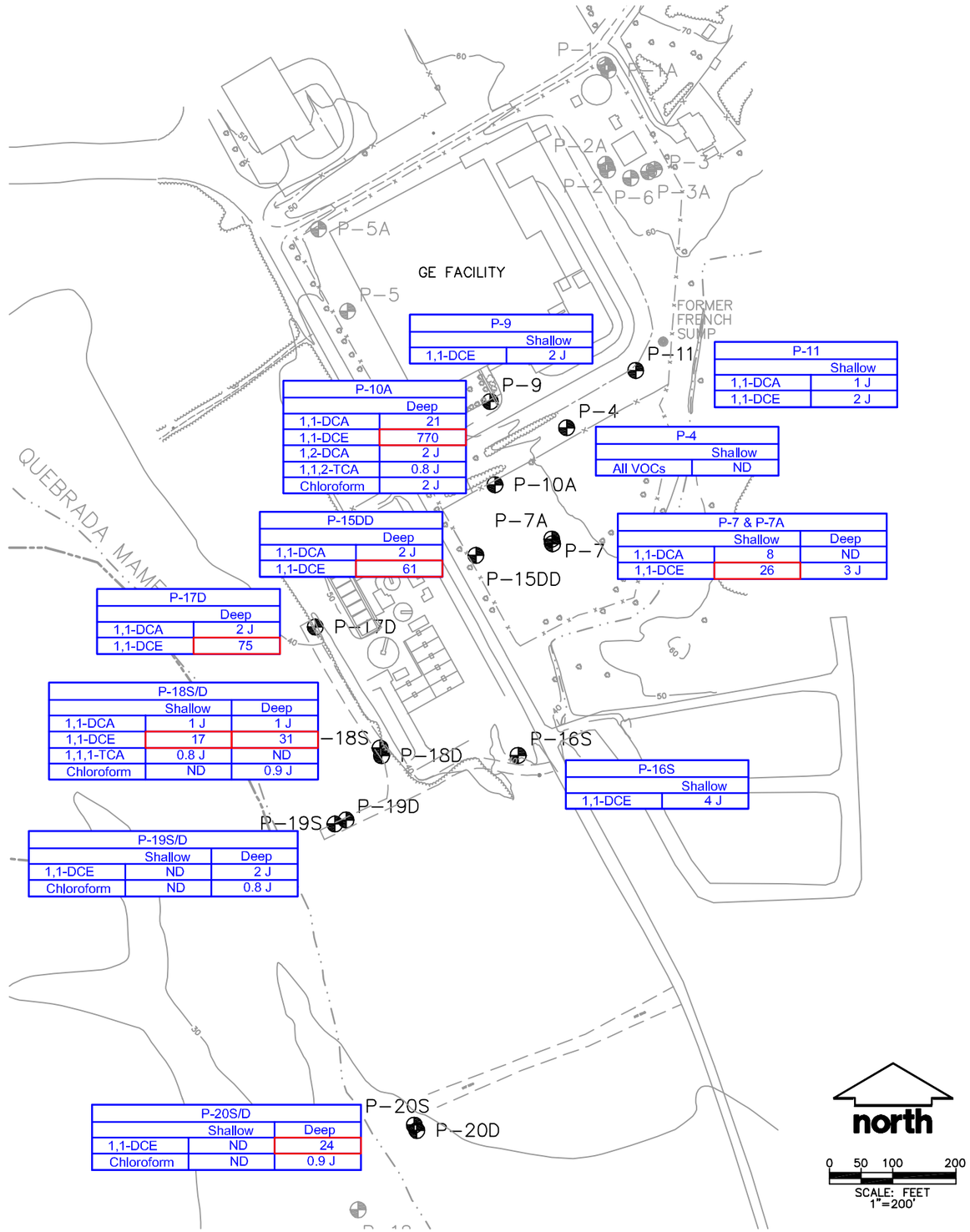
Deep Groundwater Surface Map
June 2009

FIGURE 3b

MWH

Drawn By & Date: DM 7/15/09 | Approved By & Date: | Revised By & Date: ATF 7/23/09 | Approved By & Date:

J:\01c_400 General Electric Energy\72 - PATILLAS Puerto Rico\05 - CADD\Quarterly GW Mon\June 09\Patillas GW - Deep - June 2009.dwg Aug/19/09



P-9	
	Shallow
1,1-DCE	2 J

P-11	
	Shallow
1,1-DCA	1 J
1,1-DCE	2 J

P-10A	
	Deep
1,1-DCA	21
1,1-DCE	770
1,2-DCA	2 J
1,1,2-TCA	0.8 J
Chloroform	2 J

P-4	
	Shallow
All VOCs	ND

P-15DD	
	Deep
1,1-DCA	2 J
1,1-DCE	61

P-7 & P-7A		
	Shallow	Deep
1,1-DCA	8	ND
1,1-DCE	26	3 J

P-17D	
	Deep
1,1-DCA	2 J
1,1-DCE	75

P-18S/D		
	Shallow	Deep
1,1-DCA	1 J	1 J
1,1-DCE	17	31
1,1,1-TCA	0.8 J	ND
Chloroform	ND	0.9 J

P-16S	
	Shallow
1,1-DCE	4 J

P-19S/D		
	Shallow	Deep
1,1-DCE	ND	2 J
Chloroform	ND	0.8 J

P-20S/D		
	Shallow	Deep
1,1-DCE	ND	24
Chloroform	ND	0.9 J

LEGEND

- RIVER/STREAMS
- TREE COVER
- FENCE
- BUILDING
- MONITORING WELL (NOT SAMPLED)
- MONITORING WELL (SAMPLED)

NOTES:

Results are reported in micrograms per liter (ug/L).

Shallow – The well is screened in the upper portion of the alluvium/colluvium aquifer.
Deep – The well is screened in the lower portion of the alluvium/colluvium aquifer.

	Compound	MCL
1,1,1–TCA	1,1,1–Trichloroethane	200
1,1,2–TCA	1,1,2–Trichloroethane	5
1,1–DCA	1,1–Dichloroethane	NA
1,1–DCE	1,1–Dichloroethene	7
1,2–DCA	1,2–Dichloroethane	5
	Chloroform	80

Sample Results that exceed MCLs are boxed in RED.

General Electric Puerto Rico Investment
Patillas, Puerto Rico

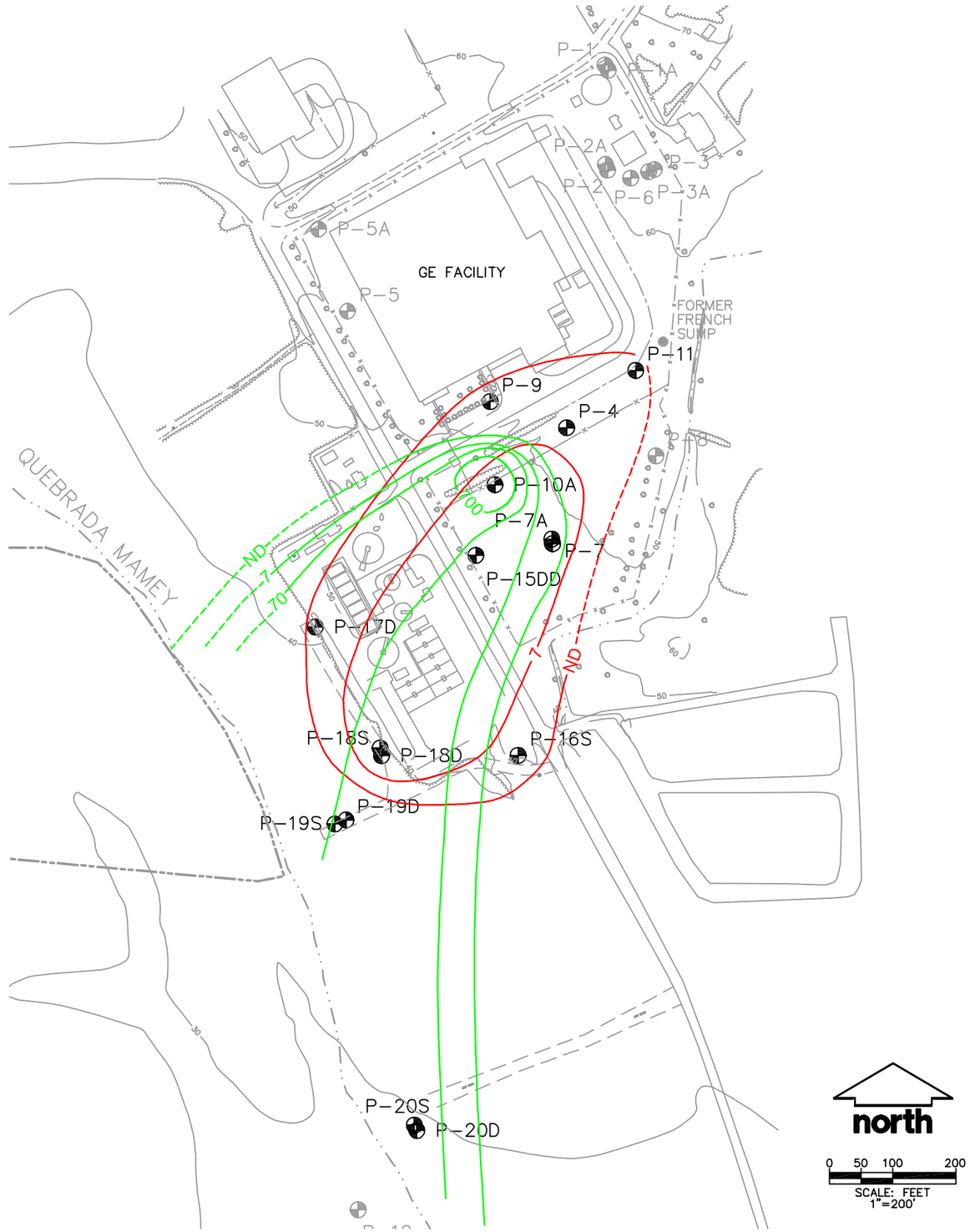
Groundwater Sample Results
June 2009

FIGURE 4

MWH

Drawn By & Date: DM 7/15/09 | Approved By & Date: BRT | Revised By & Date: | Approved By & Date:

J:\01a 400 General Electric Enerox\72 – PATILLAS Puerto Rico\05 – CADD\Quarterly GW Mon\June 09\Patillas GW – VOC Results June 09 v6RT.dwg Aug/19/09



LEGEND

- RIVER/STREAMS
- TREE COVER
- FENCE
- BUILDING
- MONITORING WELL (NOT SAMPLED)
- MONITORING WELL (SAMPLED)
- ISOCONTOUR 1,1-DCE IN DEEP GROUNDWATER
- ISOCONTOUR 1,1-DCE IN SHALLOW GROUNDWATER

NOTES:

Concentrations are reported in micrograms per liter (ug/L). Dashed where inferred.

Shallow – The well is screened in the upper portion of the alluvium/colluvium aquifer.
Deep – The well is screened in the lower portion of the alluvium/colluvium aquifer.

General Electric Puerto Rico Investment
Patillas, Puerto Rico

Extent of 1,1-DCE in Groundwater
June 2009

FIGURE 5

MWH

Drawn By & Date: DM 7/15/09 | Approved By & Date: BRT | Revised By & Date: | Approved By & Date:

J:\01a 400 General Electric Enerex\72 - PATILLAS Puerto Rico\05 - CADD\Quarterly GW Mon\June 09\Patillas GW - VOC Results June 09 v6RT.dwg Aug/19/09

TABLES

Table 1
Groundwater Elevation Data - June 2009
GE Puerto Rico Investment
Patillas, Puerto Rico

Well No.	Aquifer Zone	Well Install Date	Boring Depth (ft bgs)	Land Surface Elevation (ft amsl)	Top Of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
P- 1	Shallow	8/1/86	25.5	67.54	68.71	10.49	58.22
P- 1A	Deep Saprolite	8/7/86	70.0	67.47	68.71	11.23	57.48
P- 2	Shallow	8/1/86	20.5	61.85	63.60	9.44	54.16
P- 2A	Deep	8/20/86	69.0	62.23	63.46	14.37	49.09
P- 3	Shallow	8/4/86	25.5	63.54	64.58	10.10	54.48
P- 3A	Deep	8/15/86	70.0	63.23	64.68	15.03	49.65
P- 4	Shallow	7/29/86	19.11	51.25	52.92	7.27	45.65
P- 4A	*Abandoned*	7/31/86	63.0	51.66	52.88	NG	NG
P- 5	Shallow	8/4/86	20.5	52.29	53.90	10.90	43.00
P- 5A	Deep Saprolite	9/15/86	70.0	51.14	52.51	15.33	37.18
P- 6	Shallow	8/30/88	26.0	63.05	63.70	9.59	54.11
P- 7	Shallow	2/3/89	18.15	47.64	49.73	6.40	43.33
P- 7A	Deep Saprolite	2/2/89	58.2	47.80	49.67	12.02	37.65
P- 8	Shallow	2/3/89	17.7	52.19	54.87	8.62	46.25
P- 9	Shallow	2/6/89	17.4	50.35	52.32	7.42	44.90
P-10A	Deep Alluvium/Sap	2/9/89	51.5	47.92	49.86	12.96	36.90
P-11	Shallow	2/8/89	13.2	52.95	54.68	5.94	48.74
P-12	Shallow	11/20/89	29.5	19.70	21.82	NG	NG
P-13D	Deep	6/28/91	62.7	20.40	22.10	NG	NG
P-13S	Shallow	7/5/91	28.7	19.59	23.25	NG	NG
P-14D	Deep	7/10/91	67.8	16.28	19.38	NG	NG
P-14S	Shallow	7/13/91	30.5	15.64	18.07	NG	NG
P-15DD	Bedrock	5/26/04	73.6	45.48	47.68	11.65	36.03
P-16S	Shallow	5/27/04	26.3	40.39	42.61	13.55	29.06
P-17D	Deep	6/1/04	61.0	38.26	41.02	6.15	34.87
P-18S	Shallow	5/28/04	16.6	36.55	39.08	7.67	31.41
P-18D	Deep	5/31/04	50.0	36.26	38.52	8.03	30.49
P-19S	Shallow	5/28/04	15.8	33.89	36.37	5.21	31.16
P-19D	Deep	6/30/04	36.5	34.32	36.45	6.35	30.10
P-20S	Shallow	5/4/06	26.0	31.70	34.67	6.11	28.56
P-20D	Deep	5/4/06	52.0	31.50	34.31	7.38	26.93

Horizontal coordinates in Puerto Rico State Plane (feet), Zone 1, NAD 27
bgs - Below Ground Surface
amsl - Above Mean Sea Level
btoc - Below Top of Casing
NG - Not Gauged

Table 2
Groundwater Sample Results - June 2009
GE Puerto Rico Investment
Patillas, Puerto Rico

	RSL or MCL*	P-4	P-7	P-7A	P-7A (duplicate)	P-9
Volatile Organic Compound (ug/L)						
1,1,1,2-Tetrachloroethane	0.52	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	200*	0.8 U	**8**	0.8 U	0.8 U	0.8 U
1,1,2,2-Tetrachloroethane	0.067	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	5*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
1,1-Dichloroethane	2.4	1 U	**8**	1 U	1 U	1 U
1,1-Dichloroethene	7*	0.8 U	**26**	**3 J**	**3 J**	**2 J**
1,1-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	-	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	0.0096	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	70*	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	15	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	0.2	2 U	2 U	2 U	2 U	2 U
1,2-Dibromoethane	0.05*	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	600*	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	5*	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	5*	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	12	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	-	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	730	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	75*	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	-	1 U	1 U	1 U	1 U	1 U
2-Butanone	7,100	3 U	3 U	3 U	3 U	3 U
2-Chlorotoluene	730	1 U	1 U	1 U	1 U	1 U
4-Chlorotoluene	2,600	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-pentanone	2,000	3 U	3 U	3 U	3 U	3 U
Acetone	22,000	6 U	6 U	6 U	6 U	6 U
Benzene	5*	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromobenzene	20	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	-	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	0.12	1 U	1 U	1 U	1 U	1 U
Bromoform	8.5	1 U	1 U	1 U	1 U	1 U
Bromomethane	8.7	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5*	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	100*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Chloroethane	-	1 U	1 U	1 U	1 U	1 U
Chloroform	0.19	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Chloromethane	190	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	70*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
cis-1,3-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	0.15	1 U	1 U	1 U	1 U	1 U
Dibromomethane	370	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	390	2 U	2 U	2 U	2 U	2 U
Ethylbenzene	700*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobutadiene	0.86	2 U	2 U	2 U	2 U	2 U
Isopropylbenzene	-	1 U	1 U	1 U	1 U	1 U
Methyl Tertiary Butyl Ether	12	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5*	2 U	2 U	2 U	2 U	2 U
m-Xylene	1,400	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Naphthalene	0.14	1 U	1 U	1 U	1 U	1 U
n-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
n-Propylbenzene	-	1 U	1 U	1 U	1 U	1 U
o-Xylene	1,400	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
p-Isopropyltoluene	-	1 U	1 U	1 U	1 U	1 U
sec-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
Styrene	100*	1 U	1 U	1 U	1 U	1 U
tert-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	5*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Toluene	1000*	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
trans-1,2-Dichloroethene	100*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
trans-1,3-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
Trichloroethene	5*	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	1,300	2 U	2 U	2 U	2 U	2 U
Vinyl Chloride	2*	1 U	1 U	1 U	1 U	1 U

Concentrations are reported in micrograms per liter (ug/L)
U - Non-Detect. The analyte was not detected above the indicated reporting limit.
J - Estimated. The analyte was detected below the reporting limit.
RSL - USEPA Regional Screening Level
MCL - Maximum Contaminant Level
Results that exceed USEPA MCLs are boxed.

Table 2
Groundwater Sample Results - June 2009
GE Puerto Rico Investment
Patillas, Puerto Rico

	RSL or MCL*	P-10A	P-11	P-15DD	P-16S	P-17D
Volatile Organic Compound (ug/L)						
1,1,1,2-Tetrachloroethane	0.52	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	200*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
1,1,2,2-Tetrachloroethane	0.067	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	5*	**0.8 J**	0.8 U	0.8 U	0.8 U	0.8 U
1,1-Dichloroethane	2.4	**21**	**1 J**	**2 J**	1 U	**2 J**
1,1-Dichloroethene	7*	**770**	**2 J**	**61**	**4 J**	**75**
1,1-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	-	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	0.0096	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	70*	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	15	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	0.2	2 U	2 U	2 U	2 U	2 U
1,2-Dibromoethane	0.05*	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	600*	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	5*	**2 J**	1 U	1 U	1 U	1 U
1,2-Dichloropropane	5*	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	12	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	-	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	730	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	75*	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	-	1 U	1 U	1 U	1 U	1 U
2-Butanone	7,100	3 U	3 U	3 U	3 U	3 U
2-Chlorotoluene	730	1 U	1 U	1 U	1 U	1 U
4-Chlorotoluene	2,600	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-pentanone	2,000	3 U	3 U	3 U	3 U	3 U
Acetone	22,000	6 U	6 U	6 U	6 U	6 U
Benzene	5*	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromobenzene	20	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	-	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	0.12	1 U	1 U	1 U	1 U	1 U
Bromoform	8.5	1 U	1 U	1 U	1 U	1 U
Bromomethane	8.7	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5*	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	100*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Chloroethane	-	1 U	1 U	1 U	1 U	1 U
Chloroform	0.19	**2 J**	0.8 U	0.8 U	0.8 U	0.8 U
Chloromethane	190	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	70*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
cis-1,3-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	0.15	1 U	1 U	1 U	1 U	1 U
Dibromomethane	370	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	390	2 U	2 U	2 U	2 U	2 U
Ethylbenzene	700*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobutadiene	0.86	2 U	2 U	2 U	2 U	2 U
Isopropylbenzene	-	1 U	1 U	1 U	1 U	1 U
Methyl Tertiary Butyl Ether	12	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5*	2 U	2 U	2 U	2 U	2 U
m-Xylene	1,400	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Naphthalene	0.14	1 U	1 U	1 U	1 U	1 U
n-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
n-Propylbenzene	-	1 U	1 U	1 U	1 U	1 U
o-Xylene	1,400	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
p-Isopropyltoluene	-	1 U	1 U	1 U	1 U	1 U
sec-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
Styrene	100*	1 U	1 U	1 U	1 U	1 U
tert-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	5*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Toluene	1000*	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
trans-1,2-Dichloroethene	100*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
trans-1,3-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
Trichloroethene	5*	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	1,300	**3 J**	2 U	2 U	2 U	2 U
Vinyl Chloride	2*	1 U	1 U	1 U	1 U	1 U

Concentrations are reported in micrograms per liter (ug/L)
U - Non-Detect. The analyte was not detected above the indicated reporting limit.
J - Estimated. The analyte was detected below the reporting limit.
RSL - USEPA Regional Screening Level
MCL - Maximum Contaminant Level
Results that exceed USEPA MCLs are boxed.

Table 2
Groundwater Sample Results - June 2009
GE Puerto Rico Investment
Patillas, Puerto Rico

	RSL or MCL*	P-18S	P-18D	P-19S	P-19D	P-19D (duplicate)
Volatile Organic Compound (ug/L)						
1,1,1,2-Tetrachloroethane	0.52	1 U	1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	200*	**0.8 J**	0.8 U	0.8 U	0.8 U	0.8 U
1,1,2,2-Tetrachloroethane	0.067	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloroethane	5*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
1,1-Dichloroethane	2.4	**1 J**	**1 J**	1 U	1 U	1 U
1,1-Dichloroethene	7*	**17**	**31**	0.8 U	**2 J**	**2 J**
1,1-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichlorobenzene	-	1 U	1 U	1 U	1 U	1 U
1,2,3-Trichloropropane	0.0096	1 U	1 U	1 U	1 U	1 U
1,2,4-Trichlorobenzene	70*	1 U	1 U	1 U	1 U	1 U
1,2,4-Trimethylbenzene	15	1 U	1 U	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	0.2	2 U	2 U	2 U	2 U	2 U
1,2-Dibromoethane	0.05*	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	600*	1 U	1 U	1 U	1 U	1 U
1,2-Dichloroethane	5*	1 U	1 U	1 U	1 U	1 U
1,2-Dichloropropane	5*	1 U	1 U	1 U	1 U	1 U
1,3,5-Trimethylbenzene	12	1 U	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	-	1 U	1 U	1 U	1 U	1 U
1,3-Dichloropropane	730	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	75*	1 U	1 U	1 U	1 U	1 U
2,2-Dichloropropane	-	1 U	1 U	1 U	1 U	1 U
2-Butanone	7,100	3 U	3 U	3 U	3 U	3 U
2-Chlorotoluene	730	1 U	1 U	1 U	1 U	1 U
4-Chlorotoluene	2,600	1 U	1 U	1 U	1 U	1 U
4-Methyl-2-pentanone	2,000	3 U	3 U	3 U	3 U	3 U
Acetone	22,000	6 U	6 U	6 U	6 U	6 U
Benzene	5*	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromobenzene	20	1 U	1 U	1 U	1 U	1 U
Bromochloromethane	-	1 U	1 U	1 U	1 U	1 U
Bromodichloromethane	0.12	1 U	1 U	1 U	1 U	1 U
Bromoform	8.5	1 U	1 U	1 U	1 U	1 U
Bromomethane	8.7	1 U	1 U	1 U	1 U	1 U
Carbon Tetrachloride	5*	1 U	1 U	1 U	1 U	1 U
Chlorobenzene	100*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Chloroethane	-	1 U	1 U	1 U	1 U	1 U
Chloroform	0.19	0.8 U	**0.9 J**	0.8 U	**0.8 J**	**0.8 J**
Chloromethane	190	1 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	70*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
cis-1,3-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
Dibromochloromethane	0.15	1 U	1 U	1 U	1 U	1 U
Dibromomethane	370	1 U	1 U	1 U	1 U	1 U
Dichlorodifluoromethane	390	2 U	2 U	2 U	2 U	2 U
Ethylbenzene	700*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Hexachlorobutadiene	0.86	2 U	2 U	2 U	2 U	2 U
Isopropylbenzene	-	1 U	1 U	1 U	1 U	1 U
Methyl Tertiary Butyl Ether	12	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene Chloride	5*	2 U	2 U	2 U	2 U	2 U
m-Xylene	1,400	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Naphthalene	0.14	1 U	1 U	1 U	1 U	1 U
n-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
n-Propylbenzene	-	1 U	1 U	1 U	1 U	1 U
o-Xylene	1,400	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
p-Isopropyltoluene	-	1 U	1 U	1 U	1 U	1 U
sec-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
Styrene	100*	1 U	1 U	1 U	1 U	1 U
tert-Butylbenzene	-	1 U	1 U	1 U	1 U	1 U
Tetrachloroethene	5*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Toluene	1000*	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
trans-1,2-Dichloroethene	100*	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
trans-1,3-Dichloropropene	-	1 U	1 U	1 U	1 U	1 U
Trichloroethene	5*	1 U	1 U	1 U	1 U	1 U
Trichlorofluoromethane	1,300	2 U	2 U	2 U	2 U	2 U
Vinyl Chloride	2*	1 U	1 U	1 U	1 U	1 U

Concentrations are reported in micrograms per liter (ug/L)
U - Non-Detect. The analyte was not detected above the indicated reporting limit.
J - Estimated. The analyte was detected below the reporting limit.
RSL - USEPA Regional Screening Level
MCL - Maximum Contaminant Level
Results that exceed USEPA MCLs are boxed.

Table 2
Groundwater Sample Results - June 2009
GE Puerto Rico Investment
Patillas, Puerto Rico

	RSL or MCL*	P-20S	P-20D
Volatile Organic Compound (ug/L)			
1,1,1,2-Tetrachloroethane	0.52	1 U	1 U
1,1,1-Trichloroethane	200*	0.8 U	0.8 U
1,1,2,2-Tetrachloroethane	0.067	1 U	1 U
1,1,2-Trichloroethane	5*	0.8 U	0.8 U
1,1-Dichloroethane	2.4	1 U	1 U
1,1-Dichloroethene	7*	0.8 U	**24**
1,1-Dichloropropene	-	1 U	1 U
1,2,3-Trichlorobenzene	-	1 U	1 U
1,2,3-Trichloropropane	0.0096	1 U	1 U
1,2,4-Trichlorobenzene	70*	1 U	1 U
1,2,4-Trimethylbenzene	15	1 U	1 U
1,2-Dibromo-3-chloropropane	0.2	2 U	2 U
1,2-Dibromoethane	0.05*	1 U	1 U
1,2-Dichlorobenzene	600*	1 U	1 U
1,2-Dichloroethane	5*	1 U	1 U
1,2-Dichloropropane	5*	1 U	1 U
1,3,5-Trimethylbenzene	12	1 U	1 U
1,3-Dichlorobenzene	-	1 U	1 U
1,3-Dichloropropane	730	1 U	1 U
1,4-Dichlorobenzene	75*	1 U	1 U
2,2-Dichloropropane	-	1 U	1 U
2-Butanone	7,100	3 U	3 U
2-Chlorotoluene	730	1 U	1 U
4-Chlorotoluene	2,600	1 U	1 U
4-Methyl-2-pentanone	2,000	3 U	3 U
Acetone	22,000	6 U	6 U
Benzene	5*	0.5 U	0.5 U
Bromobenzene	20	1 U	1 U
Bromochloromethane	-	1 U	1 U
Bromodichloromethane	0.12	1 U	1 U
Bromoform	8.5	1 U	1 U
Bromomethane	8.7	1 U	1 U
Carbon Tetrachloride	5*	1 U	1 U
Chlorobenzene	100*	0.8 U	0.8 U
Chloroethane	-	1 U	1 U
Chloroform	0.19	0.8 U	**0.9 J**
Chloromethane	190	1 U	1 U
cis-1,2-Dichloroethene	70*	0.8 U	0.8 U
cis-1,3-Dichloropropene	-	1 U	1 U
Dibromochloromethane	0.15	1 U	1 U
Dibromomethane	370	1 U	1 U
Dichlorodifluoromethane	390	2 U	2 U
Ethylbenzene	700*	0.8 U	0.8 U
Hexachlorobutadiene	0.86	2 U	2 U
Isopropylbenzene	-	1 U	1 U
Methyl Tertiary Butyl Ether	12	0.5 U	0.5 U
Methylene Chloride	5*	2 U	2 U
m-Xylene	1,400	0.8 U	0.8 U
Naphthalene	0.14	1 U	1 U
n-Butylbenzene	-	1 U	1 U
n-Propylbenzene	-	1 U	1 U
o-Xylene	1,400	0.8 U	0.8 U
p-Isopropyltoluene	-	1 U	1 U
sec-Butylbenzene	-	1 U	1 U
Styrene	100*	1 U	1 U
tert-Butylbenzene	-	1 U	1 U
Tetrachloroethene	5*	0.8 U	0.8 U
Toluene	1000*	0.7 U	0.7 U
trans-1,2-Dichloroethene	100*	0.8 U	0.8 U
trans-1,3-Dichloropropene	-	1 U	1 U
Trichloroethene	5*	1 U	1 U
Trichlorofluoromethane	1,300	2 U	2 U
Vinyl Chloride	2*	1 U	1 U

Concentrations are reported in micrograms per liter (ug/L)
U - Non-Detect. The analyte was not detected above the indicated reporting limit.
J - Estimated. The analyte was detected below the reporting limit.
RSL - USEPA Regional Screening Level
MCL - Maximum Contaminant Level
Results that exceed USEPA MCLs are boxed.

