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Pacific Northwest
National Laboratory

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U.S. Department of Energy

Borehole Data Package for Well 699-37-47A, PUREX Plant Cribs, CY 1996

J. W. Lindberg
B. A. Williams
F. A. Spane

February 1997

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

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the U.S. Department of Energy
under Contract DE-AC06-76RLO-1830

Pacific Northwest National Laboratory
Richland, Washington 99352

DISCLAIMER

Summary

A new groundwater monitoring well (699-37-47A) was installed in 1996 as a downgradient groundwater monitoring well near the PUREX Plant Cribs Treatment, Storage, and Disposal (TSD) Facility at the Hanford Site, located in southeastern Washington State. This document provides data from the well drilling and construction operations, as well as data from subsequent characterization of groundwater and sediment samples that were collected during the drilling process. The data include the following:

- Well construction documentation
- Geologist's borehole logs
- Results of laboratory analysis of groundwater samples collected during the drilling process
- Results of laboratory analysis of physical tests conducted on sediment samples collected during the drilling process
- Borehole geophysics
- Results of aquifer testing including slug tests and flowmeter analysis.

Well 699-37-47A was constructed in support of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-24-00H and interim milestone M-24-35 (Ecology et al. 1994), and was funded under Project W-152. The work to prepare this data package was performed by Pacific Northwest National Laboratory for the U.S. Department of Energy under Contract DE-AC06-76RLO-1830.

Acknowledgments

Many people are involved in a drilling project to plan and carry out the work. The authors would like to acknowledge the following people for their contribution to a successful drilling and data gathering project: Jeanie Votava for helping with plans and early well site geologist support, Kent Reynolds for field team leadership, John Keller for administrative support, Willy Franklin for being the driller, Bob Jones for well construction, Vern Johnson for groundwater chemistry, Vince Vermeul for slug testing, Jim Coates for running the flowmeter, Ron Sanders for XRF analysis and Steve Reidel for interpreting the results, Dave McCready for XRD analysis and Duane Horton for interpreting the results, Heidi Hampt for helping with soil testing, Dot Stewart for administrating the groundwater chemistry analyses, Bill Thackaberry for quality assurance, John Serkowski for data support, Jeff Serne for technically reviewing this document, and Rosalind Schrempf for editing the document.

Contents

Summary iii

Acknowledgments v

1.0 Introduction 1

2.0 Drilling and Well Installation 3

3.0 Quality Assurance 7

4.0 Results of Groundwater and Sediment Analyses 9

4.1 Contaminants Detected in Groundwater Samples 9

4.2 Results of Laboratory Analyses of Sediment and Rock 10

5.0 Borehole Geophysics 13

6.0 Aquifer Testing 15

7.0 References 17

Appendix A - Well Documentation A.1

Appendix B - Well Summary Sheet and Borehole Log B.1

Appendix C - Results of Groundwater Analyses C.1

Appendix D - Results of Sediment and Rock Analyses D.1

Appendix E - Borehole Geophysics E.1

Appendix F - Aquifer Testing F.1

Figures

1 Location of Well 699-37-47A 2

2 Resulting Vectors of the Flowmeter Analyses 16

Tables

1 Drill Depths in Which Groundwater Samples were Collected 4

2 Sediment Samples Collected By Coring or With Split Spoon 5

3 Summary of Results of Laboratory Tests on Sediment 10

4 Summary of Flowmeter Tests at Five Depths in Well 699-37-47A 15

1.0 Introduction

A new groundwater well (699-37-47A) was installed in 1996 as a downgradient monitoring well near the PUREX Plant Cribs Treatment, Storage, and Disposal (TSD) Facility at the Hanford Site, located in southeastern Washington State (Figure 1). The PUREX Cribs TSD includes cribs 216-A-36B, 216-A-10, and 216-A-37-1. This document provides data from the well drilling and construction operations, as well as data from subsequent testing of groundwater and sediment samples that were collected during the drilling process. Well 699-37-47A (hereafter called the well) was constructed in support of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-24-00H and interim milestone M-24-35 (Ecology et al. 1994) and was funded under Project W-152. The work to prepare this data package was performed by Pacific Northwest National Laboratory (PNNL) for the U.S. Department of Energy under Contract DE-AC06-76RLO-1830.

The well will enhance the existing groundwater monitoring network used to assess groundwater contamination plumes emanating from cribs that were used to dispose of wastewater from PUREX operations. In addition, the borehole made during the well installation process was designed to provide geologic and hydrologic information on the complete thickness of the upper aquifer system (Delaney et al. 1991). Besides well installation, specific objectives during the well drilling process included the following:

- Characterize the stratigraphy and sediments by geologically logging the drill cuttings and sediment samples collected, collecting sediment samples in the upper aquifer system for testing in the laboratory (e.g., grain-size analysis, saturated hydraulic conductivity, effective porosity, calcium carbonate content, and specific gravity), and geophysically logging the borehole.

- Collect groundwater samples throughout the upper aquifer system and analyze for all suspected PUREX cribs groundwater contamination.

The hydrogeology of the southeastern portion of the 200 East Area where the PUREX Cribs are located is described in Connelly et al. (1992), Lindberg et al. (1993), Kasza (1994), and Lindsey et al. (1992). The approved design, data quality objectives, and justification for the well are provided in Votava et al. (1996). The well was constructed to the specifications described in WHC (1990). Other specific procedures for well drilling and installation and related activities are in WHC (1988, 1992).

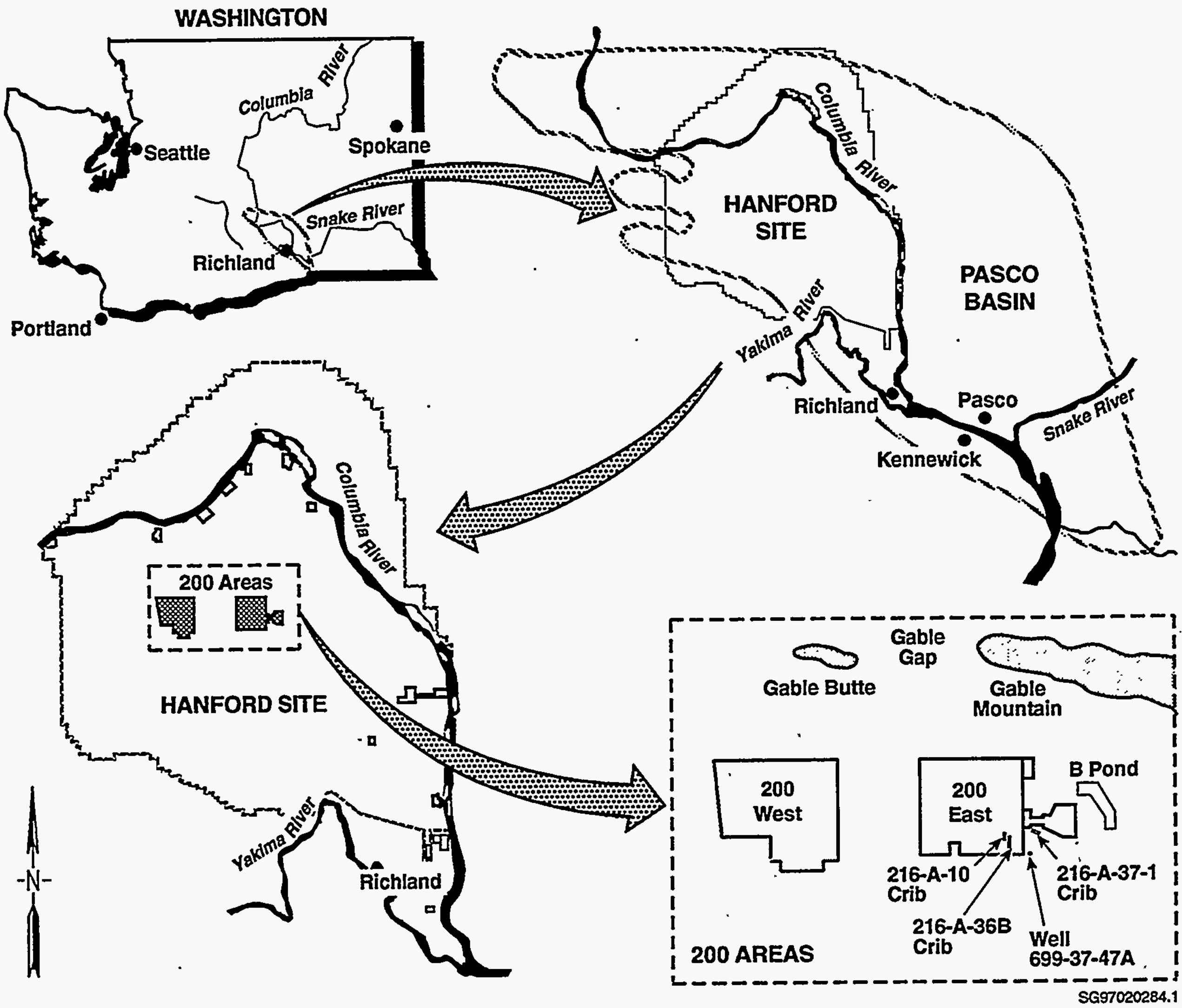

Figure 1. Location of Well 699-37-47A

2.0 Drilling and Well Installation

The well was spudded in on August 20, 1996. Total depth (TD) was reached October 11, 1996 at 525.5 ft[(a)] below ground surface (bgs). All well structures were installed by November 5, 1996, including permanent stainless steel casing and screen, annular seals, surface seal, pad, and posts. A cement seal was placed in the abandoned portion of the borehole from 365 to 410 ft to prevent any inter-aquifer flow of groundwater across the Ringold Formation lower mud unit as a localized confining layer. After the well was completed, well development occurred on November 7, slug testing on November 8, flowmeter testing on November 11-13, and sampling pump installation and testing from November 14-19, 1996. The well was sample-ready on November 19, 1996. Appendix A provides some of the pertinent documentation about well drilling and construction.

Drilling was accomplished with a rotary drilling rig (DrillTech DH-2) that was set up with a Sandvig acentric bit and casing driver device (TUBEX trademark) capable of drilling a hole slightly larger than the temporary casing that followed. Temporary carbon steel casing with threaded joints was driven immediately behind the bit by the down-hole pneumatic hammer. The first string of casing was 10 3/4 in. in diameter and was driven to 306 ft. The second set of temporary casing (8 5/8 in. dia.) was inserted inside the first set and then continued to TD at 525.5 ft.

The borehole for well 699-37-47A was drilled completely through the Hanford formation, Ringold Formation, and 9.5 ft (3 m) into the uppermost basalt flow. The well site geologist recorded sediment descriptions derived from drill cuttings and samples collected by split spoon and coring. These descriptions are on the Borehole Log and Well Summary Sheet, which are in Appendix B. The following geologic units were encountered:

Eolian silty sand	0 - 3 ft
Hanford formation, sand and sandy gravel	3 - 285 ft
Ringold Formation	
Upper Ringold unit, silty sand	285 - 310 ft
Unit E (Upper Coarse), sandy gravel	310 - 367 ft
Lower mud unit, clayey silt	367 - 412 ft
Unit A (Basal Coarse), sandy gravel	412 - 516 ft
Columbia River Basalt, Yakima Basalt, Saddle Mountains Basalt Formation, Elephant Mountain Member	516 ft - TD (525.5 ft)

(a) Non-metric units are still in common usage in drilling and drilling-related activities. In most cases non-metric units are used in this data package with metric equivalents added where appropriate.

Saturated sediments were first encountered at 311 to 312 ft of drill depth. However, after drilling through the Ringold Formation lower mud unit (a local confining layer), the water level in the well-bore rose to 308 ft.

Six groundwater samples were collected during the drilling operations to assess the vertical nature of any contaminant plumes. Three of the groundwater samples were collected at intervals above the Ringold Formation lower mud unit and three were collected below it. The groundwater samples were collected at drill depths listed in Table 1.

At times during drilling and coring, water had to be added to facilitate the drilling process. A bromide tracer (sodium bromide) was added to the drilling and coring water at a strength of 50 ppm for later well purging purposes. The concern was that added water would dilute groundwater samples thereby diluting any contaminants in the samples. By adding the tracer and then testing for the tracer during well purging (immediately before collecting each groundwater sample), the sampling team could determine when enough groundwater had been purged such that the groundwater sample was representative. Furthermore, the samples themselves were checked for bromide during laboratory analyses. Bromide was not detected in any of the samples.

In order to retrieve intact sediment samples during the drilling process, sampling by split spoon and coring were attempted six times. Each method was attempted three times. All three attempts at sampling with the split spoon were in sandy gravels of the Ringold Formation and were successful in retrieving sediment. However, one of the three samples was not intact after retrieval to the surface. Of the three attempts at coring, only one was successful and that was in the muds of the Ringold Formation lower mud unit. The other two attempts at coring were in the sandy gravels, which plugged the core barrel and kept it from filling properly. Therefore, four sediment samples were successfully retrieved

Table 1. Drill Depths in Which Groundwater Samples were Collected

Depth (ft)[a]	Sample Number
327 (unit E)	BOJ7B9, BOJ7C0
341 (unit E)	BOJ7C3, BOJ7C4
361 (unit E)	BOJ7C1, BOJ7C2
423 (unit A)	BOJ7C5, BOJ7C6
462 (unit A)	BOJ7C7, BOJ7C8
503 (unit A)	BOJ7C9, BOJ7D0
(a) Water table 312 ft (unit E), Ringold Formation Lower Mud Unit 367-412 ft, Basalt Contact 516 ft.	

and sent to the soils laboratory for analysis. Table 2 provides information about the samples including the sample numbers, depth collected, geologic unit, and whether or not sediment was recovered.

A sample of lower mud unit was sent in for X-ray diffraction (XRD) analysis in order to identify the minerals comprising the mud unit. Rock cuttings from the basalt bedrock encountered at TD were sent to the laboratory for X-ray fluorescence (XRF) analysis in order to verify that it was the Elephant Mountain Member.

The vertical position of the permanent well screen was selected after drilling was completed (and before results of water testing were obtained) based on information obtained during the drilling process. A water table position was selected for the screen because the sediments immediately below the water table were highly conductive and probably would have the greatest potential for containing groundwater contamination from the PUREX Cribs. The screen selected was 30 ft (9.1 m) long with a slot size of 0.02 inches (20 slot or 0.51 mm). The longer than usual screen was chosen to provide a longer well life as the water table recedes. The Well Summary Sheet (Appendix B) is an as-built diagram showing the well structures to scale.

After the well was installed, the well location and elevation of the brass cap and top of casing were surveyed. The location was surveyed to the 200 East Area (ft) and Lambert WCS83S/91 (m) systems. Vertical control was surveyed to the NAVD 88 Datum (ft and m). The survey data report is in Appendix A.

Table 2. Sediment Samples Collected By Coring or With Split Spoon

Depth (ft)	Type	Sample Number	Geologic Unit/Sediment Type	Analyses Request
325-327	Split Spoon	BOJ5Y5	Ringold Formation, Unit E, Sandy Gravel	Grain Size Distribution, $CaCO_3$, not intact
360-365	Core	******************NOT RECOVERED******************		
371-375	Core	BOJ5Y6	Ringold Formation, Lower Mud Unit	Sat. K, Effec. Por., Grain Size Distribution, $CaCO_3$, Spec. Grav.
420-422	Split Spoon	BOJ5Y7	Ringold Formation, Unit A, Sandy Gravel	Sat. K, Effec. Por., Grain Size Distribution, $CaCO_3$, Spec. Grav.
461-462	Split Spoon	BOJ5Y8	Ringold Formation, Unit A, Sandy Gravel	Sat. K, Effec. Por., Grain Size Distribution, $CaCO_3$, Spec. Grav.
501-503	Core	******************NOT RECOVERED******************		

3.0 Quality Assurance

The Quality Assurance requirements for wells constructed under Project W-152 are described in WHC (1992). First-line verification of well construction aspects that support groundwater monitoring wells "fitness-for-use" determination is performed by the well site geologist and is documented in the Well Construction Verification Report. Westinghouse Hanford Company (WHC) Liquid Effluent Services Quality Assurance staff performed Quality Assurance surveillance on the well. The surveillance activity consisted of spot checks of various attributes such as equipment decontamination, personnel qualifications, drilling process, construction materials, materials storage, safety requirement compliance, waste handling, documentation, and drilling logs. All of the surveillance results were satisfactory. No nonconformances were noted or reported during the construction of this well.

The surveillance reports issued for this well include numbers LESQA-96-007, LESQA 97-001 (Appendix A) and LESQA-97-002. These reports and other records (e.g., chain-of-custody forms, decontamination records, and daily field records) are on file with PNNL and the Hanford Site Records Holding Center.

4.0 Results of Groundwater and Sediment Analysis

The following sections discuss results of analyses on groundwater and sediment samples collected while drilling the well.

4.1 Contaminants Detected in Groundwater Samples

Results of analyses on the groundwater samples collected while drilling well 699-37-47A are in Appendix C. In summary, the following constituents were detected in the groundwater samples:

Total Organic Carbon	Manganese
Ammonia	Nitrate
Arsenic	Strontium
Barium	Strontium-89/90
Chromium	Sulfate
Fluoride	Technetium-99
Gross Alpha	Tritium
Gross Beta	Uranium
Iodine-129	Vanadium
Iron	Zinc

Most of the above constituents are in low concentrations. However, several exceed drinking water standards. Those constituents are:

Arsenic (one sample, in most shallow Ringold Formation unit A sample)
84.8 µg/L (MCL = 50 µg/L)

Gross Alpha (three samples, correlated to uranium)
150, 232, 123 pCi/L (proposed MCL = 15 pCi/L excluding uranium)

Iodine-129 (one sample, deepest of Ringold Formation unit E samples)
3.7 pCi/L (proposed MCL = 1.0 pCi/L)

Iron (one sample, in deepest sample from Ringold Formation unit A)
593 µg/L (MCL = 300 µg/L)

Manganese (three samples, all three from Ringold Formation unit A)
67.6, 121, 132 µg/L (MCL = 50 µg/L)

Uranium (three samples, all three from Ringold Formation unit A)
220, 395, 197 µg/L (proposed MCL = 20 µg/L)

Isotopic uranium analyses (Appendix C) on the three samples collected in Ringold Formation unit A revealed that ^{236}U was probably not detected. Peaks of ^{236}U were indistinguishable from ^{235}U peaks. Activity ratios of ^{234}U to ^{238}U ranged from 1.58 to 1.92. Activity ratios of ^{235}U to ^{238}U ranged from 0.04 to 0.05. These results are consistent with a natural uranium source.

4.2 Results of Laboratory Analyses of Sediments and Rock

Table 3 summarizes the results (Appendix D) of laboratory testing of sediment collected by coring and driving the split spoon sampler.

The sample of Ringold Formation lower mud unit clayey silt that was sent to the laboratory for X-ray diffraction analysis was from 374.1 ft of drill depth and was retrieved by coring. The results of sediment and rock analyses (Appendix D) show that the specimen contained the following minerals:

Quartz	70%
Plagioclase feldspar	20%
Muscovite (or Illite-type clays)	<10%
Chlorite (or Vermiculite-type clays)	<5%

Chips of basalt bedrock that were sent to the laboratory for X-ray fluorescence analysis were from a drill depth of 517 to 525 ft. The results are in Appendix D. The percentages of elements (expressed as oxides) present (in weight percent) indicate that the chips represent the Elephant Mountain Member of

Table 3. Summary of Results of Laboratory Tests on Sediment

Sampling Depth (ft) and Number	General Grain Size	$CaCO_3$ Content (wt.%)	Sat. K (cm/sec)	Effect. Porosity (%)	Porosity (%)	Specific Gravity (g/cm^3)
325-327 BOJ5Y5	Sandy Gravel	<1	NA[a]	NA	NA	NA
371-375 BOJ5Y6	Clayey Silt	<1	3E-7	0.37	0.41	2.71
420-422 BOJ5Y7	Slightly Silty Sandy Gravel	<1	1E-4	0.11	0.28	2.72
461-462 BOJ5Y8	Slightly Silty Sandy Gravel	<1	2E-3	0.04	0.25	2.70

(a) NA = not analyzed.

the Saddle Mountains Basalt Formation. The key elements that differentiate this member from other Saddle Mountains Basalt members are TiO_2 and P_2O_5. The TiO_2 result is around 3.5%, which is higher than typical Columbia River Basalt members and well above what would be expected for the Pomona Member (1.5 - 2.0%) and Esquatzel Member (3.0 to 3.1%), which underlie the Elephant Mountain Member. Similarly, the result for P_2O_5 is about 0.6%, which is typical of the Elephant Mountain Member but not for the Pomona and Esquatzel members where P_2O_5 is approximately 0.23% and 0.41%, respectively.

5.0 Borehole Geophysics

Borehole geophysics, consisting of the radiological logging system (RLS) spectral gamma tool, was run on August 23, 1996, from ground surface to 300 ft bgs and on October 14, 1996, from 300 ft to TD (525 ft). These two logging runs were conducted to accommodate the two strings of temporary casing that were used to drill the borehole to TD. After the hole was drilled to 306 ft and before the second set of temporary casing was installed, the first geophysical run was made. The second run was made to TD. Copies of the geophysical logs are included in Appendix E.

Geophysical log results are used, along with the geologic and hydrologic results, to characterize the subsurface. Specifically, the total gamma curve is used to correlate geologic units, define formation contacts and lithologic changes, and indicate radiological anomalies. When combined with other hydrogeologic data results, geophysical logs provide a confidence tool for improved subsurface hydrogeologic interpretations consisting of visual-continuous type curves, more accurate depth correlations, and consistent and objective cross borehole correlations.

Based on the geophysical log correlation, the contact between the Hanford formation and the Ringold Formation upper fine unit is at 285 ft bgs. The Ringold Formation unit E begins at 312 ft bgs and extends to the top of the Ringold Formation lower mud unit at 365 ft. The base of the lower mud unit and the top of the Ringold Formation unit A is at 414 ft. The top of the Elephant Mountain Basalt Member is at a depth of 517 ft. The water table was encountered at 312 ft and is within the Ringold Formation unit E sandy gravel.

A uranium anomaly was identified in the uranium spectral and total gamma curves at a depth interval of 410 to 420 ft. The uranium averages 2.5 to 3.0 pCi/g, which is three times higher than the background level (approximately 1 pCi/g). This anomaly is associated with the upper 8 ft of the Ringold Formation unit A and the less permeable silts of the overlying Ringold Formation lower mud unit. Independent water sample analyses confirm elevated uranium at these depths (Section 4.1).

Formation contact depths selected from the geophysical logs are slightly different than those selected from the geological logs (Appendix B). The geophysical logs are considered more accurate than the geological logs due to the depth determination inaccuracies that are associated with the drill cuttings removal process during drilling. Also, the interpreted geophysical logs have been corrected for various borehole effects, including signal attenuation due to multiple casing strings and saturated sediments below the water table and log run depth overlap.

6.0 Aquifer Testing

Pump discharge rate and the drawdown versus time were recorded during well development in order to provide a very simple, single-well pumping test. Those data were recorded on the daily Field Activity Forms and Aquifer Test Data Sheets and are in Appendix F. The data suggest that the transmissivity of Ringold Formation unit E in the immediate vicinity of the well is high.

After the well was developed, a slug test was performed. The results are in Appendix F. Six slug withdrawal tests were conducted with slugging rods of three separate volumes (two tests with each volume). All six slug tests exhibited complete recovery patterns within approximately 5 seconds, indicating that the Ringold Formation unit E, where the well is located, exhibits high transmissivity. Based on the overall better type-curve match results obtained while using a slugging rod of 0.414 ft^3 (the slugging rod with the greatest volume), best-estimate values for hydraulic conductivity and transmissivity are 196.4 ft/d and 11,000 ft^2/d, respectively, for the unconfined aquifer in proximity to the well. However, because of the very rapid recovery times these estimates should be considered very qualitative.

The last test conducted on the newly constructed well was a flowmeter test. On November 11-13, 1996, the K-V Associates flowmeter was used to help determine flow direction and flow rate in the screened portion of the aquifer. The flowmeter analysis was conducted at five separate depths below the water table (Table 4). The results (Appendix F) show that near the water table the flow direction is to the southeast at a moderate flow rate. However, with increasing depth in the screen, the flow direction shifts to the northeast and flow rate increases (Figure 2).

Table 4. Summary of Flowmeter Tests at Five Depths in Well 699-37-47A

Depth Below Water Table (ft)	Flow Direction	Flow Rate (ft/d)	Comments
3.4	S34°E	1.0	
7.4	S79°E	2.4	9:10 a.m., Nov. 12
7.4	S39°E	1.3	3:20 p.m., Nov. 13
11.4	S25°E	1.7	
17.4	N53°E	3.3	
19.4	N49°E	5.2	3:50 p.m., Nov. 12
19.4	N37°E	6.8	10:25 a.m., Nov. 13

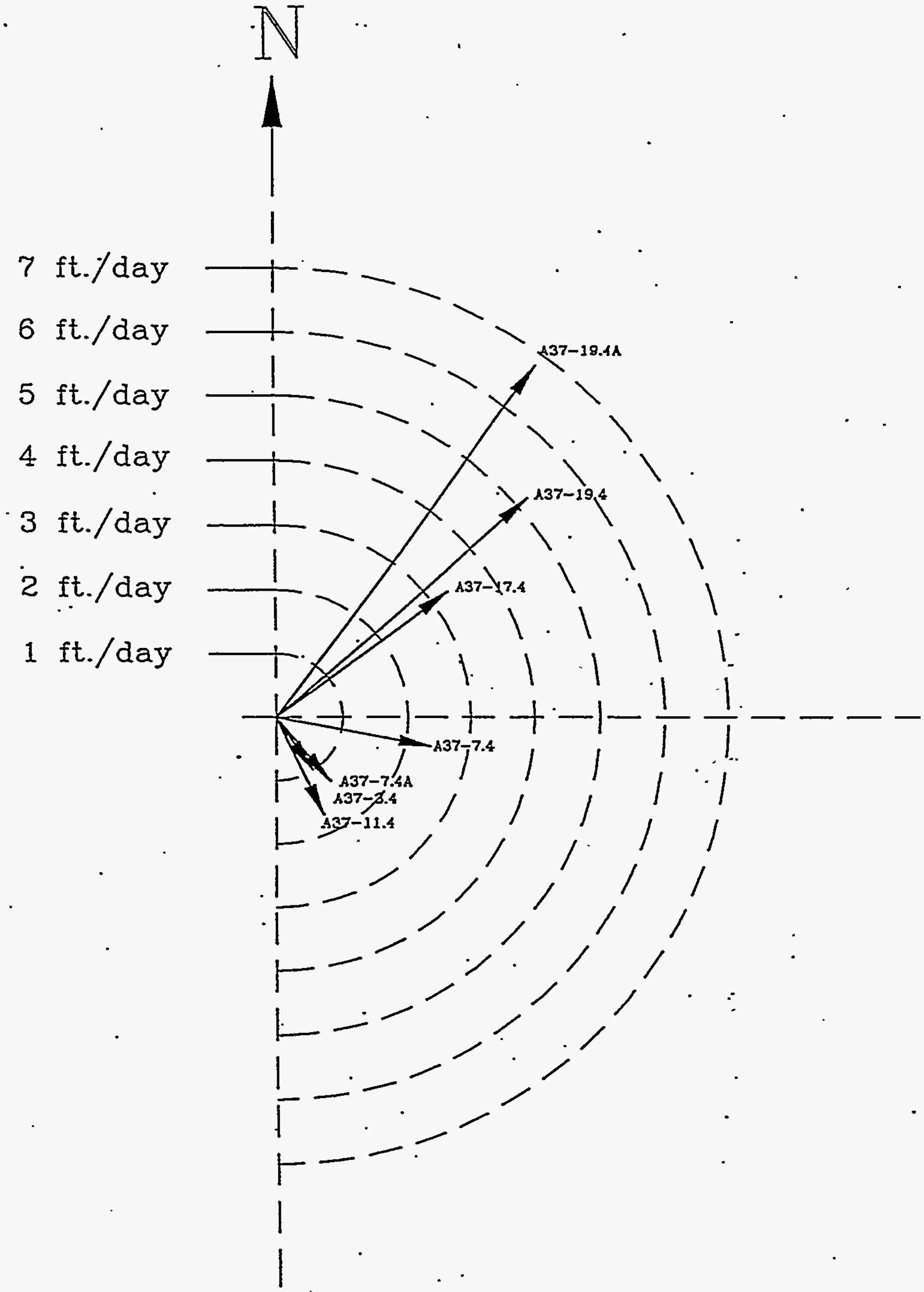

Figure 2. Resulting Vectors of the Flowmeter Analyses. Depths below water table of each vector within the well screen are given in feet behind the number A37 at the head of each arrow. The trailing "A"s are duplicate results at a given depth below the water table.