Table 3
Historical Groundwater Sample Results
GE Puerto Rico Investment
Patillas, Puerto Rico

Shallow Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	**200**		**NA**		**7.0**	
P-4	Feb-89	1.0	U	1.0	U	1.0	U
	Jul-91	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
	Oct-97	1.0	U	1.0	U	1.0	U
	Nov-98	1.0	U	1.0	U	1.0	U
	Dec-99	1.0	U	1.0	U	1.0	U
	Jun-04	1.0	U	1.0	U	1.0	U
	Jun-09	1.0	U	1.0	U	1.0	U
P-5	Feb-89	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
	Oct-97	1.0	U	1.0	U	1.0	U
	Nov-98	1.0	U	1.0	U	1.0	U
	Dec-99	1.0	U	1.0	U	1.0	U
P-7	Feb-89	**20**		1.0	U	**31**	
	Jul-91	**25**		**3.0**		**30**	
	Aug-92	**4.0**		1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	**5.0**	
	Aug-93	1.0	U	1.0	U	1.0	U
	Nov-93	**5.0**		1.0	U	**8.0**	
	Feb-94	**14**		1.0	U	**19**	
	May-94	**13**		1.0	U	**21**	
	Sep-94	**6.0**		1.0	U	**16**	
	Nov-94	1.0	U	1.0	U	**5.0**	
	Mar-95	1.0	U	1.0	U	**3.0**	
	Jun-95	1.0	U	1.0	U	**8.0**	
	Oct-95	1.0	U	1.0	U	**3.0**	
	Jan-96	1.0	U	1.0	U	**2.0**	
	Apr-96	1.0	U	1.0	U	**2.0**	
	Jul-96	1.0	U	1.0	U	1.0	U
	Oct-96	1.0	U	1.0	U	1.0	U
	Feb-97	**18**		1.0	U	**14**	
	Jun-97	**13**		1.0	U	**17**	
	Oct-97	1.0	U	1.0	U	**23**	
	Feb-98	1.0	U	1.0	U	1.0	U
	Jun-98	1.0	U	1.0	U	1.0	U
	Nov-98	1.0	U	1.0	U	1.0	U
	May-99	1.0	U	1.0	U	1.0	U
	Aug-99	1.0	U	1.0	U	1.0	U
	Dec-99	1.0	U	1.0	U	1.0	U
	Dec-00	1.0	U	1.0	U	1.0	U
	Dec-01	1.0	U	1.0	U	1.0	U
	Jun-04	1.0	U	1.0	U	1.0	U
	Jun-09	1.0	U	**8.0**		**26**	

Deep Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	**200**		**NA**		**7.0**	
No associated deep well							
P-5A	Feb-89	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
	Oct-97	1.0	U	1.0	U	1.0	U
	Nov-98	1.0	U	1.0	U	1.0	U
	Dec-99	1.0	U	1.0	U	1.0	U
P-7A	Feb-89	1.0	U	-		**17**	
	Jul-91	**10**		**2.0**		**21**	
	Nov-92	-		-		-	
	Feb-93	**12**		**5.0**		**37**	
	May-93	**23**		**6.0**		**60**	
	Aug-93	**17**		**5.0**		**40**	
	Nov-93	**11**		1.0	U	**29**	
	Feb-94	**11**		**4.0**		**50**	
	May-94	**4.0**		**3.0**		**40**	
	Sep-94	1.0	U	**3.0**		**30**	
	Nov-94	1.0	U	1.0	U	**24**	
	Mar-95	**4.0**		1.0	U	**25**	
	Jun-95	**5.0**		**3.0**		**21**	
	Oct-95	**3.0**		1.0	U	**22**	
	Jan-96	**7.0**		**3.0**		**17**	
	Apr-96	**6.0**		**3.0**		**34**	
	Jul-96	**8.0**		**3.0**		**24**	
	Oct-96	**5.0**		**3.0**		**27**	
	Feb-97	**6.0**		1.0	U	**22**	
	Jun-97	**3.0**		**3.0**		**30**	
	Oct-97	**4.0**		1.0	U	**23**	
	Feb-98	1.0	U	1.0	U	**11**	
	Jun-98	1.0	U	1.0	U	**19**	
	Nov-98	1.0	U	1.0	U	**11**	
	May-99	1.0	U	1.0	U	**12**	
	Aug-99	1.0	U	1.0	U	**19**	
	Dec-99	1.0	U	1.0	U	**18**	
	Dec-00	1.0	U	1.0	U	**19**	
	Dec-01	1.0	U	1.0	U	**16**	
	Jun-04	**0.4**		**1.2**		**18**	
	Jun-09	1.0	U	1.0	U	**14**	
						3	J

Table 3
Historical Groundwater Sample Results
GE Puerto Rico Investment
Patillas, Puerto Rico

		Shallow Zone Monitoring Wells						Deep Zone Monitoring Wells			
		1,1,1-TCA		1,1-DCA		1,1-DCE			1,1,1-TCA	1,1-DCA	1,1-DCE
	MCL:	200		NA		7.0		MCL:	200	NA	7.0
P-8	Feb-89	**9.0**		1.0	U	1.0	U	***No associated deep well***			
	Jul-91	1.0	U	1.0	U	1.0	U				
	Aug-92	1.0	U	1.0	U	1.0	U				
	Nov-92	1.0	U	1.0	U	1.0	U				
	Feb-93	1.0	U	1.0	U	1.0	U				
	May-93	1.0	U	1.0	U	1.0	U				
	May-94	1.0	U	1.0	U	1.0	U				
	Jun-95	1.0	U	1.0	U	1.0	U				
	Jul-96	1.0	U	1.0	U	1.0	U				
	Oct-97	1.0	U	1.0	U	1.0	U				
	Nov-98	**2410**		**128**		**1120**					
	May-99	**9.0**		1.0	U	**7.0**					
	Aug-99	1.0	U	1.0	U	1.0	U				
	Dec-99	**2040**		**198**		**2020**					
	Dec-00	1.0	U	1.0	U	1.0	U				
	Dec-01	1.0	U	1.0	U	1.0	U				
	Jun-04	**586**		**61**		**360**					
P-9	Feb-89	1.0	U	1.0	U	**22**		***No associated deep well***			
	Jul-91	1.0	U	**2.0**		**13**					
	Aug-92	1.0	U	1.0	U	**18**					
	Nov-92	1.0	U	**3.0**		**19**					
	Feb-93	1.0	U	1.0	U	**16**					
	May-93	1.0	U	1.0	U	**9**					
	Aug-93	1.0	U	1.0	U	**15**					
	Nov-93	**2.0**		**2.0**		**13**					
	Feb-94	1.0	U	1.0	U	**12**					
	May-94	1.0	U	1.0	U	**10**					
	Sep-94	1.0	U	1.0	U	**11**					
	Nov-94	1.0	U	1.0	U	**10**					
	Mar-95	1.0	U	1.0	U	**8.0**					
	Jun-95	1.0	U	1.0	U	**8.0**					
	Oct-95	1.0	U	1.0	U	**6.0**					
	Jan-96	1.0	U	1.0	U	**10**					
	Apr-96	1.0	U	1.0	U	**9.0**					
	Jul-96	1.0	U	1.0	U	**8.0**					
	Oct-96	1.0	U	1.0	U	**7.0**					
	Feb-97	1.0	U	1.0	U	**9.0**					
	Jun-97	1.0	U	1.0	U	**8.0**					
	Oct-97	1.0	U	1.0	U	**6.0**					
	Feb-98	1.0	U	1.0	U	1.0	U				
	Jun-98	1.0	U	1.0	U	**5.0**					
	Nov-98	1.0	U	1.0	U	**6.0**					
	May-99	1.0	U	1.0	U	**13**					
	Aug-99	1.0	U	1.0	U	**13**					
	Dec-99	1.0	U	1.0	U	**11**					
	Dec-00	1.0	U	1.0	U	**7.0**					
	Dec-01	1.0	U	1.0	U	1.0	U				
	Jun-04	1.0	U	**0.8**		**6.3**					
	Jun-09	1.0	U	1.0	U	**2.0**	J				

Table 3
Historical Groundwater Sample Results
GE Puerto Rico Investment
Patillas, Puerto Rico

Shallow Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	200		NA		7.0	
P-10A							
No associated shallow well							
P-11	Feb-89	**911**		1.0	U	**62**	
	Jul-91	**1180**		**20**		**409**	
	Aug-92	**139**		**11**		**26**	
	Nov-92	**20**		1.0	U	1.0	U
	Feb-93	**80**		**8.0**		**19**	
	May-93	**115**		**6.0**		**25**	
	Aug-93	**148**		**17**		**29**	
	Nov-93	**736**		**49**		**103**	
	Feb-94	**520**		**21**		**204**	
	May-94	**649**		1.0	U	**259**	
	Sep-94	**665**		**25**		**271**	
	Nov-94	**390**		**37**		**176**	
	Mar-95	**394**		**13**		**118**	
	Jun-95	**875**		**46**		**295**	
	Oct-95	**420**		**44**		**172**	
	Jan-96	**878**		**83**		**392**	
	Apr-96	**185**		**8.0**		**62**	
	Jul-96	**712**		**49**		**160**	
	Oct-96	**9120**		**173**		**2260**	
	Feb-97	**5850**		**65**		**1630**	
	Jun-97	**1220**		**26**		**611**	
	Oct-97	**1050**		**50**		**431**	
	Feb-98	**118**		**5.0**		**53**	
	Jun-98	**113**		1.0	U	**47**	
	Nov-98	**10**		1.0	U	1.0	U
	May-99	**17**		1.0	U	1.0	U
	Aug-99	**27**		**5.0**		**6.0**	
	Dec-99	1.0	U	1.0	U	1.0	U
	Dec-00	1.0	U	1.0	U	1.0	U
	Dec-01	1.0	U	1.0	U	1.0	U
	Jun-04	1.0	U	**1.1**		1.0	U
	Jun-09	1.0	U	**1.0**	J	**2.0**	J

Deep Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE
	MCL:	200		NA		7.0
P-10A	Feb-89	**26**		**13**		**851**
	Jul-91	1.0	U	**12**		**1740**
	Aug-92	**15**		**17**		**1310**
	Nov-92	**7.0**		**12**		**1310**
	Feb-93	1.0	U	1.0	U	**1320**
	May-93	1.0	U	1.0	U	**937**
	Aug-93	1.0	U	1.0	U	**1180**
	Nov-93	1.0	U	**17**		**1270**
	Feb-94	**9.0**		**18**		**1900**
	May-94	**7.0**		**16**		**1500**
	Sep-94	1.0	U	1.0	U	**1260**
	Nov-94	1.0	U	**13**		**1200**
	Mar-95	1.0	U	1.0	U	**960**
	Jun-95	1.0	U	**16**		**961**
	Oct-95	1.0	U	**17**		**1110**
	Jan-96	**4.0**		**13**		**1260**
	Apr-96	**3.0**		**10**		**770**
	Jul-96	**4.0**		**14**		**1100**
	Oct-96	**3.0**		**18**		**924**
	Feb-97	1.0	U	**11**		**707**
	Jun-97	1.0	U	**10**		**601**
	Oct-97	1.0	U	**12**		**800**
	Feb-98	1.0	U	**11**		**702**
	Jun-98	1.0	U	**11**		**667**
	Nov-98	1.0	U	**11**		**580**
	May-99	1.0	U	**17**		**857**
	Aug-99	1.0	U	**23**		**742**
	Dec-99	1.0	U	**23**		**1350**
	Dec-00	**6.0**		**18**		**992**
	Dec-01	**6.1**		**21**		**974**
	Jun-04	**1.3**		**23**		**1230**
	Jun-09	1.0	U	**21**		**770**

No associated deep well

Table 3
Historical Groundwater Sample Results
GE Puerto Rico Investment
Patillas, Puerto Rico

Shallow Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	200		NA		7.0	
P-12	Nov-89	**2.0**		1.0	U	**30**	
	Jul-91	**3.0**		1.0	U	**25**	
	Aug-92	1.0	U	1.0	U	**8.0**	
	Nov-92	1.0	U	1.0	U	**5.0**	
	Feb-93	1.0	U	1.0	U	**5.0**	
	May-93	1.0	U	1.0	U	**20**	
	Aug-93	1.0	U	1.0	U	**17**	
	Nov-93	**3.0**		1.0	U	**27**	
	Feb-94	**2.0**		1.0	U	**30**	
	May-94	1.0	U	1.0	U	**20**	
	Sep-94	1.0	U	1.0	U	**18**	
	Nov-94	1.0	U	1.0	U	**6.0**	
	Mar-95	1.0	U	1.0	U	**12**	
	Jun-95	1.0	U	1.0	U	1.0	U
	Oct-95	1.0	U	1.0	U	**4.0**	
	Jan-96	1.0	U	1.0	U	**6.0**	
	Apr-96	1.0	U	1.0	U	**5.0**	
	Jul-96	1.0	U	1.0	U	1.0	U
P-13S	Jul-91	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
P-14S	Jul-91	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
P-15DD							
No associated shallow well							
P-16S	Jun-04	**0.4**	J	**5.3**		**13**	
	Dec-05	0.8	U	**4.0**	J	**17**	
	May-06	0.8	U	**3.0**	J	**11**	
	Aug-06	0.8	U	**2.0**	J	**9.0**	
	Jun-09	0.8	U	1.0	U	**4.0**	J
P-17D							
No associated shallow well							
P-18S	Jun-04	**1.6**		**2.3**		**64**	
	Dec-05	**1.0**	J	**1.0**	J	**26**	
	May-06	**1.0**	J	**2.0**	J	**39**	
	Aug-06	**0.9**	J	1.0	U	**20**	
	Jun-09	**0.8**	J	**1.0**		**17**	

Deep Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	200		NA		7.0	
No associated deep well							
P-13D	Jul-91	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
P-14D	Jul-91	1.0	U	1.0	U	1.0	U
	Aug-92	1.0	U	1.0	U	1.0	U
	Nov-92	1.0	U	1.0	U	1.0	U
	Feb-93	1.0	U	1.0	U	1.0	U
	May-93	1.0	U	1.0	U	1.0	U
	May-94	1.0	U	1.0	U	1.0	U
	Jun-95	1.0	U	1.0	U	1.0	U
	Jul-96	1.0	U	1.0	U	1.0	U
P-15DD	Jun-04	**0.5**	J	**2.1**		**104**	
	Dec-05	0.8	U	**2.0**	J	**96**	
	May-06	0.8	U	**2.0**	J	**99**	
	Aug-06	0.8	U	**2.0**	J	**86**	
	Jun-09	0.8	U	**2.0**	J	**61**	
No associated deep well							
P-17D	Jun-04	1.0	U	**2.1**		**163**	
	Dec-05	0.8	U	**2.0**	J	**120**	
	May-06	0.8	U	**2.0**	J	**130**	
	Aug-06	0.8	U	**2.0**	J	**110**	
	Jun-09	0.8	U	**2.0**	J	**75**	
P-18D	Jun-04	**1.2**		**2.1**		**65**	
	Dec-05	**1.0**	J	**1.0**	J	**38**	
	May-06	0.8	U	**2.0**	J	**53**	
	Aug-06	**1.0**	J	**2.0**	J	**53**	
	Jun-09	0.8	U	**1.0**	J	**31**	

Table 3
Historical Groundwater Sample Results
GE Puerto Rico Investment
Patillas, Puerto Rico

Shallow Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	**200**		**NA**		**7.0**	
P-19S	Jun-04	**0.4**	J	**0.3**	J	**5.4**	
	Dec-05	0.8	U	1.0	U	**2.0**	J
	May-06	0.8	U	1.0	U	**1.0**	J
	Aug-06	0.8	U	1.0	U	0.8	U
	Jun-09	0.8	U	1.0	U	0.8	U
P-20S	May-06	0.8	U	1.0	U	0.8	U
	Aug-06	0.8	U	1.0	U	0.8	U
	Jun-09	0.8	U	1.0	U	0.8	U

Deep Zone Monitoring Wells

		1,1,1-TCA		1,1-DCA		1,1-DCE	
	MCL:	**200**		**NA**		**7.0**	
P-19D	Jun-04	**1.1**		**0.7**	J	**15**	
	Dec-05	0.8	U	1.0	U	**5.0**	
	May-06	0.8	U	1.0	U	**7.0**	
	Aug-06	**1.0**	J	1.0	U	**8.0**	
	Jun-09	0.8	U	1.0	U	**2.0**	J
P-20D	May-06	0.8	U	**1.0**	J	**37**	
	Aug-06	0.8	U	**1.0**	J	**44**	
	Jun-09	0.8	U	1.0	U	**24**	

Concentrations are reported in micrograms per liter (ug/L).

MCL - Maximum contaminant level
NA - Not available
1,1,1-TCA - 1,1,1-Trichoroethane
1,1-DCA - 1,1-Dichloroethane
1,1-DCE - 1,1-Dichloroethene
U - Non-Detect. The analyte was not detected above the indicated reporting limit
J - Estimated. The analyte was detected below the reporting limit.
Results that exceed MCLs are boxed.

APPENDIX A

GROUNDWATER SAMPLING LOGS

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-4	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	21.00'	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	20'		

Static Water Level (ft)	7.27
Pumping Water Level (ft)	7.80
Standing Water Column (ft)	13.73
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	30

Time Purge Started	1452
Sampling Date	6/15/09
Sample Time	1533
Total Volume Purged (gal)	4.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1506	6.37	0.399	51.7	5.00	28.84	88	7.74	450	pump pressure 85 initially
1511	6.32	0.402	21.0	4.72	28.80	92	7.78	400	
1516	6.32	0.404	12.2	4.68	28.77	93	7.80	350	
1519	6.35	0.406	9.3	4.38	28.77	96	7.80	350	
1522	6.34	0.408	8.8	4.06	28.76	97	7.80	350	
1525	6.34	0.409	6.3	4.40	28.75	98	7.80	350	
1528	6.35	0.410	5.6	4.57	28.76	97	7.80	350	
1531	6.34	0.410	5.1	4.35	28.74	96	7.80	350	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-9	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	20.01	**Samples Collected: VOCs**	
Job Number	1006833.010103	**Pump Intake Depth (ft)**	19'		

Static Water Level (ft)	7.41
Pumping Water Level (ft)	7.48
Standing Water Column (ft)	12.60
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	1613
Sampling Date	6/15/09
Sample Time	1650
Total Volume Purged (gal)	3.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (µS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1620	6.35	0.433	40.8	0.46	30.08	82	7.48	350	
1625	6.34	0.431	17.8	0.41	29.97	90	7.48	350	
1630	6.33	0.430	7.5	0.40	30.02	93	7.48	350	
1635	6.34	0.427	3.1	0.43	30.03	99	7.48	350	
1640	6.32	0.425	2.8	0.44	30.05	101	7.48	350	
1643	6.34	0.425	1.7	0.46	30.08	104	7.48	350	
1646	6.34	0.423	1.3	0.47	30.11	106	7.48	350	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-11	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	15.10	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	14'		

Static Water Level (ft)	6.05
Pumping Water Level (ft)	6.10
Standing Water Column (ft)	9.05
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	1747
Sampling Date	6/15/09
Sample Time	1825
Total Volume Purged (gal)	5.00

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1752	6.28	0.496	~~85~~ 35.6	0.96	29.26	83	6.11	400	
1757	6.29	0.484	14.7	0.51	29.30	74	6.10	400	
1802	6.32	0.467	9.2	0.28	29.28	52	6.10	400	
1807	6.31	0.460	7.7	0.25	29.27	47	6.10	400	
1810	6.33	0.462	5.7	0.18	29.28	48	6.10	400	
1813	6.33	0.459	6.2	0.15	29.27	45	6.10	400	
1816	6.33	0.460	5.0	0.12	29.27	39	6.10	400	
1819	6.32	0.459	4.6	0.11	29.28	38	6.10	400	
1822	6.34	0.460	3.9	0.10	29.28	37	6.10	400	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-7	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	19.67	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	18'		

Static Water Level (ft)	6.40
Pumping Water Level (ft)	6.58
Standing Water Column (ft)	13.27
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	0757
Sampling Date	6/16/09
Sample Time	0855
Total Volume Purged (gal)	5.00

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
0802	6.31	0.379	104	1.04	30.41	162	6.55	400	
0807	6.28	0.384	95.3	0.96	30.56	173	6.58	400	
0812	6.29	0.390	72.5	0.98	30.62	181	6.58	400	
0817	6.29	0.392	45.4	0.95	30.64	185	6.58	400	
0822	6.28	0.394	32.6	0.93	30.67	188	6.58	400	
0827	6.26	0.397	23.5	0.92	30.69	190	6.58	400	
0832	6.28	0.399	19.6	0.91	30.67	191	6.58	400	
0837	6.28	0.401	15.9	0.91	30.66	192	6.58	400	
0842	6.28	0.403	11.5	0.91	30.65	194	6.58	400	
0847	6.27	0.405	9.4	0.87	30.61	196	6.58	400	
0850	6.28	0.407	8.6	0.89	30.60	195	6.58	400	
0853	6.28	0.408	7.5	0.91	30.57	196	6.58	400	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-7A	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	53.30	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	52'		

Static Water Level (ft)	12.02
Pumping Water Level (ft)	12.15
Standing Water Column (ft)	41.28
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	30

Time Purge Started	0931
Sampling Date	6/16/09
Sample Time	1024
Total Volume Purged (gal)	4.00

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
0940	6.50	0.459	13.8	1.46	29.44	123	12.15	300	
0945	6.45	0.458	17.7	0.76	29.23	135	12.15	250	
0950	6.45	0.456	20.5	0.44	29.06	145	12.15	250	
0955	6.43	0.454	15.7	0.29	28.87	150	12.15	250	
1000	6.42	0.451	12.1	0.25	28.84	155	12.15	250	
1005	6.42	0.450	11.7	0.23	28.81	159	12.15	250	
1010	6.42	0.449	10.9	0.21	28.80	161	12.15	250	
1015	6.42	0.450	10.3	0.19	28.80	164	12.15	250	
1018	6.42	0.450	9.7	0.18	28.78	165	12.15	250	
1021	6.41	0.451	10.1	0.18	28.80	166	12.15	250	

DUP-01 collected at 1026, called 0800

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-165	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	28.04	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	27'		

Static Water Level (ft)	13.23
Pumping Water Level (ft)	13.45
Standing Water Column (ft)	14.81
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	1105
Sampling Date	6/16/09
Sample Time	1154
Total Volume Purged (gal)	2.50

All measurements taken from: Top of Casing ☑ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1110	6.56	0.566	~~10~~ 161	0.56	28.81	107	13.50	300	
1115	6.51	0.555	140	0.33	28.82	118	13.45	300	
1120	6.48	0.544	92.0	0.27	28.83	38	13.45	300	
1125	6.46	0.521	37.4	0.20	28.77	-11	13.45	300	
1130	6.46	0.515	24.1	0.17	28.80	-20	13.45	300	
1135	6.45	0.509	20.1	0.15	28.83	-22	13.45	300	
1140	6.44	0.506	18.5	0.15	28.79	-23	13.45	300	
1145	6.43	0.503	15.2	0.15	28.88	-24	13.45	300	
1148	6.43	0.501	15.0	0.14	28.84	-23	13.45	300	
1151	6.43	0.499	14.5	0.14	28.81	-24	13.45	300	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-18S	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	19.05'	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	~~18'~~ 17.5'		

Static Water Level (ft)	7.55
Pumping Water Level (ft)	7.60
Standing Water Column (ft)	11.50
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	20

Time Purge Started	1441
Sampling Date	6/16/09
Sample Time	1518
Total Volume Purged (gal)	~~3~~ 2.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1446	6.46	0.473	35.0	1.37	28.37	16	7.60	250	
1451	6.43	0.473	19.2	0.62	28.17	18	7.60	250	
1456	6.43	0.474	14.5	0.51	28.05	13	7.60	250	
1501	6.43	0.475	11.0	0.45	27.91	11	7.60	250	
1506	6.43	0.478	8.2	0.41	27.92	-2	7.60	250	
1509	6.43	0.479	6.8	0.41	27.92	-9	7.60	250	
1512	6.43	0.480	6.3	0.40	27.94	-12	7.59	250	
1515	6.43	0.478	4.7	0.39	27.95	-9	7.59	250	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-18D	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	48.05'	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	46'		

Static Water Level (ft)	7.86
Pumping Water Level (ft)	7.90
Standing Water Column (ft)	40.19
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	1553
Sampling Date	6/16/09
Sample Time	1636
Total Volume Purged (gal)	2.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1558	6.77	0.462	2.4	3.35	28.01	83	7.90	200	
1603	6.53	0.471	1.8	1.46	27.94	108	7.90	250	
1608	6.51	0.472	1.0	0.93	27.93	118	7.90	250	
1613	6.49	0.472	1.2	0.68	27.95	128	7.90	250	
1618	6.49	0.472	1.5	0.58	27.95	131	7.90	250	
1623	6.49	0.473	1.4	0.54	27.96	135	7.90	250	
1628	6.49	0.472	1.2	0.52	27.96	139	7.90	250	
1631	6.49	0.472	1.2	0.51	27.95	141	7.90	250	
1634	6.49	0.472	1.0	0.50	27.93	142	7.90	250	

MSe 1638 MSDe 1640

GROUNDWATER SAMPLING LOG

Client	GE	Well Number	P-195	Sampler	DTM
Site	Patillas	Total Well Depth	18.10	Samples Collected: VOCs	
Job Number	1006833.010103	Pump Intake Depth (ft)	16.5'		

Static Water Level (ft)	4.76
Pumping Water Level (ft)	4.78
Standing Water Column (ft)	13.34
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	20

Time Purge Started	0747
Sampling Date	6/17/09
Sample Time	0835
Total Volume Purged (gal)	3.00

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
0753	6.30	0.331	263	2.93	27.74	181	4.78	250	heavy rain last night.
0758	6.27	0.332	125	2.72	27.46	191	4.78	250	grayish brown water
0803	6.28	0.335	107	2.60	28.01	197	4.78	250	
0808	6.29	0.338	66.8	2.51	28.06	201	4.78	250	
0813	6.29	0.340	53.4	2.48	28.08	203	4.78	250	
0818	6.29	0.341	49.3	2.58	28.05	202	4.78	250	
0823	6.30	0.342	33.1	2.55	28.04	204	4.78	250	
0828	6.30	0.344	28.3	2.42	28.05	204	4.78	250	
0831	6.30	0.344	27.8	2.40	28.06	204	4.78	250	
0834	6.29	0.345	27.1	2.38	28.06	205	4.78	250	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-190	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	38.23	**Samples Collected:** VOCs DUP-02 (0800)	
Job Number	1006833.010103	**Pump Intake Depth (ft)**	36'		

Static Water Level (ft)	5.90
Pumping Water Level (ft)	5.98
Standing Water Column (ft)	32.33
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	0903
Sampling Date	6/17/09
Sample Time	0936
Total Volume Purged (gal)	2.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
0908	6.64	0.381	43.1	1.83	28.08	117	5.93	325	
0913	6.61	0.381	8.6	1.61	28.06	130	5.90	325	
0918	6.61	0.381	3.4	1.48	28.08	142	5.90	325	
0923	6.59	0.381	2.7	1.43	28.13	144	5.90	325	
0928	6.60	0.381	2.4	1.40	28.25	148	5.90	325	
0931	6.60	0.381	2.2	1.38	28.41	149	5.90	325	
0934	6.60	0.381	1.9	1.35	28.49	150	5.90	325	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-205	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	24.83	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	23'		

Static Water Level (ft)	5.63
Pumping Water Level (ft)	5.63
Standing Water Column (ft)	19.20
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	~~18~~ 20

Time Purge Started	1025
Sampling Date	6/17/09
Sample Time	1107
Total Volume Purged (gal)	2.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1030	6.85	0.240	2.6	4.12	26.65	103	5.63	250	
1035	6.76	0.243	2.2	3.57	26.38	123	5.63	300	
1040	6.75	0.243	2.9	3.46	26.29	134	5.63	300	
1045	6.75	0.243	3.7	3.41	26.24	139	5.63	300	
1050	6.75	0.243	4.4	3.39	26.23	144	5.63	300	
1055	6.74	0.243	5.4	3.37	26.20	147	5.63	300	
1100	6.74	0.242	5.7	3.35	26.19	150	5.63	300	
1105	6.75	0.243	6.3	3.33	26.17	151	5.63	300	

GROUNDWATER SAMPLING LOG

Client	GE	Well Number	P-150D	Sampler	DTM
Site	Patillas	Total Well Depth	75.79	Samples Collected: VOCs	
Job Number	1006833.010103	Pump Intake Depth (ft)	74'		

Static Water Level (ft)	11.40
Pumping Water Level (ft)	11.40
Standing Water Column (ft)	64.39
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	45

Time Purge Started	1323
Sampling Date	6/17/09
Sample Time	1415
Total Volume Purged (gal)	3.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1333	6.66	0.500	548	2.71	30.33	112	11.40	325	took until 1320 for water to produce
1338	6.75	0.535	95.5	1.49	30.22	123	11.40	300	
1343	6.77	0.537	23.6	0.99	30.17	129	11.40	250	
1348	6.78	0.538	15.6	0.80	30.19	134	11.40	250	
1353	6.78	0.538	11.8	0.61	30.14	135	11.40	250	
1358	6.78	0.538	12.5	0.52	30.11	137	11.42	250	
1403	6.77	0.538	9.9	0.45	30.14	139	11.42	250	
1408	6.78	0.538	9.1	0.40	30.12	140	11.42	250	
1411	6.76	0.539	7.8	0.38	30.10	139	11.42	250	
1414	6.74	0.538	7.5	0.36	30.15	140	11.42	250	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-170	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	63.74	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	62'		

Static Water Level (ft)	5.86
Pumping Water Level (ft)	5.94/5.95
Standing Water Column (ft)	57.88
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	45

Time Purge Started	1525
Sampling Date	6/17/09
Sample Time	1625
Total Volume Purged (gal)	3.00

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1534	7.03	0.573	96.4	1.43	27.96	83	5.94	250	
1539	7.00	0.582	101	0.53	27.98	67	5.95	300	
1544	6.98	0.582	79.4	0.42	27.83	65	5.95	300	
1549	6.98	0.583	54.2	0.37	27.77	63	5.95	300	
1554	6.99	0.584	39.5	0.32	27.89	62	5.95	300	
1559	6.99	0.583	32.1	0.31	27.86	62	5.95	300	
1604	6.99	0.584	24.3	0.28	27.97	64	5.95	300	
1609	6.97	0.583	19.3	0.26	27.96	65	5.95	300	
1612	6.96	0.583	17.7	0.25	27.94	66	5.95	300	
1615	6.98	0.583	15.8	0.23	27.88	65	5.95	300	
1618	6.98	0.584	13.3	0.23	27.91	66	5.95	300	
1621	6.99	0.584	12.4	0.22	27.97	68	5.95	300	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-20D	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	52.98	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	51'		

Static Water Level (ft)	7.02
Pumping Water Level (ft)	7.02
Standing Water Column (ft)	45.96
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	38

Time Purge Started	1049
Sampling Date	6/18/09
Sample Time	1139
Total Volume Purged (gal)	2.50

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp (°C)	ORP (mV)	Depth to Water (ft)	Flow Rate (ml/min)	Comments
	±0.1	±3%	±10%	±10 %	±3%	±10mV	<0.2'	75ml<rate<400ml	
1054	6.85	0.460	49.6	1.36	27.36	184	7.02	250	
1059	6.80	0.458	34.9	0.64	27.15	178	7.02	250	
1104	6.81	0.459	21.1	0.43	26.90	173	7.02	250	
1109	6.79	0.461	16.3	0.33	27.06	169	7.02	250	
1114	6.77	0.462	11.7	0.27	27.10	165	7.02	250	
1119	6.78	0.464	9.8	0.24	27.01	163	7.02	250	
1124	6.78	0.464	8.1	0.20	27.02	161	7.02	250	
1129	6.78	0.464	7.1	0.19	27.11	159	7.02	250	
1132	6.78	0.465	7.2	0.19	27.15	158	7.02	250	
1135	6.78	0.466	6.4	0.18	27.14	157	7.02	250	

GROUNDWATER SAMPLING LOG

Client	GE	**Well Number**	P-10A	**Sampler**	DTM
Site	Patillas	**Total Well Depth**	50.83	**Samples Collected:**	VOCs
Job Number	1006833.010103	**Pump Intake Depth (ft)**	49'		

Static Water Level (ft)	12.64
Pumping Water Level (ft)	12.85
Standing Water Column (ft)	38.19
Purge & Sampling Methods	QED Bladder Pump

BLADDER PUMP SETTINGS	
Refill	10
Discharge	5
Pressure	25

Time Purge Started	1244
Sampling Date	6/18/09
Sample Time	1333
Total Volume Purged (gal)	2.00

All measurements taken from: Top of Casing ☒ Protective Casing ☐ Ground Level ☐

Time	pH ±0.1	Cond. (mS/cm) ±3%	Turbidity (NTU) ±10%	DO (mg/L) ±10 %	Temp (°C) ±3%	ORP (mV) ±10mV	Depth to Water (ft) <0.2'	Flow Rate (ml/min) 75ml<rate<400ml	Comments
1250	7.19	0.539	21.5	1.44	29.90	98	12.82	175	
1255	6.96	0.554	24.3	0.70	29.66	108	12.85	225	
1300	6.92	0.557	12.3	0.53	29.65	52	12.85	225	
1305	6.90	0.556	9.8	0.42	29.66	34	12.85	225	
1310	6.89	0.555	8.6	0.36	29.73	30	12.85	225	
1315	6.88	0.553	6.4	0.35	29.74	22	12.85	225	
1320	6.88	0.553	6.5	0.32	29.79	23	12.86	225	
1325	6.88	0.552	6.3	0.30	29.76	25	12.85	225	
1328	6.87	0.552	5.7	0.29	29.86	23	12.85	225	
1331	6.87	0.551	5.2	0.28	29.84	25	12.85	225	

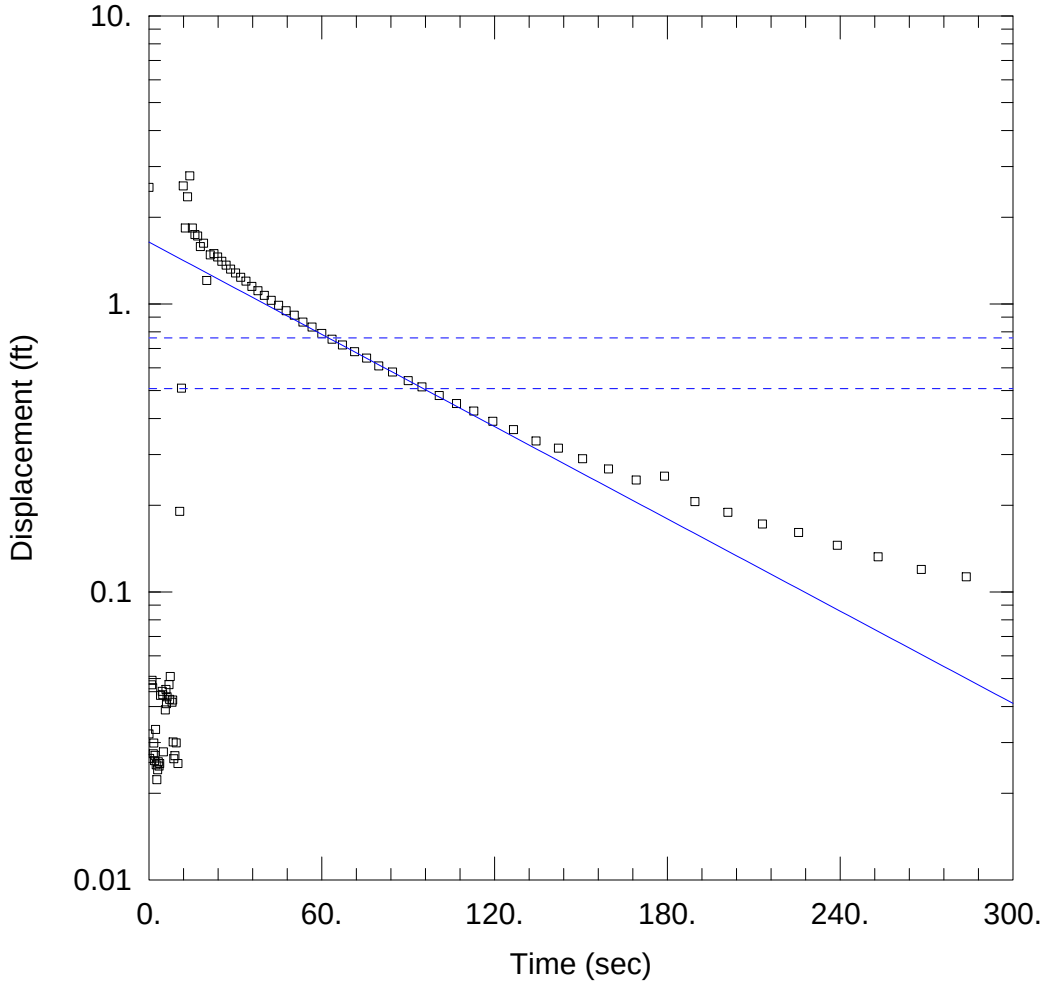
APPENDIX B

LABORATORY ANALYTICAL DATA

(INCLUDED ON CD)

APPENDIX C

AQUIFER TESTING DATA
AND
HYDRAULIC CONDUCTIVITY CALCULATIONS



FALLING HEAD TEST

Data Set: J:\...\P10A1F.aqt
Date: 06/28/09 Time: 17:09:40

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-10A
Test Date: June 17, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

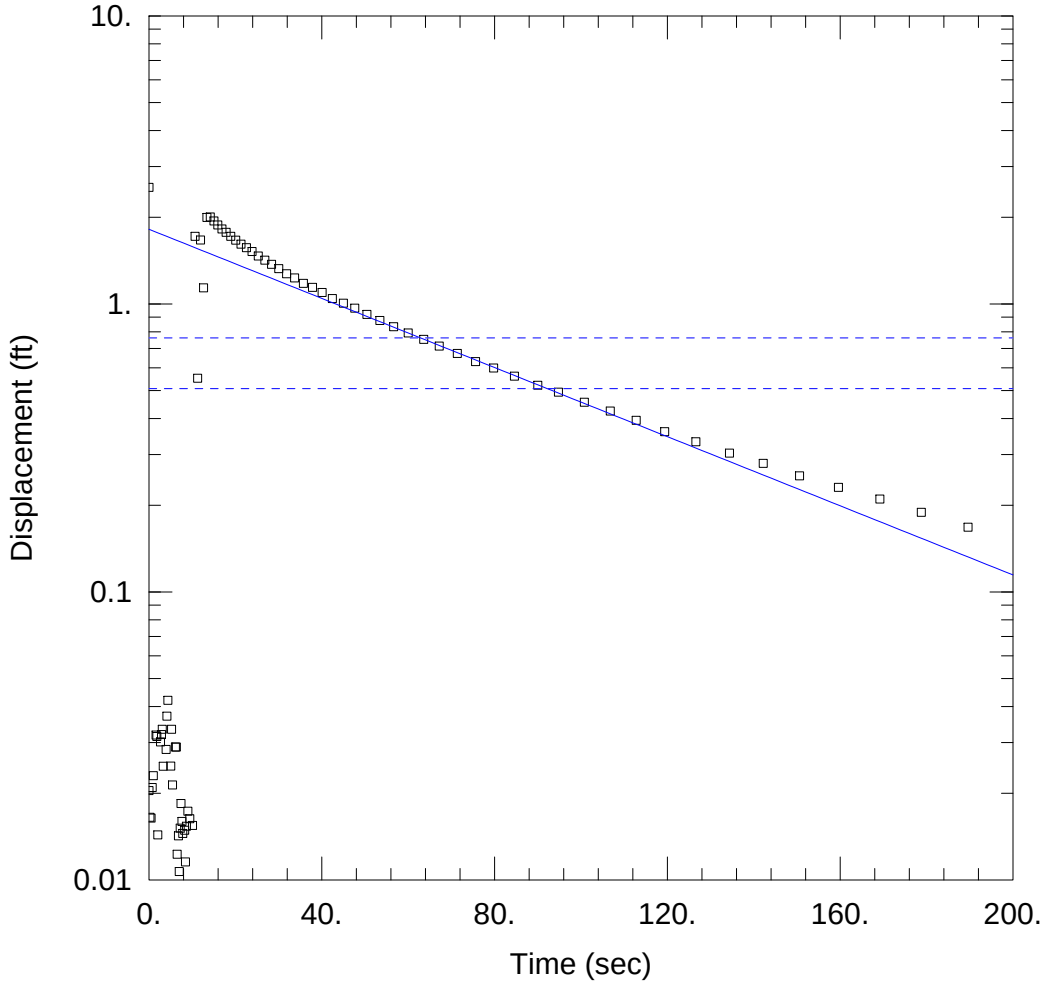
WELL DATA (P-10A)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 36. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36. ft
Screen Length: 14.3 ft
Wellbore Radius: 0.4167 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003242 cm/sec
y0 = 1.639 ft



RISING HEAD TEST

Data Set: J:\...\P10A2R.aqt
Date: 06/28/09 Time: 17:14:02

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-10A
Test Date: June 17, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

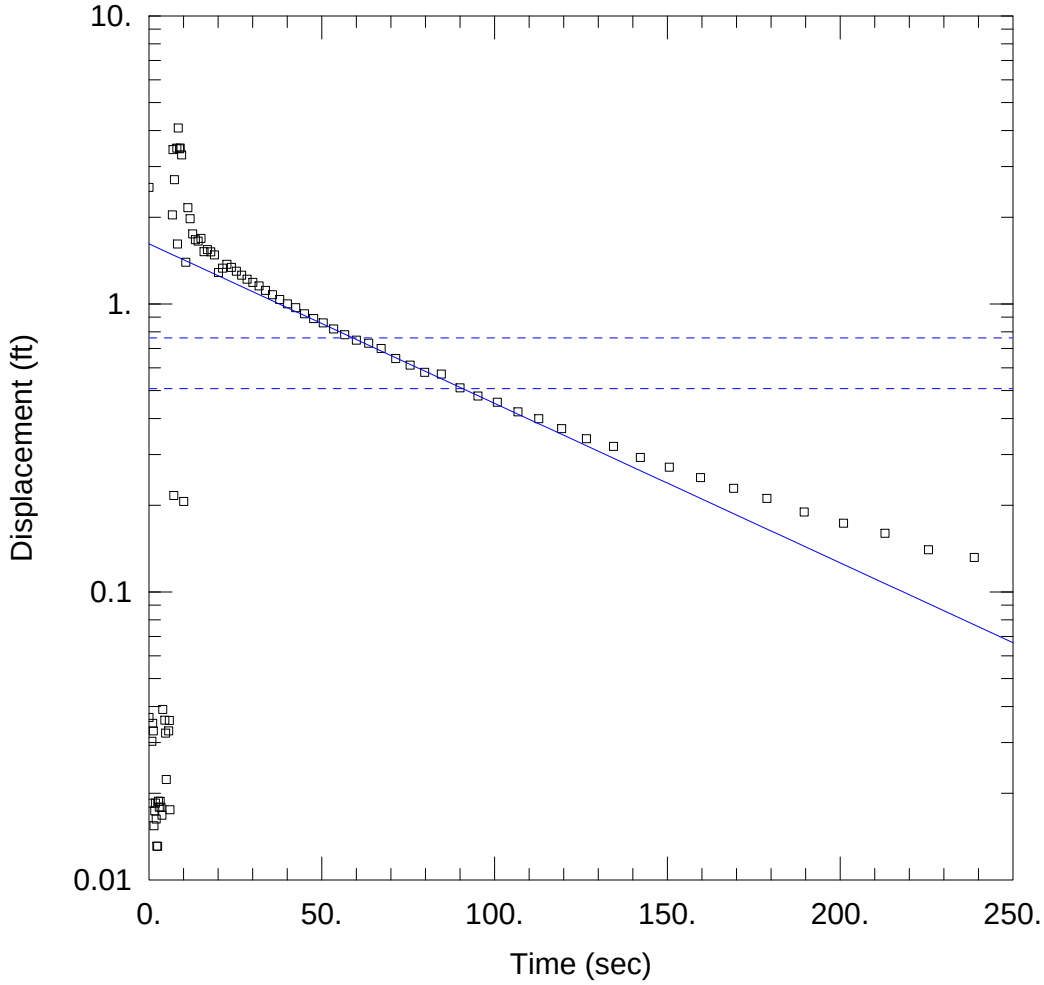
WELL DATA (P-10A)

Initial Displacement: 2.54 ft Static Water Column Height: 36. ft
Total Well Penetration Depth: 36. ft Screen Length: 14.3 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.4167 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0003644 cm/sec y0 = 1.816 ft



FALLING HEAD TEST

Data Set: J:\...\P10A3F.aqt
Date: 06/28/09 Time: 17:15:01

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-10A
Test Date: June 17, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

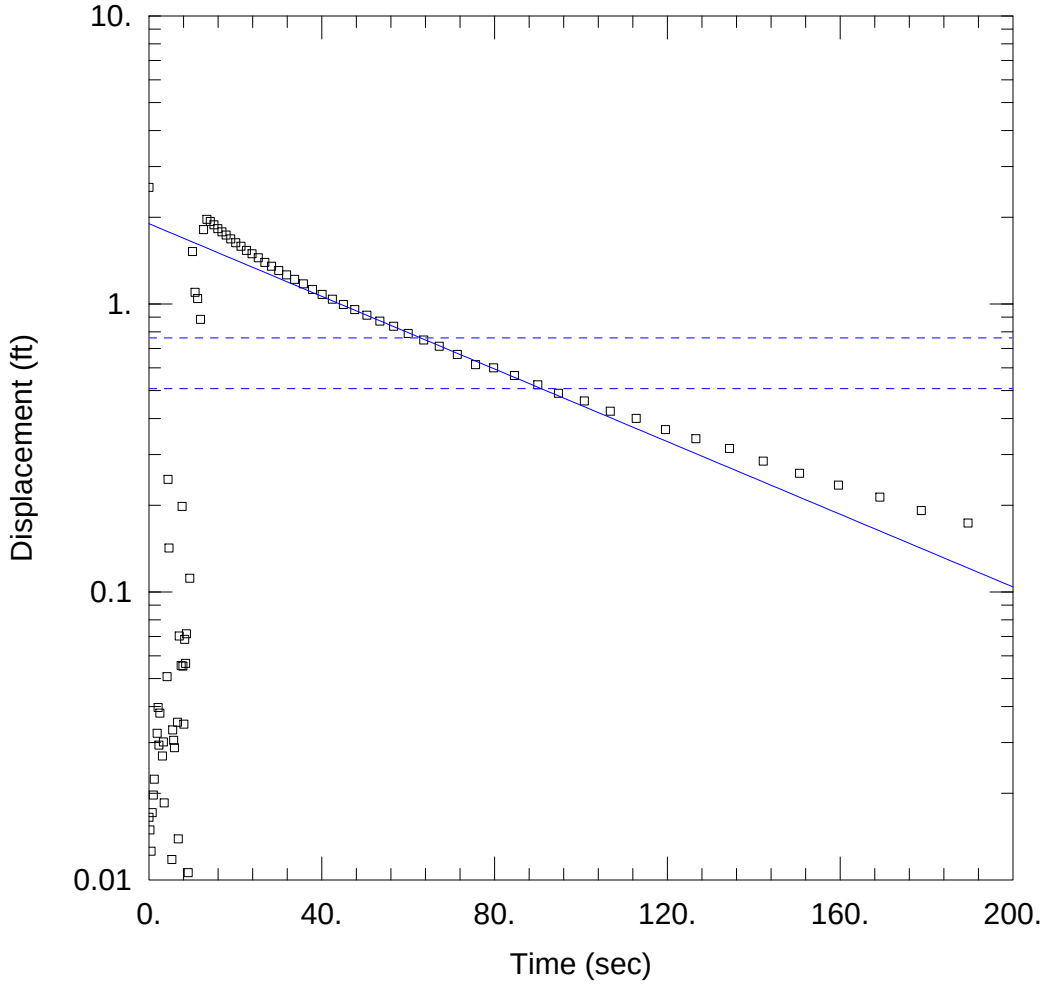
WELL DATA (P-10A)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 36. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36. ft
Screen Length: 14.3 ft
Wellbore Radius: 0.4167 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003364 cm/sec
y0 = 1.617 ft



RISING HEAD TEST

Data Set: J:\...\P10A4R.aqt
Date: 06/28/09 Time: 17:22:22

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-10A
Test Date: June 17, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

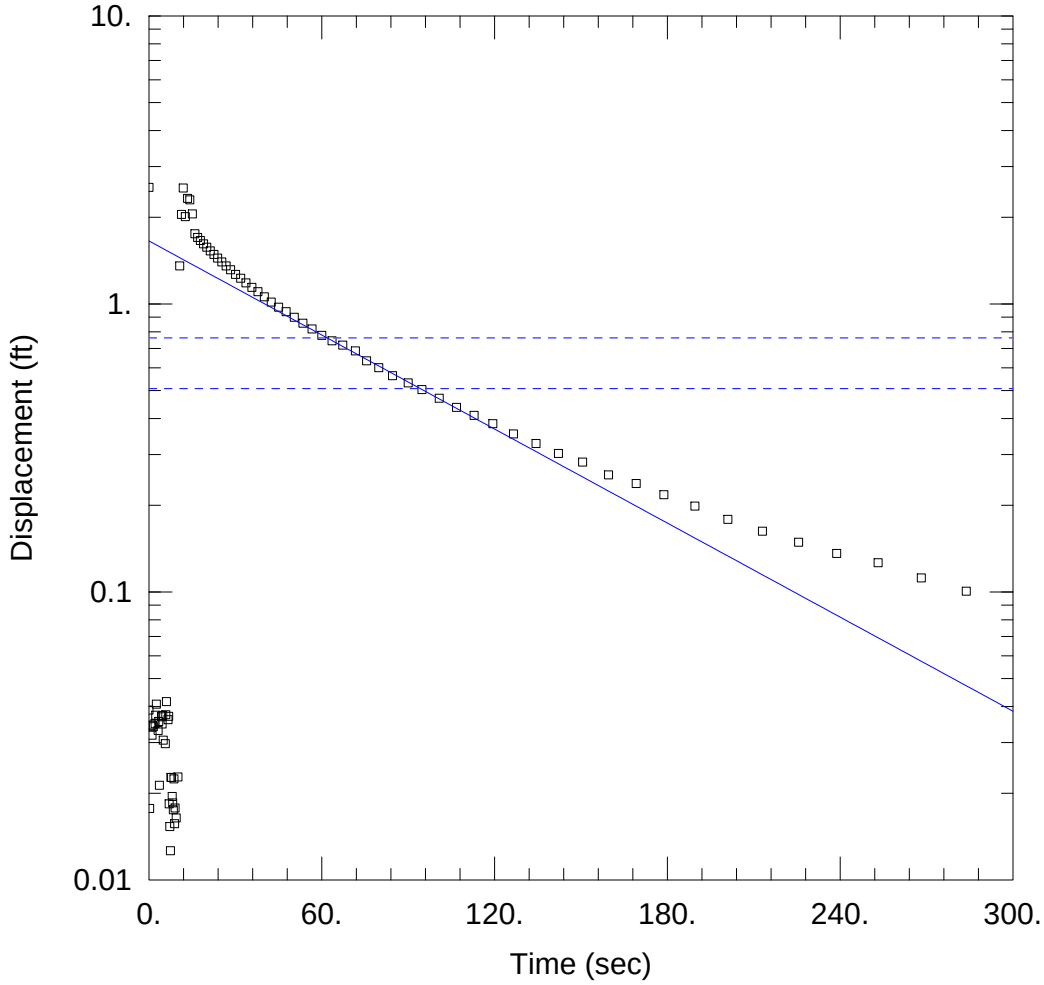
WELL DATA (P-10A)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 36. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36. ft
Screen Length: 14.3 ft
Wellbore Radius: 0.4167 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003829 cm/sec
y0 = 1.899 ft



FALLING HEAD TEST

Data Set: J:\...\P10A5F.aqt
Date: 06/28/09 Time: 17:24:06

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-10A
Test Date: June 17, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

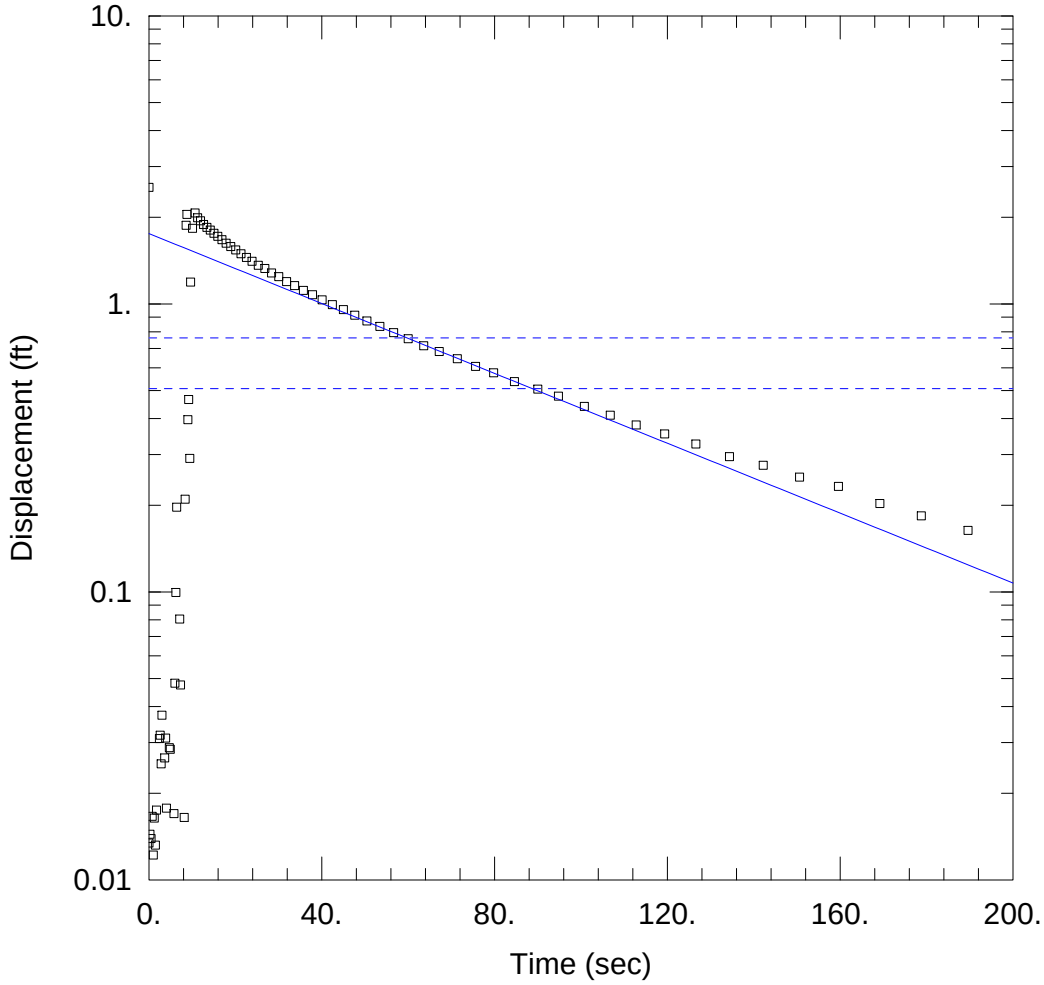
WELL DATA (P-10A)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 36. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36. ft
Screen Length: 14.3 ft
Wellbore Radius: 0.4167 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003305 cm/sec
y0 = 1.654 ft