7.0 References

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Appendix A

Well Documentation

Appendix A

Well Documentation

This appendix contains the

- Well Construction Summary Report
- Well Construction Verification Report
- Survey Data Report
- Surveillance Report LESQA 97-001
- Acceptance of Completed Work.

WELL CONSTRUCTION SUMMARY REPORT

Specification No. WHC-S-014 Rev. No. 8

ECNs 634626

Project 93L-EWW-152

Drilling Company ICF KAISER HANFORD

Driller W. FRANKLIN, L. WATKINS, L. Bultena

Other (Companies) RUST, PNNL

Geologist(s) J. W. Lindberg, J. M. Votava, R. L. Jones

Well ID B-2822 Well Name 699-37-47A

Temp. Well No. A-37 Approximate Location SEE SURVEY INFORMATION Below

Drill Method

Type Odex Air Rotary

Drilling Fluid WATER / Mist

Total Amount of Water Added During Drilling 80 Gallons Injected

Comments A polymer addition was used when coring.

Temporary Casings and Drilled Depth

Casing Type and Size	Interval	Shoe OD
Carbon steel 10 3/4"	0' - 306.3	10 3/4"
Carbon steel 8 5/8"	0 - 524.8	8 5/8"
	-	
	-	

Drilled Depth 525.57' Hole Diameter at TD 9 1/2"

Static Water Level/Date 308.14 10/21/96 312.02 11/7/96

Comments

Date Drilling Started 8/19/96

Geophysical Logging

Sondes (type)	Interval	Date
Gamma-Ray	0 - 301'	8-23-96
Gamma-Ray	280' - 525'	10-14-96
	-	
	-	
	-	

Completion Activity Date Started 10/18/96

Casing and Screen (Permanent)

Type	Depths	Length	Slot Size
SS Wirewrap	338.7 - 308.7	30'	20
SS 4" Riser	308.7 - +1.37	310.07	NA
	-		
	-		
	-		

Annular Seal/Filter Pack

Type	Interval	Volume	Mesh Size
Silica Sand	525 - 410	98 Cu ft	8-12
Cement Grout	410 - 395	10.8 Cu ft	NA
Cement Grout	395 - 365	10.8 Cu ft	NA
Bentonite Pellets	365 - 358	3.1 Cu ft	1/4" Pellets
Formation	358 - 340.8	Unknown	Formation

SEE Comment Section Below

Other Activity

Aquifer Test Performed? YES

Type Stepped Drawdown Date 11-7-96

Well Abandoned? NA

Date NA

Well Survey Data

Date 12-23-96 Site { N 37,430.58, W 40,044.23 }

Washington State Prime Coordinates N 134,893.26 m, E 575,556.97 m

Protective Casing Elevation 720.13 ft (219.495 m)

Brass Cap Elevation 716.66 ft (218.440 m)

Comments/Remarks

Type	Interval	Volume	Mesh Size
Silica Sand	340.8 - 304.49	25.7 Cu ft	10/20
Bentonite	304.49 - 301.00	1.24 Cu ft	1/4" Pellets
Bentonite	301.0 - 19.0	128.57 Cu ft	8-20 Granules
Cement (Neat)	19.0 - 3.0	14.04 Cu ft	
Concrete	3.0 - 0'	1 1/2 Cu yd.	

A-6000-436 (06/9

WELL CONSTRUCTION VERIFICATION REPORT
Criteria from WHC-S-014, and other change documents

Page 1 of 1

Well ID	Well Name	Well Specification/Revision
B2822	699-37-47A	WHC-S-014, REV. 8, ECN #634626

Subject	Verification Method	Criteria Spec	Criteria Chg. Doc.	Initials/Date
Cleaning				
Drilling Rig/Tools	Visual	7.6.7.7		KDR 8/19
Temporary Mater.	Visual	7.7		JMJ 8/30
Drill Method	Visual	5.2		KDR 8/19
Lubricants/Additives				
Lubricants	Visual	7.2		KDR 8/19
Additives	Visual	7.2		KDR 8/19
Straightness Test	Visual	8.2		RLJ 10/18
Material Storage/Packing of Completion Material				
Mtl. Hand./Stor.	Visual	7.3		RLJ 10/25/96
Material Packing	Visual	7.3		RLJ 10/25/96
Casing and Screen (Permanent)	Visual	4.2 - 4.2.5, 12.2.1	See Attached Telecon Dated 10/15/96	RLJ 10/25/96
Annular/Seal/ Filter Pack	Visual	4.2.6 - 4.2.9, 5.3.1		RLJ 11/4/96
Well Development	Visual	5.3.1.K		RLJ 11-8-96
Well Protection				
Surface Pad	Visual	4.2.9, 4.2.10		RLJ 11/5/96
Prot. Casing	Visual	4.2.10		RLJ 11/5/96
Prot. Posts	Visual	4.2.10		RLJ 11/5/96
Cap, Hasp, Lock	Visual	4.2.10		RLJ 11-6-96
Site Restored	Visual	11.0		RLJ 12/23/96
Pump Installation				
Pump Decon/Prep.	Visual	4.2.10, 12.2.1		RLJ 11-14-96
Installed	Visual	5.3.1.L		RLJ 11-19-96
Pump Tested	Visual	5.3.1.L		RLJ 11-19-96
Well Surveying/Labeling				
Ms. Pt. Surveyed	Visual	3.4		RLJ 12/23/96
P. Casing/BC Surv.	Visual	3.4		RLJ 12/23/96
Well No. Stamped	Visual	4.2.9		RLJ 11-14-96
BC Labeled	Visual	4.2.9		RLJ 12/23/96

Comments: Waste Drums on site as of 12/23/96

A-6000-868 (06/95)

Fluor Daniel Northwest	SURVEY DATA REPORT		Request No. 971-073
Project	Title WELL 699-37-47A		File No. 699N-3W4
FDNW KPCN/W.O. No. F0KCP9	Prepared By R. Hackwith	Date 12/18/96	Reviewer [signature] 1 1

DESCRIPTION OF WORK	ACCEPTABILITY	DISTRIBUTION	
Horizontal and vertical location of well 699-37-47A.	Yes []	Survey File	OR
	No []	Field Project File	--
	N/A []	J. Keller	1
	TBD by Requester [X]		

SURVEY RESULTS AND COMMENTS

WELL NO.	COORDINATES C/L CASING		VERT. DATUM	ELEVATIONS		
	200E AREA (FEET)	LAMBERT WCS83S/91 (METERS)		BRASS CAP (IN CONCRETE)	TOP HYDROSTAR PLATE N-SIDE	TOP OUTER CASING N-SIDE
699-37-47A	N37,430.58 W47,044.23	N134,893.26 E575,556.97	NAVD 88 (FEET)	716.66	720.14	720.13
			NAVD 88 (MTRS)	218.440	219.500	219.495

C:\WPDATA\REPORTS.FMS\SURDATA2.RPT

RUST FEDERAL SERVICES HANFORD INSPECTION/SURVEILLANCE REPORT

Section 1 - Initiation

[] Response [] Corrected [X] Information

Date Initiated: 1/3/97

Copies To:

DD Volkman*	T3-05	MG Gardner*	S3-24
JF Keller	L4-93	JW Lindberg*	K6-81
RB Millward*	S3-31	RL Jones*	S3-24
PK Brockman*	H6-32	WR Thackaberry*	H6-32
LESQA File	H6-32	Project File	G3-11

* CC:Mail

Subject: Resource Protection Well Completion
System: Project W-152 **Equipment Number:** 699-37-47A/B2822
Location: 600 Area **Survey Item:** N/A
Reference: WHC-S-014 rev 8, WHC-SD-EN-AP-189

Initiated By: WR Thackaberry **Organization Code:** 31300

Signature: [signature] Date: 2-7-97 Concur: [signature] Date: 2/10/97

Surveilled Organization Code: 03E00

Response Requested: [X] No [] Yes, By: N/A

QUEST Trending Code: N/A

Priority Planning Grid (PPG) Value: N/A

Reference Documents
ISR: NCR: CAR: Hold Tag:

Person Contacted: Jon Lindberg, Bob Jones, John Keller,
Surveillance Checklist Attached: Yes [X] No []
Checklist Name: Well Completion
Number of Checklist Pages: 2

Report: This assessment looked at the construction of groundwater monitoring well 699-37-47A to support RCRA monitoring of 216-A-36B, 216-A-10 and 216-A-37-1. The information presented here was gathered during the period of October 22, 1996 through Jan 27, 1997. The bore hole was drilled to a depth of 525.5 feet below ground surface, for characterization purposes, where Basalt was sampled. The well was designed to monitor the upper aquifer so the boring was backfilled to a depth of 340.8 feet where the construction of the well began. Part of the backfilling included placement of cement grout in the interval between 365 ft and 410 ft to re-establish the natural barrier that separates the upper aquifer from the lower aquifer. This is a WAC 173-160-075 requirement.

The stainless steel casing and screen used to build the well came from stock already on site. The packaging had deteriorated somewhat, so the drilling engineer/well site geologist had all stainless steel materials steam cleaned prior to installation in the boring. The materials observed on site for use in construction of the well were in compliance with the well construction specification.

Several documents were reviewed at the completion of the well. The Well Construction Verification Record, the primary QA record for the well, is complete. The Survey report issued by FDNW provides horizontal coordinates as well as vertical data referenced to NAV88 datum. I verified by telecon with R. Hackwith, that the error on the level run was within the tolerance imposed by the specification. The sample pump installation record was completed on 1/8/97. The State of Washington Resource Protection Well Report was completed and issued on 1-21-97.

A final walk-down of the well was performed on 11-19-96. Documentation of this is attached to assessment LESQA-97-002.

Section 2 - Response

N/A

Responder: _______________ Date _______________

Response Evaluation

Evaluation of Response: [ ] Acceptable [ ] Unacceptable (explain below)

Comments:

Evaluated By: Date:

Follow-up/Closure Verification Results: [ ] Acceptable
[ ] Unacceptable (explain below)

Additional Verification Required: [ ] No [ ] Yes, _______________ (identify new document)

Closed By:

[signature]
Initiator

2-10-97
Date

SURVEILLANCE CHECKLIST

Surv. No. LESQA-97-001 Title Well Completion

Date 1-3-97 Prepared By WR Thackaberry Personnel Contacted Jon Lindberg, Bob Jones, John Keller, R. Hackwith

SUBJECT/ACTIVITY REQUIREMENT REFERENCE	EVIDENCE EXAMINED/ PERSONNEL CONTACTED	OBSERVATIONS/COMMENTS	COMPLY	
			YES	NO
1.Permanent material handling, storage & packaging, WHC-S-014, 4.0, 7.3	Material on site/Bob Jones	Some of the packaging of well casing has deteriorated. Bob Jones is having it all steam cleaned prior to installation. 10/25/96 - All casing has been cleaned and is wrapped up and stored on racks or trailer. Bentonite, sand and cement are in clearly marked packaging.	X	
2. Natural Barriers restored.	Well Summary/Bob Jones	The geologic log indicates that a natural barrier(the lower mud) was found to be from 367 to 420 ft below ground surface. The lower mud isolates the upper aquifer from the lower (confined) aquifer. The natural barrier was breached by this bore hole and was restored by placing a cement grout/bentonite mixture from 365 to 410.8. The effectiveness of the seal was demonstrated immediately by a change in the static water level in the boring. It reverted back to the observed static level of the upper aquifer.	X	
3. Permanent materials & equipment installation - screen, casing, filter pack, seals, grout, alignment & sampling pump, WHC-S-014, 4.0, 5.0, 8.2	Materials on site include Plastic buckets of PelPlug 3/8" bentonite tablets, Enviroplug 1/4" bentonite tablets, Colorado Silica sand 10-20, Well Construction Verification report/Bob Jones	The casing and screen on site are Johnson A304 stainless steel 4 inch diameter schedule 5. Bob Jones signed off for the well straightness test on 10/18/96. Pump installation was accepted on 11/19/96. This was verified on the final walkdown.	X	

SURVEILLANCE CHECKLIST

Surv. No. LESQA-97-001 Title Well Completion

Date 1-3-97 Prepared By WR Thackaberry Personnel Contacted Jon Lindberg, Bob Jones, John Keller, R. Hackwith

SUBJECT/ACTIVITY REQUIREMENT REFERENCE	EVIDENCE EXAMINED/ PERSONNEL CONTACTED	OBSERVATIONS/COMMENTS	COMPLY	
			YES	NO
4. Documentation review: Well Construction Verification Report and Decontamination Records Pump installation Resource Protection Well Report EII 5.4, 6.7 WHC-S-014, 12.0	Well Construction Verification Report, FDNW Survey report for 699-37-47A, Sample Pump Installation record./Bob Jones, R. Hackwith	12/31/96 The WCVR is complete. Decontamination records were reviewed for this well on report number LESQA-96-007. 1/9/97 Sample Pump installation record was completed on 1/8/97. The State Resource Protection Well Report was issued 1/21/97.	X	

ACCEPTANCE OF COMPLETED WORK

Date: 11/19/96

Project Number: W-152

Project Title: FISCAL YEAR 1993-1996 RCRA GROUNDWATER MONITORING WELLS.

Building Number(s): 600 AREA

Work on this project/system has been completed and accepted by the user/sponsor with exception of the items listed on sheet 2.

Remarks

ACCEPTANCE OF COMPLETED WORK FOR THE A-37 CRIB WELL LISTED BELOW:

699-37-47A - B2822

Projects Department John Keller Date 11/19/96

Safety (when appropriate) N/A JK 11/19/96 Date

Quality Assurance [signature] 11-19-96 Date 11-19-96

User/Sponsor B.A. [signature] 11-19-96 Date 11-19-96

Acceptance Inspector N/A WRO 11-19-96 Date

Construction Contractor [signature] Date 11/19/96

A-6000-805 (09/91)

ACCEPTANCE OF COMPLETED WORK (continued)

699-37-47A - B2822

Exceptions to Completion as of the date of acceptance by the user/sponsor.

1) QA review of Well Construction Documentation

2) remove diesel waste drums

3) perform survey of casing, marker

4) level spoil pile

Final Acceptance (all exceptions are completed)

Projects Department ______________________ Date __________

Safety (when appropriate) ______________________ Date __________

Quality Assurance ______________________ Date __________

User/Sponsor ______________________ Date __________

Acceptance Inspector ______________________ Date __________

Construction Contractor ______________________ Date __________

A-6000-805R (09/91)

Appendix B

Well Summary Sheet and Borehole Log

WELL SUMMARY SHEET

Boring or Well No. 699-37-47A (B2822)

Sheet 1 of 2

Location: 200 East Area, SE Corner

Project: RCRA / W152

Prepared By: (Sign/Print Name) JW Lindberg Date: 11/4/96

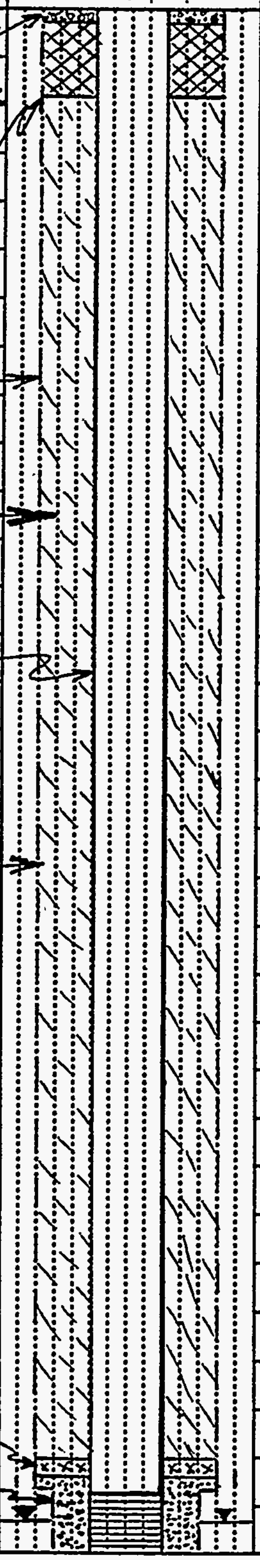
Reviewed By: (Sign/Print Name) BA WILLIAMS Date: 11/22/96

CONSTRUCTION DATA

Description

- 0'-3' Concrete with 6" stainless steel protective casing.
- 3'-19' Surface seal (neat cement)
- 10 3/4" Temporary Casing 0.0-306.3' (carbon steel)
- 8 5/8" Temporary Casing 0.0 to 525.5' (carbon steel)
- 4" stainless Steel Casing (Permanent)
- Bentonite Crumbles 301.0'-19.0'
- Bentonite Pellets (1/4") 304.5'-301.0'
- Sandpack Interval 340.8-304.5' 10/20 Sand
- Static Water Level 312 ft.

Diagram

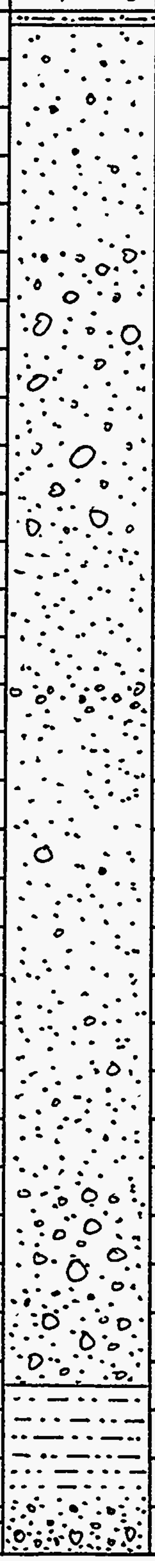


Depth in Feet

10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 260, 270, 280, 285, 290, 300, 310, 312 Water Table

GEOLOGIC/HYDROLOGIC DATA

Graphic Log



Lithologic Description

- Eolian Silty Sand 0-3'
- Hanford fm. 3'-285' Dark Gray
  - 3'-50' Sand with occasional pebbles
  - 50'-110' gravelly sand
  - 110'-165' Sand, med.-coarse grained
  - 140'-146' pebbles
  - 165'-245' Sand, occasional pebbles
  - 245'-285' Gravelly Sand, coarsening downward
- Ringold Fm. Upper Ringold unit 285'-310', Silty Sand, Grades Downward to unit E, Olive Brown.
- Ringold Fm, Unit E 310-367'

A-6000-384 (01/93)

WELL SUMMARY SHEET

Boring or Well No. 699-37-47A

Sheet 2 of 2

Location: 200East Area, SE Corner

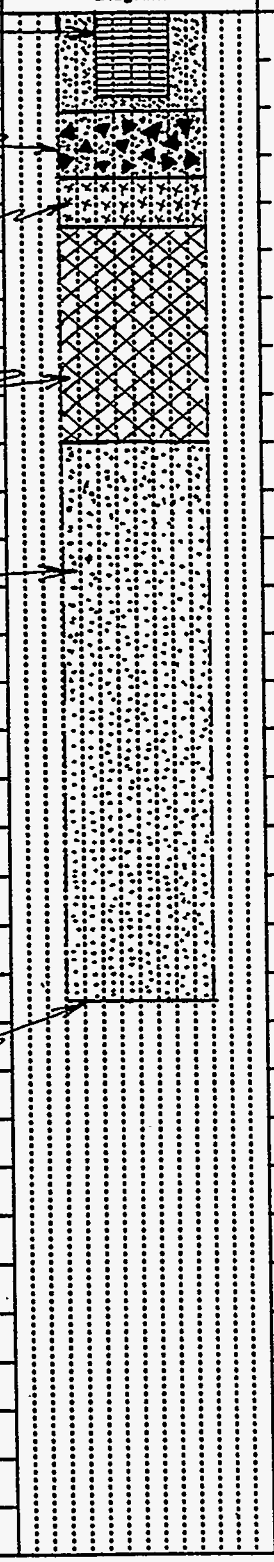
Project: RCRA/W152

Prepared By: JW Lindberg (Sign/Print Name) Date: 11/4/96

Reviewed By: BA Williams (Sign/Print Name) Date: 11/22/96

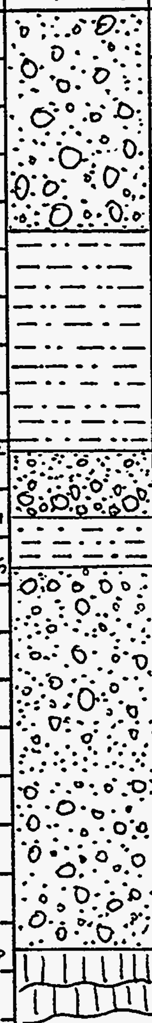
CONSTRUCTION DATA

Description	Depth in Feet
Stainless Steel Screen 338.7'–308.7' 20 slot	330
Slough (formation) 358.0'–340.8'	350
Bentonite Pellets (1/4") 358'–365'	360–370
Cement Grout 365.0'–410.0'	400
Silica Sand 525.5'–410.0'	440
hole TD = 525.5'	530



Depth in Feet: 330, 340, 350, 360, 370 (367), 380, 390, 400, 410 (412), 420, 430 (427, 437.5), 440, 450, 460, 470, 480, 490, 500, 510, 520 (516), 530

GEOLOGIC/HYDROLOGIC DATA



Lithologic Description
Unit E 310'–367' Sandy Gravel DarkGray
Ringold Fm, lower mud unit 367'–412' Sandy silt, tr. clay. Gray (lt. gray when dry).
Ringold Fm, unit A and lower mud unit mixed. 412'–437.5' dark gray to brown for fines
Ringold Fm, unit A Sandy Gravel 437.5'–516' Dark Olive Gray
475–480' fine sand gray-brown
516' to TD Basalt, Elephant Mtn. Member TD=525.5' Black

A-6000-384 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A (B2822)

Sheet 1 of 14

Location 200 East Area, SE Corner

Project RCRA/W152

Prepared By JEANIE M VOTAVA (Sign/Print Name) Date 8/30/96

Reviewed By J.W. Lindberg (Sign/Print Name) J.W. Lindberg Date 10/18/96

Depth (0)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
				0-3' HOLOCENE SURFICIAL DEPOSITS-SURFACE BLOW SAND, SILTY SAND,	The borehole was made with the ODEX (or TUBEX) drill rig (Big Blue) which advanced either 10 3/4" ID or 8 5/8" I.D. casing with a down-hole hammer. The bit always remained 0.4 to 0.7 ft beyond casing shoe (while drilling). Sediment samples were collected by coring or split spoon which was tripped in/out of casing on the drill pipe. The ODEX or TUBEX is an air-rotary method.
5				4-110. HANFORD FM; Hf; MED-CRS GRND SAND, OCC FINE GRND W/ SOME PEBBLES; 30-40% MED, 30-40% CRS, TR-10% FINE, TR-5% PEBBLES; 5YR 3/1-4/1 VERY DK GREY - DK GREY (DAMP), SALT & PEPPER; SLIGHTLY DAMP; POOR TO MOD SRTD, OCC POORLY SORTED W/ PEBBLES & SML GRVL; SUB ANG - SUB RND, OCC ANG; 40-50% MAFIC, 50-60% FELSIC; PEBBLE; LITTLE TO NO REACTION TO HCl	
10					
15					
20					
25					
30				30 - SAME AS ABOVE W/ SLT INC IN FELSIC CONTENT.	
35					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 2 of 14

Location 200 EAST, SE Corner Project RCRA / W152

Prepared By JEANIE M VOTAVA (Sign/Print Name) Date 8/30/96 Reviewed By JW Lindberg (Sign/Print Name) JWLindberg Date 10/18/96

Depth (40)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
45					
50				50-110 SAME AS ABOVE W/ INCR. IN V. CRS GRNS W/ SM PEBBLES & COBBLES.	
55					
60					
65					
70					
75					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 3 of 14

Location 200 EAST Area, SE Corner Project RCRA / W157

Prepared By JEANIE M VOTAVA (Sign/Print Name) Date 8/30/96 Reviewed By JW Lindberg (Sign/Print Name) JW Lindberg Date 10/18/96

Depth (80)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
85					
90					
95					
100					
105					
110				110-165 HANFORD FM; Hf; MED-CRS GRND SAND, OCC FINE GRND; 30-40% MED, 25-35% CRS, TR-15% FINE; 5YR 3/1-4/1, V. DK GREY - DK GREY (DAMP), SALT & PEPPER; SLTY DAMP, PR TO MOD SRTD, ~~OCC PRLY SRTD w/~~ gmv 8/30/96 SUB RND, OCC ANG; 30-40% MAFIC 60-70% FELSIC; SAND; LITTLE TO NO REACTION W/ HCL.	
115					

A-6000-382 (01/93)

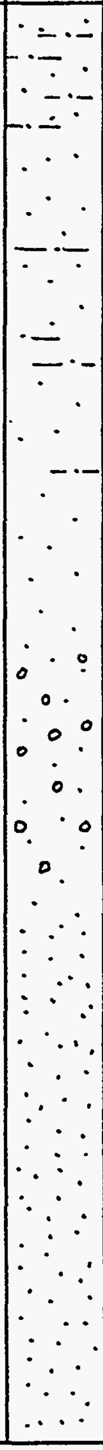
BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 4 of 14

Location 200 EAST Area, SE Corner   Project RCRA / W152

Prepared By JEANIE M VOTAVA (Sign/Print Name)   Date 8/30/96   Reviewed By JW Lindberg / JWLindberg (Sign/Print Name)   Date 10/18/96

Depth (120)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
				120-140 SAME AS ABOVE W/ INC FINES	
125					
130					
135					
140				140-146 SAME AS ABOVE W/ SLT CRSNING; INC MED-CRS GRND W TR PEBBLES.	
145				146-165 SAME AS ABOVE W/ INC FINES & INC MOISTURE.	
150					
155					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 5 of 14

Location: Zoo East Area, SE Corner
Project: RCRA / W152

Prepared By: JEANIE M VOTAVA (Sign/Print Name) Date: 8/30/96
Reviewed By: JW Lindberg (Sign/Print Name) J W Lindberg Date: 10/18/96

Depth (160)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
165				165-170 HANFORD FM; HF; MED-CRS GRND SAND, OCC FINE GRND W/ PEBBLES 30-40% MED, 25-35% CRS, TR-15% FINE 5% PEBBLE; 5YR 3/1-4/1, V. DK GREY - DK GREY (DAMP), SALT & PEPPER; SLTLY DAMP; PRLY TO MOD SRTD, OCC PRLY SRTD W/ PEBBLES; SUB RND, OCC ANG; 30-40% MAFIC, 60-70% FELSIC, PEBBLE, LITTLE TO NO REACTION W HCl	
170					
175					
180					
185					
190				190-245 SAME AS ABOVE W/ TR PEBBLES & COBBLES.	
195					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699- 37-47A

Sheet 6 of 14

Location 200 East Area, SE Corner   Project RCRA / W152

Prepared By Leanie M. Votava (Sign/Print Name)   Date 8/30/96   Reviewed By JW Lindberg / JWLindberg (Sign/Print Name)   Date 10/18/96

Depth (200)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
				190-245 continued	
205					
210					
215					
220					
225					
230					
235					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 7 of 14

Location 200 East Area, SE Corner

Project RCRA / W152

Prepared By JEANIE M. VOTAVA (Sign/Print Name) Date 8/30/96

Reviewed By JW Lindberg (Sign/Print Name) JWLindberg Date 10/18/96

Depth (240)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
245				245-285 SAME AS ABOVE; CRSNING.	
250					
255					
260					
265					
270					
275					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 8 of 14

Location 200 EAST Area, SE Corner Project RCRA / W152

Prepared By JEANIE M VOTAVA (Sign/Print Name) Date 8/30/96 Reviewed By JW Lindberg (Sign/Print Name) Date 10/18/96

Depth (280)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
285				285-305 UPPER UNIT RINGOLD FM, SILTY SAND, PRED FINE TO V. FINE GRND, TR-MED. 40-50% FINE TO V. FINE, 10-15% MED, 30-50% SILT, TR CLY-MUD. 2.5Y 4/3 OLIVE BROWN WELL SORTED	
290					
295					
300					
305				SILTY SAND, V. FINE TO MED GRND. 80%-90% SAND. 10%-20% SILT. 2.5Y 4/2 DK GREYISH BROWN. 25% MAFIC, 75% FELSIC. DAMP. MOD SORTED W/ PEBBLES, SUB ANGULAR - SUB ROUNDED SLIGHT REACTION W/HCL.	
▽ When Drill Depth Was 420'-525' 340. ▽ When drilling Above Ringold Lower Mud				310 315 SAME AS ABOVE W/ PEBBLES AND SAND GRAINS RANGING FROM FINE TO COARSE, LESS SILT	
315				315-325 SANDY GRAVEL, FINE TO COARSE GRAINED, 75% GRAVEL, 25% SAND, 2.5YR 4/1 DARK GREY, DAMP, POORLY SORTED, ANGULAR 50-60% MAFIC, 40-50% FELSIC, NO REACTION TO HCL.	

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

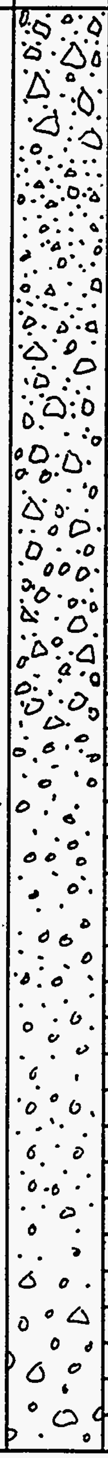
Sheet 9 of 14

Location 200 East Area, SE Corner

Project RCRA / WISZ

Prepared By Jeanie M Votava (Sign/Print Name) Date 9/13/96

Reviewed By JW Lindberg / JW Lindberg (Sign/Print Name) Date 10/18/96

Depth (320)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
325	Split Spoon B0J5Y5	Water Sample		325'-367' Same as above w/ increase in med. sand grains.	Water Sample @ 327' 9-6-96 #s B0J855, B0J856, B0J7B9, B0J7C0
330					
335					
340		Water Sample			Water Sample @ 341.2' 9-12-96, #s B0J7C3, B0J7C4, B0JB33, FXR112
345					
350					
355					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 9 of 14

Location 200 East Area (S.E. corner) Project RCRA/W152

Prepared By Jw Lindberg (Sign/Print Name) Assistant Well Site Geologist Date 9-3-96 Reviewed By ______ (Sign/Print Name) Date ______

Depth (300)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
305				Sand, silty, Sand 80%-90%, silt 10%-20%, 2.5Y 4/2 dark grayish brown, Sand 25% basalt frags, 75% Qtz and felsic frags, Sand v. fine to medium, slight reaction w/ HCl.	
310				↓ ↓ coarsening downward ↓ ↓ Same as above except pebbly, and sand grains ranging from fine to coarse, less silt.	
315				Sandy Gravel, 75% gravel, 25% sand; Sand 75% Quartz and felsic, 25% basalt frags; Gravel 70% basalt, v. slight reaction to HCl. Sand fine to coarse	
320				Sandy gravel, 90% gravel, 10% Sand; gravel 70% basalt, 30% Qtzite & felsic frags; Sand, fine to coarse, 30% basalt liths, 70% Quartz and felsic liths, mica flakes, trace silt. None to slight reaction to HCl	
325	Split Spoon			Same as 320'. Gravel is fine pebbles to at least coarse cobbles. Sand mostly coarse, less medium sand, trace fine sand. Gravel well rounded, sand - subround to angular.	
330					
335					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No.

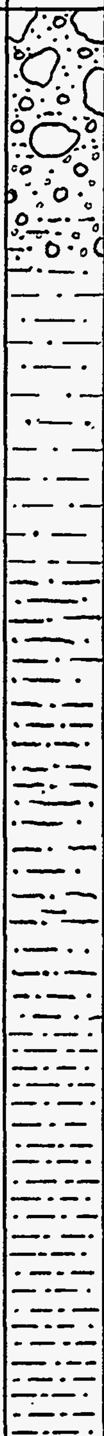
Sheet 10A of 14

Location 200 EAST

Project RCRA / W152

Prepared By Jeanie M Votava (Sign/Print Name) Date 9/20/96

Reviewed By JW Lindberg (Sign/Print Name) JW Lindberg Date 10/18/96

Depth (360)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
→	CORE	Water Sample			Water Sample @ 361.2' 9-20-96, #s B0J7C1, B0J7C2F, B0JB59.
365					
370				367' to 412' Ringold Formation, Lower Mud Unit. Very little of this unit was recovered because of drilling method and shaker used to separate water from solids during air rotary drilling. See page 10B for core description.	
	CORE				
375	B0J5Y6	374.1' XRD			
380					
385					
390					
395					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 10B of 14

Location 200 East Area, SE Corner

Project RCRA W-152

Prepared By JW Lindberg (Sign/Print Name) Date 9/25/96

Reviewed By BA Williams (Sign/Print Name) Date 11/22/96

Depth (370)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
				CORE DESCRIPTION	
370.6					
371				370.6-375.3' Ringold Formation, lower mud unit, slightly sandy and clayey mud (silt), Color when wet 2.5Y 4/0 to 5/0 dark gray to gray. Sand fraction less than 10%, mostly quartz and v. fine. Abundant plant material throughout as black lignitic traces (fossils mostly steams and leaves). Dries to light gray 2.5Y 7/0. Clay content appears to be substantial because of sheen upon scraping. Plant material most abundant in the 370.6-371.3 section. Bioturbated and not well bedded. upon drying generally splits horizontally but also cracks other directions as well. Relatively massive, perhaps a lacustrine deposit like an oxbow or shallow lake. No reaction to very weak reaction to HCl.	
372	B0J5Y6				
373		$CaCO_3$			
374	B0J5Y6	374.1' XRD			
375					
375.3					
376					
377					

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 11 of 14

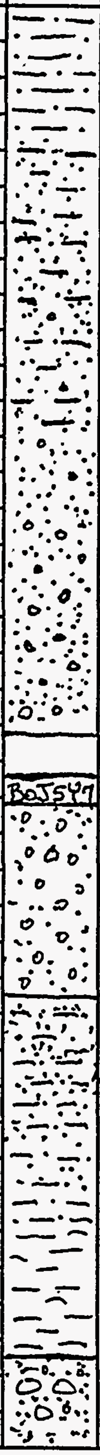
Location 200 East, SE corner

Project RCRA / W152

Prepared By JW Lindberg (Sign/Print Name) Date 11/22/96

Reviewed By [signature] BA WILLIAMS (Sign/Print Name) Date 11/22/96

Depth (400' ft.)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
				Ringold Lower Mud (continued)	
405					
410				gradational contact from Ringold Fm lower mud to unit A	
415				412'–427.5' Silty Sandy gravel and Pebbly Sand, sand fine to medium. with abundant mica flakes, Sand is 80% qtz and felsic grains and approx 20% basaltic grains. Gravel is mostly pebbles. Makes H_2O	Water Sample @ 423' 10-1-96, #s B0J7C5, B0J7C6
420				Unit grades from pebbly sand at top to sandy gravel lower.	Actually only drove it 20 in
420.3 to 422.3	B0J5Y7	Split Spoon	Water Sample 420.3–422.3	→ Unit is silty and matrix (sand & silt) is very dark brown with slight green. No reaction to very slight reaction to HCl. Slight cementing around some gravel. Sand is lowest in abundance, mostly gravel & silt.	420.3–422.3 Split spoon was a slightly sandy, silty gravel. Color is very dark greenish brown to almost black. Gravels are mostly Qtzite with some basalt.
425					
430				427.5–437.5 Silty Sand to sandy ~~gravel~~ silt, light brown, sand is mostly quartz and is v. fine to fine. This unit is probably an overbank deposit including paleosols.	
435					
				437.5'–448.0' Sandy Gravel Sand is tan and gravel is a mix of quartzites and basalts. (cont)	



A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Location: 200 East Area, SE Corner — Project: W-152 RCRA

Prepared By: JW Lindberg (Sign/Print Name) — Date: 11/22/96

Reviewed By: [signature] (Sign/Print Name) RA WILLIAMS — Date: 11/22/96

Depth (440)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
440–447				The sand fraction varies in grainsize between fine to coarse with fine to med. most abundant. The unit grades downward with gravel size mostly small pebbles at top to pebbles and cobbles near base of unit.	
445					
448–451				448 to 451 Gravelly Sand Gravel mostly quartzites and basalts, sand is fine to medium with coarse grains in less abundance. Sand is tan and is mainly quartz	
450					
455				451 — 475.5 Sandy Gravel Same as 437.5'-448.0'	
460, 460.5 – Water Sample 462.4	Split Spoon	B0J7C7 B0J7C8 B0J548			Water Sample @ 462.4 10-6-96, #s B0J7C7, B0J7C8
465					
470					
475				475.5-479.5 fine sand, high water bearing, no recovery with ODEX	

A-6000-382 (01/93)

BOREHOLE LOG

Boring or Well No. 699-37-47A

Sheet 13 of 14

Location: 200 East Area, SE Corner

Project: RCRA W-152/A-37

Prepared By: JW Lindberg (Sign/Print Name) Date: 11/22/96

Reviewed By: [signature] BA Williams (Sign/Print Name) Date: 11/22/96

Depth (480)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description (Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl)	Comments (Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level)
485				479.5–516.0 Sandy Gravel, dark olive gray, 5Y-3/2, Gravel is fine pebbles to cobbles, basalt and quartzite clasts with minor metamorphics such as schists & gneisses. Sand mostly quartz grains fine to medium grained less coarse grains. Partially cemented with ferrous cement or silica cement; no to very slight reaction to HCl.	
490					
495					
500 / 500.5–502.6	core	water sample			Water Sample @ 502.6' 10-10-96, #5 B0J7C9, B0J7D0.
505					
510					
515				516'–525' Basalt, black, with minor amount of yellow palagonite	

A-6000-382 (01/93)

BOREHOLE LOG	Boring or Well No. 699-37-47A Sheet 14 of 14

Location 200 East Area, S.E. Corner   Project W-152/A-37 RCRA

Prepared By JW Lindberg (Sign/Print Name)   Date 11/22/96   Reviewed By [signature] (Sign/Print Name) BA Williams   Date 11/22/96

Depth (516)	Sample: Type and No.	Sample: Blows or Recovery	Graphic Log	Sample Description: Group Name, Group Symbol, Grain Size Distribution, Soil Classification, Color, Moisture Content, Sorting, Angularity, Mineralogy, Max Particle Size, Reaction to HCl	Comments: Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level
				Basalt 516' - TD (525)	
525.0	XRF				
TD 525.5					

A-6000-382 (01/93)

Appendix C

Results of Groundwater Analyses

Appendix C

Results of Groundwater Analyses

This appendix contains the results of

- Groundwater Analyses
- Isotopic Uranium for Samples BOJ7C5, BOJ7C7, and BOJ7C9.

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
=>	Conductivity	CONDUCT	Conductivity (field	699-37-47A	9/06/96	B0J7B9	N	219.00			umhos/cm
=>					9/12/96	B0J7C3	N	228.00			
=>					9/22/96	B0J7C1	N	227.00			
=>					10/01/96	B0J7C5	N	322.00			
=>					10/06/96	B0J7C7	N	360.00			
=>					10/10/96	B0J7C9	N	313.00			
=>			EPA120.1	699-37-47A	9/06/96	B0J7B9	N	198.00 H			
=>						B0J8S5	N	1.45 H			
=>					9/12/96	B0J7C3	N	208.00 H			
=>					9/22/96	B0J7C1	N	199.00 H			
=>					10/01/96	B0J7C5	N	337.00			
=>					10/06/96	B0J7C7	N	361.00			
=>					10/10/96	B0J7C9	N	334.00			
=>	Total organic carbon	TOC	EPA9060	699-37-47A	9/06/96	B0J7B9	N	574.00			ug/L
=>						B0J8S5	N	532.00 U			
=>					9/12/96	B0J7C3	N	532.00 U			
=>					9/22/96	B0J7C1	N	532.00 U			
=>					10/01/96	B0J7C5	N	532.00 U			
=>					10/06/96	B0J7C7	N	532.00 U			
=>					10/10/96	B0J7C9	N	532.00 U			
=>	pH Measurement	PH	EPA150.1	699-37-47A	9/06/96	B0J7B9	N	8.01		8.50	pH
=>						B0J8S5	N	6.35			
=>					9/12/96	B0J7C3	N	8.09			
=>					9/22/96	B0J7C1	N	7.96			
=>					10/01/96	B0J7C5	N	7.68			
=>					10/06/96	B0J7C7	N	7.64 H			
=>					10/10/96	B0J7C9	N	7.66 H			
=>			pH (field measuremen	699-37-47A	9/06/96	B0J7B9	N	8.27			
=>					9/12/96	B0J7C3	N	8.25			
=>					9/22/96	B0J7C1	N	7.93			
=>					10/01/96	B0J7C5	N	8.31			
=>					10/06/96	B0J7C7	N	7.70			
=>					10/10/96	B0J7C9	N	7.93			

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
1,1,1-Trichloroethane	1,1,1-T	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U			200.00	ug/L
					B0J8S5	N	5.00 U				
				9/12/96	B0J7C3	N	5.00 U				
				9/22/96	B0J7C1	N	1.00 U				
				10/01/96	B0J7C5	N	1.00 U				
				10/06/96	B0J7C7	N	1.00 U				
				10/10/96	B0J7C9	N	1.00 U				
1,1,2-Trichloroethane	1,1,2-T	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U	*		5.00	ug/L
					B0J8S5	N	5.00 U	*			
				9/12/96	B0J7C3	N	5.00 U	*			
				9/22/96	B0J7C1	N	1.00 U				
				10/01/96	B0J7C5	N	1.00 U				
				10/06/96	B0J7C7	N	1.00 U				
				10/10/96	B0J7C9	N	1.00 U				
1,1-Dichloroethane	1,1-DCL	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U				ug/L
					B0J8S5	N	5.00 U				
				9/12/96	B0J7C3	N	5.00 U				
				9/22/96	B0J7C1	N	1.00 U				
				10/01/96	B0J7C5	N	1.00 U				
				10/06/96	B0J7C7	N	1.00 U				
				10/10/96	B0J7C9	N	1.00 U				
1,2-Dichloroethane	1,2-DCL	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U	*		5.00	ug/L
					B0J8S5	N	5.00 U	*			
				9/12/96	B0J7C3	N	5.00 U	*			
				9/22/96	B0J7C1	N	1.00 U				
				10/01/96	B0J7C5	N	1.00 U				
				10/06/96	B0J7C7	N	1.00 U				
				10/10/96	B0J7C9	N	1.00 U				
1,4-Dichlorobenzene	14DICLBE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U			75.00	ug/L
					B0J8S5	N	5.00 U				
				9/12/96	B0J7C3	N	5.00 U				
				9/22/96	B0J7C1	N	1.00 U				

C.3

Schedule Period: 4/01/96 - 6/30/96

RCRA Quarterly Report - 2/07/97

Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
	1,4-Dichlorobenzene	14DICLBE	EPA8260A	699-37-47A	10/01/96	B0J7C5	N	1.00 U		75.00	ug/L
					10/06/96	B0J7C7	N	1.00 U			
					10/10/96	B0J7C9	N	1.00 U			
	1-Butanol	1BUTANOL	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	100.00 U			ug/L
						B0J8S5	N	100.00 U			
					9/12/96	B0J7C3	N	100.00 U			
					9/22/96	B0J7C1	N	100.00 U			
					10/01/96	B0J7C5	N	100.00 U			
					10/06/96	B0J7C7	N	100.00 U			
					10/10/96	B0J7C9	N	100.00 U			
	2-Butanone	METHONE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	10.00 U			ug/L
						B0J8S5	N	10.00 U			
					9/12/96	B0J7C3	N	10.00 U			
					9/22/96	B0J7C1	N	10.00 U			
					10/01/96	B0J7C5	N	10.00 U			
					10/06/96	B0J7C7	N	10.00 U			
					10/10/96	B0J7C9	N	10.00 U			
	4-Methyl-2-Pentaone	HEXONE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	10.00 U			ug/L
						B0J8S5	N	10.00 U			
					9/12/96	B0J7C3	N	10.00 U			
					9/22/96	B0J7C1	N	10.00 U			
					10/01/96	B0J7C5	N	10.00 U			
					10/06/96	B0J7C7	N	10.00 U			
					10/10/96	B0J7C9	N	10.00 U			
=>	Acetone	ACETONE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	10.00 U			ug/L
=>						B0J8S5	N	10.00 U			
=>					9/12/96	B0J7C3	N	10.00 U			
=>					9/22/96	B0J7C1	N	10.00 U			
=>					10/01/96	B0J7C5	N	10.00 U			
=>					10/06/96	B0J7C7	N	10.00 U			
=>					10/10/96	B0J7C9	N	3.00 BJ			

C.4

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

C.5

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
=>	Alkalinity	ALKALINI	Alkalinity by CaC03	699-37-47A	9/12/96	B0J7C3	N	74000.00				ug/L
=>					9/22/96	B0J7C1	N	78000.00				
=>					10/01/96	B0J7C5	N	138000.00				
=>					10/06/96	B0J7C7	N	117000.00				
=>					10/10/96	B0J7C9	N	109000.00				
=>	Aluminum	AL	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	58.50 U	*		50.00	ug/L
=>						B0J8S6	Y	58.50 U	*			
=>					9/12/96	B0J7C4	Y	58.50 U	*			
=>					9/22/96	B0J7C2	Y	74.30 B	*			
=>					10/01/96	B0J7C6	Y	80.70 B	*			
=>					10/06/96	B0J7C8	Y	58.50 U	*			
=>					10/10/96	B0J7D0	Y	58.50 U	*			
=>	Ammonia	AMM-ABS	EPA350.1	699-37-47A	9/06/96	B0J7B9	N	28.00 U				ug/L
=>						B0J8S5	N	28.00 U				
=>					9/12/96	B0J7C3	N	28.00 U				
=>					9/22/96	B0J7C1	N	28.00 U				
=>					10/01/96	B0J7C5	N	55.10				
=>					10/06/96	B0J7C7	N	28.00 U				
=>					10/10/96	B0J7C9	N	28.00 U				
	Antimony	SB	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	27.20 U	*		6.00	ug/L
						B0J8S6	Y	27.20 U	*			
					9/12/96	B0J7C4	Y	27.20 U	*			
					9/22/96	B0J7C2	Y	27.20 U	*			
					10/01/96	B0J7C6	Y	27.20 U	*			
					10/06/96	B0J7C8	Y	27.20 U	*			
					10/10/96	B0J7D0	Y	27.20 U	*			
=>	Arsenic	AS	EPA7060	699-37-47A	9/06/96	B0J7C0	Y	11.40			50.00	ug/L
=>						B0J8S6	Y	1.20 U				
=>					9/12/96	B0J7C4	Y	9.50 B				
=>					9/22/96	B0J7C2	Y	7.60 B				
=>					10/01/96	B0J7C6	Y	84.80	*			
=>					10/06/96	B0J7C8	Y	12.10				

Schedule Period: 4/01/96 - 6/30/96   RCRA Quarterly Report - 2/07/97   Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
=>	Arsenic	AS	EPA7060	699-37-47A	10/10/96	B0J7D0	Y	3.20 B			50.00	ug/L
=>	Barium	BA	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	20.30			2000.00	ug/L
=>						B0J8S6	Y	.87 B				
=>					9/12/96	B0J7C4	Y	19.60				
=>					9/22/96	B0J7C2	Y	27.30 E				
=>					10/01/96	B0J7C6	Y	56.80 E				
=>					10/06/96	B0J7C8	Y	79.30				
=>					10/10/96	B0J7D0	Y	85.40				
	Benzene	BENZENE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U	*		5.00	ug/L
						B0J8S5	N	5.00 U	*			
					9/12/96	B0J7C3	N	5.00 U	*			
					9/22/96	B0J7C1	N	1.00 U				
					10/01/96	B0J7C5	N	1.00 U				
					10/06/96	B0J7C7	N	1.00 U				
					10/10/96	B0J7C9	N	1.00 U				
=>	Beryllium	BE	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	.48 B			4.00	ug/L
=>						B0J8S6	Y	.40 U				
=>					9/12/96	B0J7C4	Y	.40 U				
=>					9/22/96	B0J7C2	Y	.50 B				
=>					10/01/96	B0J7C6	Y	.40 B				
=>					10/06/96	B0J7C8	Y	.40 U				
=>					10/10/96	B0J7D0	Y	.40 U				
	Bromide	BROMIDE	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	23.00 UH				ug/L
						B0J8S5	N	23.00 UH				
					9/12/96	B0J7C3	N	23.00 U				
					9/22/96	B0J7C1	N	23.00 U				
					10/01/96	B0J7C5	N	23.00 U				
					10/06/96	B0J7C7	N	23.00 U				
					10/10/96	B0J7C9	N	23.00 U				
=>	Cadmium	CD	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	3.00 U			5.00	ug/L
=>						B0J8S6	Y	3.00 U				

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
=>	Cadmium	CD	EPA6010A	699-37-47A	9/12/96	B0J7C4	Y	3.00 U			5.00	ug/L
=>					9/22/96	B0J7C2	Y	3.00 U				
=>					10/01/96	B0J7C6	Y	3.00 U				
=>					10/06/96	B0J7C8	Y	4.20 B				
=>					10/10/96	B0J7D0	Y	3.00 U				
=>	Calcium	CA	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	19200.00 Q				ug/L
=>						B0J8S6	Y	201.00 Q				
=>					9/12/96	B0J7C4	Y	21100.00				
=>					9/22/96	B0J7C2	Y	21400.00				
=>					10/01/96	B0J7C6	Y	31100.00				
=>					10/06/96	B0J7C8	Y	33200.00				
=>					10/10/96	B0J7D0	Y	28400.00				
=>	Carbon disulfide	CARBIDE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U				ug/L
=>						B0J8S5	N	5.00 U				
=>					9/12/96	B0J7C3	N	5.00 U				
=>					9/22/96	B0J7C1	N	1.00 U				
=>					10/01/96	B0J7C5	N	1.00 U				
=>					10/06/96	B0J7C7	N	1.00				
=>					10/10/96	B0J7C9	N	1.00 U				
	Carbon tetrachloride	CARBTET	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U	*		5.00	ug/L
						B0J8S5	N	5.00 U	*			
					9/12/96	B0J7C3	N	5.00 U	*			
					9/22/96	B0J7C1	N	1.00 U				
					10/01/96	B0J7C5	N	1.00 U				
					10/06/96	B0J7C7	N	1.00 U				
					10/10/96	B0J7C9	N	1.00 U				
	Cesium-137	CS-137	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	4.61 U			200.00	pCi/L
						B0J8S5	N	-.50 U				
					9/12/96	B0J7C3	N	3.83 U				
					9/22/96	B0J7C1	N	.61 U				
					10/01/96	B0J7C5	N	3.18 U				
					10/06/96	B0J7C7	N	2.91 U				

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
	Cesium-137	CS-137	GAMMAHI	699-37-47A	10/10/96	B0J7C9	N	-.67 U		200.00	pCi/L
=>	Chloride	CHLORIDE	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	1950.00			ug/L
=>						B0J8S5	N	64.00 U			
=>					9/12/96	B0J7C3	N	2010.00			
=>					9/22/96	B0J7C1	N	2610.00			
=>					10/01/96	B0J7C5	N	2260.00			
=>					10/06/96	B0J7C7	N	2400.00			
=>					10/10/96	B0J7C9	N	2310.00			
=>	Chloroform	CHLOROFO	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U			ug/L
=>						B0J8S5	N	5.00 U			
=>					9/12/96	B0J7C3	N	5.00 U			
=>					9/22/96	B0J7C1	N	.20 J			
=>					10/01/96	B0J7C5	N	1.00 U			
=>					10/06/96	B0J7C7	N	1.00 U			
=>					10/10/96	B0J7C9	N	1.00 U			
=>	Chromium	CR	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	4.40 U		100.00	ug/L
=>						B0J8S6	Y	4.40 U			
=>					9/12/96	B0J7C4	Y	4.40 U			
=>					9/22/96	B0J7C2	Y	4.40 U			
=>					10/01/96	B0J7C6	Y	4.40 U			
=>					10/06/96	B0J7C8	Y	4.40 U			
=>					10/10/96	B0J7D0	Y	17.00			
	Cobalt	CO	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	3.00 U			ug/L
						B0J8S6	Y	3.00 U			
					9/12/96	B0J7C4	Y	3.00 U			
					9/22/96	B0J7C2	Y	3.00 U			
					10/01/96	B0J7C6	Y	3.00 U			
					10/06/96	B0J7C8	Y	3.00 U			
					10/10/96	B0J7D0	Y	3.00 U			
	Cobalt-58	CO-58	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	.53 U			pCi/L
						B0J8S5	N	3.10 U			

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

C.9

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
	Cobalt-58	CO-58	GAMMAHI	699-37-47A	9/12/96	B0J7C3	N	.99 U			pCi/L
					9/22/96	B0J7C1	N	2.65 U			
					10/01/96	B0J7C5	N	2.85 U			
					10/06/96	B0J7C7	N	-8.23 U			
					10/10/96	B0J7C9	N	-.47 U			
	Cobalt-60	CO-60	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	2.37 U		100.00	pCi/L
						B0J8S5	N	6.02 U			
					9/12/96	B0J7C3	N	4.59 U			
					9/22/96	B0J7C1	N	2.67 U			
					10/01/96	B0J7C5	N	3.59 U			
					10/06/96	B0J7C7	N	3.88 U			
					10/10/96	B0J7C9	N	5.93 U			
=>	Copper	CU	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	8.60 B		1000.00	ug/L
=>						B0J8S6	Y	8.00 U			
=>					9/12/96	B0J7C4	Y	8.00 U			
=>					9/22/96	B0J7C2	Y	9.00 B			
=>					10/01/96	B0J7C6	Y	14.10 B			
=>					10/06/96	B0J7C8	Y	8.00 U			
=>					10/10/96	B0J7D0	Y	8.00 U			
	Cyanide	CYANIDE	EPA9010	699-37-47A	9/06/96	B0J7B9	N	3.00 U		200.00	ug/L
						B0J8S5	N	3.00 U			
					9/12/96	B0J7C3	N	3.00 U			
					9/22/96	B0J7C1	N	3.00 U			
					10/01/96	B0J7C5	N	3.00 U			
					10/06/96	B0J7C7	N	3.00 U			
					10/10/96	B0J7C9	N	3.00 U			
	Ethyl cyanide	ETHCYANI	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	10.00 U			ug/L
						B0J8S5	N	10.00 U			
					9/12/96	B0J7C3	N	10.00 U			
					9/22/96	B0J7C1	N	10.00 U			
					10/01/96	B0J7C5	N	10.00 U			
					10/06/96	B0J7C7	N	10.00 U			

Schedule Period: 4/01/96 - 6/30/96

RCRA Quarterly Report - 2/07/97

Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
	Ethyl cyanide	ETHCYANI	EPA8260A	699-37-47A	10/10/96	B0J7C9	N	10.00 U			ug/L
	Europium-152	EU-152	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	-6.83 U			pCi/L
						B0J8S5	N	-.29 U			
					9/12/96	B0J7C3	N	3.68 U			
					9/22/96	B0J7C1	N	-5.55 U			
					10/01/96	B0J7C5	N	-6.83 U			
					10/06/96	B0J7C7	N	10.30 U			
					10/10/96	B0J7C9	N	-7.62 U			
	Europium-154	EU-154	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	7.22 U			pCi/L
						B0J8S5	N	-16.30 U			
					9/12/96	B0J7C3	N	-4.15 U			
					9/22/96	B0J7C1	N	.54 U			
					10/01/96	B0J7C5	N	-20.40 U			
					10/06/96	B0J7C7	N	6.75 U			
					10/10/96	B0J7C9	N	-4.82 U			
	Europium-155	EU-155	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	1.09 U			pCi/L
						B0J8S5	N	4.03 U			
					9/12/96	B0J7C3	N	-1.39 U			
					9/22/96	B0J7C1	N	3.24 U			
					10/01/96	B0J7C5	N	2.72 U			
					10/06/96	B0J7C7	N	-.35 U			
					10/10/96	B0J7C9	N	-3.14 U			
=>	Fluoride	FLUORIDE	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	360.00		4000.00	ug/L
=>						B0J8S5	N	19.00 U			
=>					9/12/96	B0J7C3	N	320.00			
=>					9/22/96	B0J7C1	N	380.00			
=>					10/01/96	B0J7C5	N	420.00			
=>					10/06/96	B0J7C7	N	440.00			
=>					10/10/96	B0J7C9	N	500.00			
=>	Gross alpha	ALPHA	GADGPC	699-37-47A	9/06/96	B0J7B9	N	.49 U		15.00	pCi/L
=>						B0J8S5	N	.02 U			