RISING HEAD TEST

Data Set: J:\...\P10A6R.aqt
Date: 06/28/09 Time: 17:28:36

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-10A
Test Date: June 17, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

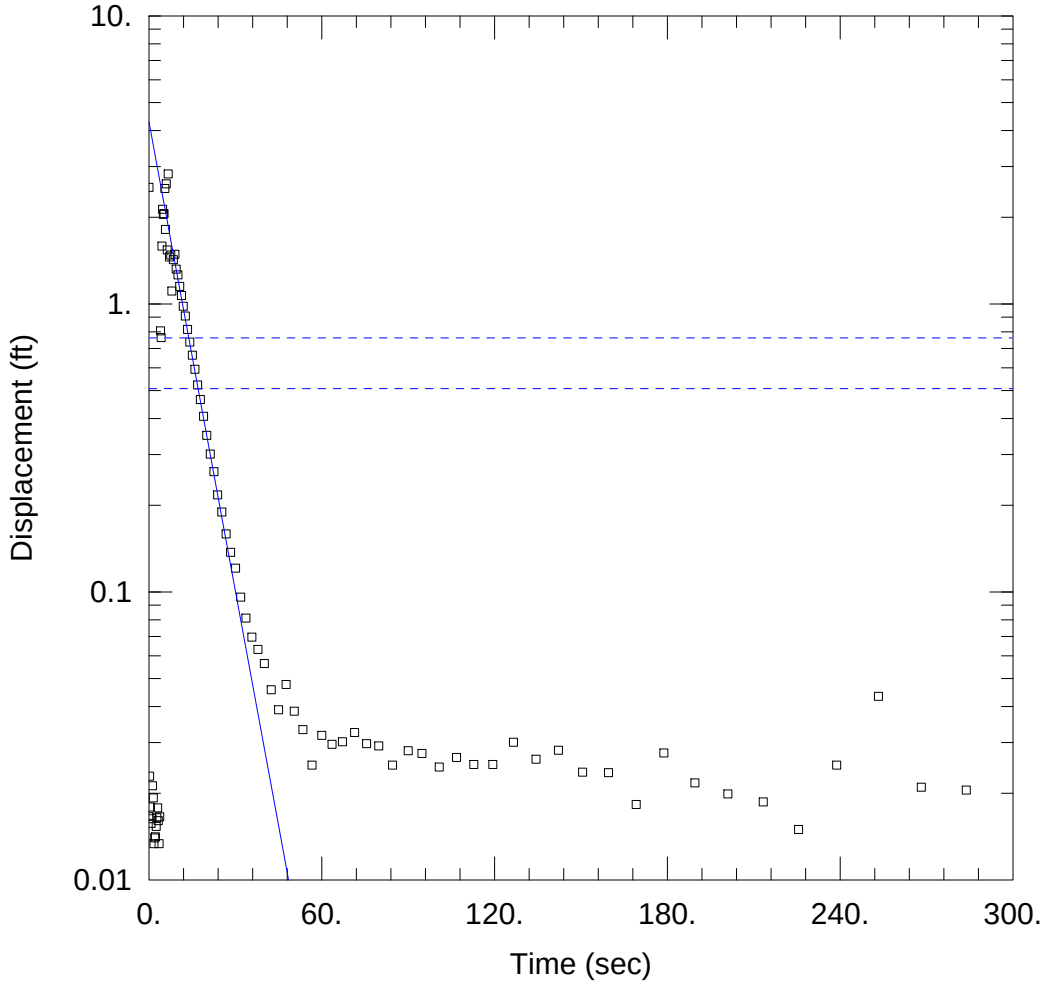
WELL DATA (P-10A)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 36. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 36. ft
Screen Length: 14.3 ft
Wellbore Radius: 0.4167 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0003684 cm/sec
y0 = 1.754 ft



FALLING HEAD TEST

Data Set: J:\...\P15DD1F.aqt
Date: 06/28/09 Time: 17:31:29

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-15DD
Test Date: June 15, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

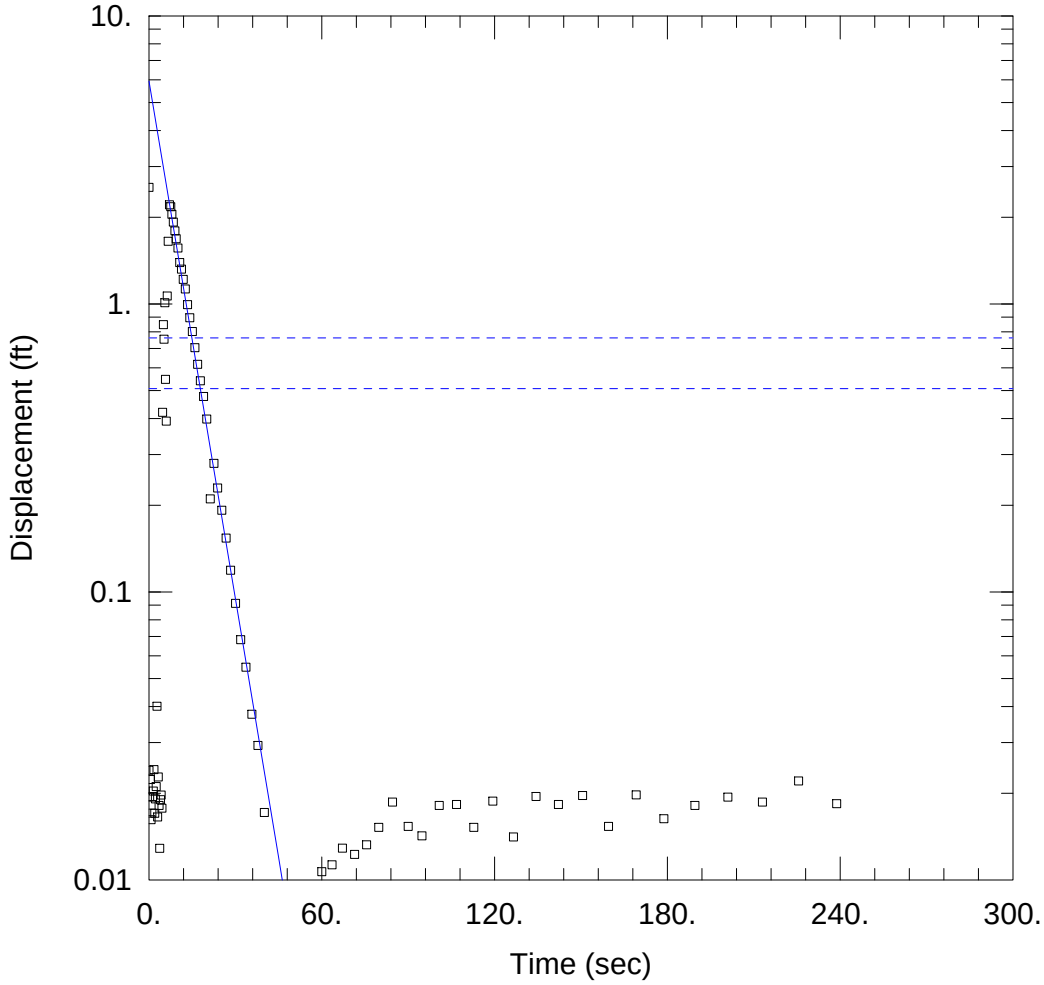
WELL DATA (P-15DD)

Initial Displacement: 2.54 ft Static Water Column Height: 60. ft
Total Well Penetration Depth: 60. ft Screen Length: 7.5 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007611 cm/sec y0 = 4.282 ft



RISING HEAD TEST

Data Set: J:\...\P15DD2R.aqt
Date: 06/28/09 Time: 17:32:33

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-15DD
Test Date: June 15, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

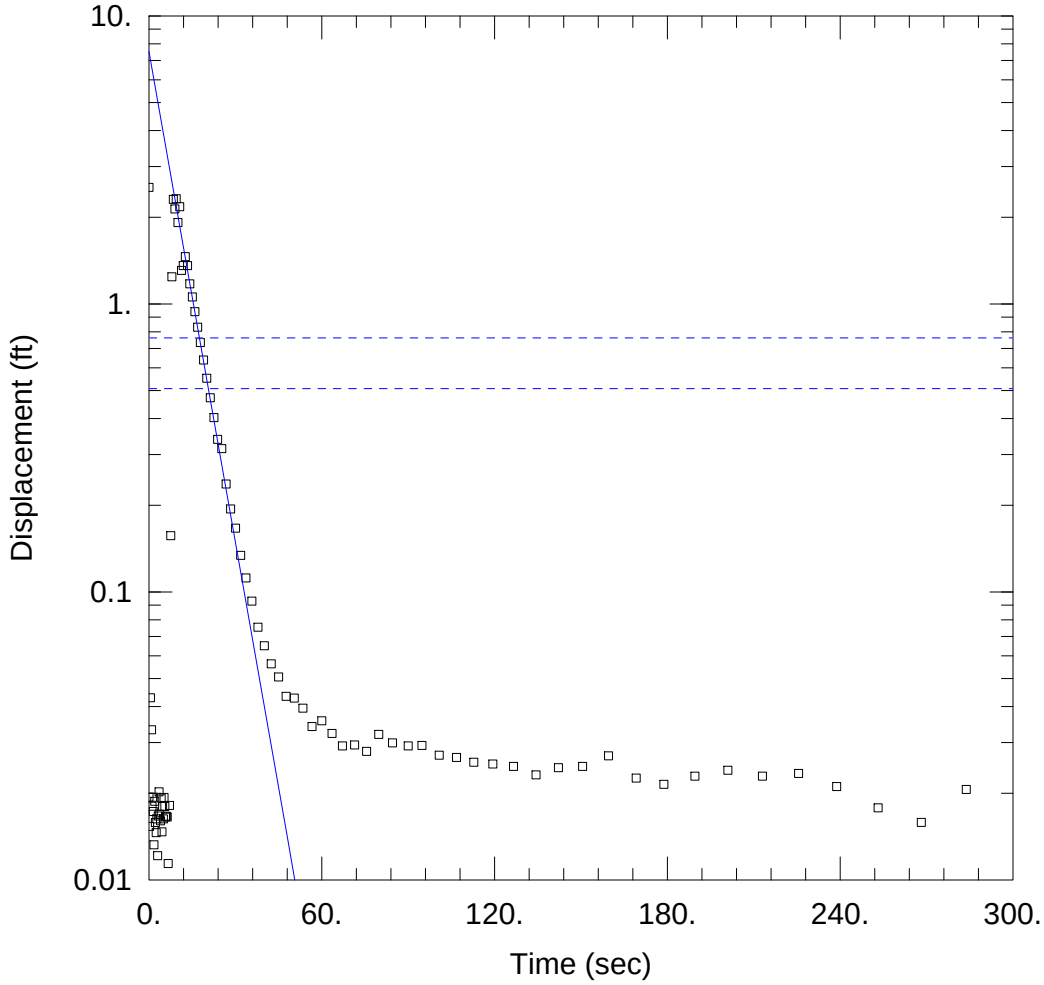
WELL DATA (P-15DD)

Initial Displacement: 2.54 ft Static Water Column Height: 60. ft
Total Well Penetration Depth: 60. ft Screen Length: 7.5 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008395 cm/sec y0 = 5.935 ft



FALLING HEAD TEST

Data Set: J:\...\P15DD3F.aqt
Date: 06/28/09 Time: 17:34:56

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-15DD
Test Date: June 15, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

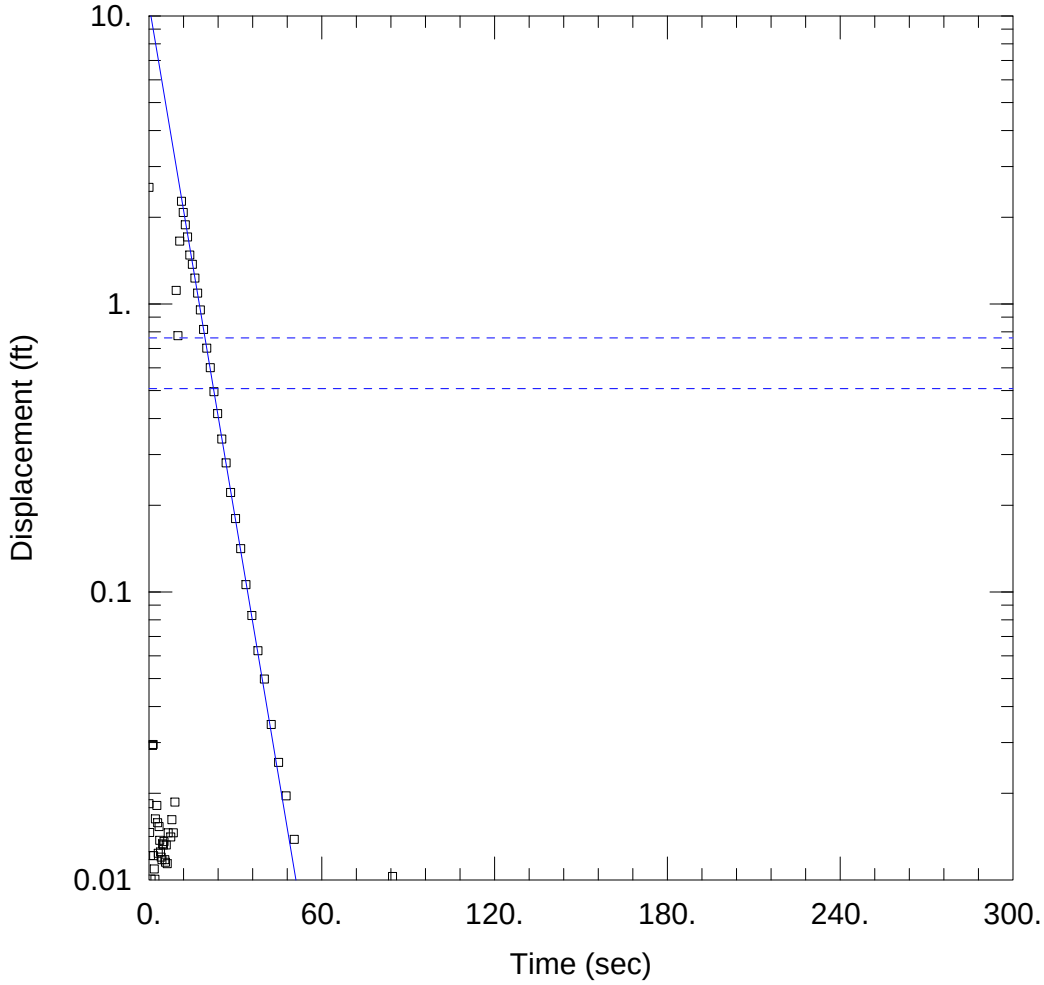
WELL DATA (P-15DD)

Initial Displacement: 2.54 ft Static Water Column Height: 60. ft
Total Well Penetration Depth: 60. ft Screen Length: 7.5 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.007957 cm/sec y0 = 7.513 ft



RISING HEAD TEST

Data Set: J:\...\P15DD4R.aqt
Date: 06/28/09 Time: 17:39:07

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-15DD
Test Date: June 15, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

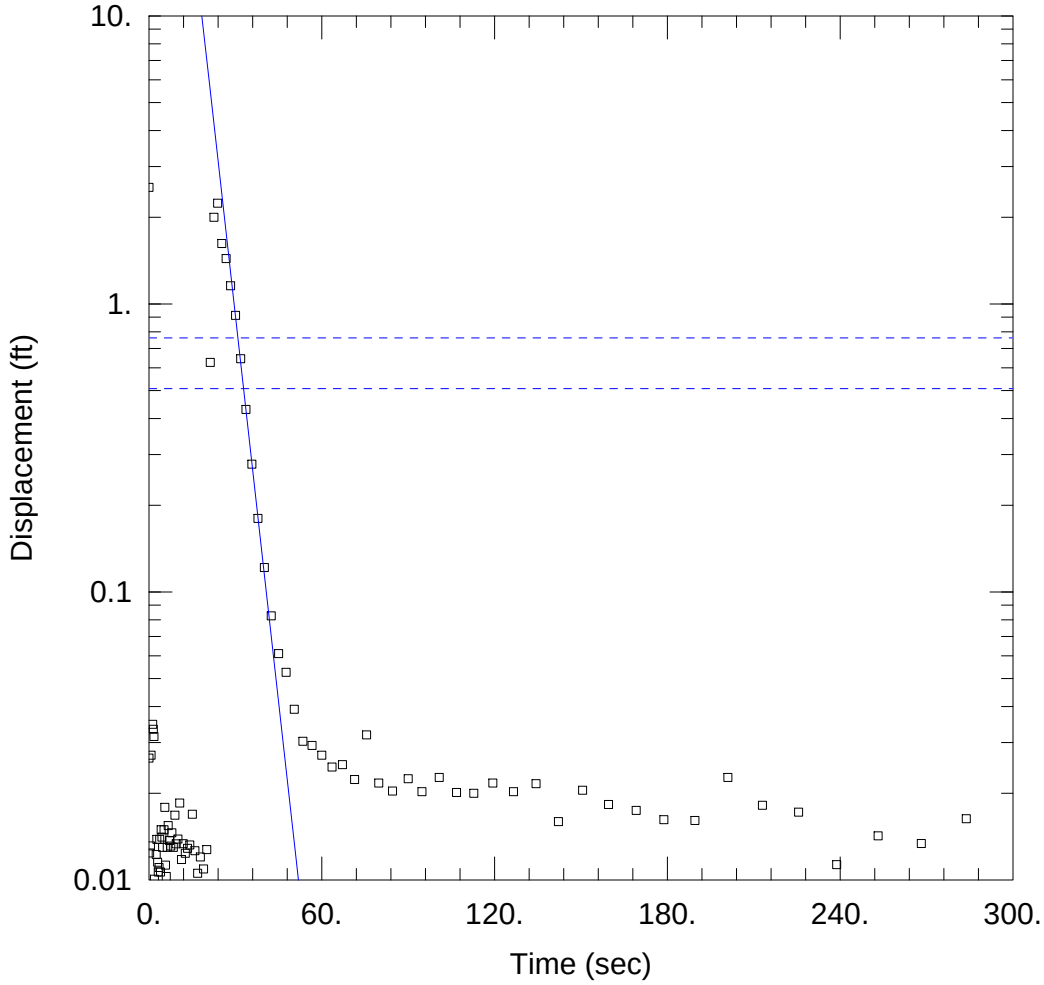
WELL DATA (P-15DD)

Initial Displacement: 2.54 ft Static Water Column Height: 60. ft
Total Well Penetration Depth: 60. ft Screen Length: 7.5 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.008354 cm/sec y0 = 10.98 ft



FALLING HEAD TEST

Data Set: J:\...\P15DD5F.aqt
Date: 06/28/09 Time: 17:42:06

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-15DD
Test Date: June 15, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

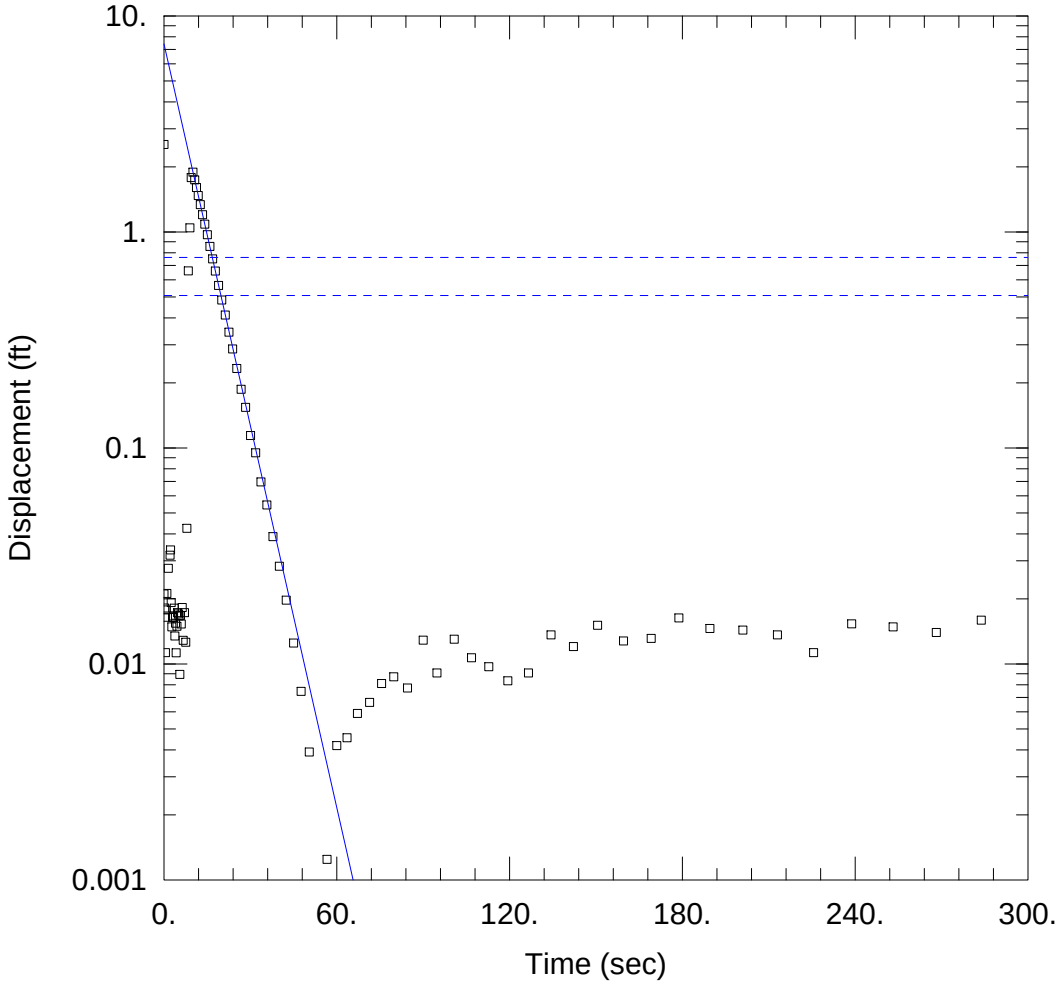
WELL DATA (P-15DD)

Initial Displacement: 2.54 ft Static Water Column Height: 60. ft
Total Well Penetration Depth: 60. ft Screen Length: 7.5 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01255 cm/sec y0 = 441.7 ft



RISING HEAD TEST

Data Set: J:\...\P15DD6R.aqt
Date: 06/28/09 Time: 17:43:08

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-15DD
Test Date: June 15, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

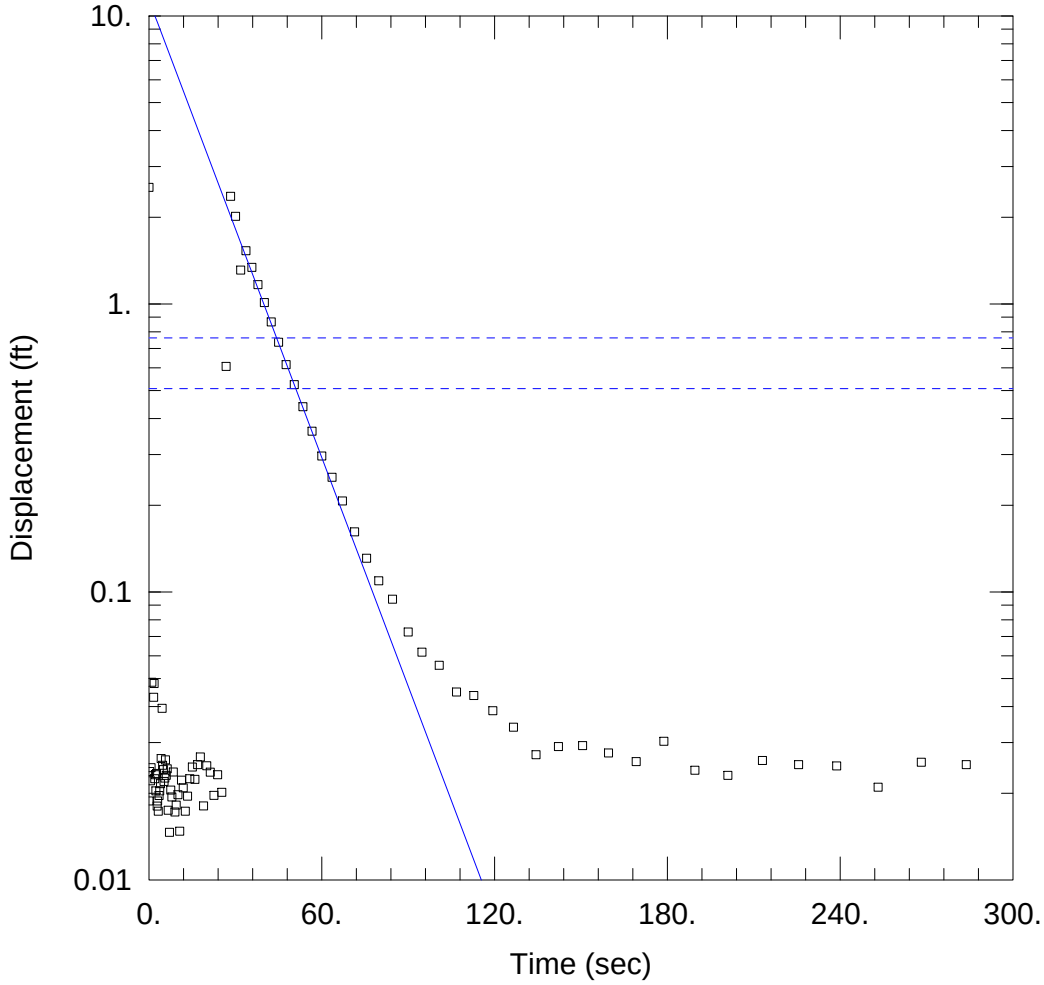
WELL DATA (P-15DD)

Initial Displacement: 2.54 ft Static Water Column Height: 60. ft
Total Well Penetration Depth: 60. ft Screen Length: 7.5 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.00826 cm/sec y0 = 7.417 ft