Schedule Period: 4/01/96 - 6/30/96

RCRA Quarterly Report - 2/07/97

Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
=>	Gross alpha	ALPHA	GADGPC	699-37-47A	9/12/96	B0J7C3	N	.57 U			15.00	pCi/L
=>					9/22/96	B0J7C1	N	2.12 J				
=>					10/01/96	B0J7C5	N	150.00	*			
=>					10/06/96	B0J7C7	N	232.00	*			
=>					10/10/96	B0J7C9	N	123.00	*			
=>	Gross beta	BETA	GBDPC	699-37-47A	9/06/96	B0J7B9	N	7.19				pCi/L
=>						B0J8S5	N	1.10 U				
=>					9/12/96	B0J7C3	N	7.55				
=>					9/22/96	B0J7C1	N	8.03				
=>					10/01/96	B0J7C5	N	31.60				
=>					10/06/96	B0J7C7	N	82.00				
=>					10/10/96	B0J7C9	N	57.20				
=>	Iodine-129	I-129	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	2.13 U	*		1.00	pCi/L
=>						B0J8S5	N	.89 U				
=>					9/12/96	B0J7C3	N	1.43 U	*			
=>					9/22/96	B0J7C1	N	3.70 J	*			
=>					10/01/96	B0J7C5	N	-.54 U				
=>			I129LEPS	699-37-47A	10/06/96	B0J7C7	N	-.77 U				
=>					10/10/96	B0J7C9	N	-1.01 U				
=>	Iron	FE	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	30.50 CQ			300.00	ug/L
=>						B0J8S6	Y	14.10 BCQ				
=>					9/12/96	B0J7C4	Y	62.20 C				
=>					9/22/96	B0J7C2	Y	83.80 C				
=>					10/01/96	B0J7C6	Y	165.00 C				
=>					10/06/96	B0J7C8	Y	139.00 C				
=>					10/10/96	B0J7D0	Y	593.00 C	*			
	Iron-59	FE-59	GAMMAHI	699-37-47A	9/06/96	B0J7B9	N	5.18 U				pCi/L
						B0J8S5	N	-9.02 U				
					9/12/96	B0J7C3	N	2.42 U				
					9/22/96	B0J7C1	N	3.17 U				
					10/01/96	B0J7C5	N	5.37 U				
					10/06/96	B0J7C7	N	12.50 U				

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
	Iron-59	FE-59	GAMMAHI	699-37-47A	10/10/96	B0J7C9	N	1.83 U				pCi/L
	Lead	PB	EPA7421	699-37-47A	9/06/96	B0J7C0	Y	.60 U			15.00	ug/L
						B0J8S6	Y	.60 U				
					9/12/96	B0J7C4	Y	.60 U				
					9/22/96	B0J7C2	Y	.80 U				
					10/01/96	B0J7C6	Y	.80 U				
					10/06/96	B0J7C8	Y	.80 UN				
					10/10/96	B0J7D0	Y	.80 UN				
=>	Magnesium	MG	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	5710.00				ug/L
=>						B0J8S6	Y	50.80 U				
=>					9/12/96	B0J7C4	Y	6310.00				
=>					9/22/96	B0J7C2	Y	6610.00				
=>					10/01/96	B0J7C6	Y	10300.00				
=>					10/06/96	B0J7C8	Y	12200.00				
=>					10/10/96	B0J7D0	Y	11100.00				
=>	Manganese	MN	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	6.00			50.00	ug/L
=>						B0J8S6	Y	.90 U				
=>					9/12/96	B0J7C4	Y	8.80				
=>					9/22/96	B0J7C2	Y	11.00				
=>					10/01/96	B0J7C6	Y	67.60	*			
=>					10/06/96	B0J7C8	Y	121.00	*			
=>					10/10/96	B0J7D0	Y	132.00	*			
	Mercury	HG	EPA7470	699-37-47A	9/06/96	B0J7C0	Y	.10 U			2.00	ug/L
						B0J8S6	Y	.10 U				
					9/12/96	B0J7C4	Y	.10 U				
					9/22/96	B0J7C2	Y	.10 U				
					10/01/96	B0J7C6	Y	.10 U				
					10/06/96	B0J7C8	Y	.10 U				
					10/10/96	B0J7D0	Y	.10 U				
=>	Methylenechloride	METHYCH	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 UQ	*		5.00	ug/L
=>						B0J8S5	N	5.00 UQ	*			

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
=>	Methylenechloride	METHYCH	EPA8260A	699-37-47A	9/12/96	B0J7C3	N	5.00 UQ *		5.00	ug/L
=>					9/22/96	B0J7C1	N	2.00			
=>					10/01/96	B0J7C5	N	1.00 U			
=>					10/06/96	B0J7C7	N	.50 BJ			
=>					10/10/96	B0J7C9	N	2.00 BJ			
	Nickel	NI	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	13.40 U		100.00	ug/L
						B0J8S6	Y	13.40 U			
					9/12/96	B0J7C4	Y	13.40 U			
					9/22/96	B0J7C2	Y	13.40 U			
					10/01/96	B0J7C6	Y	13.40 U			
					10/06/96	B0J7C8	Y	13.40 U			
					10/10/96	B0J7D0	Y	13.40 U			
=>	Nitrogen in Nitrate	NO3-N	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	880.00 H		10000.00	ug/L
=>						B0J8S5	N	2.00 UH			
=>					9/12/96	B0J7C3	N	840.00			
=>					9/22/96	B0J7C1	N	1940.00			
=>					10/01/96	B0J7C5	N	2.00 U			
=>					10/06/96	B0J7C7	N	2.00 U			
=>					10/10/96	B0J7C9	N	72.00			
	Nitrogen in Nitrite	NO2-N	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	2.00 UH		1000.00	ug/L
						B0J8S5	N	2.00 UH			
					9/12/96	B0J7C3	N	2.00 U			
					9/22/96	B0J7C1	N	2.00 U			
					10/01/96	B0J7C5	N	2.00 U			
					10/06/96	B0J7C7	N	2.00 U			
					10/10/96	B0J7C9	N	2.00 U			
	Phosphate	PHOSPHAT	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	36.00 UH			ug/L
						B0J8S5	N	36.00 UH			
					9/12/96	B0J7C3	N	36.00 U			
					9/22/96	B0J7C1	N	36.00 U			
					10/01/96	B0J7C5	N	36.00 U			
					10/06/96	B0J7C7	N	36.00 U			

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
	Phosphate	PHOSPHAT	EPA300.0	699-37-47A	10/10/96	B0J7C9	N	36.00 U			ug/L
=>	Potassium	K	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	6430.00 C			ug/L
=>						B0J8S6	Y	1950.00 UC			
=>					9/12/96	B0J7C4	Y	7500.00 C			
=>					9/22/96	B0J7C2	Y	5050.00			
=>					10/01/96	B0J7C6	Y	8330.00			
=>					10/06/96	B0J7C8	Y	10700.00			
=>					10/10/96	B0J7D0	Y	9960.00			
=>	Radium	RA	RAGPC	699-37-47A	9/06/96	B0J7B9	N	.02 U			pCi/L
=>						B0J8S5	N	.02 U			
=>					9/12/96	B0J7C3	N	.09 U			
=>					9/22/96	B0J7C1	N	.11 J			
=>					10/01/96	B0J7C5	N	.61 J			
=>					10/06/96	B0J7C7	N	.31 J			
=>					10/10/96	B0J7C9	N	.25 J			
=>	Selenium	SE	EPA7740	699-37-47A	9/06/96	B0J7C0	Y	.80 U		50.00	ug/L
=>						B0J8S6	Y	.80 U			
=>					9/12/96	B0J7C4	Y	.80 U			
=>					9/22/96	B0J7C2	Y	1.10 B			
=>					10/01/96	B0J7C6	Y	1.10 B			
=>					10/06/96	B0J7C8	Y	3.30 BN			
=>					10/10/96	B0J7D0	Y	3.30 BN			
	Silver	AG	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	6.60 U		100.00	ug/L
						B0J8S6	Y	6.60 U			
					9/12/96	B0J7C4	Y	6.60 U			
					9/22/96	B0J7C2	Y	6.60 U			
					10/01/96	B0J7C6	Y	6.60 U			
					10/06/96	B0J7C8	Y	6.60 U			
					10/10/96	B0J7D0	Y	6.60 U			
=>	Sodium	NA	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	14700.00 Q			ug/L
=>						B0J8S6	Y	418.00 Q			

Schedule Period: 4/01/96 - 6/30/96 RCRA Quarterly Report - 2/07/97 Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
=>	Sodium	NA	EPA6010A	699-37-47A	9/12/96	B0J7C4	Y	13600.00			ug/L
=>					9/22/96	B0J7C2	Y	15600.00			
=>					10/01/96	B0J7C6	Y	20300.00			
=>					10/06/96	B0J7C8	Y	21600.00			
=>					10/10/96	B0J7D0	Y	20300.00			
=>	Strontium (elemental)	SR	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	100.00			ug/L
=>						B0J8S6	Y	2.00 U			
=>					9/12/96	B0J7C4	Y	108.00			
=>					9/22/96	B0J7C2	Y	109.00			
=>					10/01/96	B0J7C6	Y	233.00			
=>					10/06/96	B0J7C8	Y	263.00			
=>					10/10/96	B0J7D0	Y	226.00			
=>	Strontium-89/90	SR-89/90	SR8990	699-37-47A	9/06/96	B0J7B9	N	.78 J			pCi/L
=>						B0J8S5	N	.01 U			
=>					9/12/96	B0J7C3	N	-.02 U			
=>					9/22/96	B0J7C1	N	.03 U			
=>					10/01/96	B0J7C5	N	.18 UH			
=>					10/06/96	B0J7C7	N	-.03 U			
=>					10/10/96	B0J7C9	N	-.10 U			
=>	Sulfate	SULFATE	EPA300.0	699-37-47A	9/06/96	B0J7B9	N	15800.00		250000.00	ug/L
=>						B0J8S5	N	122.00 U			
=>					9/12/96	B0J7C3	N	15800.00			
=>					9/22/96	B0J7C1	N	19700.00			
=>					10/01/96	B0J7C5	N	24100.00			
=>					10/06/96	B0J7C7	N	51500.00			
=>					10/10/96	B0J7C9	N	48500.00			
=>	Technetium-99	TC-99	TC99CHEMLSC	699-37-47A	9/06/96	B0J7B9	N	-1.33 U		900.00	pCi/L
=>						B0J8S5	N	.03 U			
=>					9/12/96	B0J7C3	N	1.22 U			
=>					9/22/96	B0J7C1	N	6.43 J			
=>					10/01/96	B0J7C5	N	1.77 U			
=>					10/06/96	B0J7C7	N	4.63 UJ			

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
=>	Technetium-99	TC-99	TC99CHEMLSC	699-37-47A	10/10/96	B0J7C9	N	5.65 J			900.00	pCi/L
=>	Temperature	TEMPERAT	PNL MA-567 field pro	699-37-47A	9/06/96	B0J7B9	N	20.40				Deg C
=>					9/12/96	B0J7C3	N	20.40				
=>					9/22/96	B0J7C1	N	20.10				
=>					10/01/96	B0J7C5	N	20.60				
=>					10/06/96	B0J7C7	N	20.60				
=>					10/10/96	B0J7C9	N	21.60				
	Tetrachloroethene	PERCENE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U	*		5.00	ug/L
						B0J8S5	N	5.00 U	*			
					9/12/96	B0J7C3	N	5.00 U	*			
					9/22/96	B0J7C1	N	1.00 U				
					10/01/96	B0J7C5	N	1.00 U				
					10/06/96	B0J7C7	N	1.00 U				
					10/10/96	B0J7C9	N	1.00 U				
	Tetrahydrofuran	TETHYDF	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	50.00 U				ug/L
						B0J8S5	N	50.00 U				
					9/12/96	B0J7C3	N	50.00 U				
					9/22/96	B0J7C1	N	10.00 U				
					10/01/96	B0J7C5	N	10.00 U				
					10/06/96	B0J7C7	N	10.00 U				
					10/10/96	B0J7C9	N	10.00 U				
	Thallium	TL	EPA7841	699-37-47A	9/06/96	B0J7C0	Y	1.20 U			2.00	ug/L
						B0J8S6	Y	1.20 U				
					9/12/96	B0J7C4	Y	1.20 U				
					9/22/96	B0J7C2	Y	1.20 U				
					10/01/96	B0J7C6	Y	1.20 U				
					10/06/96	B0J7C8	Y	1.20 U				
					10/10/96	B0J7D0	Y	1.20 U				
	Tin	SN	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	33.50 U				ug/L
						B0J8S6	Y	33.50 U				
					9/12/96	B0J7C4	Y	33.50 U				

Schedule Period: 4/01/96 - 6/30/96 | RCRA Quarterly Report - 2/07/97 | Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT	MDL	MCL	UNITS
	Tin	SN	EPA6010A	699-37-47A	9/22/96	B0J7C2	Y	33.50 U			ug/L
					10/01/96	B0J7C6	Y	33.50 U			
					10/06/96	B0J7C8	Y	33.50 U			
					10/10/96	B0J7D0	Y	33.50 U			
=>	Toluene	TOLUENE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U		1000.00	ug/L
=>						B0J8S5	N	2.00 BJ			
=>					9/12/96	B0J7C3	N	2.00 BJ			
=>					9/22/96	B0J7C1	N	1.00 U			
=>					10/01/96	B0J7C5	N	1.00 U			
=>					10/06/96	B0J7C7	N	1.00 U			
=>					10/10/96	B0J7C9	N	1.00 U			
=>	Total dissolved solids	TDS	EPA160.1	699-37-47A	9/06/96	B0J7B9	N	174000.00 Q		500000.00	ug/L
=>						B0J8S5	N	12000.00 Q			
=>					9/12/96	B0J7C3	N	149000.00			
=>					9/22/96	B0J7C1	N	150000.00			
=>					10/01/96	B0J7C5	N	236000.00			
=>					10/06/96	B0J7C7	N	265000.00			
=>					10/10/96	B0J7C9	N	167000.00			
=>	Total halogens (all)	TOTHALOG	EPA9020	699-37-47A	9/06/96	B0J7B9	N	2.65 UQ			ug/L
=>						B0J8S5	N	2.65 UQ			
=>					9/12/96	B0J7C3	N	2.65 U			
=>					9/22/96	B0J7C1	N	2.65 U			
=>					10/01/96	B0J7C5	N	2.65 U			
=>					10/06/96	B0J7C7	N	2.65 U			
=>					10/10/96	B0J7C9	N	6.05			
	Trichloroethene	TRICELN	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U *		5.00	ug/L
						B0J8S5	N	5.00 U *			
					9/12/96	B0J7C3	N	5.00 U *			
					9/22/96	B0J7C1	N	1.00 U			
					10/01/96	B0J7C5	N	1.00 U			
					10/06/96	B0J7C7	N	1.00 U			
					10/10/96	B0J7C9	N	1.00 U			

C.17

Schedule Period: 4/01/96 - 6/30/96

RCRA Quarterly Report - 2/07/97

Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
=>	Tritium	TRITIUM	H3HIGH	699-37-47A	9/06/96	B0J7B9	N	17700.00			20000.00	pCi/L
=>						B0J8S5	N	-35.90 U				
=>					9/12/96	B0J7C3	N	13000.00				
=>					9/22/96	B0J7C1	N	14200.00				
=>					10/01/96	B0J7C5	N	52.70 U				
=>					10/06/96	B0J7C7	N	30.20 U				
=>					10/10/96	B0J7C9	N	-65.00 U				
=>	Turbidity	TURBIDIT	Standard Methods Tur	699-37-47A	9/06/96	B0J7B9	N	1.68				NTU
=>					9/12/96	B0J7C3	N	2.31				
=>					9/22/96	B0J7C1	N	3.93				
=>					10/01/96	B0J7C5	N	4.60				
=>					10/06/96	B0J7C7	N	5.61				
=>	Uranium	U	UFLUOR	699-37-47A	9/06/96	B0J7B9	N	1.15				ug/L
=>						B0J8S5	N	.00 J				
=>					9/12/96	B0J7C3	N	1.67				
=>					9/22/96	B0J7C1	N	4.24				
=>					10/01/96	B0J7C5	N	220.00				
=>					10/06/96	B0J7C7	N	395.00				
=>					10/10/96	B0J7C9	N	197.00				
=>	Vanadium	V	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	37.10				ug/L
=>						B0J8S6	Y	3.10 U				
=>					9/12/96	B0J7C4	Y	36.60				
=>					9/22/96	B0J7C2	Y	28.10				
=>					10/01/96	B0J7C6	Y	40.00				
=>					10/06/96	B0J7C8	Y	20.80				
=>					10/10/96	B0J7D0	Y	9.10 B				
	Vinyl chloride	VINYIDE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U	*		2.00	ug/L
						B0J8S5	N	5.00 U	*			
					9/12/96	B0J7C3	N	5.00 U	*			
					9/22/96	B0J7C1	N	2.00 U	*			
					10/01/96	B0J7C5	N	2.00 U	*			

Schedule Period: 4/01/96 - 6/30/96 | RCRA Quarterly Report - 2/07/97 | Receipt Period: 4/01/96 - 9/09/96

	CONSTITUENT NAME	SHORT NAME	METHOD NAME	WELL	COLLECT DATE	SAMPLE NUMBER	FLTR	RESULT		MDL	MCL	UNITS
	Vinyl chloride	VINYIDE	EPA8260A	699-37-47A	10/06/96	B0J7C7	N	2.00 U	*		2.00	ug/L
					10/10/96	B0J7C9	N	2.00 U	*			
	Xylenes (total)	M-XYLE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U			10000.00	ug/L
						B0J8S5	N	5.00 U				
					9/12/96	B0J7C3	N	5.00 U				
					9/22/96	B0J7C1	N	1.00 U				
					10/01/96	B0J7C5	N	1.00 U				
					10/06/96	B0J7C7	N	1.00 U				
					10/10/96	B0J7C9	N	1.00 U				
=>	Zinc	ZN	EPA6010A	699-37-47A	9/06/96	B0J7C0	Y	8.20 BQ			5000.00	ug/L
=>						B0J8S6	Y	3.50 UQ				
=>					9/12/96	B0J7C4	Y	56.10				
=>					9/22/96	B0J7C2	Y	182.00 EN				
=>					10/01/96	B0J7C6	Y	139.00 EN				
=>					10/06/96	B0J7C8	Y	343.00				
=>					10/10/96	B0J7D0	Y	265.00				
	cis-1,2-Dichloroethylene	CISDCE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U			70.00	ug/L
						B0J8S5	N	5.00 U				
					9/12/96	B0J7C3	N	5.00 U				
					9/22/96	B0J7C1	N	1.00 U				
					10/01/96	B0J7C5	N	1.00 U				
					10/06/96	B0J7C7	N	1.00 U				
					10/10/96	B0J7C9	N	1.00 U				
	trans-1,2-Dichloroethylene	TRANDCE	EPA8260A	699-37-47A	9/06/96	B0J7B9	N	5.00 U			100.00	ug/L
						B0J8S5	N	5.00 U				
					9/12/96	B0J7C3	N	5.00 U				
					9/22/96	B0J7C1	N	1.00 U				
					10/01/96	B0J7C5	N	1.00 U				
					10/06/96	B0J7C7	N	1.00 U				
					10/10/96	B0J7C9	N	1.00 U				

SOIL TECHNOLOGY, INC.
SPECIALIZING IN PHYSICAL SOIL TESTING

LETTER OF TRANSMITTAL

TO:	**Battelle Northwest for DOE** **6th & W Streets, 790 Building** **Richland, WA 99352**	**Date:** **Job No.:**	**1-10-97** **J-1000**
ATTENTION:	**Jon Lindberg**		
SUBJECT:	**PO 259132-AB8**		
RE:	**Sample ID No. BOJ5Y5, BOJ5Y6, BOJ5Y7 and BOJ5Y8**		

We are sending the following items:

Date	Copies	Description
1-10-97	2	Rigid Wall Hydraulic Conductivity (Table 1)
1-10-97	2	Soil Parameters (Table 2)
1-10-97	2	Test Methods (2 pages)
1-10-97	2	Particle Size Distribution Test Report (Plate 1 and 2)
1-10-97	1	Chains of Custody Records (4 pages)
1-10-97	1	Original Invoice No. 1421

These are transmitted for your use.

Remarks: Samples were tested in accordance with generally accepted laboratory procedures. Please call if you have any questions regarding this submittal or presentation of the data. Thank you.

Best Regards,
SOIL TECHNOLOGY, INC.

Richard G. Sheets,
Vice President

Battelle Pacific Northwest Laboratories

Table 1: Rigid and Flexible Wall Hydraulic Conductivity of RCRA Well Soil Samples

Sample ID	Water Content %		Wet Density pcf		Saturation[1]		Hydraulic Conductivity[2] cm/sec	Gradient[3]	Porosity	Effective Porosity[4]
	Before	After	Before	After	Before	After				
BOJ5-Y6 - Flexible Wall	25	26	125	126	1.0	1.0	3×10^{-7}	8	0.41	0.37
BOJ5-Y7 - Rigid Wall	13	14	138	139	0.90	0.98	1×10^{-4}	1.5	0.28	0.11*
BOJ5-Y8 - Rigid Wall	8	12	137	142	0.68	1.00	2×10^{-3}	0.2	0.25	0.04

[1] Saturation calculated using measured specific gravity as reported on table 2.

[2] Averaged hydraulic conductivity using tap water. BOJ5-Y6: Head Water = 30.5 psi Tail Water = 29.5 psi Cell Pressure = 80 psi Confining Stress = 50 psi

[3] Gradient (i)= H/l

[4] See attached method.

Soil Technology, Inc.
J-1000

Table 2: Soil Parameters

Sample Number	Depth feet	Moisture Content [1] %	Specific Gravity [2]	Calcium Carbonate [3] %
BOJ5Y5	325 - 327	4	NR	< 1.0
BOJ5Y6	370.5 - 375.4	19	2.71	< 1.0
BOJ5Y7	420.3 - 422.3	8	2.72	< 1.0
BOJ5Y8	460.5 - 462.4	10	2.70	< 1.0

NA Not requested

[1] Moisture Content determined following ASTM D 2216 methodology.

[2] Specific Gravity determined following ASTM D 854 methodology.

[3] Calcium carbonate determined following ASTM D 4373 methodology.

Test Methods

Hydraulic Conductivity Testing

Flexible Wall Tests. Hydraulic conductivity testing using a flexible wall permeameter was performed on one sample in general accordance with ASTM D-5084. The procedure involved saturation of the head water lines, porous stones and filter fabric. The latex membrane is then placed over the soil and sealed on the platens with the use of O-rings. Drainage lines for the tail water are connected and the cell containing the sample is filled with water.

The sample is then connected to a triaxial panel board using an air-water interface a stress is applied to the sample to consolidate the sample and minimize side-wall leakage. Samples were back pressure saturated. A differential pressure was set across the sample to achieve an appropriate gradient to measure flow through the sample. Flow through the sample was computed according to Darcy's law for falling head and raising tail water conditions as follows:

$$k = \frac{aL}{2AT} \ln \frac{h1}{h2}$$

Rigid Wall Tests. End caps are placed over each end of the sample sleeve and tightened. A constant head reservoir is then attached to the permeameter. The sample is saturated using charcoal filtered tap water in 0.5 inch tubing connected at the bottom fitting in an up-flow mode. After saturation, the reservoir is sealed and a Marriott tube is used for setting a constant head. The outflow line elevation is fixed and flow is started. The use of 0.5 inch diameter lines with perforated disks and fabric without the use of porous stones minimizes system head losses. During hydraulic conductivity testing, measurements of flow with respect to time are made. Flow through the samples is made using constant head conditions, and is calculated using the following formula: k= QL/AtH.

Effective Porosity. Following measurement of the hydraulic conductivity of the sample, using either a rigid wall permeameter (for coarse grained material) or a flexible wall permeameter (for fine grained material) the tap water in the permeameter reservoir is removed and is replaced with saline water at approximately 20 millimhos electrical conductivity. Flow of the tracer through the sample is initiated and the electrical conductivity of the effluent is recorded over time until it reaches steady state.

One pore volume (the effective porosity) of tracer is assumed to have flowed through the sample when the electrical conductivity of the effluent is equal to 50% of the difference between the electrical conductivity of the tap water and the electrical conductivity of the tracer at steady state. This is also known as the tracer breakthrough (Freeze and Cherry, 1979, pp.389-393).

Grain Size Analysis. Grain size analysis was performed on selected samples in general accordance with ASTM D-422. The wet sieve analysis method was used and determines the size distribution greater than the U.S. No. 200 mesh sieve. The results of the tests are presented as curves on plates 1 and 2.

Specific Gravity. Specific gravity determinations are based on the minus U.S. No. 40 sieve portion and were made on samples in general accordance with ASTM D-854 and are reported as specific gravity on Table 1.

Calcium Carbonate. Calcium carbonate is determined on the soil in general accordance with ASTM D-4373. The soil is placed in a reaction chamber and acid is added. The acid reacts with the carbonate to generate carbon dioxide gas. The chamber is equipped with a pressure gauge and the pressure is related to a carbonate content by the use of calibration curves.

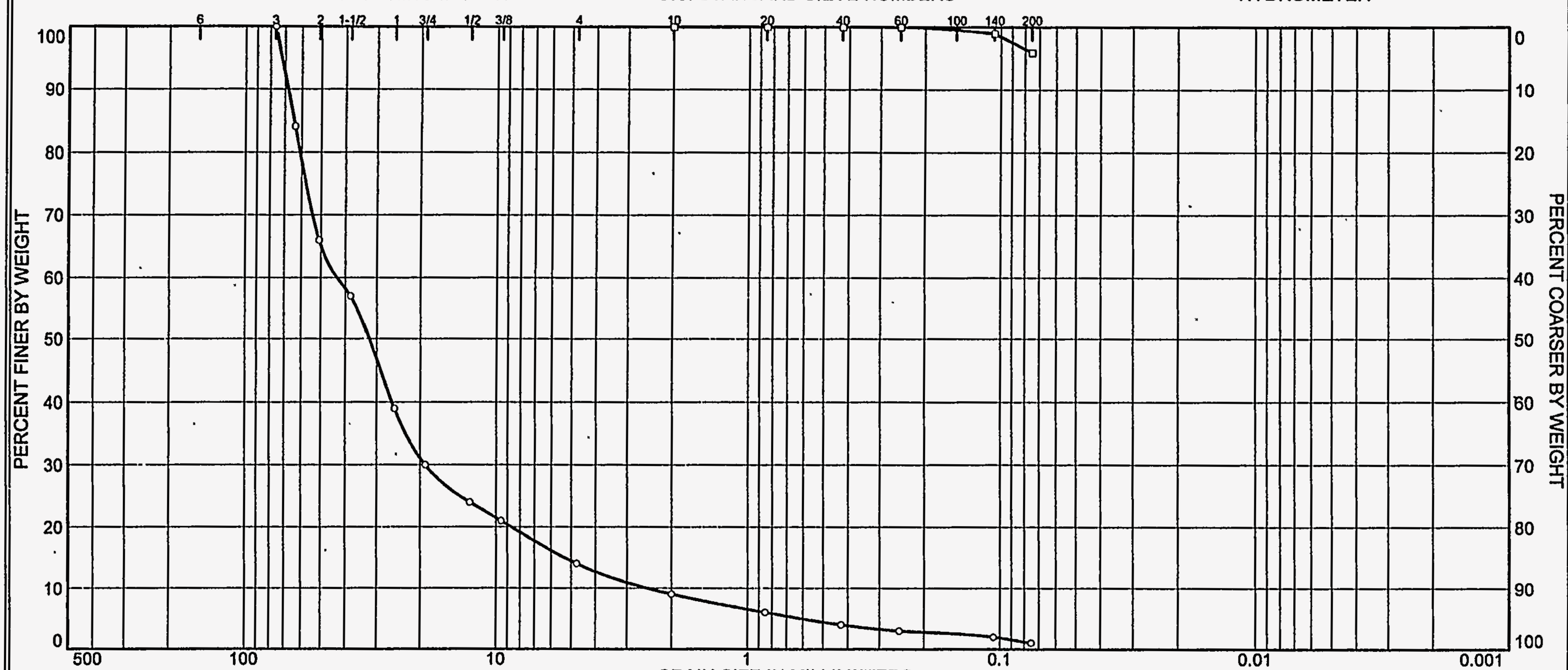
Discussion

Sample BOJ5Y6. This sample was a core of soil that was submitted for flexible wall hydraulic conductivity and effective porosity testing. The testing was routine and there were no anomalies.