FALLING HEAD TEST

Data Set: J:\...\P17D1F.aqt
Date: 06/28/09 Time: 17:46:20

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

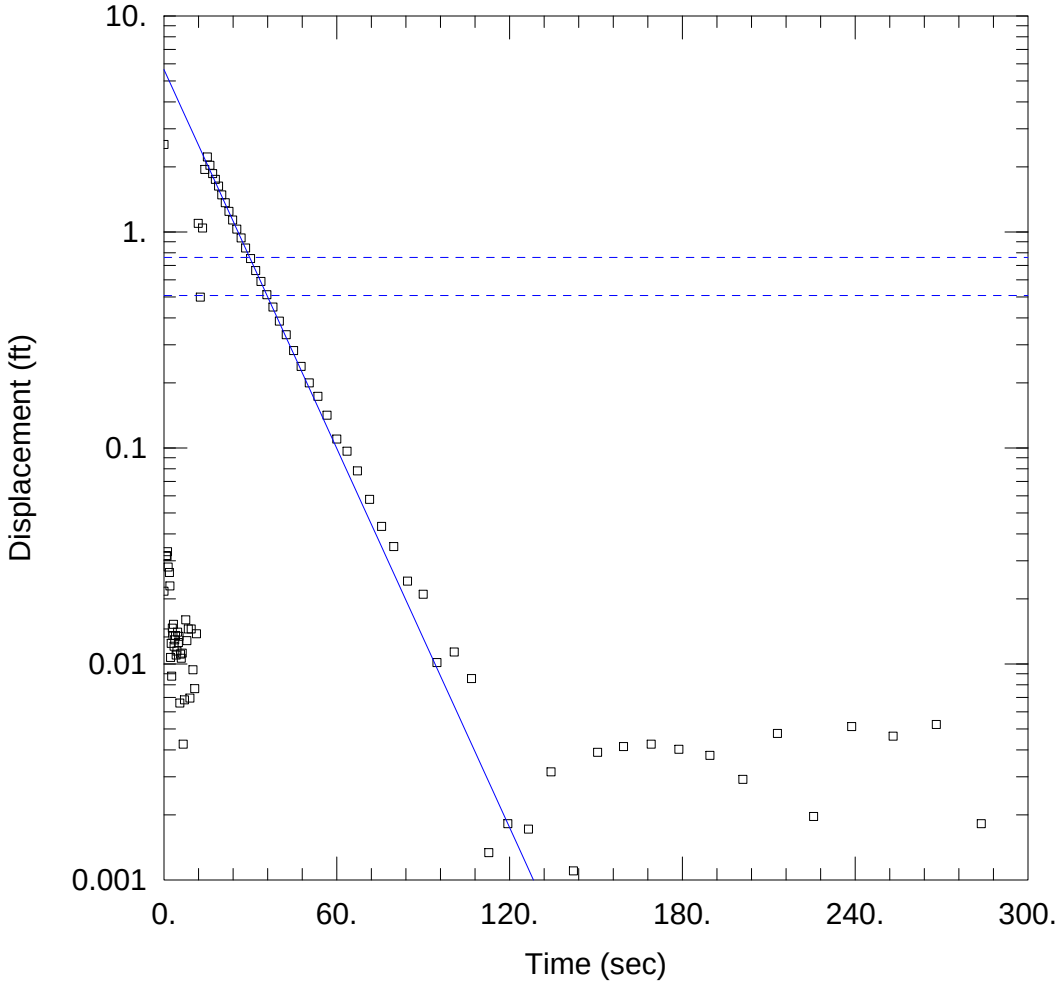
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002149 cm/sec y0 = 11.36 ft



RISING HEAD TEST

Data Set: J:\...\P17D2R.aqt
Date: 06/28/09 Time: 17:48:20

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

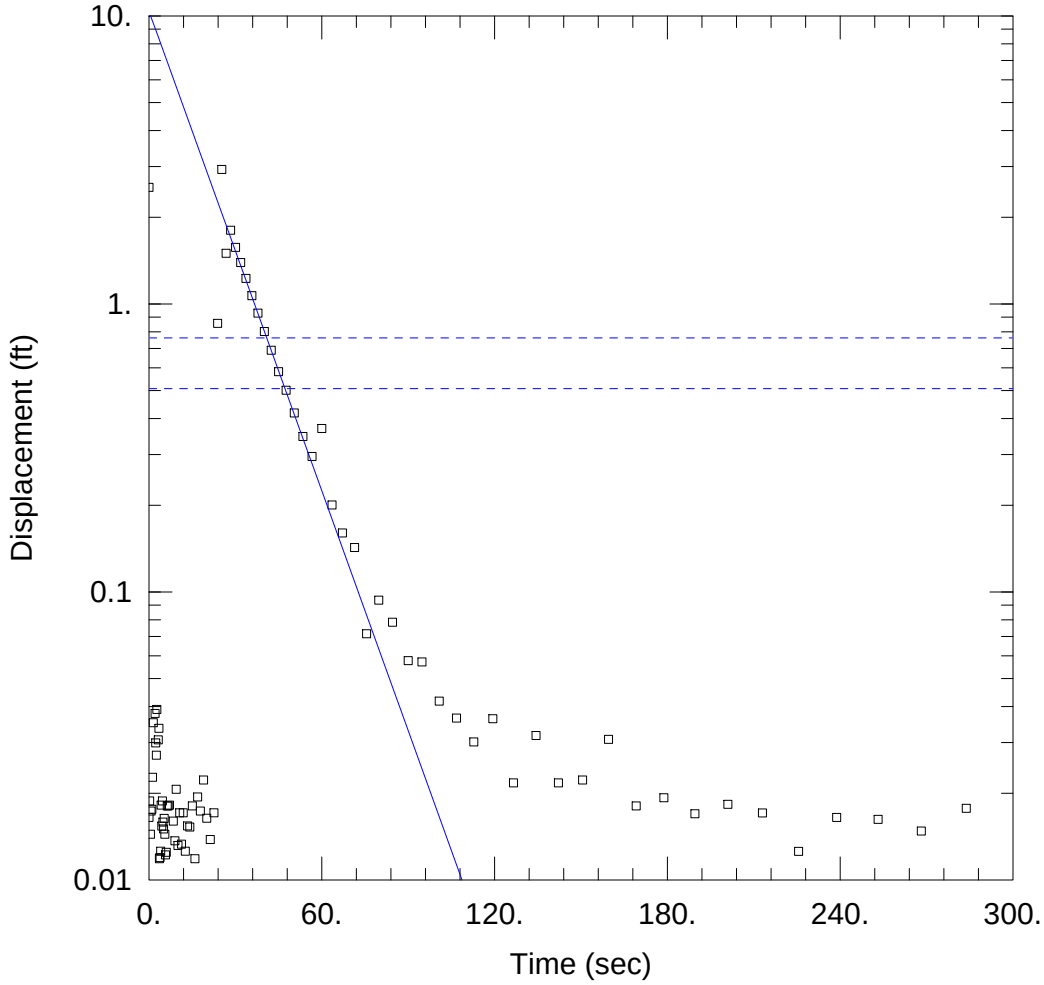
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.002373 cm/sec
y0 = 5.646 ft



FALLING HEAD TEST

Data Set: J:\...\P17D3F.aqt
Date: 06/28/09 Time: 17:50:03

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

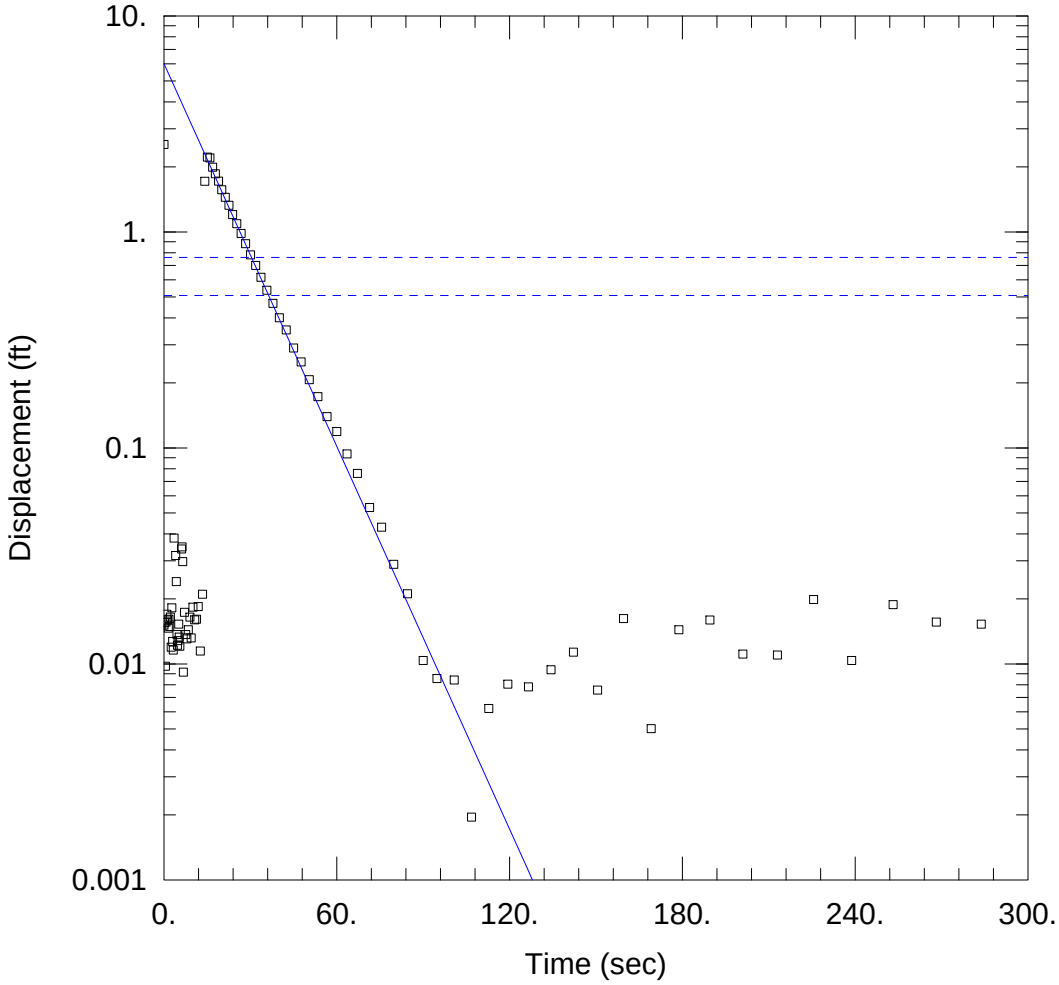
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.002253 cm/sec
y0 = 10.39 ft



RISING HEAD TEST

Data Set: J:\...\P17D4R.aqt
Date: 06/28/09 Time: 17:54:15

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

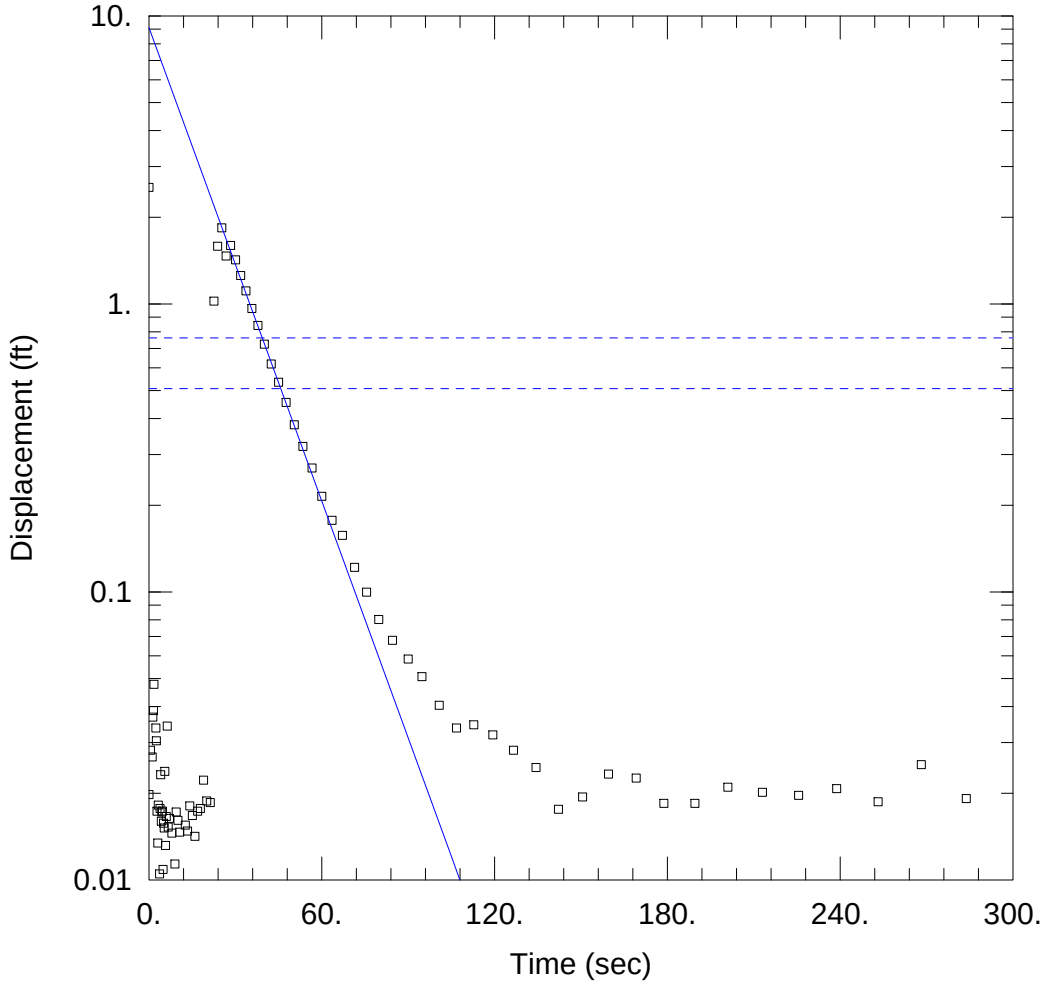
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002397 cm/sec y0 = 6.012 ft



FALLING HEAD TEST

Data Set: J:\...\P17D5F.aqt
Date: 06/28/09 Time: 17:55:54

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

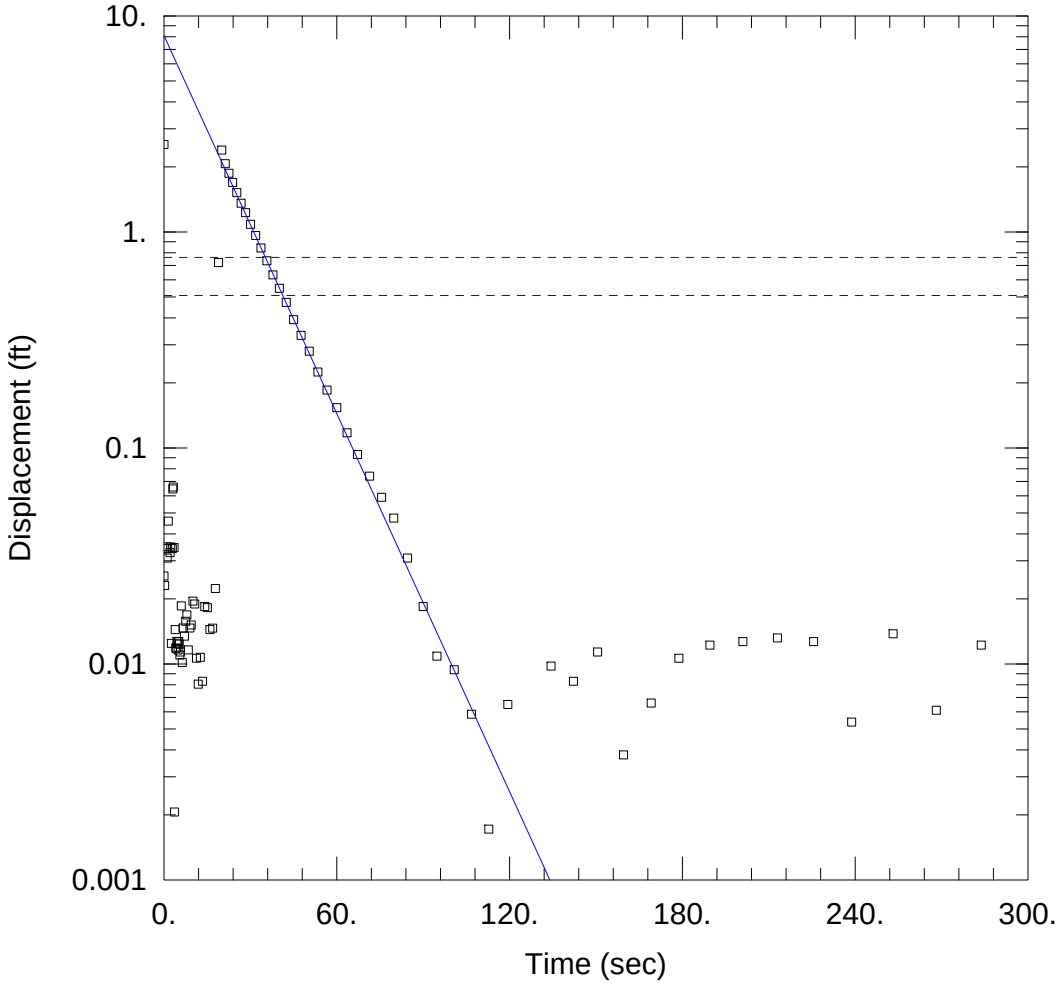
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002224 cm/sec y0 = 9.106 ft



RISING HEAD TEST

Data Set: J:\...\P17D6R.aqt
Date: 06/28/09 Time: 17:57:04

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

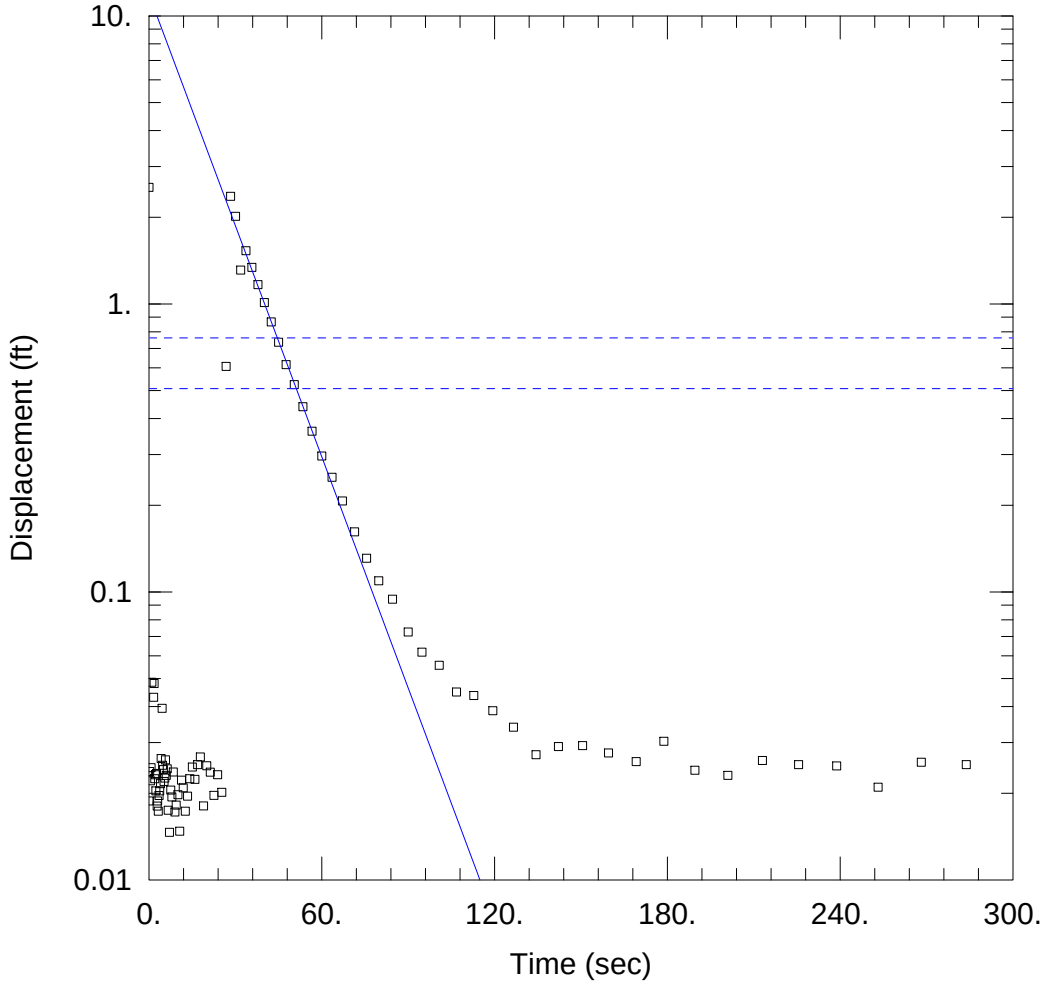
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002368 cm/sec y0 = 8.108 ft



FALLING HEAD TEST

Data Set: J:\...\P17D1F.aqt
Date: 06/29/09 Time: 09:30:41

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 52. ft Anisotropy Ratio (Kz/Kr): 0.1

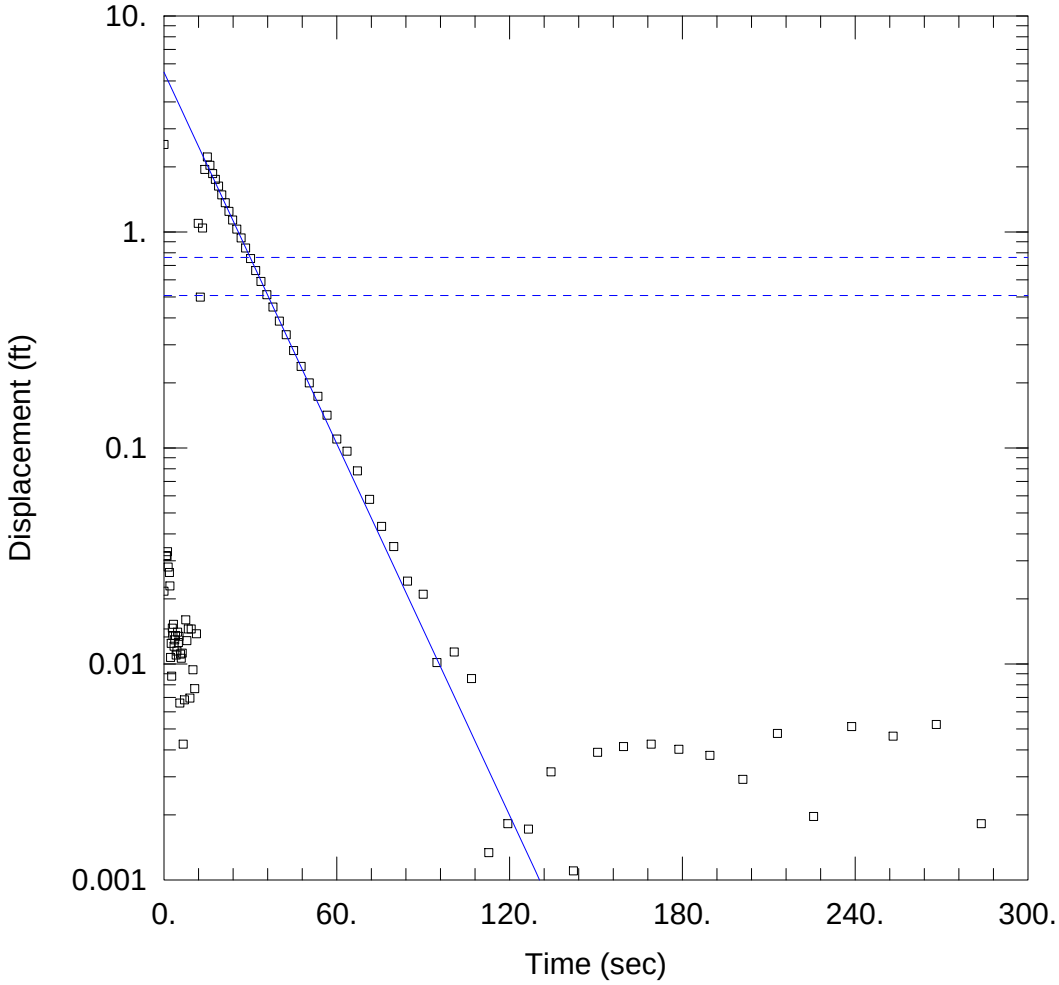
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002481 cm/sec y0 = 11.85 ft



RISING HEAD TEST

Data Set: J:\...\P17D2R.aqt
Date: 06/29/09 Time: 09:31:46

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 52. ft Anisotropy Ratio (Kz/Kr): 0.1

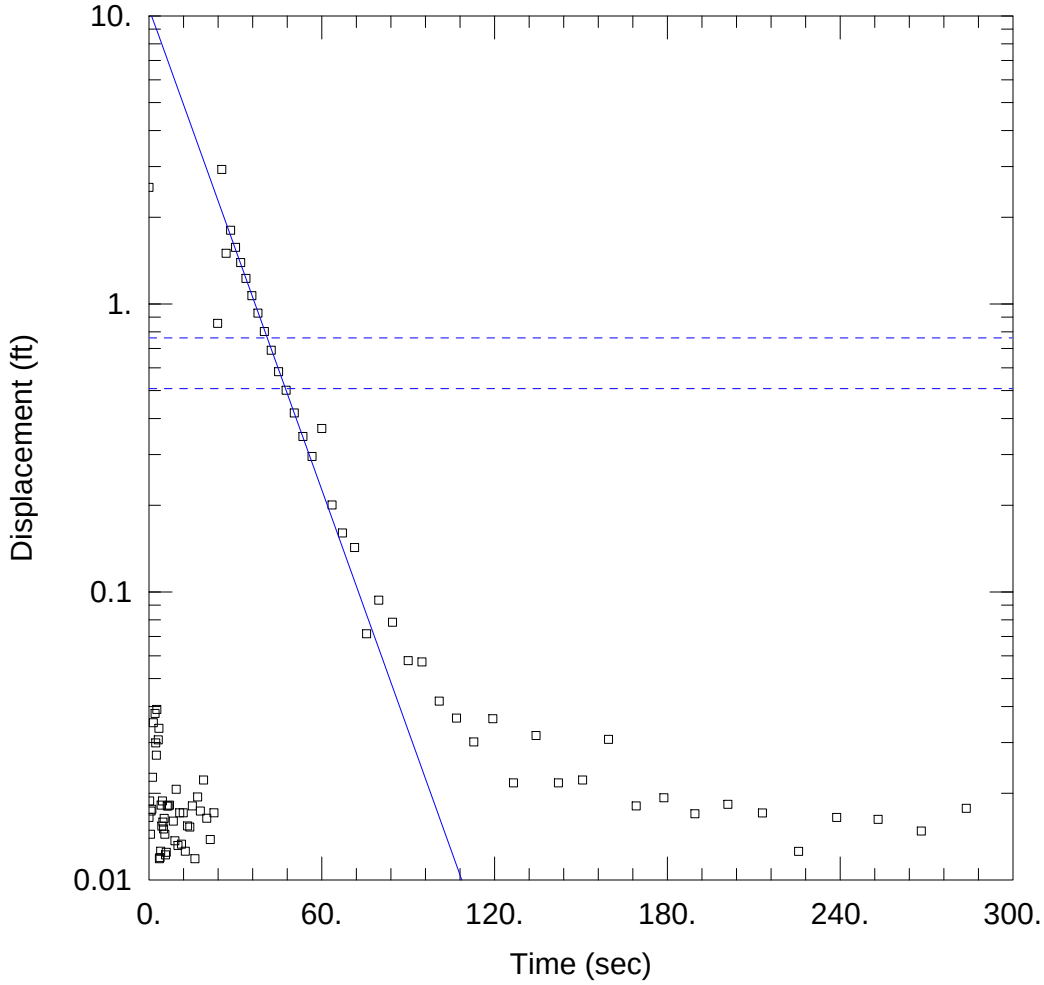
WELL DATA (P-17D)