Sample BOJ5Y7. This sample was a sandy sample submitted in a stainless steel liner, for rigid wall hydraulic conductivity and effective porosity testing. After the hydraulic conductivity test was complete and steady state flow was achieved, the effective porosity test was started. After the introduction of the salt solution tracer, the hydraulic conductivity jumped an order of magnitude, from 1×10^{-4} to 1×10^{-3} cm/s. The conductivity readings were uniform and consistent throughout the effective porosity test. It may be that the use of a salt solution reacted in some way with the sample, and this lead to a change in the conductivity. If any following testing is done, it may be worth considering using a different type of tracer for the testing.

Sample BOJ5Y8. This sample was a sandy sample submitted in a stainless steel liner, submitted for rigid wall hydraulic conductivity and effective porosity testing. The effective porosity is generally defined as the porosity that contributes to fluid flow. The measured effective porosity for this sample is lower than would be expected, given the hydraulic conductivity and the grain size analysis values. Following the test, the sample was taken down carefully and examined. No indications of side wall leakage, channeling or other anomalies could be visually identified. Like sample BOJ5Y7, the salt solution that was used as a tracer could have had an effect on the sample.

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
○	0	86	13	1	
□	0	0	4	96	

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○		BOJ5Y5	325-327		GP	Poorly graded gravel			
□		BOJ5Y6	371.9-372.2						

Client Battelle Pacific Northwest Laboratories	**SOIL TECHNOLOGY, INC.**	○
Project RCRA Groundwater Well Samples		□
RCRA Groundwater Well Samples		
Project No. J-1000 Plate 1		

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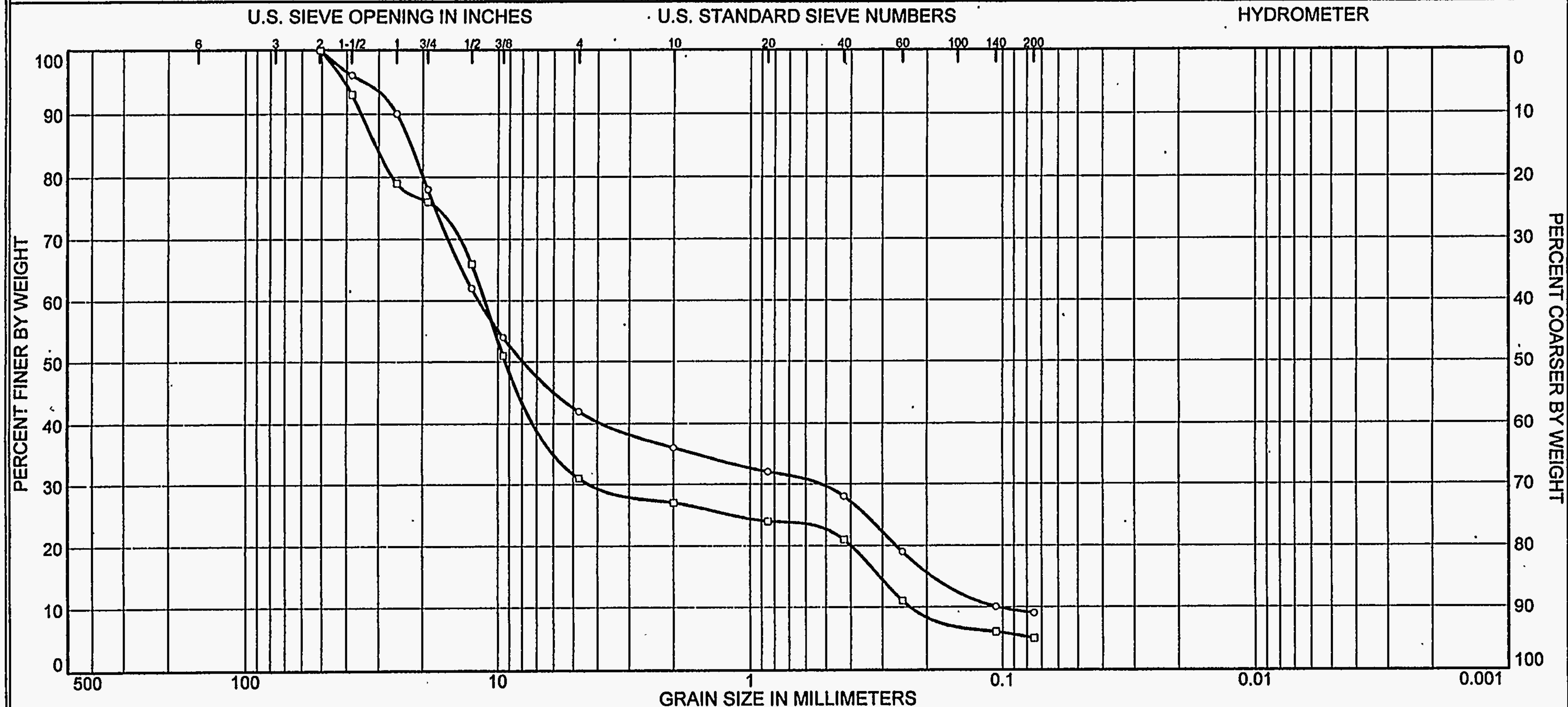
PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
○	0	58	33	9	
□	0	69	26	5	

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○		BOJ5Y7	420.3-420.8		GP-GM	Poorly graded gravel with silt and sand			
□		BOJ5Y8	461.5-462.2		GP-GM	Poorly graded gravel with silt and sand			

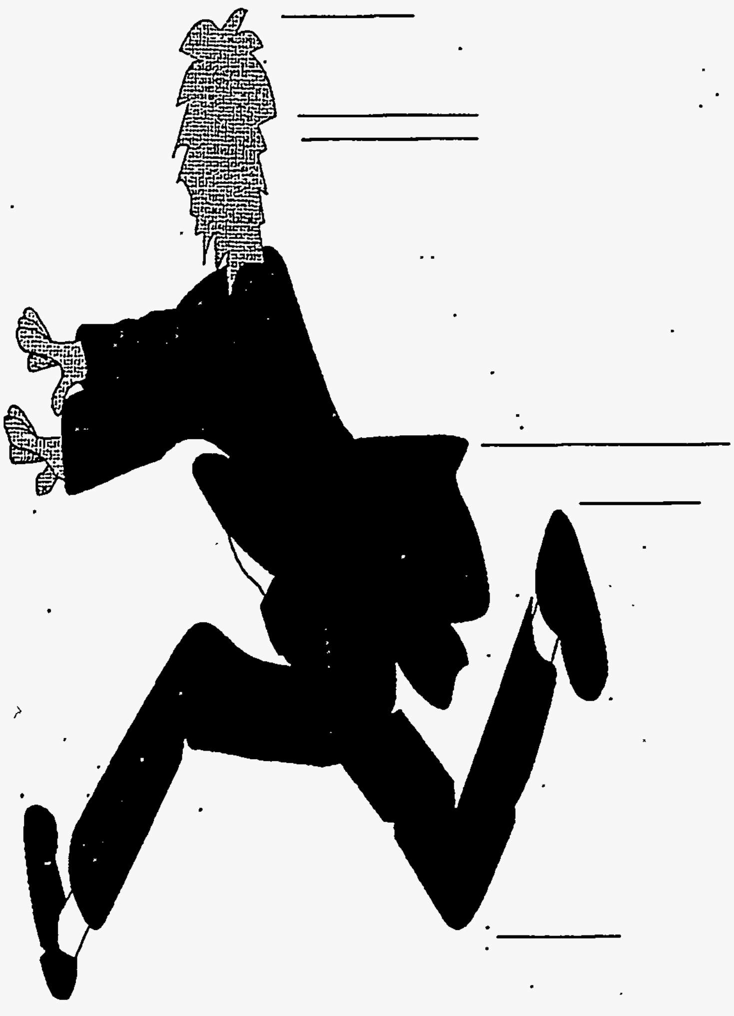
Client Battelle Pacific Northwest Laboratories
Project RCRA Groundwater Well Samples
RCRA Groundwater Well Samples
Project No. J-1000 Plate 2

SOIL TECHNOLOGY, INC.

○
□

facsimile
TRANSMITTAL

to: Dorothy Stewart
fax #: 372-1704
re: **PRIORITY DATA: SDG W1418**
RESULTS FOR: B0J7C5, B0J7C7, B0J7C9
date: January 28, 1997
pages: 12, including this cover sheet.



From the desk of...

Kathy Wheeler

Analytical Services
1820 Terminal Drive
Richland, Wa 99352

(509) 372-2395
Fax: (509) 372-1616

SAMPLE DATA AND LABORATORY ADMINISTRATION

RECORD OF DISPOSITION REV 1

ROD-96-0080
Record of Disposition No.

DATE: January 21, 1997	LABORATORY: Quanterra
PROJECT TITLE/SAF #: 96-053	NCR NO.: N/A

SAMPLE IDENTIFICATION NUMBERS: B0J7C5, B0J7C7, and B0J7C9

DESCRIPTION OF EVENT:

Isotopic Uranium analyses including the reporting of U-236 is to added to the analyses reported for these samples.

DISPOSITION OF SAMPLES:

The isotopic uranium analyses, including the reporting of uranium 236, is to be performed and reported with a TAT of 7 days starting 1/21/97. Results are due in 7 days with the summary data package and EDD due within 15 days.

APPROVAL SIGNATURES:

Karl N Pool [signature] 1/21/97
SDLA Project Coordinator (Print/Sign Name) Date

Dorothy Stewart [signature] 1/22/97
Technical Representative (Print/Sign Name) Date

SAMPLE RESULTS

PRIORITY

LAB NAME:	QUANTERRA, Richland	SDG:	W01418
LAB SAMPLE ID:	70124201	MATRIX:	WATER
CLIENT ID:	B0J7C9	DATE RECEIVED:	1/21/1997 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
U-234	1.02E+02	4.3E+00	1.2E+01	5.10E-01	pCi/L	78.60%	RICHRC5030
U-235	2.38E+00	6.7E-01	7.2E-01	2.61E-01	pCi/L	78.60%	RICHRC5030
U-236	2.87E-01	2.5E-01	2.5E-01	3.17E-01	pCi/L	78.60%	RICHRC5067
U-238	6.39E+01	3.4E+00	7.7E+00	3.97E-01	pCi/L	78.60%	RICHRC5030

Number of Results: 4

SAMPLE RESULTS

PRIORITY

LAB NAME:	QUANTERRA, Richland	SDG:	W01418
LAB SAMPLE ID:	70124202	MATRIX:	WATER
CLIENT ID:	B0J7C7	DATE RECEIVED:	1/21/1997 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
U-234	2.20E+02	8.0E+00	2.4E+01	5.67E-01	pCi/L	91.10%	RICHRC5030
U-235	6.54E+00	1.4E+00	1.5E+00	1.97E-01	pCi/L	91.10%	RICHRC5030
U-236	7.12E-01	4.9E-01	5.0E-01	5.67E-01	pCi/L	91.10%	RICHRC5067
U-238	1.39E+02	6.4E+00	1.6E+01	6.25E-01	pCi/L	91.10%	RICHRC5030

Number of Results: 4

SAMPLE RESULTS

PRIORITY

LAB NAME:	QUANTERRA, Richland	SDG:	W01418
LAB SAMPLE ID:	70124203	MATRIX:	WATER
CLIENT ID:	B0J7C5	DATE RECEIVED:	1/21/1997 10:00:00 AM

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
U-234	1.36E+02	4.7E+00	1.5E+01	4.85E-01	pCi/L	80.00%	RICHRC5030
U-235	3.54E+00	7.6E-01	8.5E-01	3.15E-01	pCi/L	80.00%	RICHRC5030
U-236	1.88E+00	5.5E-01	5.9E-01	2.28E-01	pCi/L	80.00%	RICHRC5067
U-238	7.07E+01	3.4E+00	8.1E+00	3.47E-01	pCi/L	80.00%	RICHRC5030

Number of Results: 4

DUPLICATE RESULTS

LAB NAME:	QUANTERRA, Richland	SDG:	W01418
LAB SAMPLE ID:	R0124203	MATRIX:	WATER
CLIENT ID:	B0J7C5	DATE RECEIVED:	1/21/1997 10:00:00
ORIG LAB SAMPLE ID:	70124203		

ISOTOPE	DUP RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER	ORIG RESULT	RPD
U-234	1.39E+02	5.0E+00	1.6E+01	3.48E-01	pCi/L	75.70%	RICHRC5030	1.36E+02	2.69%
U-235	2.71E+00	7.1E-01	7.6E-01	3.48E-01	pCi/L	75.70%	RICHRC5030	3.54E+00	26.48%
U-236	2.05E-01	2.5E-01	2.5E-01	4.43E-01	pCi/L	75.70%	RICHRC5067	1.88E+00	160.61%
U-238	7.21E+01	3.6E+00	8.5E+00	4.15E-01	pCi/L	75.70%	RICHRC5030	7.07E+01	2.01%

Number of Results: 4

BLANK RESULTS

LAB NAME:	QUANTERRA, Richland	SDG:	W01418
LAB SAMPLE ID:	T012421B	MATRIX:	WATER

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
U-234	-3.50E-02	7.0E-02	7.0E-02	2.48E-01	pCi/L	33.10%	RICHRC5030
U-235	-4.00E-02	4.0E-02	4.0E-02	2.15E-01	pCi/L	33.10%	RICHRC5030
U-238	-7.01E-02	5.3E-02	5.4E-02	2.63E-01	pCi/L	33.10%	RICHRC5030

Number of Results: 3

LABORATORY CONTROL SAMPLE

LAB NAME: QUANTERRA, Richland **SDG:** W01418
LAB SAMPLE ID: T012421S **MATRIX:** WATER

ISOTOPE	RESULT	COUNTING ERROR (2 s)	TOTAL ERROR (2 s)	MDA	REPORT UNIT	YIELD	EXPECTED	RECOVER
U-234	8.92E+00	5.8E-01	1.1E+00	5.33E-02	pCi/L	86.50%	8.69E+00	102.62%
U-235	2.98E-01	1.1E-01	1.1E-01	5.33E-02	pCi/L	86.50%	3.97E-01	75.24%
U-238	9.78E+00	6.1E-01	1.2E+00	1.18E-01	pCi/L	86.50%	9.10E+00	107.42%

Number of Results: 3

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

LOG#: RD-97-

Corrective Action

Root Cause Initial and date: [illegible] 1-28-97

U235 and U236 regions of interest overlap, due to this overlap it is only in spectra that two distinct peaks appear in the presence of U236 that an estimated result may be calculated. The samples listed do not have any distinct peak in the U236 region of interest and therefore only represent counts [struck through] in a[illegible]

Corrective Action Initial and Date: [illegible] 1-28-97 [illegible] 1-28-97

Inform client that there may or may not be U236 in these samples and these results only represent the counts in an energy region. Quanterra Richland has always reported U235 and U235/U236 without differentiation. Only after we commented that certain samples appear to have U236 have we been asked to report U236 and do so with hesitation.

Responsibility for performing CA assigned to: __________

Actions to prevent recurrence Initial and Date: __________

First Level Supervisor: [signature] Date: 1-28-97

Responsible Manager: __________ Date: __________

Quality Assurance Review

- ☐ Anomaly ☐ Deficiency ☐ Retrain
- ☐ Further action required: __________

Assigned to: __________

QA signature: __________ Date: __________

Corrective Action Verification

- ☐ Verified
- ☐ Cannot Verify (specify reason): __________

Nonconformance Memo Closure

QA signature/date: __________

QUANTERRA LABORATORY NONCONFORMANCE MEMO (NCM)

PAGE 1 OF 2

LOG #: RD-97-

Project ID: KUS   NCM Initiated by: JTK 1-28-97
Sample Numbers: 70124201-03
Tests: Uiso
Matrix: Water

Analytical Area (check appropriate area):

☐ Sample control	☐ GC	☐ Wet chemistry	☒ Data review
☐ Organic preparation	☐ HPLC	☐ Metals	☒ Radiochemistry
☐ Inorganic preparation	☐ GC/MS	☐ Reporting	☐ Bioassay

Nonconformance (check appropriate area):

Holding Time Violations (exceeded by ______ days)

Category I: Laboratory Independent

- ☐ 1. Holding time expired in transit
- ☐ 2. Sample received > 48 hrs. or 1/2 holding time has expired
- ☐ 3. Test added by client after expiration

Category II: Laboratory Dependent

- ☐ 4. Instrument failure
- ☐ 5. Analyst error
- ☐ 6. Login error
- ☐ 7. Miscommunication
- ☐ 8. Other (complete description required)

Category III: Analysis Reruns (QA/QC)

- ☐ 9. Surrogates
- ☐ 10. Internal Standards
- ☐ 11. Spike Recoveries
- ☐ 12. Blank Contamination

Category IV: Analysis Reruns (Confirmation)

- ☐ 13. Second column
- ☐ 14. Contamination check
- ☐ 15. Confirmation of matrix effects
- ☐ 16. Other (complete description required)

Quality Assurance/Quality Control

- ☐ 17. QC data reported outside of controls
- ☐ 18. Incorrect procedure used
- ☐ 19. SOP intentionally modified with QA and Tech. approva
- ☐ 20. Invalid instrument calibration
- ☐ 21. Insufficient sample received for proper analysis

Incorrect or Incomplete Client Deliverable

- ☐ 22. Hardcopy deliverable error
- ☐ 23. Electronic deliverable error

Reported detection limits elevated due to:

- ☐ 24. Sample matrix
- ☐ 25. Insufficient sample volume
- ☐ 26. Other (complete description required)
- ☒ 27. *Other (specify):* U235 values reported are an estimate only

Comments/Explanation:

Notification (check appropriate area):

Client notified by (name and date):
- ☐ in writing
- ☐ by facsimile
- ☐ by telephone
- ☐ other (explain)

Client's name and response:
- ☐ process "as is"
- ☐ re-sample
- ☐ on hold until ______
- ☐ other (explain)

Project Manager (signature and date):

SAMPLE DATA AND LABORATORY ADMINISTRATION

RECORD OF DISPOSITION REV 1

ROD-96-0080
Record of Disposition No.

DATE: January 21, 1997 | **LABORATORY:** Quanterra

PROJECT TITLE/SAF #: 96-053 | **NCR NO.:** N/A

SAMPLE IDENTIFICATION NUMBERS: B0J7C5, B0J7C7, and B0J7C9

DESCRIPTION OF EVENT: RUS

Isotopic Uranium analyses including the reporting of U-236 is to added to the analyses reported for these samples.

61015001 - B0J7C9 - 10-10 0950 70124201
61008001 - B0J7C7 10-6 1210 ↓ 02
61003201 - B0J7C5 10-1 1800 ↓ 03

SDG W01418

DISPOSITION OF SAMPLES:

The isotopic uranium analyses, including the reporting of uranium 236, is to be performed and reported with a TAT of 7 days starting 1/21/97. ~~The summary data package and EDD are due within the 7 day TAT.~~ Results in Z summary Package + EDD in 15 days.

PRIORITY

APPROVAL SIGNATURES:

Karl N Pool
SDLA Project Coordinator (Print/Sign Name) Date

Dorothy Stewart
Technical Representative (Print/Sign Name) Date

Author: Vernon G Johnson at ~PNL105
Date: 1/29/97 9:35 AM
Priority: Normal
TO: Jonathan W Lindberg
Subject: Uranium isotopes in groundwater sample

-- Message Contents --

Based on a quick review of the data report for th priority samples associated with SDG W1418, my opinion is that the uranium isotopic composition is consistent with a natural source. This opinion is based on the following main indicators:

1) the activity ratio of U-235 to U-238 in the sample with the highest total uranium concentration is 0.047. The activity ratio for a natural source is 0.045 (based on a mass abundance of 0.71% for U-235).

2) Notes from the analyst along with the results suggest there is no detectable U-236 which would be expected for as source that has been cycled through the reactor.

The above does not rule out the possibility that a "cold" source of uranium could have been used in past cold runs. However, I have no knowledge that this is the case.

Appendix D

Results of Sediment and Rock Analyses

Appendix D

Results of Sediment and Rock Analyses

This appendix contains the results of

- Physical Tests on Sediment
- X-Ray Diffraction of Ringold Formation Lower Mud Unit
- X-Ray Fluorescence of Uppermost Basalt Flow.

SOIL TECHNOLOGY, INC.
SPECIALIZING IN PHYSICAL SOIL TESTING

LETTER OF TRANSMITTAL

TO: **Battelle Northwest**
6th & W Streets, 790 Building
Richland, WA 99352

Date: January 20, 1997
Job No.: J-1000

ATTENTION: **Jon Lindberg**

SUBJECT: **PO 259132-AB8**

RE: **Sample ID No. BOJ5Y5 and BOJ5Y6**

We are sending the following items:

Date	Copies	Description
1-20-97	2	Particle Size Distribution with Hydrometer Test Report
1-20-97	1	Copy of Invoice No. 1425

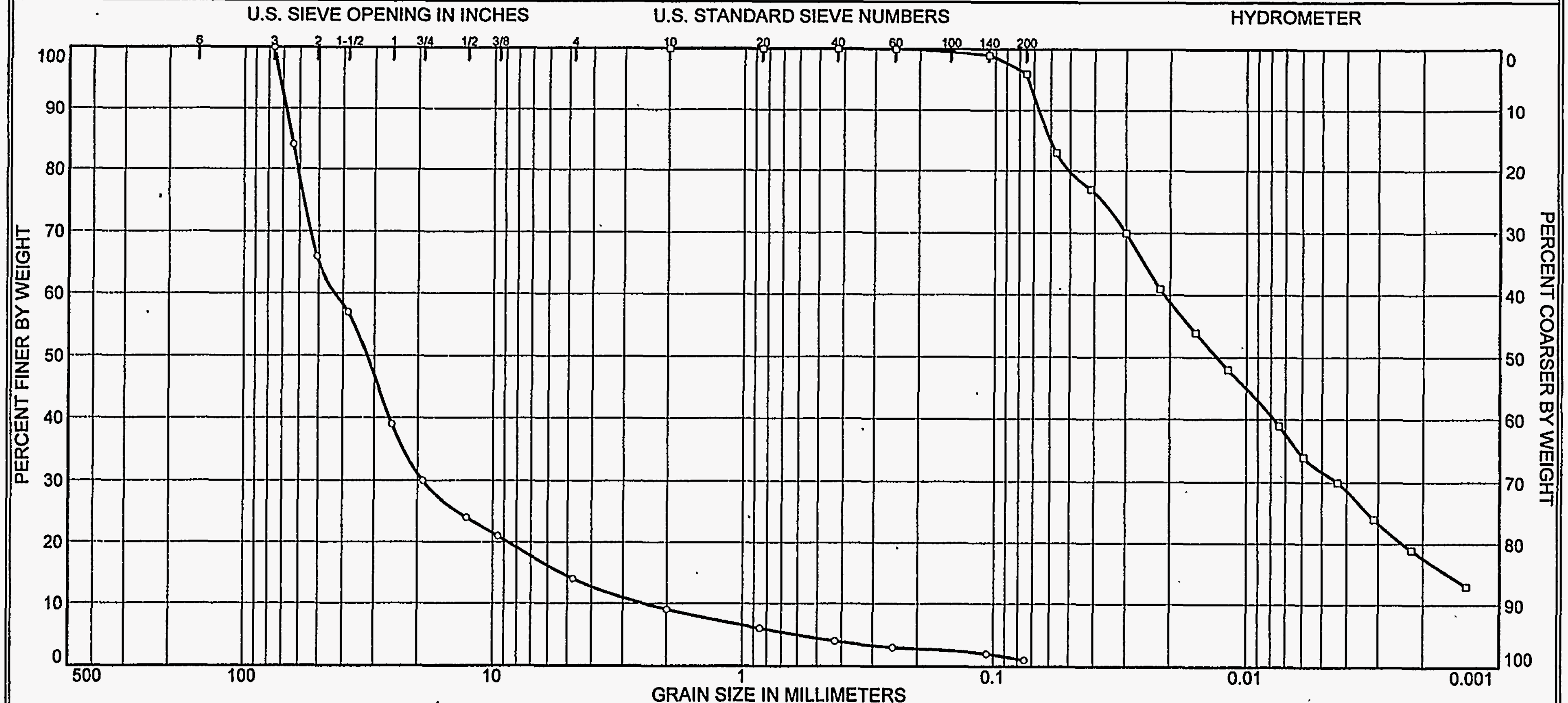
These are transmitted for your use.

Remarks: Samples were tested in general accordance with ASTM D-422. Please call if you have any questions regarding this submittal or presentation of the data. Thank you.

Best Regards,
SOIL TECHNOLOGY, INC.

Richard G. Sheets,
Vice President

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
○	0	86	13	1	
□	0	0	4	64	32

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○		BOJ5Y5	325-327		GP	Poorly graded gravel			
□		BOJ5Y6	371.9-372.2		ML	Silt			

Client Battelle Pacific Northwest Laboratories

Project RCRA Groundwater Well Samples

RCRA Groundwater Well Samples

Project No. J-1000 Plate 1

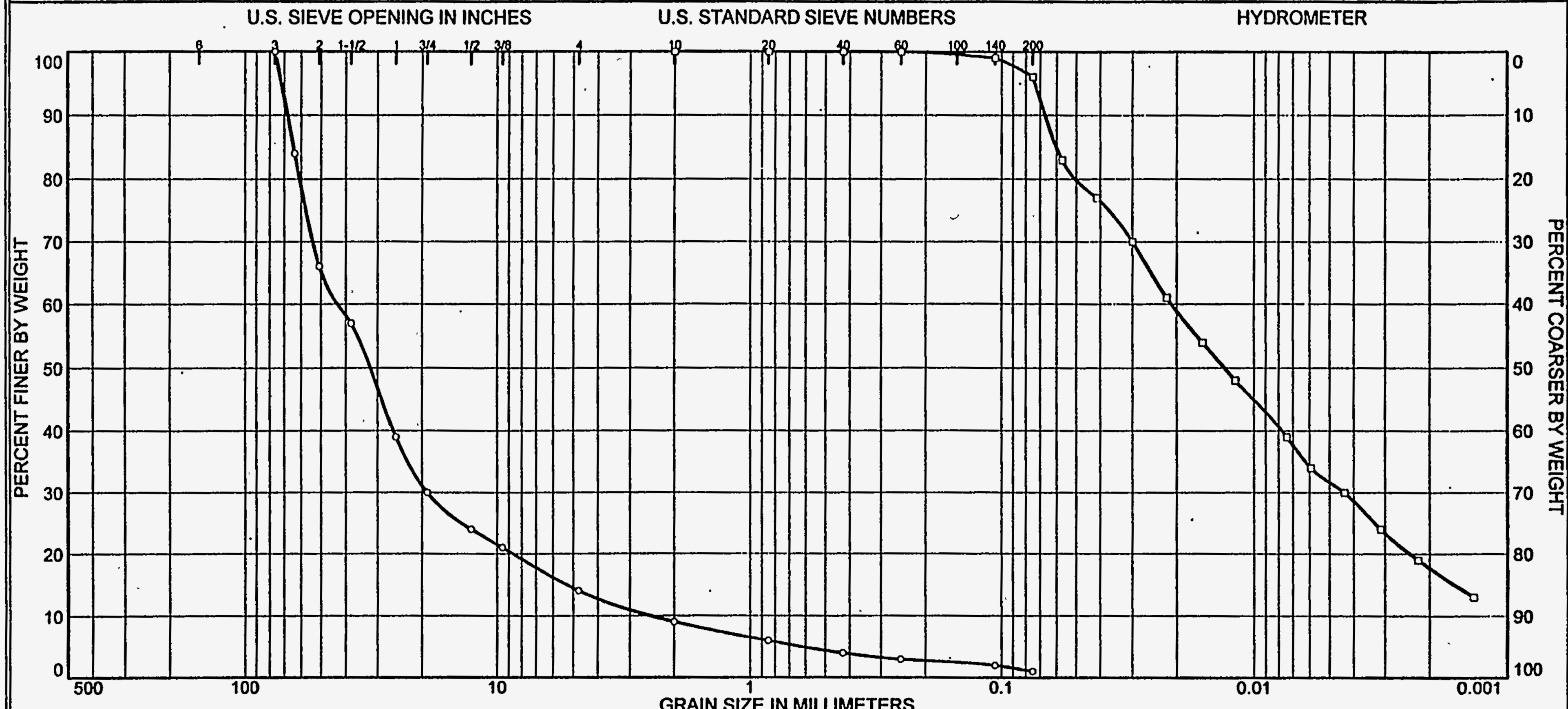
SOIL TECHNOLOGY, INC.

○

□

D.3

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
○	0	86	13	1	
□	0	0	4	64	32

	SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PL
○		BOJ5Y5	325-327		GP	Poorly graded gravel			
□		BOJ5Y6	371.9-372.2		ML	Silt			

Client Battelle Pacific Northwest Laboratories
Project RCRA Groundwater Well Samples
RCRA Groundwater Well Samples
Project No. J-1000 Plate 1

SOIL TECHNOLOGY, INC.

○
□

D.4

XRD RESULTS

Sample : **Core Sample , Well 699 - 37 - 47A , Depth 374.1**

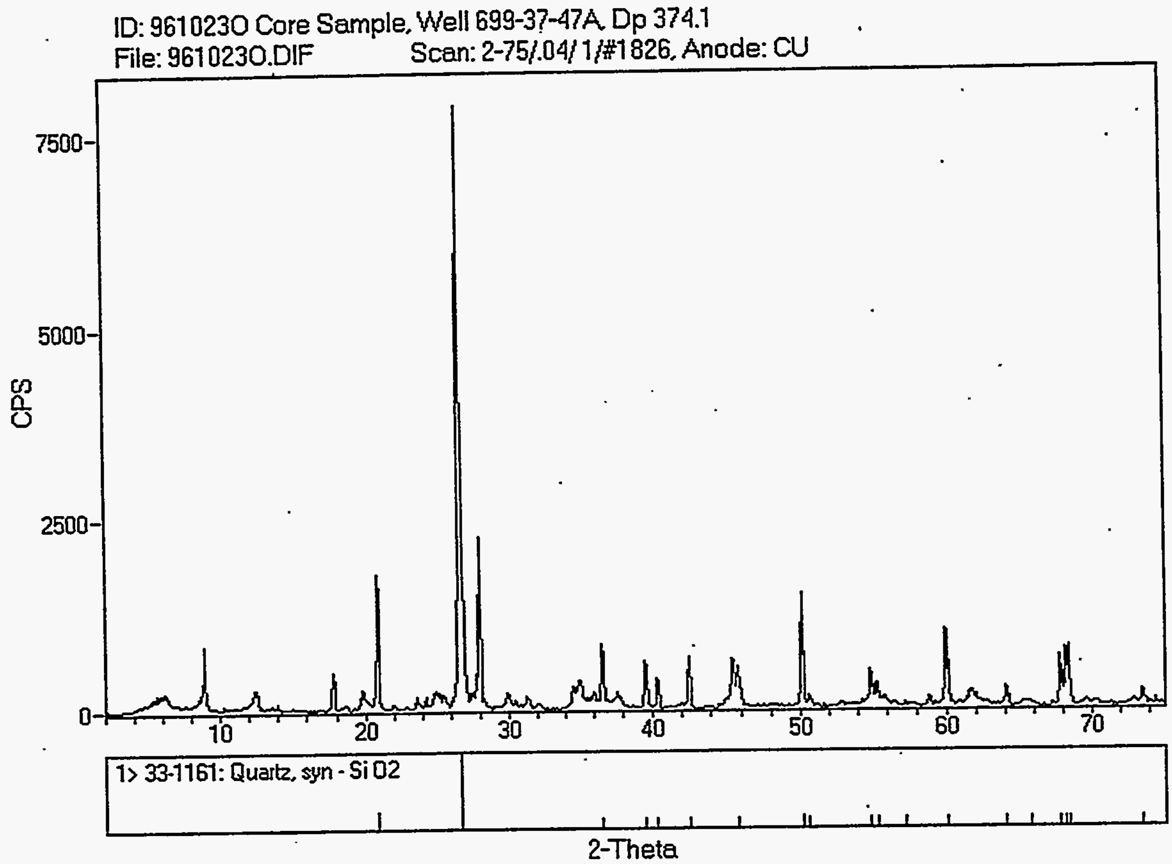
Phase	**PDF #**	**Semi Quant (wt%)**
Quartz, SiO_2	33-1161	70
Albite, $NaAlSi_3O_8$(1)	9-466	20
Muscovite (Illite) Type(2)	6-263 (26-911)	<10
Clinochlore (Vermiculite) Type(3)	16-613	<5

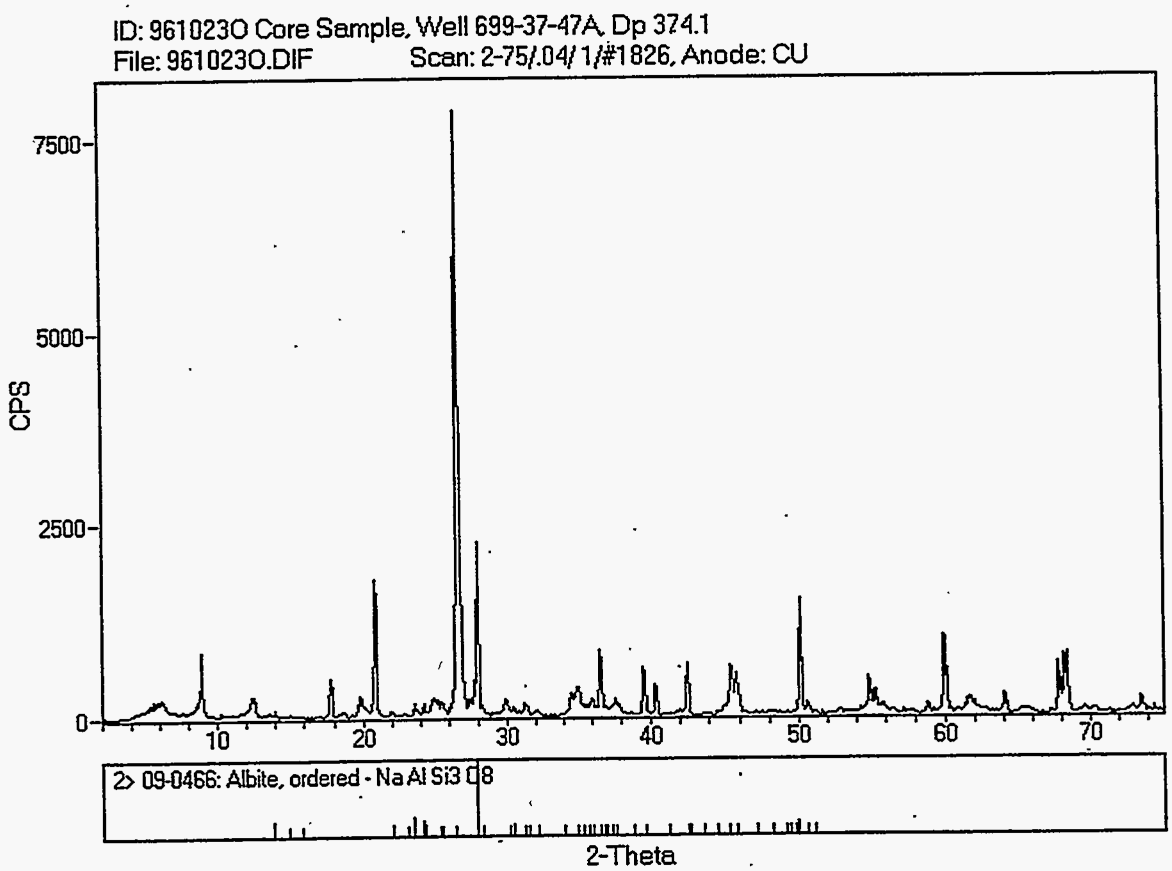
Notes

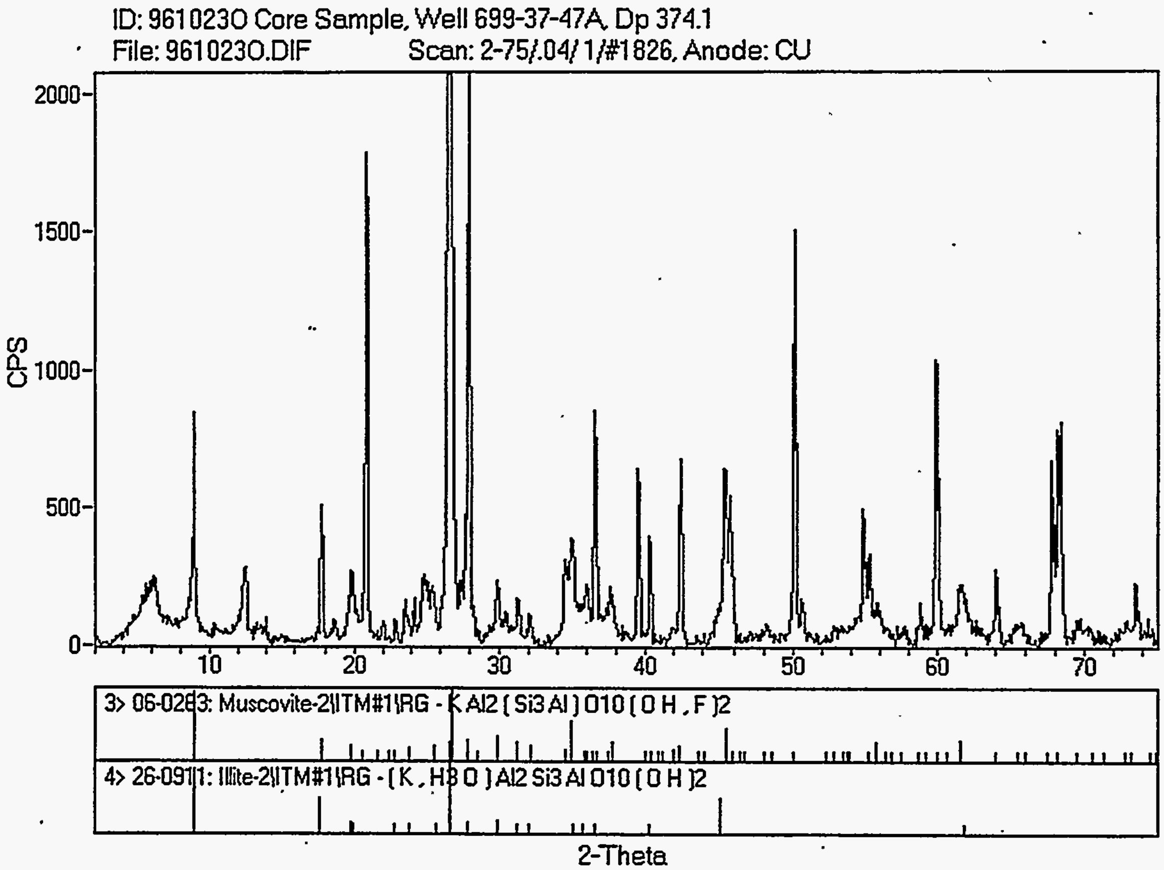
1) Solid solution *possible* in the case of the *structure match* with Albite, PDF 9-466.

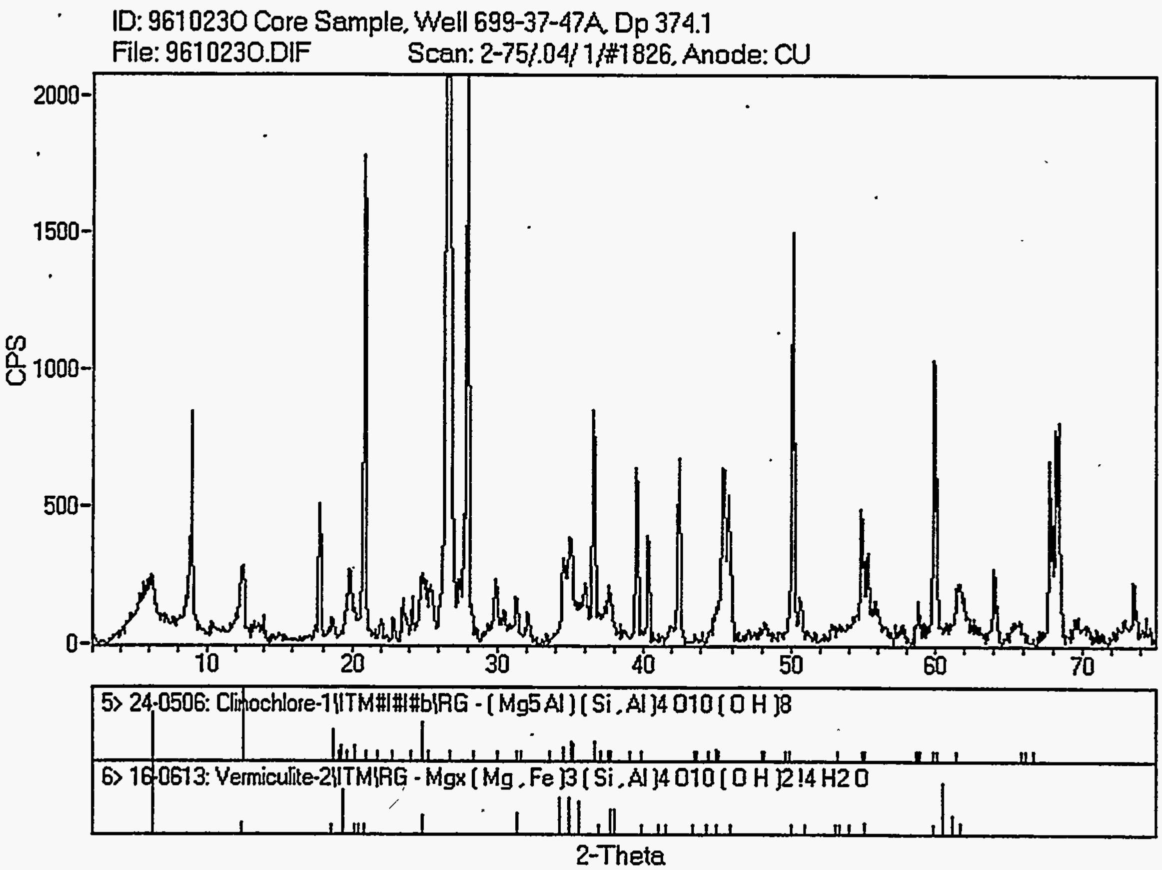
2) Solid solution *likely* in the case of the identified illite-type clay. Also, calculated concentration was ~8 wt%.

3) Solid solution *likely* in the case of the identified vermiculite-type clay. Also, calculated concentration was ~2 wt%.


ID: 9610230 Core Sample, Well 699-37-47A, Dp 374.1
File: 9610230.DIF
Scan: 2-75/.04/1/#1826, Anode: CU
7500
5000
2500
0
CPS
10
20
30
40
50
60
70
1> 33-1161: Quartz, syn - Si O2
2-Theta


ID: 9610230 Core Sample, Well 699-37-47A, Dp 374.1
File: 9610230.DIF
Scan: 2-75/.04/1/#1826, Anode: CU
7500
5000
2500
0
CPS
10
20
30
40
50
60
70
2> 09-0466: Albite, ordered - Na Al Si3 O8
2-Theta


ID: 9610230 Core Sample, Well 699-37-47A, Dp 374.1
File: 9610230.DIF
Scan: 2-75/.04/1/#1826, Anode: CU
CPS
2000
1500
1000
500
0
10
20
30
40
50
60
70
3> 06-0263: Muscovite-2\ITM#1\RG - K Al2 (Si3 Al) O10 (O H , F)2
4> 26-0911: Illite-2\ITM#1\RG - (K , H3 O) Al2 Si3 Al O10 (O H)2
2-Theta


ID: 9610230 Core Sample, Well 699-37-47A, Dp 374.1
File: 9610230.DIF
Scan: 2-75/.04/1/#1826, Anode: CU
CPS
2000
1500
1000
500
0
10
20
30
40
50
60
70
5> 24-0506: Clinochlore-1\ITM#I#I#b\RG - (Mg5 Al) (Si , Al)4 O10 (O H)8
6> 16-0613: Vermiculite-2\ITM\RG - Mgx (Mg , Fe)3 (Si , Al)4 O10 (O H)2 !4 H2 O
2-Theta

33-1161 JCPDS-ICDD Copyright (c) 1995 PDF-2 Sets 1-45 database Quality: *

SiO_2

Silicon Oxide

Quartz, syn

Rad: CuKa1 Lambda: 1.540598 Filter: Mono. d-sp: Diff.
Cutoff: Int: Diffractometer I/Icor: 3.6
Ref: Natl. Bur. Stand. (U.S.) Monogr. 25, 18 61 (1981)

Sys: Hexagonal S.G.: P3221 (154)
a: 4.9133(2) b: c: 5.4053(4) A: C: 1.1001
A: B: C: Z: 3 mp:
Ref: Ibid.

Dx: 2.65 Dm: 2.66 SS/FOM: F30=77(.013,31)

ea: nwB: 1.544 ey: 1.553 Sign: + 2V:
Ref: Swanson, Fuyat, Natl. Bur. Stand. (U.S.), Circ. 539, 3 24 (1954)

Color: Colorless
Pattern taken at 25 C. Sample from the Glass Section at NBS, Gaithersburg, Maryland, USA, ground single-crystals of optical quality. Pattern reviewed by Holzer, J., McCarthy, G., North Dakota State University, Fargo, North Dakota, USA, ICDD Grant-in-Aid (1990). Agrees well with experimental and calculated patterns. O2Si type. Quartz group. Also called: silica. Also called: low quartz. Si used as internal standard. PSC: hP9. To replace 5-490 and validated by calculated pattern. Plus 6 additional reflections to 0.9089.
Mwt: 60.08. Volume[CD]: 113.00.

d A	Int.	h k l
4.257	22	1 0 0
3.342	100	1 0 1
2.457	8	1 1 0
2.282	8	1 0 2
2.237	4	1 1 1
2.127	6	2 0 0
1.9792	4	2 0 1
1.8179	14	1 1 2
1.8021	<1	0 0 3
1.6719	4	2 0 2
1.6591	2	1 0 3
1.6082	<1	2 1 0
1.5418	9	2 1 1
1.4536	1	1 1 3
1.4189	<1	3 0 0
1.3820	6	2 1 2
1.3752	7	2 0 3
1.3718	8	3 0 1
1.2880	2	1 0 4
1.2558	2	3 0 2
1.2285	1	2 2 0
1.1999	2	2 1 3
1.1978	1	2 2 1
1.1843	3	1 1 4
1.1804	3	3 1 0

d A	Int.	h k l	d A	Int.	h k l	d A	Int.	h k l
1.1532	1	3 1 1	1.0476	1	1 0 5	0.9873	1	3 1 3
1.1405	<1	2 0 4	1.0438	<1	4 0 1	0.9783	<1	3 0 4
1.1143	<1	3 0 3	1.0347	<1	2 1 4	0.9762	1	3 2 0
1.0813	2	3 1 2	1.0150	1	2 2 3	0.9636	<1	2 0 5
1.0635	<1	4 0 0	0.9898	1	4 0 2			

Strong lines: 3.34/X 4.26/2 1.82/1 1.54/1 2.46/1 2.28/1 1.37/1 1.38/1

9- 466 JCPDS-ICDD Copyright (c) 1995 PDF-2 Sets 1-45 database Quality: *

$NaAlSi_3O_8$

Sodium Aluminum Silicate

Albite, ordered

Rad: CuKa1 Lambda: 1.5405 Filter: Ni d-sp:
Cutoff: Int: Diffractometer I/Icor: 2.1
Ref: Smith, Mineral. Mag., 31 47 (1956)

Sys: Triclinic S.G.: C-1 (2)
a: 8.144 b: 12.787 c: 7.160 A: C:
A: 94.26 B: 116.6 C: 87.67 Z: 4 mp: 1118 deg.
Ref: Ibid.

Dx: 2.62 Dm: 2.61 SS/FOM: F30=36(.014,60)

ea: 1.525 nwB: 1.529 ey: 1.536 Sign: + 2V: 70 deg.
Ref: Winchell, H., Elements of Optical Mineralogy, 2 312 (1951)

Color: Colorless, gray, white, bluish
Specimen from Amelia, Virginia, USA. Composition (wt.%): albite 98.2, orthoclase 1.8. Low temperature structure. For variations in 2theta with composition to 50% anorthite see Smith, Mineral. Mag., 31 47 (1956), also Smith, Yoder, Am. Mineral., 41 632 (1956). Feldspar group, plagioclase subgroup. C.D. Cell: a=7.439, b=7.718, c=7.160, alpha=107.32, beta=100.44, gamma=115.03, a/b=0.9638, c/b=0.9276, S.G.=P-1 (2). PSC: aP26. To replace 1-739 and validated by calculated pattern 20-554. Mwt: 262.22. Volume[CD]: 332.42.

d A	Int.	h k l
6.39	20	0 0 1
5.94	2	-1 -1 1
5.59	2	-1 1 1
4.03	16	-2 0 1
3.857	8	1 -1 1
3.780	25	1 1 1
3.684	20	1 3 0
3.663	16	-1 -3 1
3.509	10	-1 -1 2
3.484	2	-2 -2 1
3.375	8	-1 1 2
3.196	100	0 0 2
3.151	10	-2 2 0
2.964	10	1 -3 1
2.933	16	0 -2 2
2.866	8	1 3 1
2.843	2	-1 -3 2
2.787	2	0 2 2
2.639	6	-1 3 2
2.563	8	-2 -4 1
2.538	2	-3 -1 2
2.511	2	1 -1 2
2.496	6	2 -2 1
2.460	6	2 2 1
2.443	4	-2 4 1
2.431	2	-1 -5 1
2.405	2	2 4 0
2.388	4	3 1 0
2.320	4	-3 -3 1
2.278	2	-1 1 3
2.189	4	0 4 2
2.125	8	0 6 0
2.119	6	-1 -3 3
2.076	2	2 -4 1
2.035	2	2 4 1
2.000	2	2 0 2
1.980	4	0 6 1
1.927	2	2 -2 2
1.889	8	2 2 2
1.851	2	-4 0 3
1.844	3	-2 6 1
1.829	4	-2 6 0
1.824	18	0 -4 3
1.804	6	1 1 3
1.785	8	-2 0 4

Strong lines: 3.20/X 3.78/3 6.39/2 3.68/2 1.82/2 4.03/2 3.66/2 2.93/2

$KAl_2(Si_3Al)O_{10}(OH,F)_2$

Potassium Aluminum Silicate Hydroxide

Muscovite-2M1

Rad: CuKa Lambda: 1.5418 Filter: Ni d-sp:
Cutoff: Int: Diffractometer I/Icor:
Ref: Gillery, F., Penn State University, University Park, Pennsylvania, USA, Private Communication

Sys: Monoclinic S.G.: C2/c (15)
a: 5.19 b: 9.03 c: 20.05 A: C:
A: B: 95.77 C: Z: 4 mp:
Ref: Ibid.

Dx: 2.84 Dm: SS/FOM: F30=12(.045,56)

ea: 1.50-1.56 nwB: ey: 1.59-1.61 Sign: - 2V: 36-50 deg.
Ref: Hendricks, Jefferson, Am. Mineral., 24 759 (1939)

Color: Colorless
Space group by Jackson, West, Z. Kristallogr., 76 211 (1930) and Hendricks, Jefferson, Am. Mineral., 24 729 (1939). Other sources give refractive indexes for muscovites: epslionalpha=1.55-1.57, nomegabeta=1.58-1.61, epsliongamma=1.59-1.62. Locality not given. Mica group, dioctahedral subgroup. C.D. Cell: a=20.050, b=9.030, c=5.190, beta=95.77, a/b=2.2204, c/b=0.5748, S.G.=A2/a (15). PSC: mC84. Volume[CD]: 934.90.

d A	Int.	h k l
9.95	95	0 0 2
4.97	30	0 0 4
4.47	20	-1 1 1
4.30	4	1 1 1
4.11	4	0 2 2
3.95	6	1 1 2
3.88	14	-1 1 3
3.73	18	0 2 3
3.48	20	-1 1 4
3.34	25	0 2 4
3.32	100	0 0 6
3.19	30	1 1 4
3.12	2	-1 1 5
2.987	35	0 2 5
2.859	25	1 1 5
2.789	20	-1 1 6
2.596	16	-1 3 1
2.566	55	1 1 6
2.505	8	-1 1 7
2.491	14	0 0 8
2.465	8	-1 3 3
2.450	8	2 0 2
2.398	10	-2 0 4
2.384	25	1 3 3
2.254	10	0 4 0

d A	Int.	h k l	d A	Int.	h k l	d A	Int.	h k l
2.236	4	-1 3 5	1.646	25	1 3 9	1.267	4	0 4 13
2.208	8	2 2 1	1.631	6	-1 5 4	1.253	6	-2 2 14
2.189	4	0 2 8	1.620	6	2 4 3	1.246	8	-3 5 0
2.149	16	2 2 2	1.603	6	-2 4 5	1.227	4	3 5 2
2.132	20	1 3 5	1.573	4	-3 1 6	1.221	6	-1 7 4
2.070	4	2 2 3	1.559	8	-2 2 10	1.208	4	3 5 3
2.053	6	0 4 4	1.541	4	-1 5 6	1.200	4	4 2 3
1.993	45	0 0 10	1.524	12	-1 3 11	1.1903	4	-2 2 15
1.972	10	-1 3 7	1.504	30	-2 4 7	1.1828	4	-1 7 6
1.951	6	2 0 6	1.453	4	0 2 13	1.1582	2	0 6 11
1.941	4	-2 2 6	1.424	2	0 0 14	1.1300	2	2 6 8
1.894	2	-2 0 8	1.414	2	0 4 11	1.1220	4	1 5 13
1.871	4	1 3 7	1.388	2	1 5 8	1.1167	4	0 6 12
1.822	4	0 2 10	1.375	2	-3 3 7			
1.746	4	-2 2 8	1.352	12	-1 3 13			
1.731	8	-1 3 9	1.335	10	-3 3 8			
1.710	6	2 0 8	1.321	4	-2 2 13			
1.704	6	-1 5 1	1.299	8	-2 6 0			
1.699	4	-3 1 1	1.292	6	-3 3 9			
1.662	12	0 0 12	1.274	6	-2 6 4			

Strong lines: 3.32/X 9.95/X 2.57/6 1.99/5 2.99/4 4.97/3 3.19/3 1.50/3

$(K,H_3O)Al_2Si_3AlO_{10}(OH)_2$

Potassium Aluminum Silicate Hydroxide

Illite-2M1

Rad: CoKa Lambda: 1.7902 Filter: Fe d-sp:
Cutoff: Int: Diffractometer I/Icor:
Ref: Sekino et al., Neues Jahrb. Mineral., Monatsh., 189 (1973)

Sys: Monoclinic S.G.: C2/c (15)
a: 5.19 b: 9.00 c: 20.16 A: C:
A: B: 95.18 C: Z: 4 mp:
Ref: Ibid.

Dx: 2.82 Dm: 2.79 SS/FOM: F18=2(.082,148)

ea: 1.579 nwB: 1.602 ey: 1.618 Sign: - 2V: 37 deg.
Ref: Ibid.