Initial Displacement: 2.54 ft Static Water Column Height: 52. ft
Total Well Penetration Depth: 52. ft Screen Length: 13.8 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002659 cm/sec y0 = 5.489 ft



FALLING HEAD TEST

Data Set: J:\...\P17D3F.aqt
Date: 06/29/09 Time: 09:32:17

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 52. ft Anisotropy Ratio (Kz/Kr): 0.1

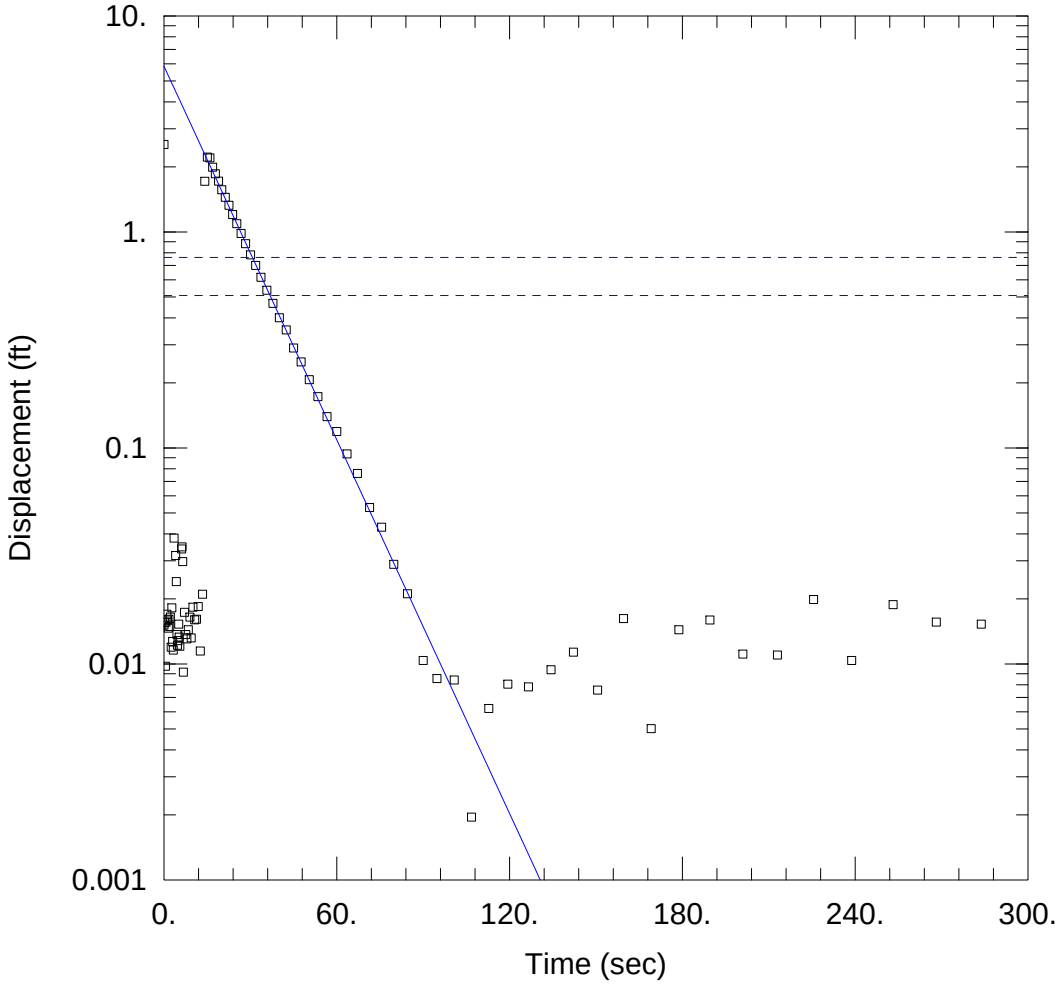
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002584 cm/sec y0 = 10.62 ft



RISING HEAD TEST

Data Set: J:\...\P17D4R.aqt
Date: 06/29/09 Time: 09:32:54

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 52. ft Anisotropy Ratio (Kz/Kr): 0.1

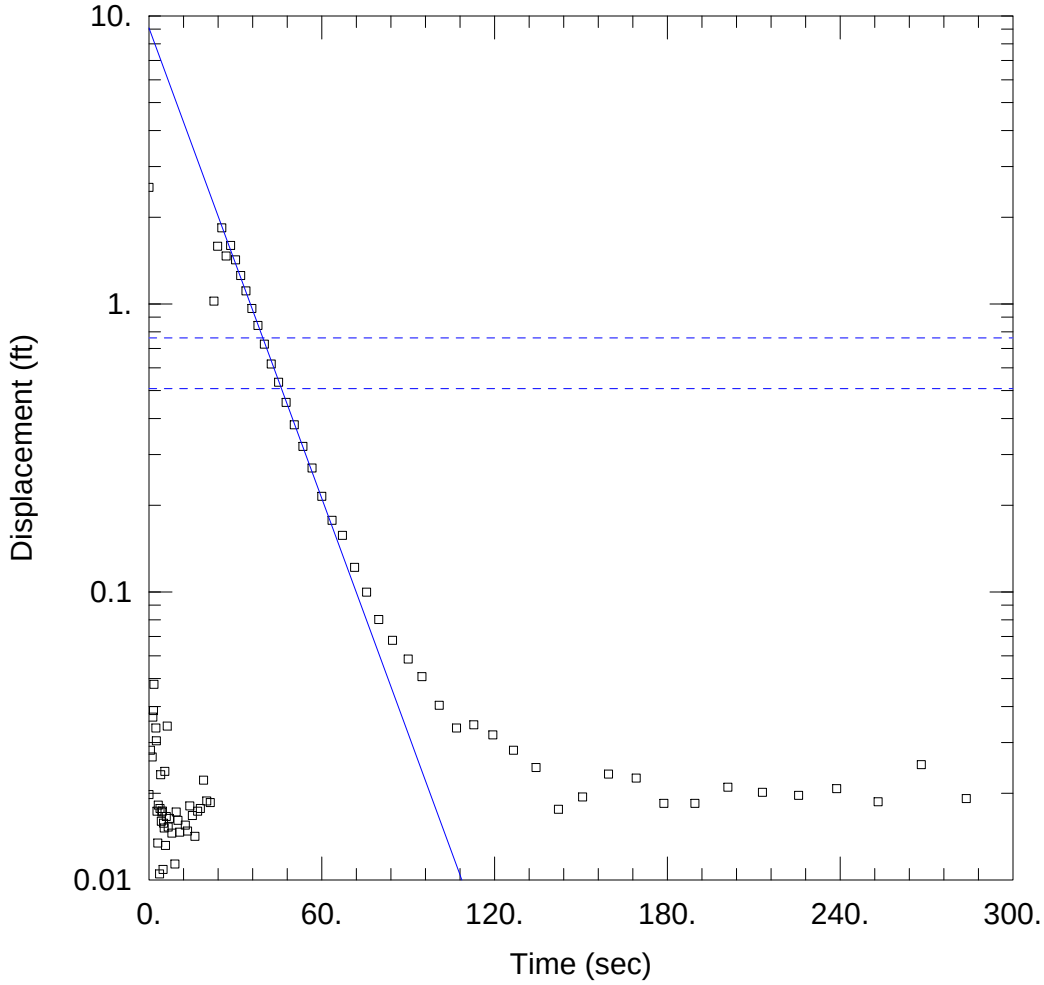
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002674 cm/sec y0 = 5.85 ft



FALLING HEAD TEST

Data Set: J:\...\P17D5F.aqt
Date: 06/29/09 Time: 09:33:50

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 52. ft Anisotropy Ratio (Kz/Kr): 0.1

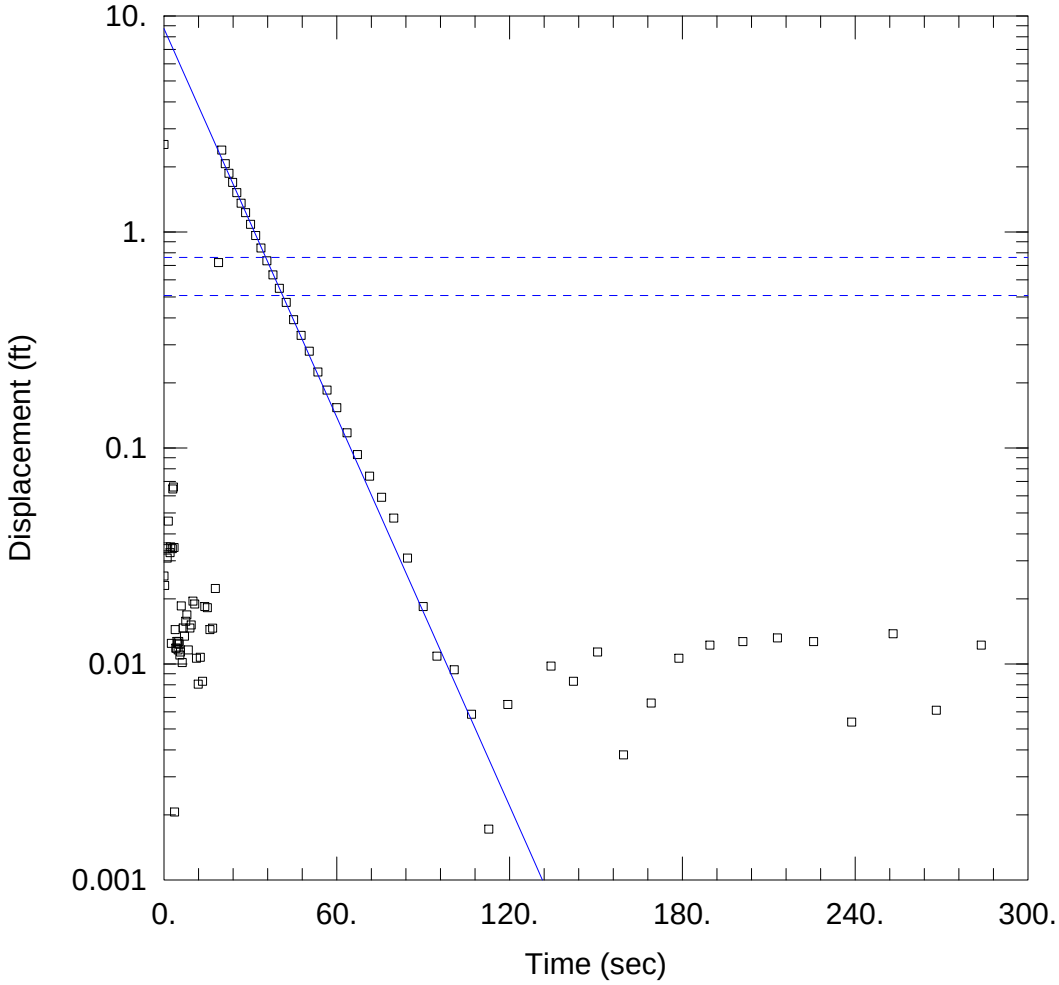
WELL DATA (P-17D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 52. ft
Casing Radius: 0.0833 ft
Static Water Column Height: 52. ft
Screen Length: 13.8 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002525 cm/sec y0 = 9.077 ft



RISING HEAD TEST

Data Set: J:\...\P17D6R.aqt
Date: 06/29/09 Time: 09:34:30

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-17D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 52. ft Anisotropy Ratio (Kz/Kr): 0.1

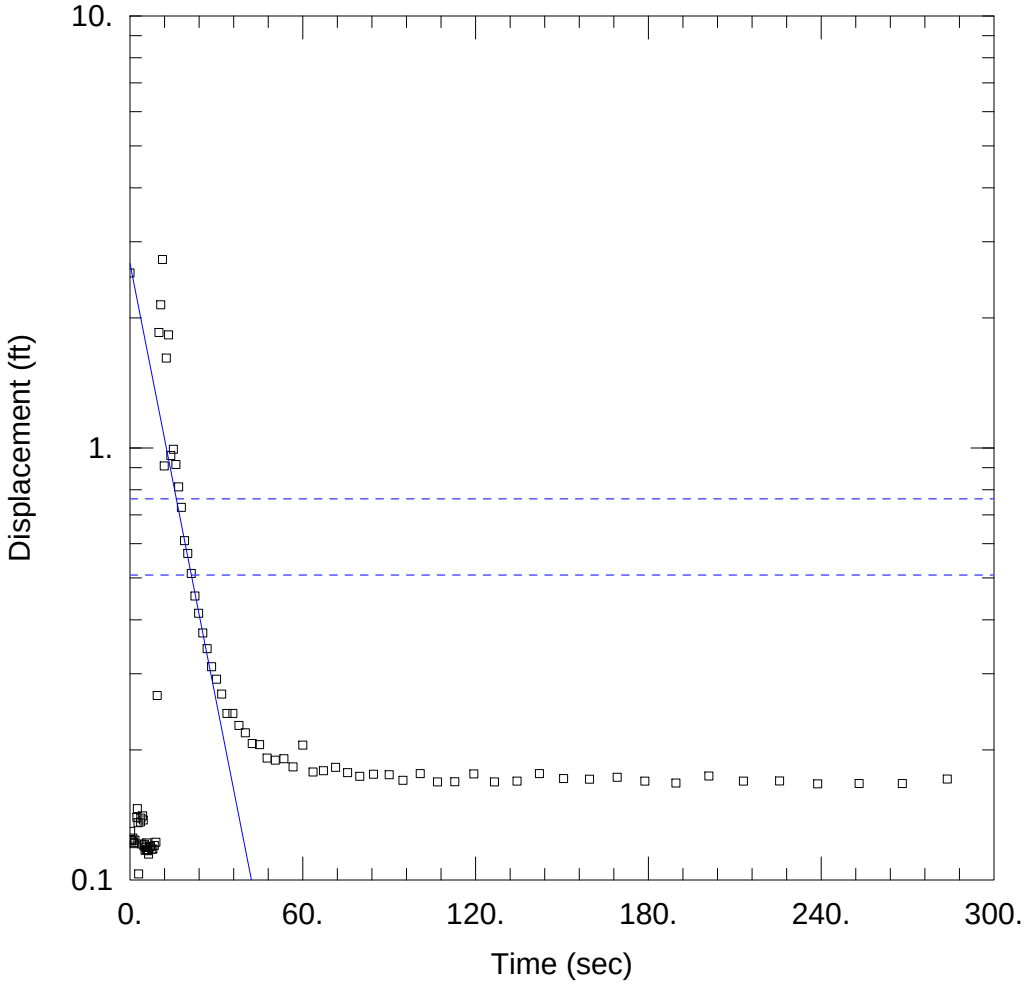
WELL DATA (P-17D)

Initial Displacement: 2.54 ft Static Water Column Height: 52. ft
Total Well Penetration Depth: 52. ft Screen Length: 13.8 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002781 cm/sec y0 = 8.735 ft



FALLING HEAD TEST

Data Set: J:\...\P19D1F.aqt
Date: 06/28/09 Time: 17:58:54

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-19D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

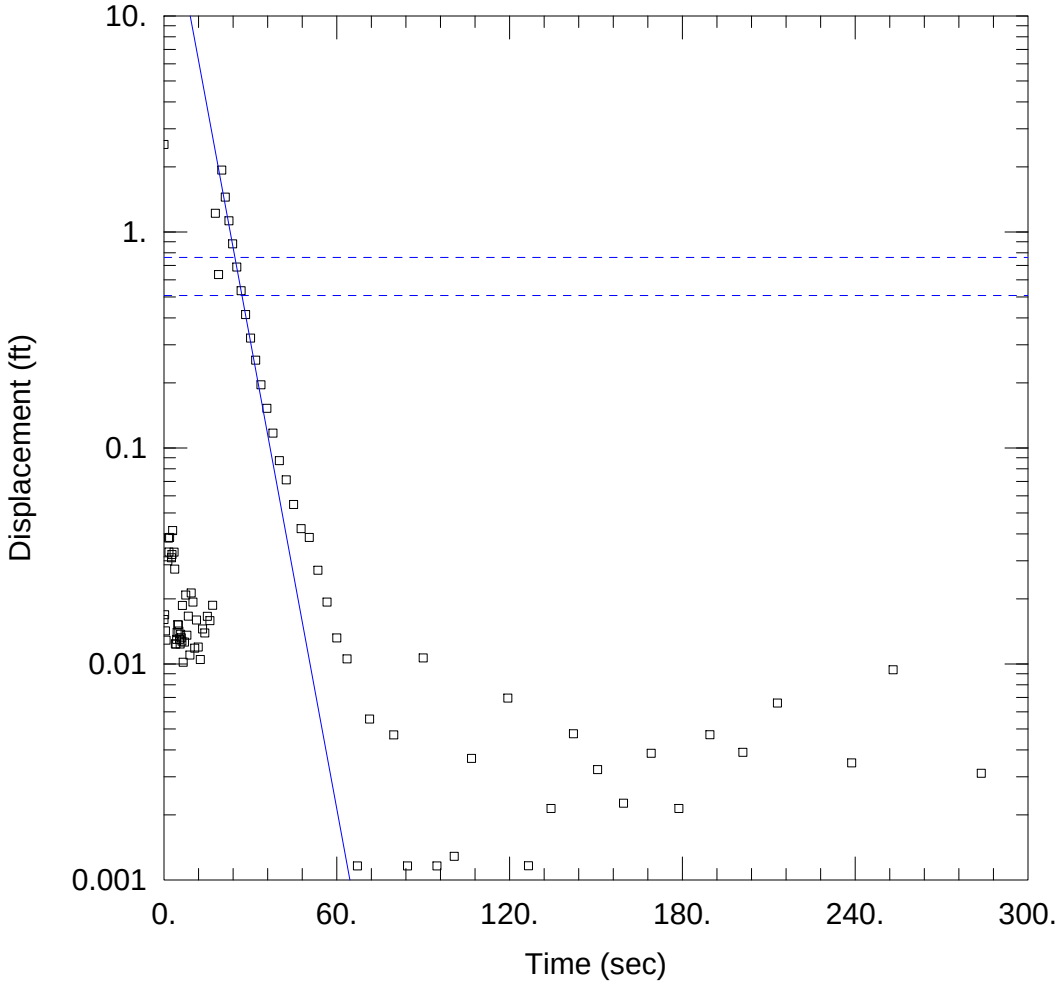
WELL DATA (P-19D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 27.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 27.8 ft
Screen Length: 14.5 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.002449 cm/sec y0 = 2.672 ft



RISING HEAD TEST

Data Set: J:\...\P19D2R.aqt
Date: 06/28/09 Time: 17:59:49

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-19D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

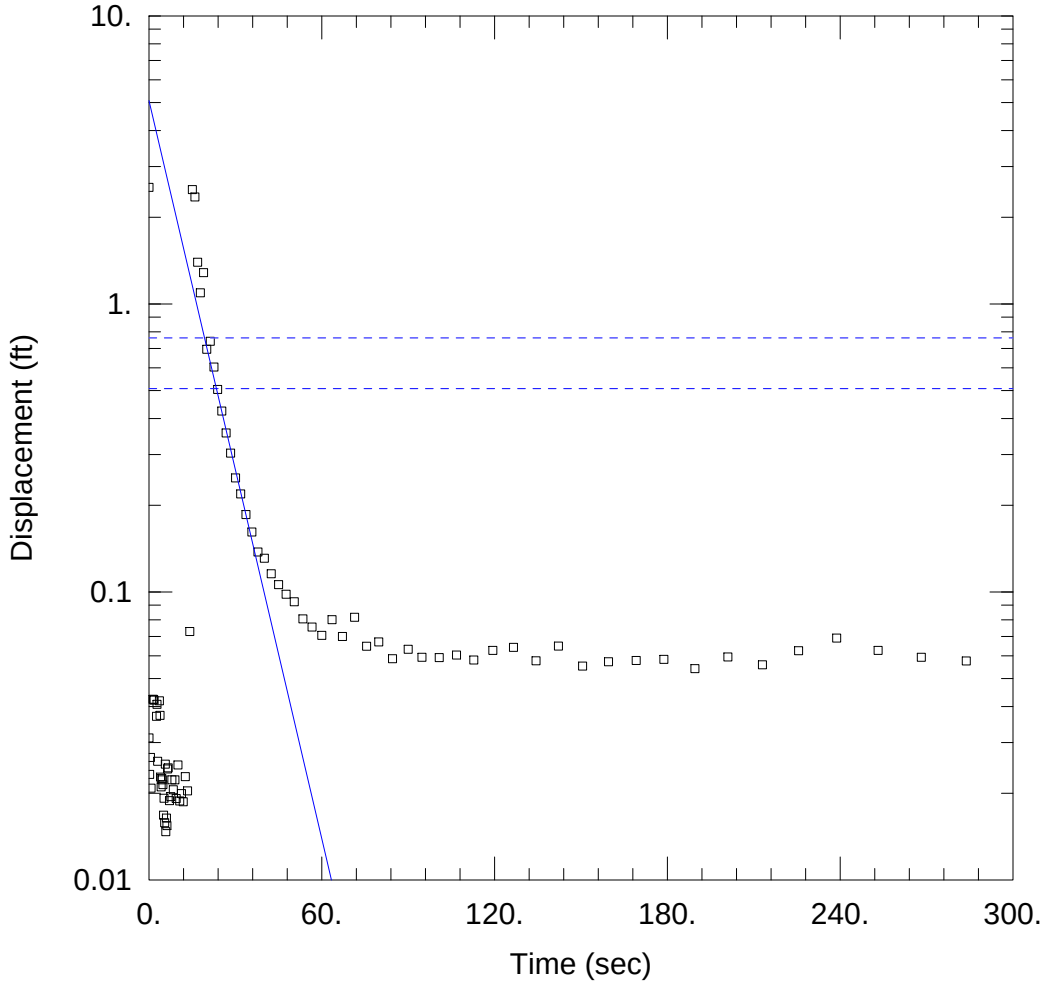
WELL DATA (P-19D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 27.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 27.8 ft
Screen Length: 14.5 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.005223 cm/sec y0 = 45.63 ft



FALLING HEAD TEST

Data Set: J:\...\P19D3F.aqt
Date: 06/28/09 Time: 18:00:51

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-19D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

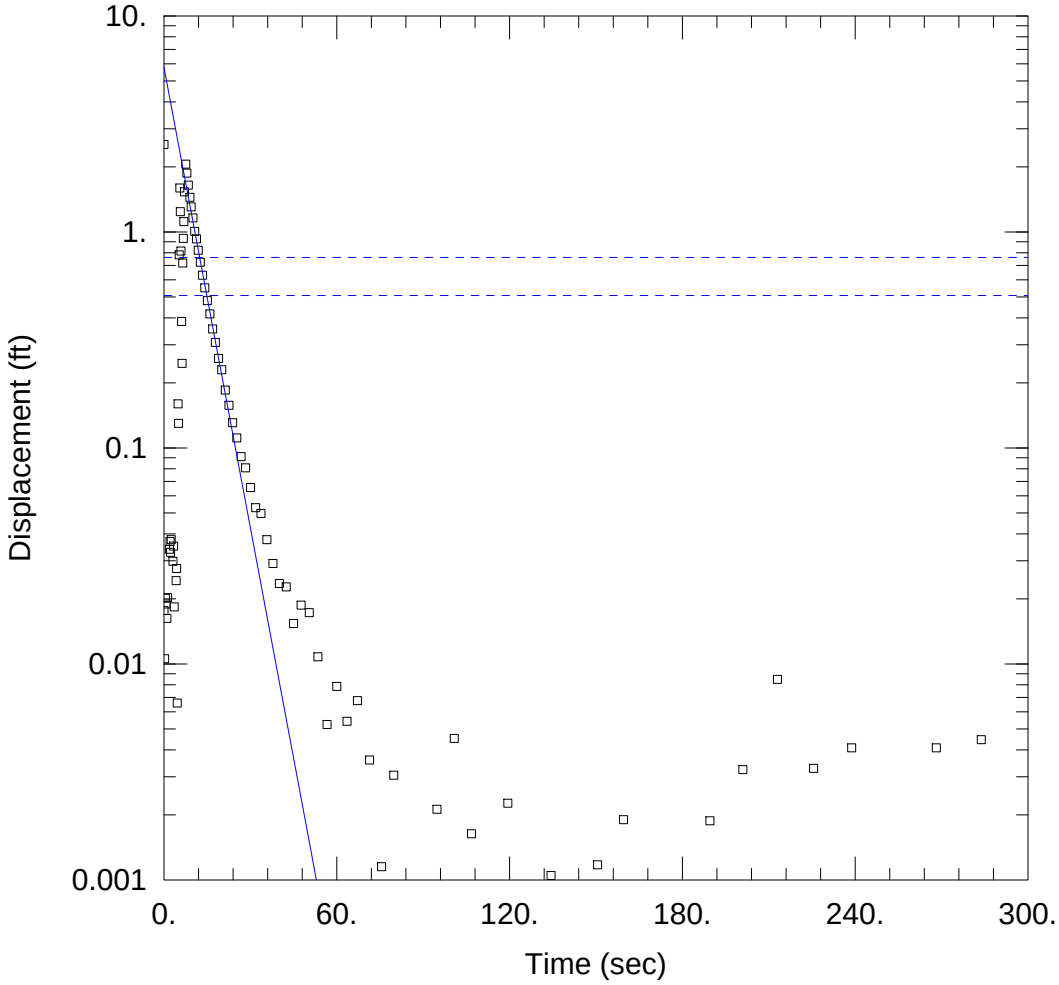
WELL DATA (P-19D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 27.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 27.8 ft
Screen Length: 14.5 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.003091 cm/sec y0 = 5.078 ft



RISING HEAD TEST

Data Set: J:\...\P19D4R.aqt
Date: 06/28/09 Time: 18:01:44

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-19D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

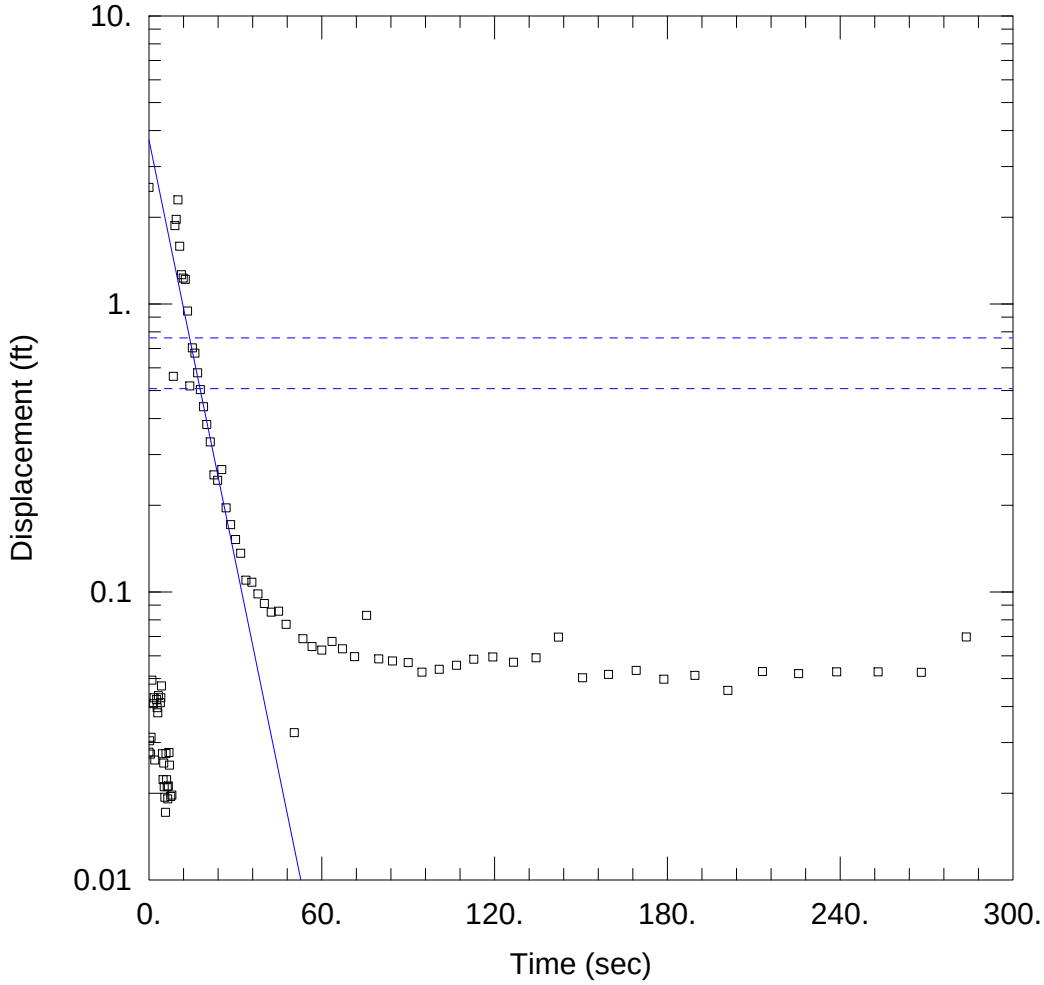
WELL DATA (P-19D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 27.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 27.8 ft
Screen Length: 14.5 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.005143 cm/sec y0 = 5.779 ft