Color: White
Specimen from Tanakami-yama pegmatite, Shiga Prefecture, Japan. Chemical analysis (wt.%): SiO2 45.67, Al2O3 36.88, MnO 0.82, K2O 8.90, H2O 6.78, F 0.64, minor Na2O, FeO, Fe2O3. Density calculated for K1 no H3O. 2M1 structure. Mica group, dioctahedral subgroup. C.D. Cell: a=20.160, b=9.000, c=5.190, beta=95.18, a/b=2.2400, c/b=0.5767, S.G.=A2/a (15). Si used as internal standard. PSC: mC84. To replace 9-334 and 15-603. Volume[CD]: 937.83.

d A	Int.	h k l
10.0	90	0 0 2
5.02	50	0 0 4
4.48	16	1 1 0
4.44	14	-1 1 1
3.89	8b	-1 1 3
3.72	12	0 2 3
3.46	14b	-1 1 4
3.34	100	0 0 6
3.20	16	1 1 4
2.988	18b	0 2 5
2.867	12b	1 1 5
2.799	12	-1 1 6
2.558	12b	1 3 1
2.509	8	0 0 8
2.463	8	-1 3 3
2.241	4	2 2 0
2.005	50	1 3 6
1.499	14	-3 3 1

Strong lines: 3.34/X 10.0/9 5.02/5 2.01/5 2.99/2 4.48/2 3.20/2 4.44/1

$(Mg\ Al)_5(Si,Al)_4O_{10}(OH)_8$

Magnesium Aluminum Silicate Hydroxide

Clinochlore-1MIIb

Rad: FeKa1 Lambda: 1.93597 Filter: d-sp: Calculated
Cutoff: Int: Calculated I/Icor:
Ref: Smith, D. et al., Penn State University, University Park, Pennsylvania, USA, ICDD Grant-in-Aid, (1973)

Sys: Triclinic S.G.: P1 (1)
a: 5.34 b: 9.27 c: 14.36 A: C:
A: 90.0 B: 97.36 C: 90.0 Z: 2 mp:
Ref: Steinfink, Acta Crystallogr., 11 195 (1958)

Dx: 2.63 Dm: SS/FOM: F30=46(.006,101)

ea: nwB: ey: Sign: 2V:
Ref:

Peak height intensities. Specimen from Mochako District, Kenya. Analysis (wt.%): SiO2 27.4, Fe2O3 2.4, FeO 0.8, Al2O3 18.9, Cr2O3 2.3, MgO 34.0. Chlorite group, tri/trioctahedral subgroup. C.D. Cell: a=9.270, b=14.360, c=5.340, alpha=97.36, beta=90.00, gamma=90.00, a/b=0.6455, c/b=0.3719. PSC: aP72. Volume[CD]: 704.99.

d A	Int.	h k l
14.242	67	0 0 1
7.121	100	0 0 2
4.747	43	0 0 3
4.635	7	0 2 0
4.598	22	1 1 0, -1 1 0
4.526	9	-1 -1 1, -1 1 1
4.407	22	0 -2 1, 0 2 1
4.240	8	1 -1 1, 1 1 1
4.075	13	-1 1 2, -1 -1 2
3.885	6	0 2 2
3.681	8	1 -1 2, 1 1 2
3.560	53	0 0 4
3.503	6	-1 -1 3
3.316	5	0 -2 3, 0 2 3
3.133	4	1 -1 3, 1 1 3
2.980	3	-1 1 4
2.848	9	0 0 5
2.824	3	0 2 4, 0 -2 4
2.669	3	1 1 4, -1 3 0
2.593	19	[1 3 1, -2 0 2]
2.554	27	-1 3 2, -1 -3 2
2.545	23	2 0 1
2.448	25	[1 3 2, 2 0 -3]
2.427	2	0 -2 5
2.393	9	-1 3 3, -1 -3 3

d A	Int.	h k l	d A	Int.	h k l	d A	Int.	h k l
2.384	6	2 0 2	1.8334	5	-1 -3 6, -1 3 6	1.5086	4	-3 -3 3
2.309	2	1 1 5, 1 -1 5	1.8262	3	2 0 5	1.5063	4	3 -3 1, 3 3 1
2.265	10	1 -3 3, 1 3 3	1.7194	2	1 -3 6, 1 3 6	1.4172	2	-3 -3 5, -3 3 5
2.077	2	-2 0 5	1.6709	2	-1 3 7, -1 -3 7	1.4134	2	3 3 3, 3 -3 3
2.072	3	1 -3 4, 1 3 4	1.6647	2	-1 5 3, 2 0 6	1.4014	6	-1 3 9, -1 -3 9
2.035	2	0 0 7	1.5737	5	-2 0 8			
2.013	16	-1 -3 5, -1 3 5	1.5699	9	1 -3 7, 1 3 7			
2.005	10	2 0 4	1.5667	5	2 2 6			
1.892	4	-2 0 6	1.5424	14	-3 -3 1			
1.8877	6	1 -3 5, 1 3 5	1.5360	8	0 -6 1, 0 6 1			

Strong lines: 7.12/X 14.2/7 3.56/5 4.75/4 2.55/3 2.45/3 4.60/2 4.41/2

16-613 JCPDS-ICDD Copyright (c) 1995 PDF-2 Sets 1-45 database Quality: i

$Mg_x (Mg,Fe)_3 (Si,Al)_4 O_{10} (OH)_2$!4H_2O

Magnesium Iron Aluminum Silicate Hydroxide Hydrate

Vermiculite-2M

Rad: CuKa Lambda: 1.5418 Filter: d-sp: Guinier
Cutoff: Int: Densitometer I/Icor:
Ref: Mukherjee, Clay Miner. Bull., 5 194 (1963)

Sys: Monoclinic S.G.: C2/c (15)
a: 5.24 b: 9.17 c: 28.60 A: C:
A: B: 94.6 C: Z: 4 mp:
Ref: Ibid.

Dx: 2.26 Dm: 2.28 SS/FOM: F30=3(.054,203)

ea: 1.525 nwB: 1.545 ey: 1.545 Sign: - 2V: 0 deg.
Ref: Winchell, H., Elements of Optical Mineralogy, 2 396 (1951)

Color: Brown, green
Specimen from Ajmer-Marwar, India (Indian Museum 8247). CAS no.: 1318-00-9.
Analysis (wt.%): SiO2 34.92, Al2O3 13.97, Fe2O3 6.25, FeO 0.52, MgO 20.37, CaO 2.15, Na2O 0.32, H2O 21.00. Chlorite group, tri/trioctahedral subgroup.
C.D. Cell: a=28.600, b=9.170, c=5.240, beta=94.60, a/b=3.1189, c/b=0.5714, S.G.=A2/a (15). PSC: mC1408. To replace 10-418 and validated by calculated pattern 34-166. Structure reference: Shirozu, H., Bailey, S., Am. Mineral., 51 1124 (1966). Volume[CD]: 1369.83.

d A	Int.	h k l
14.2	100	0 0 2
7.14	15	0 0 4
4.76	10	0 0 6
4.57	60	0 2 0
4.41	10	-1 1 2
4.35	10	0 2 2
4.25	"	1 1 2
3.56	25	0 0 8
2.85	30	0 0 10
2.615	50	-1 3 2
2.570	50	-1 3 3
2.525	45	-2 0 4
2.430	5	-1 3 5
2.380	35	0 0 12
2.365	"	-2 0 6
2.265	5	-2 2 2
2.200	5	-2 2 4
2.170	"	-1 1 12
2.080	5b	1 3 8
2.040	10	0 0 14
2.010	"	-2 0 10
1.975	5	-1 3 10
1.820	5	1 3 11
1.790	"	2 2 9
1.725	10	-2 4 1

d A	Int.	h k l	d A	Int.	h k l	d A	Int.	h k l
1.715	"	-3 1 1	1.514	25	1 3 15			
1.695	5	-2 4 4	1.502	15	1 5 9			
1.665	15	-1 5 5						
1.543	10	1 5 8						
1.528	70	0 6 0						

Strong lines: 14.2/X 1.53/7 4.57/6 2.62/5 2.57/5 2.53/5 2.37/4 2.85/3

Battelle
Pacific Northwest Laboratories

XRD - REQUEST FOR ANALYTICAL SERVICE

This Analysis is Governed by QA Plan MCS-007

*Impact Level ☐ I ☐ II ☒ III (Refer to PAP-70-208)

*Work Requested By	*Phone	*Mail Stop	DATE
JWLindberg	376-5005	K6-81	*Submitted
*Org Code: D9T21	*Payroll No.: 35976	*Work Package No.: M83734	*Required

*Samples:

Core - Ringold Fm, Lower Mud Unit, Well 699-37-47A
Depth 374.1'
Sample # B0J5Y6

*Possible Chemistry (cations, anions, functional groups):

Geological Sample

*Analysis Required (check all that apply):

- ☒ Qualitative Phase Identification
- ☐ Crystallite Size
- ☐ Lattice Parameter Determination
- ☐ Data Collection ONLY (2-Theta Range ______ Scan Rate ______)
- ☐ Other (specify):
- ☒ Semi Quantitative Analysis
- ☐ Quantitative Analysis

*Requestor Supplied Information

*Requestor Signature: JW Lindberg

Analytical Procedure Used: PNL-SP-2

M&TE ID No.: APD3620

Analyst: [signature]

Date: 10/23/96

Reviewer: N. T. Saay

Date: 10/23/96

BD-1700-003 (04/93)

XRD Sample / File Log

form : lgbk_one.wri

Requestor : Lindberg Wk Pkg : M83734

Report Date : 10/23/96 Operator : DEMc

Sample : Core Sample Datafile : 961230

Well 699-37-47A

Depth 374.1

Experimental Summary

Apparatus : ✓ Philips X-Ray Diffractometer (M&TE ID APD3620)

___ Philips X-Ray Diffractometer (M&TE ID APD3621)

Anode (fixed) : ✓ Cu ___ Other :

V / I (power) : ✓ 45 kV / 40 mA ___ Other :

Sample Mount : ✓ Zero Bkgnd Cavity (12 mm) ___ Zero Bkgnd Cavity (9 mm)

___ Zero Bkgnd Plate ___ Glass Cavity

___ Self (monolithic solids) ___ Other :

2θ Range : ___ 5 - 75° ✓ Other : 2-75

Scan Rate : ✓ 0.04° / 2 sec ___ Other :

___ 0.05° / 2 sec

Temperature : ✓ Room Temp ___ Other :

PROJECT SPECIFIC RECORD TRANSFER FORM

To: Project Record Custodian (Customer)

From: KLM Analytical EDXRF Service Center

The records listed below are being submitted to the Project Records Custodian (as defined by the Task File Index) for storage in the program files. These records have been inspected for legibility, completeness, and clarity and were generated in response to Purchase Request # M83734.

Type of records:

Final Report - 16-1 (WDXRF)
3 1/2" diskette (161WD1.WKS and 161WD1.XLS)
COC for Project W-152/RCRA
Invoice # 44

[signature]
Analytical Service Center Manager

11/1/96
Date

The records listed above have been received, inspected and stored. I am signing and returning this form to the indicated Analytical Service Center as proof of receipt. Mail to KLM Analytical, 2000 Logston Blvd. Richland WA 99352

Project Records Custodian

Date

TEST/ANALYSIS SUMMARY for - KLM-ARF-16-1

KLM ANALYTICAL EDXRF ANALYSIS SERVICE CENTER: 2000 LOGSTON BLVD. RICHLAND WA

IDENTIFICATION

Project W152 RCRA (Basalt) ~~PR#~~ LOI ~~NA~~ well 699-37-47A

Requester J.V. Lindberg WP# M83734

ARF# 16-1

Requester Sample Numbers Analyzed: Basalt Drill Cuttings (699-37-47A) at depth of 517' - 525' (525')

Service Lab Identification Numbers: R1-16-1, R2-16-2, R3-16-3

Type of Analysis WDXRF Date 10-30/31-96

MEASURING TEST EQUIPMENT USED

Instrument	Calib. No	Instrument	Calibration No.
[ ] XRF 0810	RGD #09	[ ] Balance	512-06-03-017
[ ] XRF 0810a	RGD #10	[ ] Balance	512-06-03-018
[ ] XRF 770	RGD #31	[ ] Balance	512-06-03-015
[X] XRF SRS3000	RGD #42		

ANALYTICAL METHOD USED:

Procedures used: (See ARF for Designated Procedure)

[ ] ALO 266 [X] APM [ ] ______ [ ] ______
[ ] 7-40-48 [ ] ______ [ ] ______

Test Instructions used: NA

Standards Used: USGS - BCR-1 and BHVO-1

M and TE performed checks included with data [X]

TEST/ANALYSIS SUMMARY PREPARED BY [signature] DATE: 11/1/96

edxrf and wdxrf												
results												
	oxide	BCR-1		BHVO-1		ARC -1		16-1		16-1		
	con factor		%		%		%		%		%	
		ppm	oxide	ppm	oxide	ppm	oxide	ppm	oxide	ppm	oxide	
F WDXRF	1.0000	501	0.05	273	0.0273	394	0.04	660	0.07	660	0.07	F WDXRF
Na WDXRF	1.3480	24184	3.26	17211	2.32	21513	2.90	16543	2.23	16766	2.26	Na WDXRF
Mg WDXRF	1.6581	20686	3.43	43906	7.28	19058	3.16	22797	3.78	22857	3.79	Mg WDXRF
Al WDXRF	1.8895	72982	13.79	71500	13.51	67531	12.76	68166	12.88	68113	12.87	Al WDXRF
Al xrf	1.8895	72300	13.66	81400	15.38	72800	13.76	72000	13.60			Al xrf
Si WDXRF	2.1393	255364	54.63	233020	49.85	247604	52.97	241761	51.72	242042	51.78	Si WDXRF
Si xrf	2.1393	256000	54.77	232000	49.63	254000	54.34	238000	50.92			Si xrf
P WDXRF	2.2914	1702	0.39	960	0.22	3404	0.78	2662	0.61	2575	0.59	P WDXRF
P xrf	2.2914	1700	0.39	2000	0.46	2980	0.68	1800	0.41			P xrf
S WDXRF	2.5000	394	0.10	98	0.02	582	0.15	480	0.12	465	0.12	S WDXRF
S xrf	2.5000	441	0.11	351	0.09	640	0.16	493	0.12			S xrf
Cl WDXRF	1.0000	64	0.01	80	0.01	119	0.01	89	0.01	79	0.01	Cl WDXRF
Cl XRF	1.0000	140	0.01	160	0.02	160	0.02	150	0.02			Cl XRF
K WDXRF	1.2046	14196	1.71	4400	0.53	20588	2.48	9879	1.19	9796	1.18	KWDXRF
K xrf	1.2046	14050	1.69	4180	0.50	20300	2.45	9890	1.19			Kxrf
Ca WDXRF	1.3992	48599	6.80	81975	11.47	44383	6.21	62750	8.78	63322	8.86	CaWDXRF
Ca xrf	1.3992	49200	6.88	86900	12.16	51770	7.24	65300	9.14			Caxrf
Ti WDXRF	1.6681	13488	2.25	15886	2.65	17025	2.84	20682	3.45	21042	3.51	Ti WDXRF
T ixrf	1.6681	13200	2.20	16660	2.78	17710	2.95	20300	3.39			Tixrf
V WDXRF	1.6282	441	0.07	513	0.08	561	0.09	654	0.11	666	0.11	V WDXRF
V xrf	1.6282	399	0.06	462	0.08			555	0.09			V xrf
Cr WDXRF	1.4616	16	0.00	287	0.04	22	0.00	21	0.00	19	0.00	Cr WDXRF
Cr xrf	1.4616	7	0.00	267	0.04	41	0.01	8.4	0.00			Cr xrf
Mn WDXRF	1.2912	1451	0.19	1297	0.17	1552	0.20	1373	0.18	1369	0.18	Mn WDXRF
Mn xrf	1.2912	1401	0.18	1356	0.18	1631	0.21	1503	0.19			Mnxrf
FeWDXRF	1.4297	93306	13.34	84773	12.12	94705	13.54	100650	14.39	101140	14.46	FeWDXRF
Fe xrf	1.4297	93680	13.39	88550	12.66	101100	14.45	111260	15.91			Fexrf
Co WDXRF	1.2715	43	0.01	39	0.01	42	0.01	47	0.01	48	0.01	Co WDXRF
Co xrf	1.2715	87	0.01	87	0.01	42	0.01	98	0.01			Co XRF
Ni xrf	1.2725	9	0.00	132	0.02	0	0.00	30.3	0.00			Nixrf
Ni WDXRF	1.2725	17	0.00	115	0.01	20	0.00	24	0.00	22	0.00	Ni WDXRF
Cu xrf	1.2518	21	0.00	136	0.02	14	0.00	26.3	0.00			Cuxrf
Cu WDXRF	1.2518	16	0.00	134	0.02	14	0.00	20	0.00	21	0.00	Cu WDXRF
Zn xr	1.2448	126	0.02	102	0.01	129	0.02	151.7	0.02			Znxr
Zn WDXRF	1.2448	125	0.02	95	0.01	129	0.02	134	0.02	133	0.02	Zn WDXRF
Ga xrf	1.3442	24	0.00	22	0.00	21	0.00	20.8	0.00			Ga xrf
Se xrf	1.4053	2	0.00	2	0.00			1.6	0.00			Sexrf
Pb xrf	1.1545	17	0.00	4	0.00	9	0.00	5.6	0.00			Pbxrf
As xrf	1.3203	3	0.00	2	0.00			2.5	0.00			As xrf
Br xrf	1.0000	2	0.00	1	0.00			1.5	0.00			Br xrf
Rb xrf	1.2807	46	0.01	9	0.00	45	0.01	28.02	0.00			Rbxrf
Sr xrf	1.1826	330	0.04	401	0.05	290	0.03	251	0.03			Srxrf
Sr WDXRF	1.1826	304	0.04	353	0.04	238	0.03	240	0.03	229	0.03	Sr WDXRF
Y xrf	1.2699	36	0.00	23	0.00	42	0.01	44.4	0.01			Yxrf
Zr xrf	1.3508	190	0.03	153	0.02	397	0.05	220	0.03			Zrxrf
ZR WDXRF	1.3508	175	0.02	166	0.02	392	0.05	234	0.03	218	0.03	ZR WDXRF
Nb xrf	1.4305	9	0.00	17	0.00	17	0.00	19.1	0.00			Nbxrf
Mo xrf	1.5003	0	0.00	6	0.00			7.0	0.00			Moxrf
Ru xrf	1.2375	0	0.00	4	0.00			7.6	0.00			Ruxrf
Rh xrf	1.2332	0	0.00	8	0.00			7.9	0.00			Rhxrf
Pd xrf	1.1471	0	0.00	8	0.00			8.1	0.00			Pdxrf
Ag xrf	1.0742	0	0.00	8	0.00			7.9	0.00			Agxrf
Cd xrf	1.1424	0	0.00	7	0.00			7.1	0.00			Cdxrf
Sn xrf	1.1348	0	0.00	9	0.00			8.7	0.00			Snxrf
Sb xrf	1.3285	0	0.00	11	0.00			13	0.00			Sb xrf
Te xrf	1.2508	0	0.00	13	0.00			18	0.00			Texrf
Cs xrf	1.0602	0	0.00	28	0.00			33	0.00			Csxrf
Ba xrf	1.1165	675	0.08	152	0.02	3040	0.34	461	0.05			Baxrf
Ba WDXRF	1.1165	688	0.08	154	0.02	2958	0.33	554	0.06	558	0.06	BaWDXRF
La xrf	1.1728	0	0.00	49	0.01	105	0.01	54	0.01			Laxrf
La WDXRF	1.1728	0	0.00	26	0.00	23	0.00	23	0.00	23	0.00	LaWDXRF
Ce xrf	1.2284	0	0.00	60	0.01	113	0.01	86	0.01			Cexrf
Ce WDXRF	1.2284	49	0.01	41	0.01	138	0.02	54	0.01	56	0.01	Ce WDXRF
												LOI Wt %
Wt.% total	WDXRF											
	xrf											
			100.24		102.11		100.72		100.46		99.93	

Calibration Not linear ns

Final Report: KLM ARF 16-1(Analysis of Basalt from Well 699-37-47A)

Analysis: R.W. Sanders

Date of Analysis : Oct 30-31, 1996

\$S3\DAT	DATE	TIME	F	Na2O	MgO	Al2O3	SiO2	P2O5	SO3	Cl	K2O	CaO	TiO2	V2O5	Cr2O3	MnO
			ppm	%	%	%	%	%	ppm	ppm	%	%	%	ppm	ppm	ppm
SIO2	30-Oct	16.51	-15	-0.01	1.59	0.00	96.10	0.03	239	-6	0.01	0.05	-0.01	-1	16	-3
SIO2	30-Oct	16.51	-13	-0.01	1.59	0.00	96.13	0.03	257	-8	0.01	0.05	-0.01	0	14	-6
SIO2	30-Oct	16.51	-14	-0.02	1.61	0.00	96.11	0.03	252	-14	0.01	0.05	-0.01	0	17	19
avg			-14	-0.01	1.60	0.00	96.12	0.03	249	-9	0.01	0.05	-0.01	0	15	3
sd			1	0.00	0.01	0.00	0.02	0.00	9	4	0.00	0.00	0.00	0	1	14
BCR-1	30-Oct	18.08	468	3.21	3.30	13.50	54.28	0.40	976	55	1.71	6.77	2.26	716	25	1770
BCR-1	30-Oct	18.08	498	3.21	3.41	13.52	54.30	0.39	986	57	1.70	6.78	2.27	711	21	1764
BCR-1	30-Oct	18.08	495	3.20	3.46	13.62	54.30	0.40	1013	59	1.70	6.79	2.26	702	16	1708
avg			487	3.21	3.39	13.55	54.29	0.39	992	57	1.70	6.78	2.26	710	20	1748
sd			16	0.00	0.08	0.07	0.01	0.01	20	2	0.00	0.01	0.01	7	5	34
BHVO-1	30-Oct	19.25	404	2.31	6.98	13.49	49.66	0.22	250	94	0.53	11.50	2.66	831	418	1565
BHVO-1	30-Oct	19.25	419	2.32	7.08	13.55	49.67	0.22	254	95	0.53	11.50	2.66	833	430	1559
BHVO-1	30-Oct	19.25	426	2.33	7.18	13.62	49.67	0.22	257	98	0.53	11.48	2.66	829	421	1546
avg			416	2.32	7.08	13.55	49.66	0.22	254	95	0.53	11.49	2.66	831	423	1557
sd			12	0.01	0.10	0.06	0.01	0.00	4	2	0.00	0.01	0.00	2	6	9
ARCHO-1	30-Oct	20.42	516	2.86	2.99	12.47	52.48	0.82	1506	156	2.51	6.15	2.82	903	-7	1931
ARCHO-1	30-Oct	20.42	514	2.86	3.03	12.44	52.51	0.81	1460	165	2.49	6.15	2.82	906	-9	1925
ARCHO-1	30-Oct	20.42	520	2.85	3.11	12.54	52.49	0.79	1464	155	2.50	6.16	2.82	899	-6	1932
avg			517	2.86	3.04	12.48	52.50	0.81	1477	158	2.50	6.15	2.82	903	-7	1929
sd			3	0.00	0.07	0.05	0.01	0.01	26	6	0.01	0.01	0.00	3	2	4
R1-161	30-Oct	21.58	657	2.24	3.69	12.85	51.72	0.61	1190	82	1.19	8.77	3.43	1061	19	1798
R1-161	30-Oct	21.58	648	2.24	3.78	12.85	51.71	0.61	1208	96	1.19	8.78	3.45	1060	23	1766
R1-161	30-Oct	21.58	674	2.22	3.87	12.93	51.72	0.60	1201	90	1.20	8.78	3.45	1065	30	1773
avg			660	2.23	3.78	12.88	51.72	0.61	1200	89	1.19	8.78	3.44	1062	24	1779
sd			13	0.01	0.09	0.05	0.01	0.01	9	7	0.00	0.01	0.01	3	5	17
R2-161	30-Oct	23.15	651	2.27	3.68	12.84	51.74	0.59	1156	93	1.18	8.84	3.50	1092	29	1785
R2-161	30-Oct	23.15	663	2.25	3.81	12.89	51.82	0.59	1150	79	1.18	8.85	3.52	1079	25	1774
R2-161	30-Oct	23.15	666	2.25	3.89	12.89	51.77	0.59	1183	66	1.18	8.87	3.52	1082	31	1746
avg			660	2.26	3.79	12.87	51.78	0.59	1163	79	1.18	8.86	3.51	1084	28	1768
sd			8	0.01	0.11	0.03	0.04	0.00	18	13	0.00	0.02	0.01	7	3	20
R3-161	31-Oct	18.49	689	2.30	3.96	13.02	51.92	0.62	1185	83	1.20	8.78	3.50	1078	29	1698
R3-161	31-Oct	18.49	688	2.30	4.04	13.00	51.92	0.62	1177	90	1.20	8.78	3.49	1077	21	1665
R3-161	31-Oct	18.49	710	2.30	4.06	13.09	52.05	0.61	1203	85	1.20	8.81	3.51	1079	22	1710
avg			696	2.30	4.02	13.04	51.96	0.61	1188	86	1.20	8.79	3.50	1078	24	1691
sd			13	0.00	0.06	0.04	0.07	0.01	13	3	0.00	0.02	0.01	1	4	23

Fe2O3	Co3O4	NiO	CuO	ZnO	SrO	ZrO2	BaO	La2O3	CeO2	total	
%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	
-0.01	1	14	4	35	0	-5	-31	12	7	97.8	SIO2
-0.01	1	18	14	33	2	-7	-42	11	7	97.8	SIO2
-0.01	1	20	6	34	0	-6	-26	12	7	97.8	SIO2
-0.01	1	17	8	34	1	-6	-33	12	7	97.8	
0.00	0	3	5	1	1	1	8	0	0		
12.91	55	18	20	148	392	236	770	24	46	98.9	BCR-1
13.06	55	19	27	148	391	237	771	27	46	99.2	BCR-1
13.14	55	18	26	153	393	235	749	29	47	99.4	BCR-1
13.03	55	18	24	150	392	236	764	27	46	99.2	
0.12	0	1	4	2	1	1	12	3	1		
11.65	50	150	154	126	454	217	230	11	58	99.5	BHVO-1
11.83	50	152	167	128	453	217	240	9	56	99.9	BHVO-1
11.87	49	148	147	126	451	217	224	8	56	100.1	BHVO-1
11.78	50	150	156	127	453	217	231	9	56	99.8	
0.12	0	2	10	1	1	0	8	2	1		
13.26	56	15	15	153	333	670	3118	13	44	97.3	ARCHO-1
13.42	56	17	19	155	335	675	3058	14	42	97.5	ARCHO-1
13.48	56	17	20	153	335	675	3051	16	41	97.7	ARCHO-1
13.38	56	16	18	154	334	673	3075	15	42	97.5	
0.11	0	1	3	1	1	3	34	1	2		
14.23	61	29	27	166	284	315	638	40	66	99.4	R1-161
14.44	61	33	25	167	285	315	618	42	68	99.7	R1-161
14.50	61	33	22	169	282	317	603	41	67	99.9	R1-161
14.39	61	32	25	167	284	316	620	41	67	99.7	
0.14	0	2	2	1	1	1	18	1	1		
14.34	61	28	20	165	273	294	607	25	68	99.6	R2-161
14.53	61	28	27	166	271	295	625	27	69	100.1	R2-161
14.51	61	30	29	165	270	296	638	29	69	100.1	R2-161
14.46	61	29	26	165	271	295	623	27	69	99.9	
0.11	0	1	4	1	2	1	15	2	1		
14.53	61	31	27	170	288	344	668	19	67	100.5	R3-161
14.74	61	30	18	168	290	346	650	22	68	100.7	R3-161
14.77	61	31	21	171	286	343	636	16	67	101.0	R3-161
14.68	61	31	22	170	288	344	652	19	67	100.7	
0.13	0	1	5	1	2	2	16	3	1		

EM - Elephant Mountain
P - Pomona
ESQ - Esquatzel
UM - Umatilla
PR - Priest Rapids