FALLING HEAD TEST

Data Set: J:\...\P19D5F.aqt
Date: 06/28/09 Time: 18:02:46

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-19D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

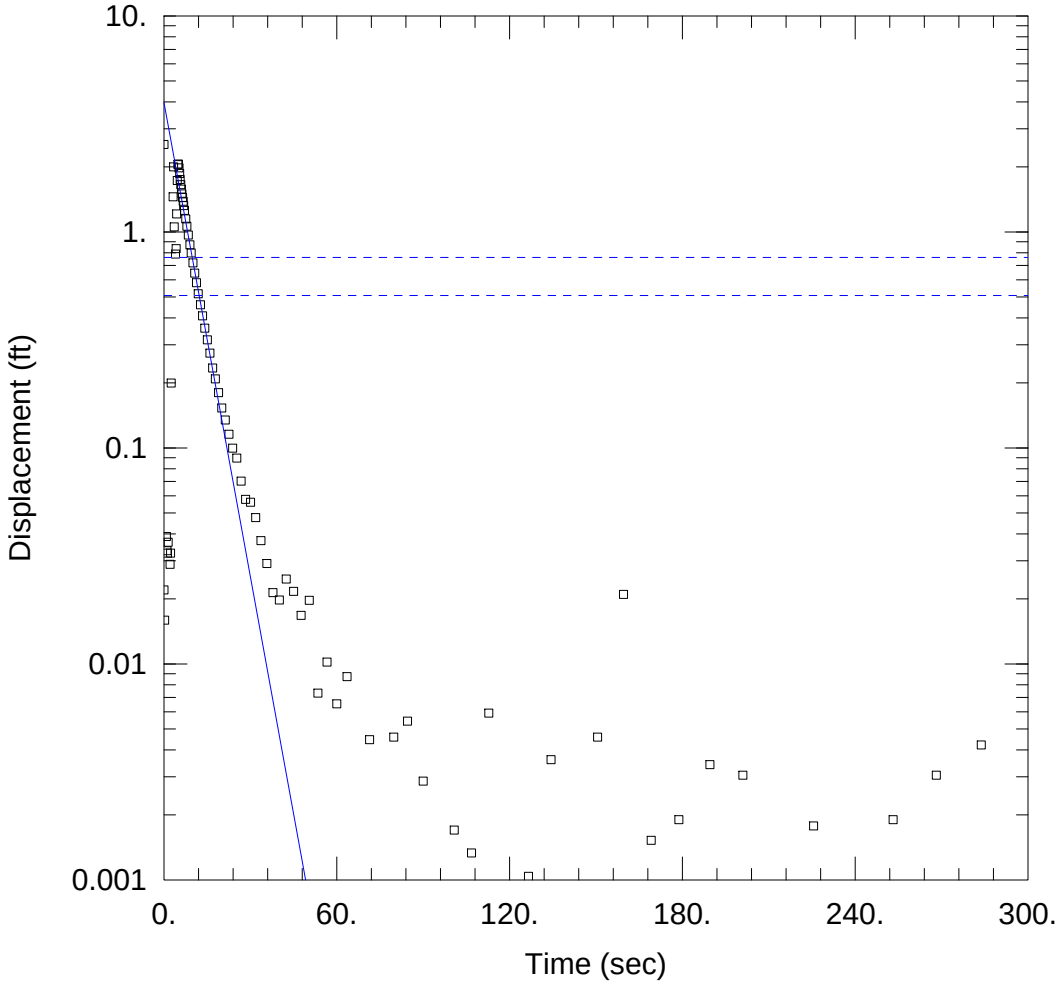
WELL DATA (P-19D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 27.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 27.8 ft
Screen Length: 14.5 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.003526 cm/sec y0 = 3.709 ft



RISING HEAD TEST

Data Set: J:\...\P19D6R.aqt
Date: 06/28/09 Time: 18:03:53

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-19D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

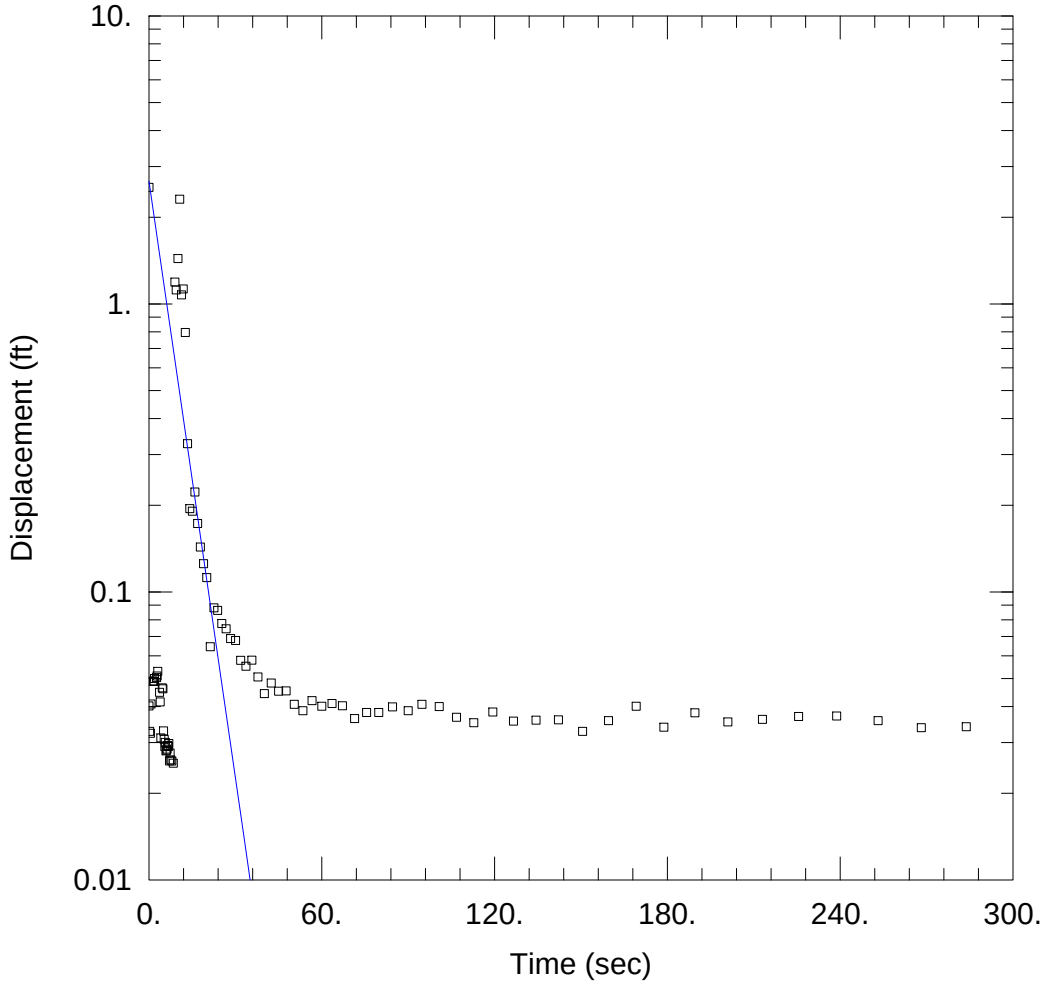
WELL DATA (P-19D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 27.8 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 27.8 ft
Screen Length: 14.5 ft
Wellbore Radius: 0.1667 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.005297 cm/sec y0 = 3.974 ft



FALLING HEAD TEST

Data Set: J:\...\P20D1F.aqt
Date: 06/28/09 Time: 18:07:14

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-20D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

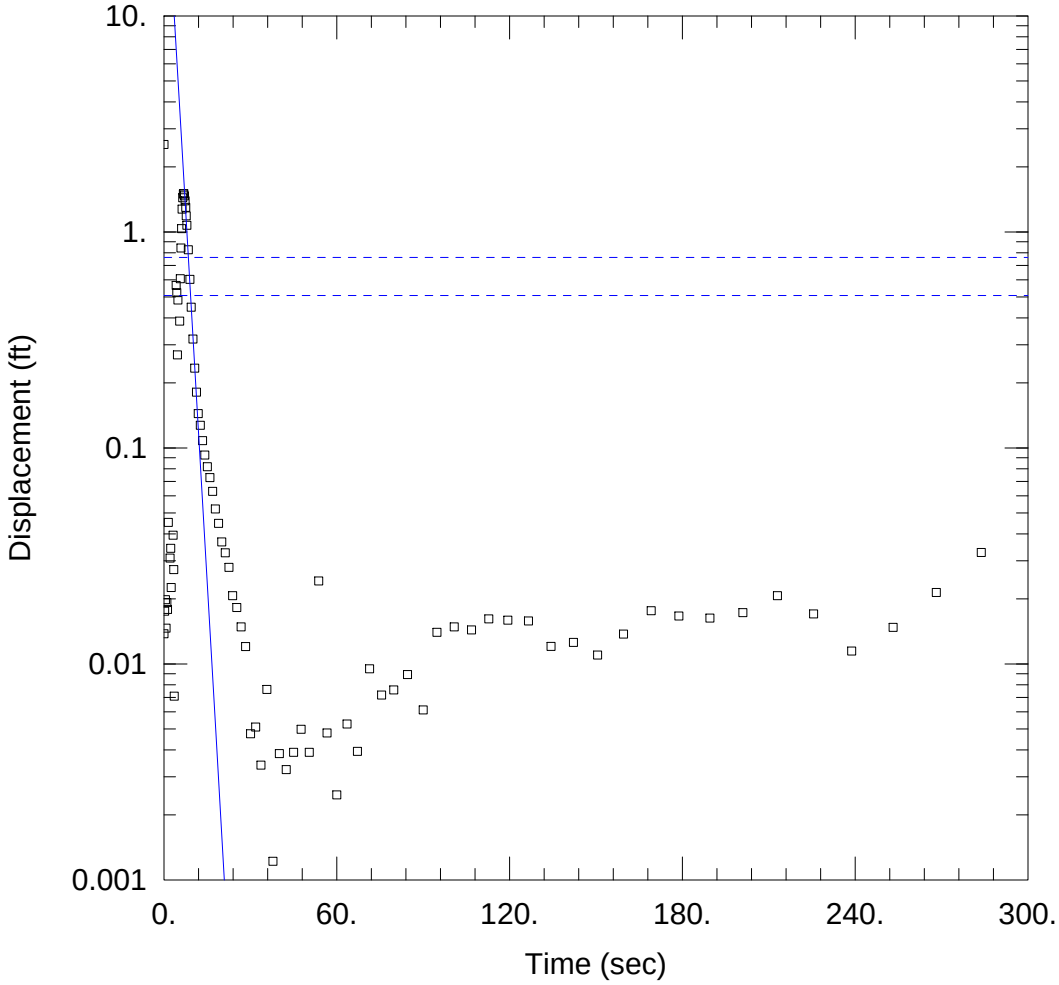
WELL DATA (P-20D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 40.6 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 40.6 ft
Screen Length: 13. ft
Wellbore Radius: 0.1875 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.005593 cm/sec y0 = 2.665 ft



RISING HEAD TEST

Data Set: J:\...\P20D2R.aqt
Date: 06/28/09 Time: 18:09:01

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-20D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

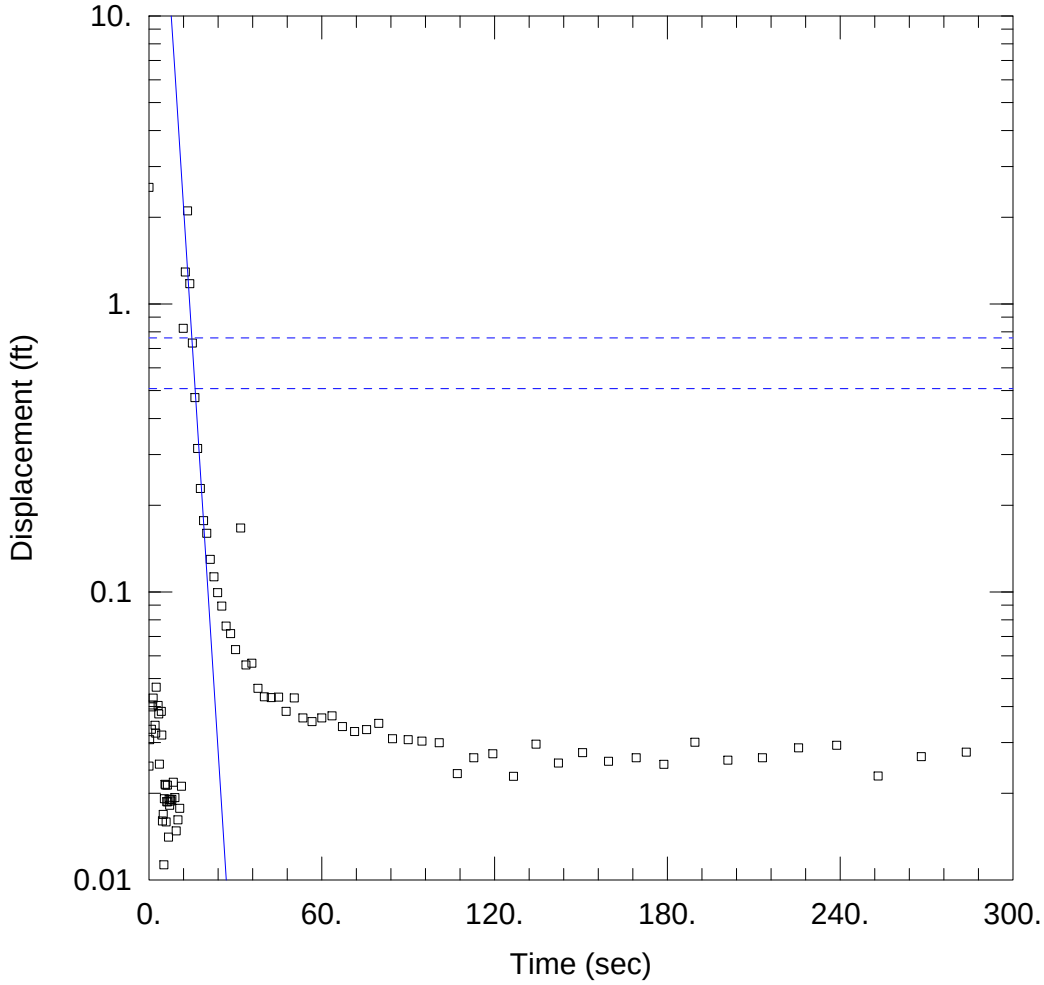
WELL DATA (P-20D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 40.6 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 40.6 ft
Screen Length: 13. ft
Wellbore Radius: 0.1875 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01864 cm/sec y0 = 67.42 ft



FALLING HEAD TEST

Data Set: J:\...\P20D3F.aqt
Date: 06/28/09 Time: 18:11:33

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-20D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

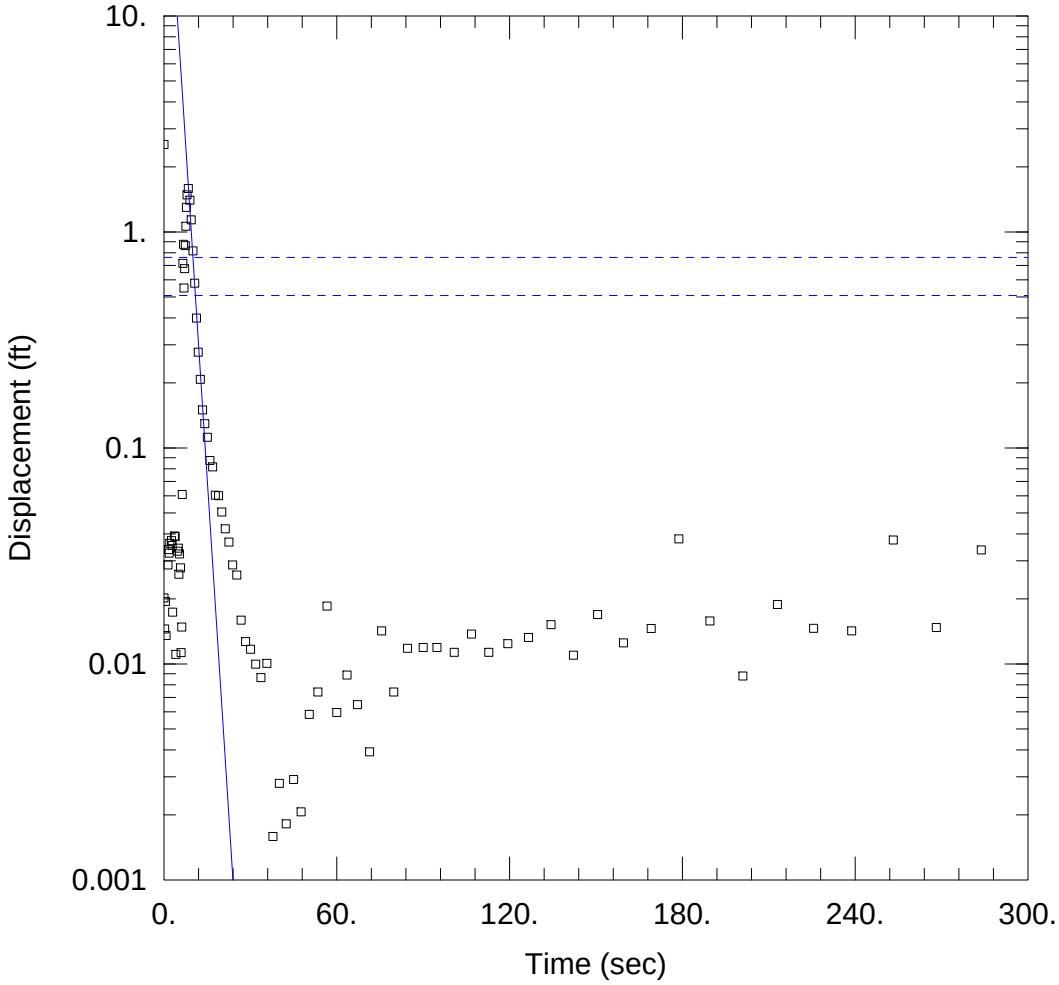
WELL DATA (P-20D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 40.6 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 40.6 ft
Screen Length: 13. ft
Wellbore Radius: 0.1875 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01275 cm/sec y0 = 167.1 ft



RISING HEAD TEST

Data Set: J:\...\P20D4R.aqt
Date: 06/28/09 Time: 18:12:51

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-20D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

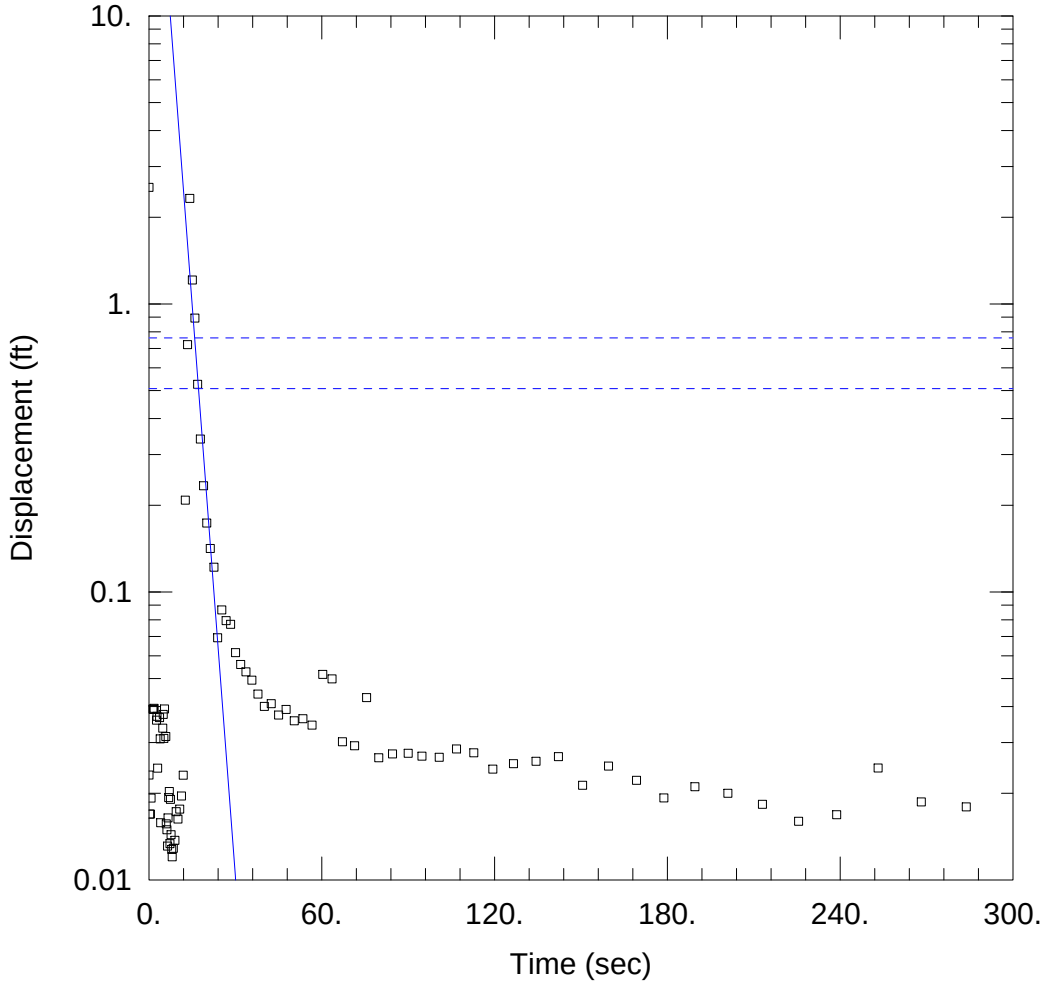
WELL DATA (P-20D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 40.6 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 40.6 ft
Screen Length: 13. ft
Wellbore Radius: 0.1875 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01677 cm/sec y0 = 91.39 ft



FALLING HEAD TEST

Data Set: J:\...\P20D5F.aqt
Date: 06/28/09 Time: 18:14:23

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-20D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

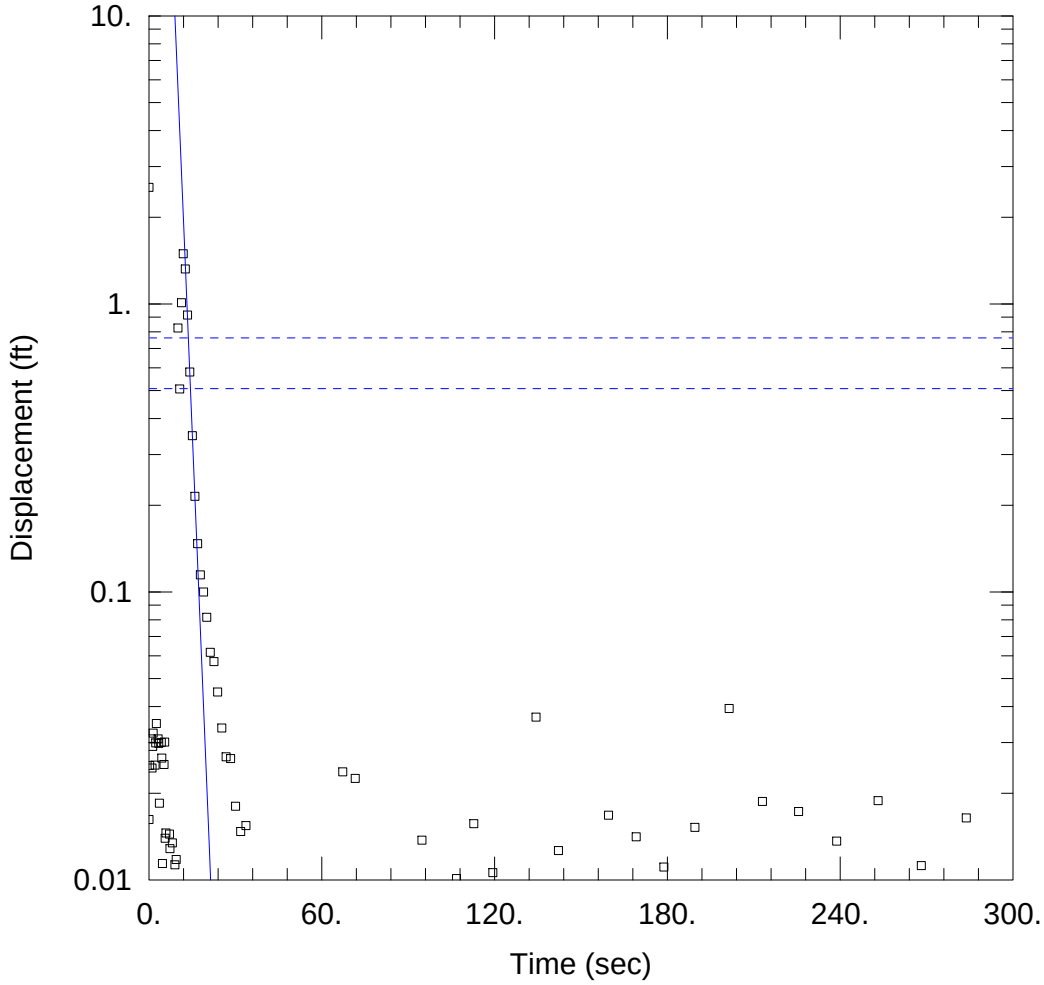
WELL DATA (P-20D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 40.6 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 40.6 ft
Screen Length: 13. ft
Wellbore Radius: 0.1875 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01071 cm/sec y0 = 94.88 ft



RISING HEAD TEST

Data Set: J:\...\P20D6R.aqt
Date: 06/28/09 Time: 18:15:14

PROJECT INFORMATION

Company: MWH Americas Inc
Client: GE Energy
Project: 1006833
Location: Patillas
Test Well: P-20D
Test Date: June 16, 2009

AQUIFER DATA

Saturated Thickness: 90. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (P-20D)

Initial Displacement: 2.54 ft
Total Well Penetration Depth: 40.6 ft
Casing Radius: 0.0833 ft
Static Water Column Height: 40.6 ft
Screen Length: 13. ft
Wellbore Radius: 0.1875 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.01966 cm/sec y0 = 1572.9 ft

Estimated Hydraulic Conductivity of Deep Aquifer Underlying GE Facility, Patallis
GE Energy, Patillas Puerto Rico

Well ID	Well Screened Interval (ft bgs)	Boring Logs/Notes	Estimated Saturated Thickness (ft)	Slug Test Method	Aquifer Model	Solution Method	Hydraulic Conductivity Calculation Summary		
							Hydraulic Conductivity	Geometric Mean Rising Head Tests	
							(cm/sec)	(cm/sec)	(ft/day)
P-10A	37.6-48.4	Poorly graded sand w/ gravel, SP-SG, from 36.5-46.5 ft Clayey silt (ML) from 46.5 to 50.5 ft, total depth	90	Falling Head Rising Head Falling Head Rising Head Falling Head Rising Head	Unconfined	Bouwer-Rice	3.24 E-04 3.64 E-04 3.36 E-04 3.83 E-04 3.31 E-04 3.68 E-04	**3.72E-04**	**1.05**
P-15DD	68.5-73.5	Diorite, highly fractured at 65' to total depth Wet at 15 ft during drilling	90	Falling Head Rising Head Falling Head Rising Head Falling Head Rising Head	Unconfined	Bouwer-Rice	7.61 E-03 8.40 E-03 7.96 E-03 8.35 E-03 1.26 E-02 8.26 E-03	**8.34E-03**	**23.63**
P-17D	50.1-60.1	Poorly graded sand with silt (SP), 34.8-52 ft Diorite, hard; unweathered @ 60.5 ft to total depth Wet at 15 ft during drilling	52	Falling Head Rising Head Falling Head Rising Head Falling Head Rising Head	Unconfined	Bouwer-Rice	2.48 E-03 2.66 E-03 2.58 E-03 2.67 E-03 2.53 E-03 2.78 E-03	**2.70E-03**	**7.66**
P-19D	25.7-35.7	Well graded sand w/ clay (SW-SC) at 26 ft SW at 29 to 36.5 ft, f-vc crs sand with gravel Total depth 36.5 ft Wet @ 17' during drilling	90	Falling Head Rising Head Falling Head Rising Head Falling Head Rising Head	Unconfined	Bouwer-Rice	2.45 E-03 5.22 E-03 3.09 E-03 5.14 E-03 3.53 E-03 5.30 E-03	**5.22E-03**	**14.80**
P-20D	40-50	Interbedded sand (SW), silty clay (CL) and silty to clayey sand (SM-SC) grading to gravelly sand (SW) 46-51.5 ft Bedrock at 51.5 ft, weathered and highly fractured Wet at 12 ft during drilling	90	Falling Head Rising Head Falling Head Rising Head Falling Head Rising Head	Unconfined	Bouwer-Rice	5.59 E-03 1.86 E-02 1.28 E-02 1.68 E-02 1.07 E-02 1.97 E-02	**1.83E-02**	**51.95**
							Geometric Mean All Wells	**3.81E-03**	**10.79**
							Geometric Mean Offsite	**6.37E-03**	**18.06**

Notes:
1. Slug tests conducted June 15-17, 2009
2. ft bgs = feet below ground surface

APPENDIX D

BIOCHLOR
FATE AND TRANSPORT MODELING

Biochlor Input Summary sheet for GE Patillas - 1,1 DCE Migration Simulations
Source: French Sump
5/26/2009 Rev 7/8/09
mlg

MCL for for 1,1, DCE = 7 ug/L
Assumptions
1. Data are sufficient only for a "centerline" analysis
2. No degradation
3. Plume length for DCE is 2000 ft
4. foc is 0.003
5. Source concentration/location for model: well P-10A

1. Hydrogeologic Data

1a. Seepage velocity: 480.0 ft/yr for alluvium onsite
Modified from 520 ft/yr Earthtech) , MLG changed eff porosity to 0.2 from 0.3 assumption in the report.
Source: Earthtech 2005 Supplemental RFI page 3-8

1b. Seepage velocity from field data collected June 2009
June 2009 Water Level Data and Water table contour map estimate: Deep Aquifer Data only

			Deep aquifer dh/dl June 2009	
Onsite:				
head differential from P-10A to French Sump	8.4	ft	0.0237	
Distance from French Sump to Well P-10A along flow path:	355	ft		
Seepage velocity = 466.15 ft/yr onsite				
Advective travel time Fr Sump to P-10A using estimated Seepage velocity (ft/yr) =			0.76	yrs
Retarded travel time of plume Fr Sump to 10-A assuming R =	2.95		2.25	yrs
head differential from P-10A to P-17D	2.03	ft	0.0053	Calibration value P-10A to P-17D
Distance betw wells along flow path	380	ft		gradient decreased due to recharge from WWTP ponds
Offsite:				
head differential from P-10A to P-19D	6.8	ft	0.0112	
Distance betw wells along flow path:	605	ft		

2. Dispersion

Assumed a 2000' plume for 1,1, DCE

33	ft	Xu and Ekstein
200	ft	assumption of 10% of plume length

Biochlor Input Summary sheet for GE Patillas - 1,1 DCE Migration Simulations
Source: French Sump
5/26/2009 Rev 7/8/09
mlg

3. Adsorption kg/L

Soil Bulk Density:	2.00	gm/ml	EarthTech SRFI
Porosity	0.2		MLG
foc	0.003		MLG
Koc	65	L/kg	USEPA for 1,1 DCE

Retardation Factor 2.95 from Biochlor spreadsheet calculation
EarthTech reports 0.01 as estimated foc based on a previous SEC (1991) RFI, but we don't know source of value

4. Biotransformation

No degradation, no data to support degradation is occurring

5. General Data

Original release: 1977-1980 French Sump

Simulation Time:

from 1977	yrs	
to 2004	27	release to 2004
to 2006	29	
to 2009	32	release to present

Assuming 2.25 years required to reach P10-A, need 32- 2.25 years or 29.75 year simulation time for model with P10-A as source
For model, well P-10A is the source being simulated, not Fr Sump
For Steady State, assume 100 years simulation

Distance along assumed flow path from P-10A to Rio Patillas (surface stream receptor): a + b
a. Distance from P-10A to Rio Chico:
scaled from WT contour base map 795 ft

b. Distance from Rio Chico to Rio Patillas 2000 ft

Total Distance to Rio Patillas receptor 2795 ft use 2800 for model length

Model Dimensions:	W	800	ft
	L	2800	ft

Biochlor Input Summary sheet for GE Patillas - 1,1 DCE Migration Simulations
Source: French Sump
5/26/2009 Rev 7/8/09
mlg

6. Source Data

a. Source Area Concentrations
1,1 DCE
Modeled as a constant source at well P-10A, not as a decaying source

b. Source Area Width

Model Options:			Actual Source Conc	Actual Source Conc	Derivation
Spatially Varying	Source Zone	Width (ft)	in 2004 (ug/L)	in 2009 (ug/L)	
	1	50	1230	770	Max concentration
	2	170	221		Geo mean betw edge zone 1 and 2
	3	350	22.1		Geo mean betw edge zone 2 and 3
Single Planar		100		**Used the Single Planar method for 2009 data**	

c. Source Thickness in Saturated Zone
Estimate thickness of alluvium = 40 ft
Aquifer Sat Thickness at P-10A 35

Shallow Well P-4, directly upgradient, no DCE in 2004 or 2009
screened 9-19 ft bgs, elev screen top 42 ft, bottom 32 ft msl
WT ~ 43 msl in P-4, therefore water column 43 to 32 (11 ft) no DCE, clean above this screen elev
Therefore top 11 ft of Sat Thickness is clean

Earthtech reports Saprolite 52 ft thick, assume bottom of P-10A screened in Saprolite
Plume potential thickness = 52 + 35 - 11 -------> 75 ft thick
If Saprolite is 75 ft thick, plume thickness could be 75 + 35 - 11 ------> 100 ft thick

7. Field Data

Jun-09

Deep Aquifer Seepage Velocity Calcs from June 09 Slug Tests:	K		K derivedfrom:
Geometric mean K for deep aquifer from slug tests:	**10.79**	ft/day	all wells tested (5)
Geometric mean K for deep aquifer from slug tests:	**18.06**	ft/day	off site wells only (3)
K for deep aquifer from slug tests:	**1.05**	ft/day	P-10A

Biochlor Input Summary sheet for GE Patillas - 1,1 DCE Migration Simulations
Source: French Sump
5/26/2009 Rev 7/8/09
mlg

all assume effective porosity of 20%

Deep Aquifer

Estimated seepage velocity French sump to P-10A:	v = K*dh/dl/(eff porosity)	=	1.277132	ft/day	=	466.15	ft/year
assumes K = 10.79 ft/day - mean for all wells slug tested							
Retarded flow velocity						158.018	ft/yr
Estimated Seepage velocity P-10A to P-17D:	v = K*dh/dl/(eff porosity)	=	0.482351	ft/day	=	176.06	ft/year
calibration value to use with 2009 sample data from wells 10A and 17D							
Estimated Seepage velocity offsite, downgradient P-10A to P-19D:	v = K*dh/dl/(eff porosity)	=	1.014857	ft/day	=	370.42	ft/year
forward model input value to predict offsite migration, higher K offsite than onsite							

Field Data for model Calibration Runs
2009 contour map/flow path Deep Aquifer

Well Name	Distance from P-10A along flow path (ft)	Concentration (ug/L) 2004	2006	2009	
P-10A	0	1230	-	770	
P-17D	380	163	110	75	well may or maynot be on/near centerline
P-18D	525	65	53	31	not on plume centerline
_20-D			44	24	not on plume centerline

Model Run Observations:

1. *Model output - very senstive to source width, less to source thickness*
2. *Model sensitive to dispersivity*
3. *Model somewhat sensitive to retardation*
4. *Model relatively insensitive to seepage velocity*

Calibration

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

GE Patillas 2009
Source: French Sump
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in gray cells. Press Enter, then C
0.02
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	176.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i		(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	200	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	2	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE		(L/kg)	1.00	(-)
TCE		(L/kg)	1.00	(-)
DCE	65	(L/kg)	2.95	(-)
VC		(L/kg)	1.00	(-)
ETH		(L/kg)	1.00	(-)
Common R (used in model)* =			**2.95**	

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	0.000		0.74
DCE → VC	0.000		0.64
VC → ETH	0.000		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	30	(yr)
Modeled Area Width*	800	(ft)
Modeled Area Length*	2800	(ft)
Zone 1 Length*	2800	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Continuous, Single Planar

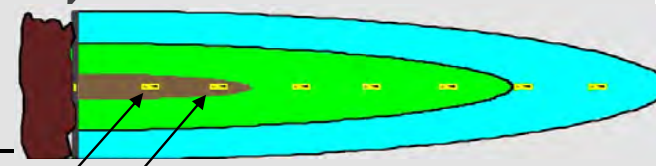
Source Options

Source Thickness in Sat. Zone* 60 (ft)

Width* (ft) Y1 30

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE		0.2
TCE		0.2
DCE	.77	0.2
VC		0.2
ETH		0.2

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)	.77		.075								
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	0		380								
Date Data Collected	2009										

8. CHOOSE TYPE OF OUTPUT TO SEE:

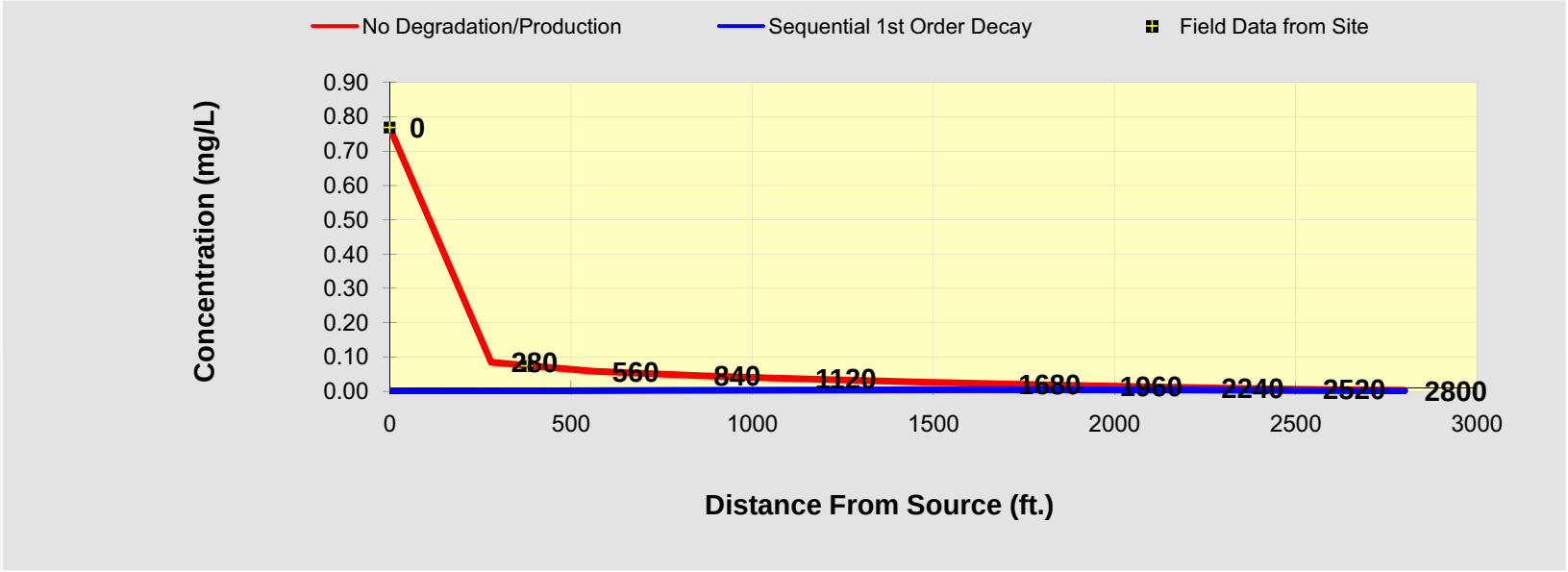
RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Calibration

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	280	560	840	1120	1400	1680	1960	2240	2520	2800
No Degradation	0.770	0.086	0.060	0.047	0.038	0.030	0.023	0.017	0.011	0.007	0.004
Biotransformation	0.0019	0.001	0.002	0.003	0.005	0.005	0.005	0.005	0.004	0.003	0.002

	Monitoring Well Locations (ft)										
	0		380								
Field Data from Site	0.770		0.075								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

30.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

Model Run #1
Forward Model (using best-fit input parameters)

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

GE Patillas 2009 Data
French Sump
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in gray cells. Press Enter, then C
0.02
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	370.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i		(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	200	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	2	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE		(L/kg)	1.00	(-)
TCE		(L/kg)	1.00	(-)
DCE	65	(L/kg)	2.95	(-)
VC		(L/kg)	1.00	(-)
ETH		(L/kg)	1.00	(-)
Common R (used in model)* =			**2.95**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	0.000		0.74
DCE → VC	0.000		0.64
VC → ETH	0.000		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	30	(yr)
Modeled Area Width*	800	(ft)
Modeled Area Length*	2800	(ft)
Zone 1 Length*	2800	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous, Single Planar

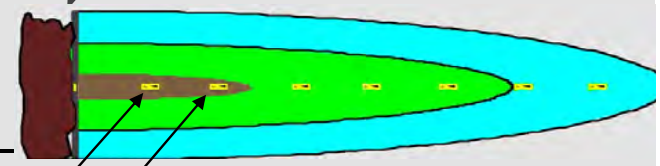
Source Options

Source Thickness in Sat. Zone* 60 (ft)

Width* (ft) Y1 30

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE		0.2
TCE		0.2
DCE	.77	0.2
VC		0.2
ETH		0.2

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)	.77		.075								
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	0		380								
Date Data Collected	2009										

8. CHOOSE TYPE OF OUTPUT TO SEE:

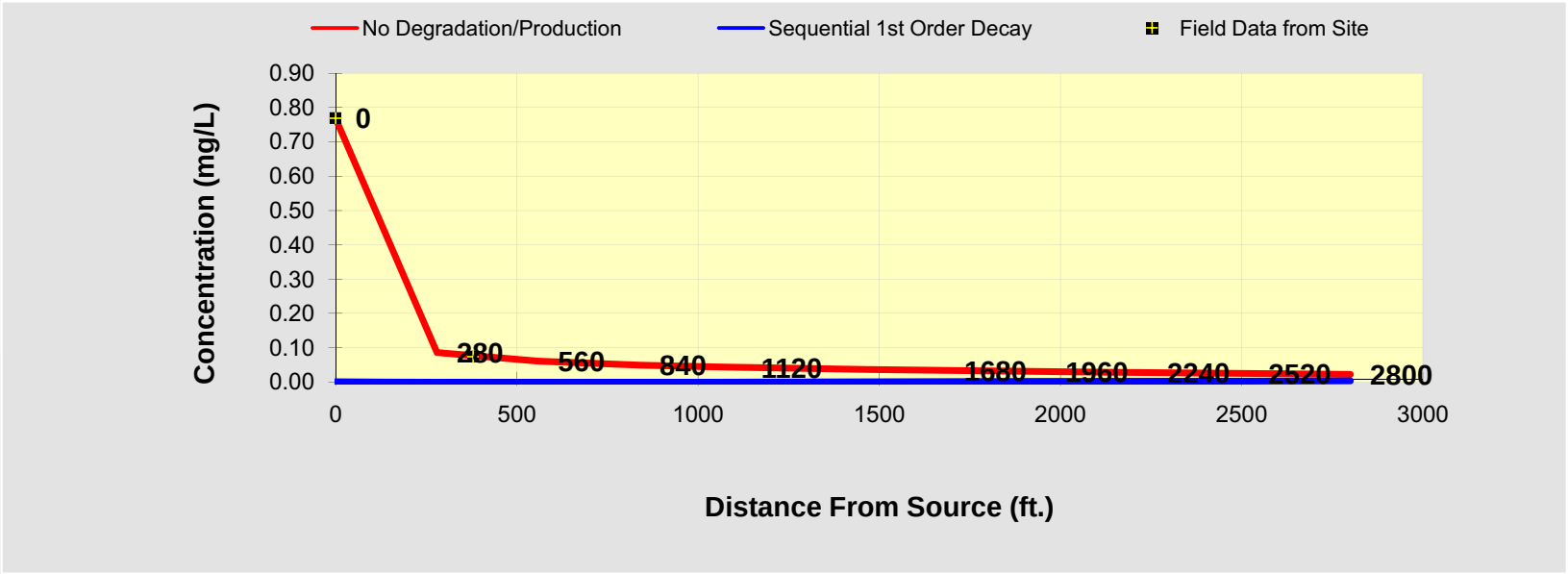
RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Model Run #1
Forward Model (using best-fit input parameters)

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	280	560	840	1120	1400	1680	1960	2240	2520	2800
No Degradation	0.770	0.087	0.061	0.050	0.043	0.038	0.035	0.031	0.029	0.026	0.023
Biotransformation	0.0019	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.005

	Monitoring Well Locations (ft)										
	0		380								
Field Data from Site	0.770		0.075								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
30.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

Model Run #2
Forward Model (minimal reasonable travel distance)

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

GE Patillas 2009 Data
French Sump
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	370.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i		(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	400	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	2	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE		(L/kg)	1.00	(-)
TCE		(L/kg)	1.00	(-)
DCE	65	(L/kg)	2.95	(-)
VC		(L/kg)	1.00	(-)
ETH		(L/kg)	1.00	(-)
Common R (used in model)* =			**2.95**	

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	0.000		0.74
DCE → VC	0.000		0.64
VC → ETH	0.000		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	30	(yr)
Modeled Area Width*	800	(ft)
Modeled Area Length*	2800	(ft)
Zone 1 Length*	2800	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Continuous, Single Planar

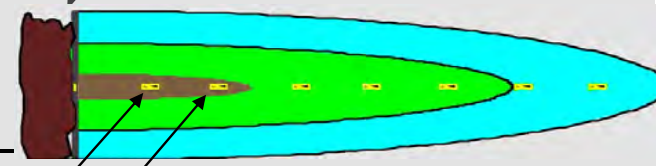
Source Options

Source Thickness in Sat. Zone* 60 (ft)

Width* (ft) Y1 15

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE		0.2
TCE		0.2
DCE	.77	0.2
VC		0.2
ETH		0.2

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)	.77		.075								
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	0		380								
Date Data Collected	2009										

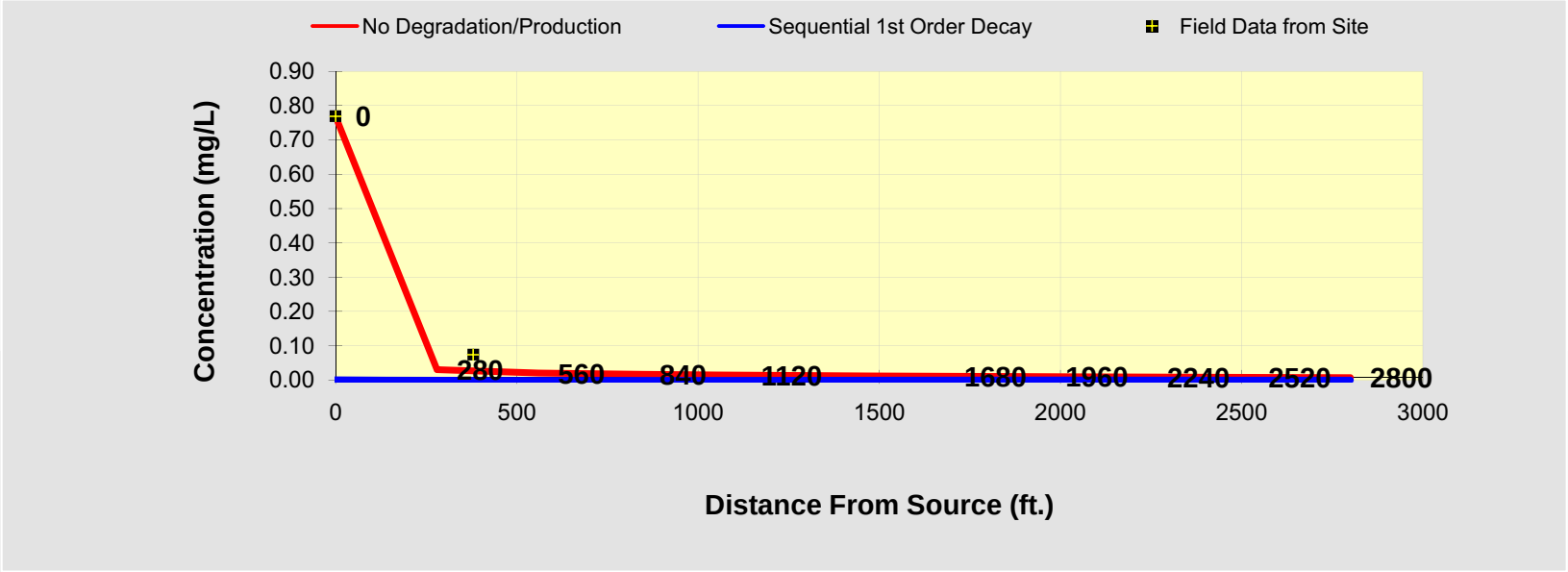
8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Model Run #2
Forward Model (minimal reasonable travel distance)

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	280	560	840	1120	1400	1680	1960	2240	2520	2800
No Degradation	0.770	0.031	0.022	0.018	0.015	0.013	0.012	0.011	0.010	0.009	0.008
Biotransformation	0.0019	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Monitoring Well Locations (ft)										
	0		380								
Field Data from Site	0.770		0.075								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
30.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

Model Run #3
Forward Model (maximum reasonable travel distance)

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

GE Patillas 2009 Data
French Sump
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then (C)
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	370.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i		(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	33	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-99	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho	2	(kg/L)		
FractionOrganicCarbon, foc	3.0E-3	(-)		
Partition Coefficient	Koc			
PCE		(L/kg)	1.00	(-)
TCE		(L/kg)	1.00	(-)
DCE	65	(L/kg)	2.95	(-)
VC		(L/kg)	1.00	(-)
ETH		(L/kg)	1.00	(-)
Common R (used in model)* =			**1.65**	

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		0.79
TCE → DCE	0.000		0.74
DCE → VC	0.000		0.64
VC → ETH	0.000		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	30	(yr)
Modeled Area Width*	800	(ft)
Modeled Area Length*	2800	(ft)
Zone 1 Length*	2800	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Continuous, Single Planar

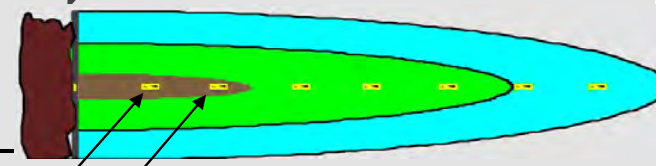
Source Options

Source Thickness in Sat. Zone* 60 (ft)

Width* (ft) Y1 60

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE		0.2
TCE		0.2
DCE	.77	0.2
VC		0.2
ETH		0.2

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)											
TCE Conc. (mg/L)											
DCE Conc. (mg/L)	.77		.075								
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Distance from Source (ft)	0		380								
Date Data Collected	2009										

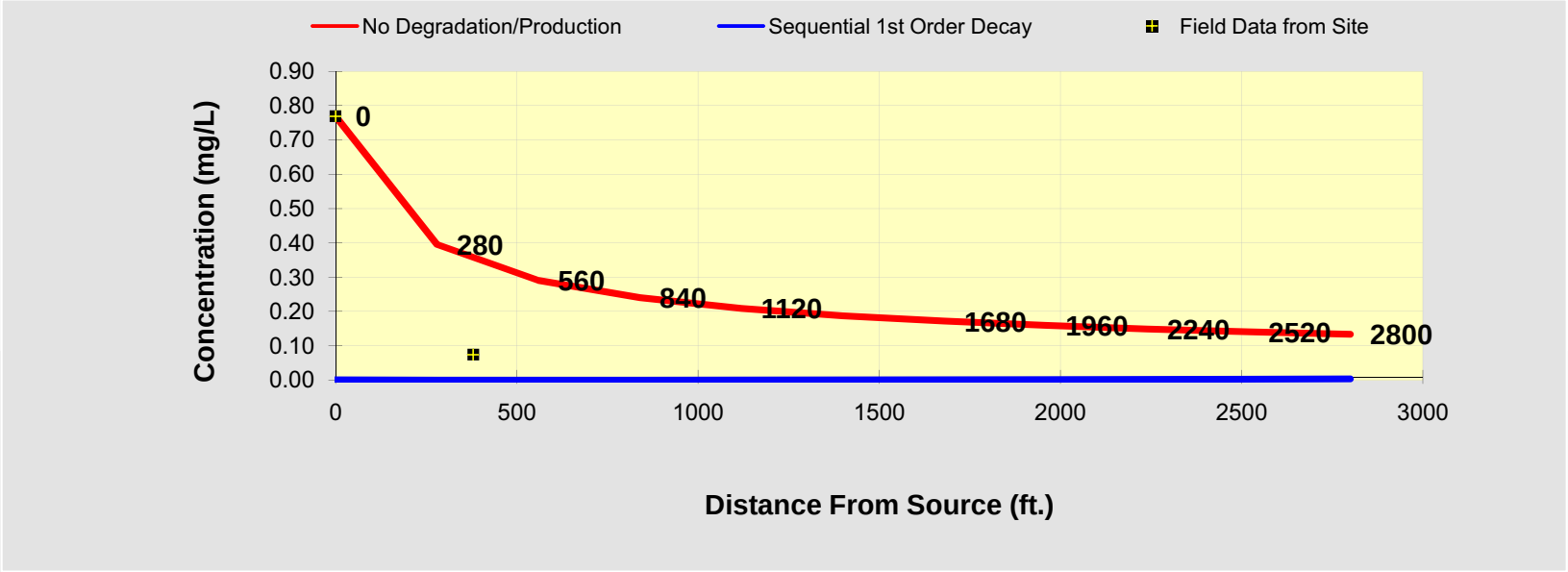
8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Model Run #3
Forward Model (maximum reasonable travel distance)

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

DCE	Distance from Source (ft)										
	0	280	560	840	1120	1400	1680	1960	2240	2520	2800
No Degradation	0.770	0.396	0.291	0.241	0.210	0.189	0.173	0.160	0.150	0.142	0.134
Biotransformation	0.0019	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.004	0.004
	Monitoring Well Locations (ft)										
	0		380								
Field Data from Site	0.770		0.075								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
30.0 Years
Log ⟺ Linear

Return to Input

To All

To Array