EM, P, ESQ, UM: Saddle Mts Basalt
PR: Wanapum Basalt

	DC23GR 395	DC23GR 435	DC23GR 590	DC23GR 665	DC23GR 785	DC23GR 835
Date	13-Jan-93	13-Jan-93	13-Jan-93	13-Jan-93	13-Jan-93	13-Jan-93
	EM	EM	P	P	ESQ	ESQ
Unnormalized Results (Weight %):						
SiO2	51.55	51.42	54.90	53.20	54.40	53.81
Al2O3	12.66	12.52	14.51	14.51	13.26	13.09
TiO2	3.535	3.607	1.606	1.635	3.026	3.083
FeO*	14.99	15.22	10.41	10.61	13.34	13.61
MnO	0.212	0.215	0.168	0.175	0.188	0.192
CaO	8.70	8.37	9.93	10.43	7.62	7.54
MgO	4.09	4.21	6.41	6.90	3.84	3.81
K2O	1.26	1.30	0.81	0.73	1.65	1.71
Na2O	2.54	2.59	2.53	2.48	3.00	3.02
P2O5	0.552	0.567	0.240	0.229	0.408	0.408
Total	100.09	100.02	101.51	100.90	100.73	100.27
Normalized Results (Weight %):						
SiO2	51.50	51.41	54.08	52.73	54.00	53.66
Al2O3	12.65	12.52	14.29	14.38	13.16	13.05
TiO2	3.53	3.61	1.582	1.620	3.00	3.07
FeO*	14.98	15.22	10.25	10.52	13.24	13.57
MnO	0.212	0.215	0.165	0.173	0.187	0.191
CaO	8.69	8.37	9.78	10.34	7.56	7.52
MgO	4.09	4.21	6.31	6.84	3.81	3.80
K2O	1.26	1.30	0.80	0.72	1.64	1.71
Na2O	2.54	2.59	2.49	2.46	2.98	3.01
P2O5	0.552	0.567	0.236	0.227	0.405	0.407
Trace Elements (ppm):						
Ni	2	6	36	40	3	0
Cr	23	27	93	99	13	14
Sc	36	32	25	27	19	21
V	406	420	266	278	347	365
Ba	475	469	277	245	576	591
Rb	30	34	21	16	47	44
Sr	235	230	234	228	258	257
Zr	246	249	138	135	208	212
Y	51	51	31	29	40	43
Nb	27.1	27.9	13.3	14.4	24.8	24.8
Ga	22	21	20	19	24	23
Cu	16	10	47	49	9	14
Zn	183	155	95	97	128	303
Pb	24	6	14	7	13	38
La	35	33	13	18	32	20
Ce	79	69	26	45	68	62

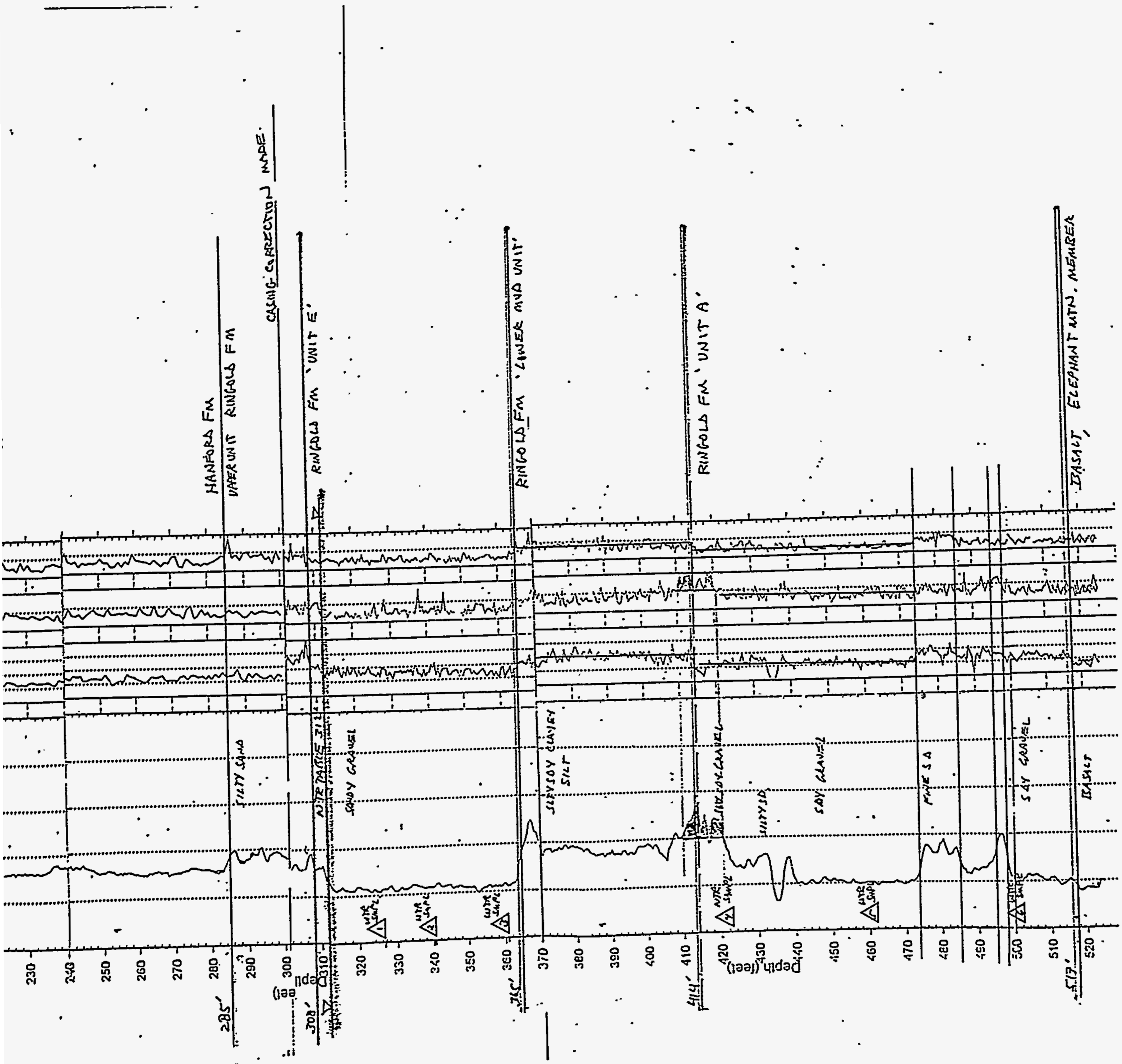
Th	6	6	3	3	8	6

	DC23GR 925	DC23GR 955	DC23GR 1015	DC23GR 2595	DC23GR 2620
Date	14-Jan-93	14-Jan-93	14-Jan-93	14-Jan-93	14-Jan-93
	UM	UM	UM	PR	PR
					Unnormaliz
SiO2	54.66	54.61	54.53	55.02	55.14
Al2O3	13.83	13.57	13.54	14.29	14.18
TiO2	3.011	2.757	2.673	1.753	1.819
FeO*	12.89	12.74	12.70	11.39	11.50
MnO	0.213	0.215	0.205	0.194	0.195
CaO	6.65	6.26	6.21	8.56	8.42
MgO	2.66	2.71	2.74	4.89	4.57
K2O	2.40	2.59	2.73	1.23	1.22
Na2O	3.28	3.44	3.40	3.12	3.20
P2O5	0.860	0.955	0.959	0.318	0.353
Total	100.45	99.85	99.69	100.77	100.60
					Normalized
SiO2	54.41	54.69	54.70	54.60	54.81
Al2O3	13.77	13.59	13.58	14.18	14.10
TiO2	3.00	2.76	2.68	1.740	1.808
FeO*	12.83	12.76	12.74	11.30	11.43
MnO	0.212	0.215	0.206	0.193	0.194
CaO	6.62	6.27	6.23	8.50	8.37
MgO	2.65	2.71	2.75	4.85	4.54
K2O	2.39	2.59	2.74	1.22	1.21
Na2O	3.27	3.45	3.41	3.10	3.18
P2O5	0.86	0.96	0.96	0.316	0.351
					Trace Elem
Ni	0	0	0	10	2
Cr	5	2	3	48	41
Sc	23	25	21	30	37
V	234	188	162	309	289
Ba	3066	3308	3313	503	562
Rb	45	44	47	33	32
Sr	295	280	281	308	310
Zr	434	448	454	156	163
Y	51	50	51	33	36
Nb	23.7	23.6	22.4	11.7	12.7

Ga	22	22	22	21	22
Cu	5	2	0	18	19
Zn	138	132	127	111	117
Pb	9	12	12	6	5
La	30	44	57	24	22
Ce	68	70	80	50	46
Th	8	5	6	3	1

Appendix E

Borehole Geophysics

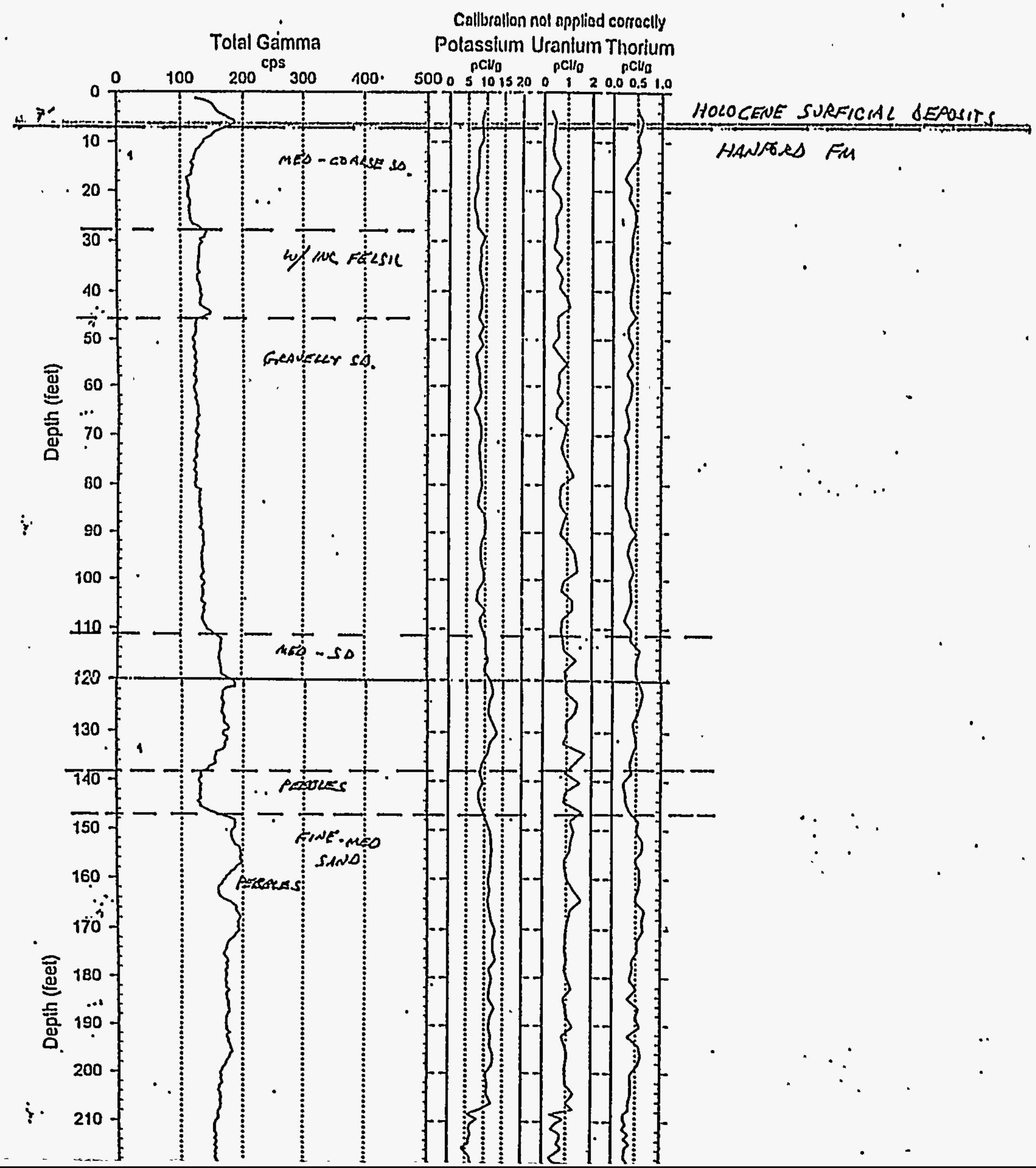

HANFORD FM
UPPER UNIT RINGOLD FM
CASING CORRECTION MADE
RINGOLD FM 'UNIT E'
RINGOLD FM 'LOWER MUD UNIT'
RINGOLD FM 'UNIT A'
BASALT, ELEPHANT MTN. MEMBER
SILTY SAND
SANDY GRAVEL
SILTY SDY CLAYEY SILT
SILTY SD
SDY GRAVEL
FINE S A
SDY GRAVEL
BASALT
285'
308'
365'
414'
513'
230
240
250
260
270
280
290
300
310
320
330
340
350
360
370
380
390
400
410
420
430
440
450
460
470
480
490
500
510
520
Depth (feet)

Corrected + Correlated by [signature] 1/16/97

RLS Enhanced Spectral KUT Processed Data

Project: Eastern Hanford Site; 600Area
Borehole: 699-37-47A

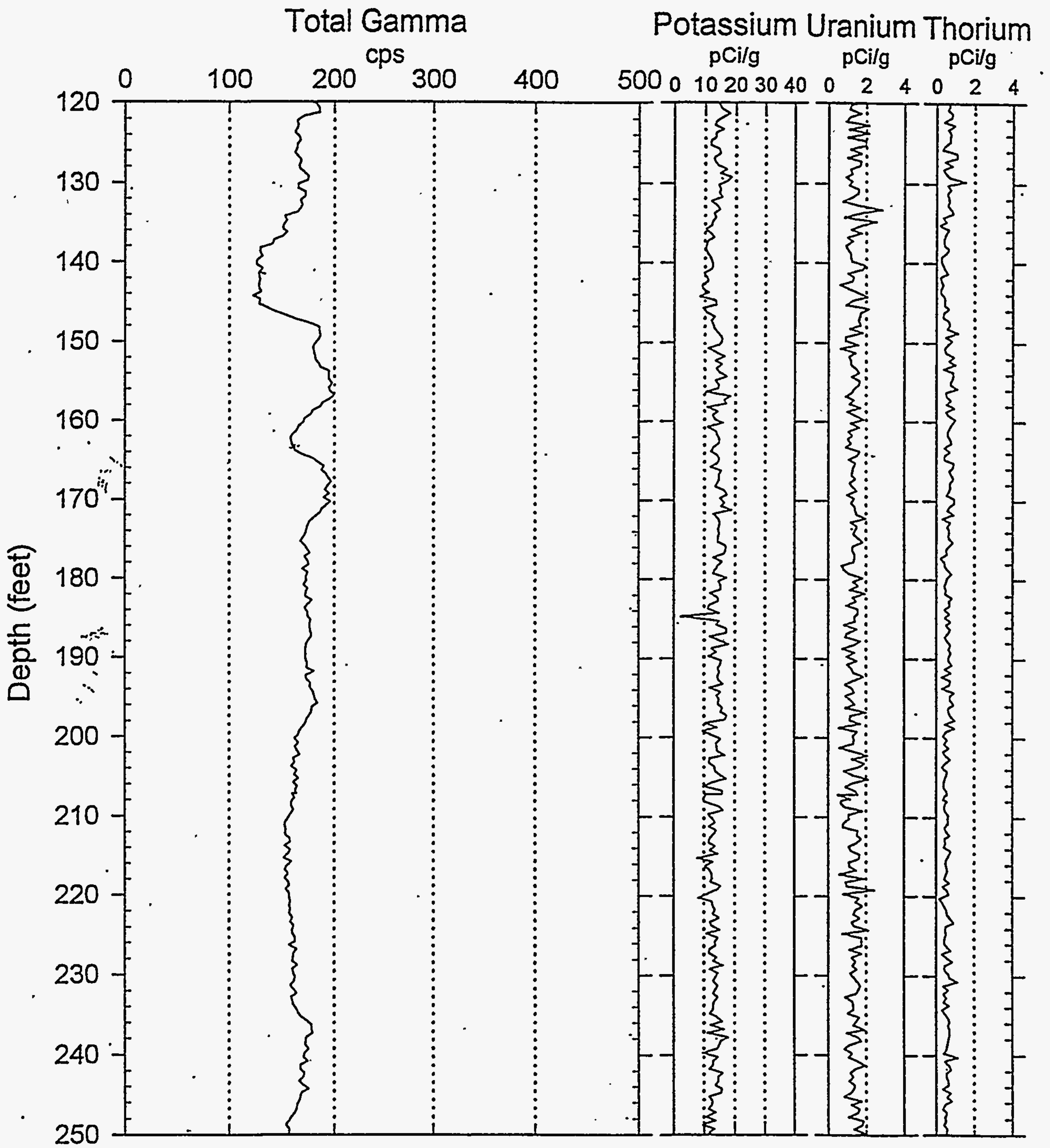
Log Date : Aug. 23, 1996
Westinghouse Hanford Co.



RLS Spectral KUT Processed Data

Project: Eastern Hanford Site; 600Area
Borehole: 699-37-47A

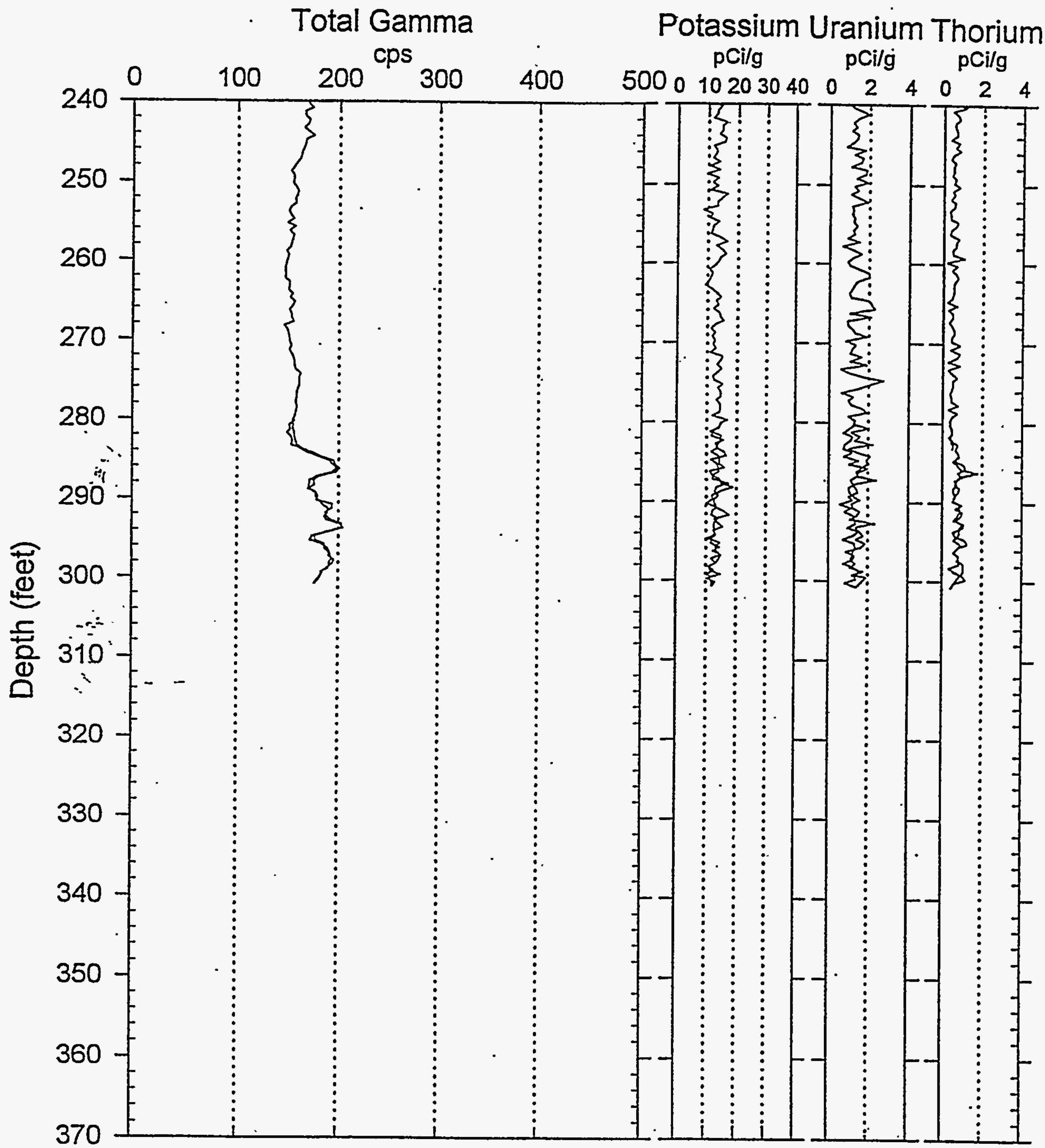
Log Date : Aug. 23, 1996
Westinghouse Hanford Co.



RLS Spectral KUT Processed Data

Project: Eastern Hanford Site; 600Area
Borehole: 699-37-47A

Log Date : Aug. 23, 1996
Westinghouse Hanford Co.

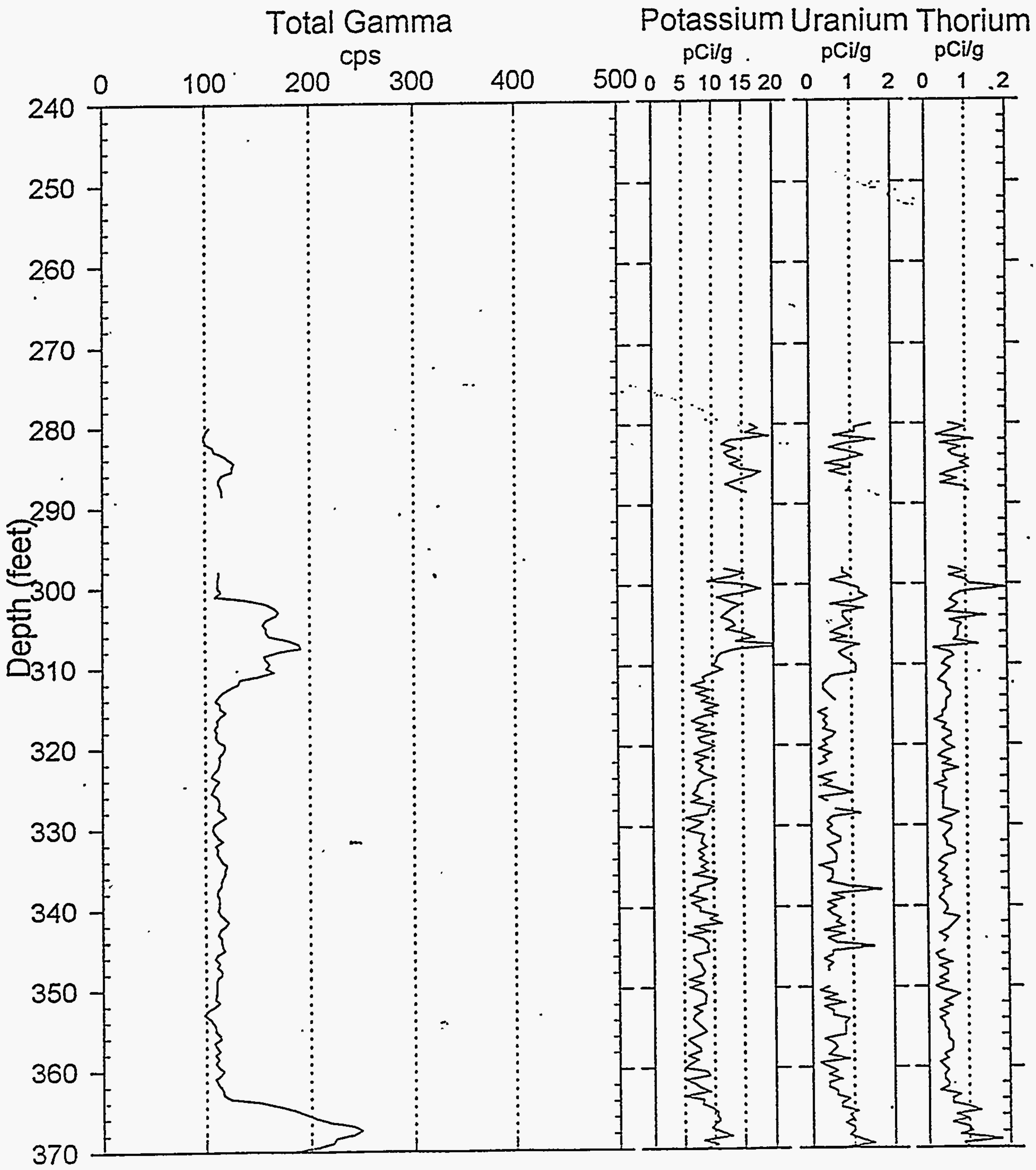


RLS Spectral KUT Processed Data

Borehole: 699-37-47A

Log Date : Oct. 14, 1996

Analysis Date: Oct. 14, 1996

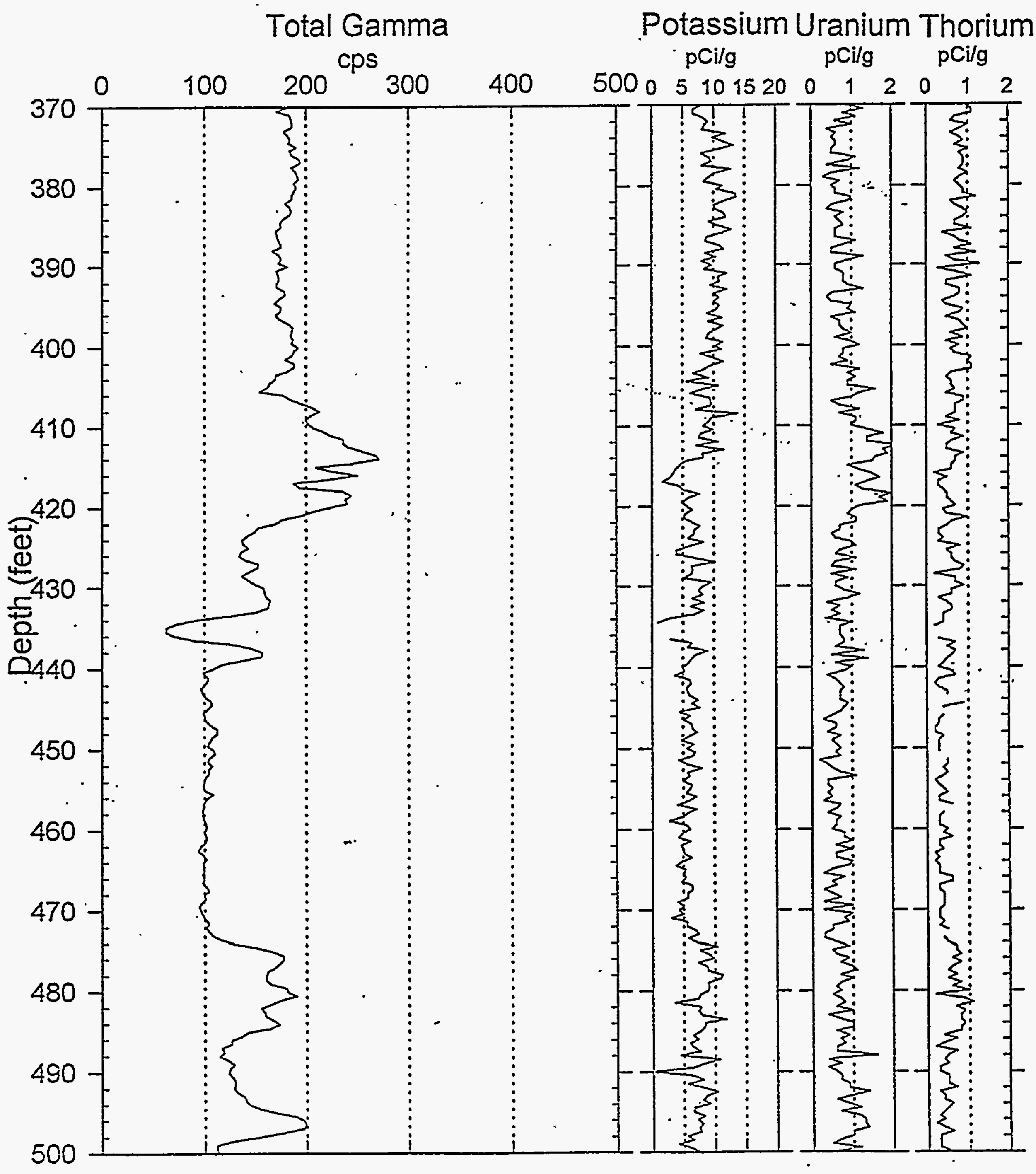


RLS Spectral KUT Processed Data

Borehole: 699-37-47A

Log Date : Oct. 14, 1996

Analysis Date: Oct. 14, 1996

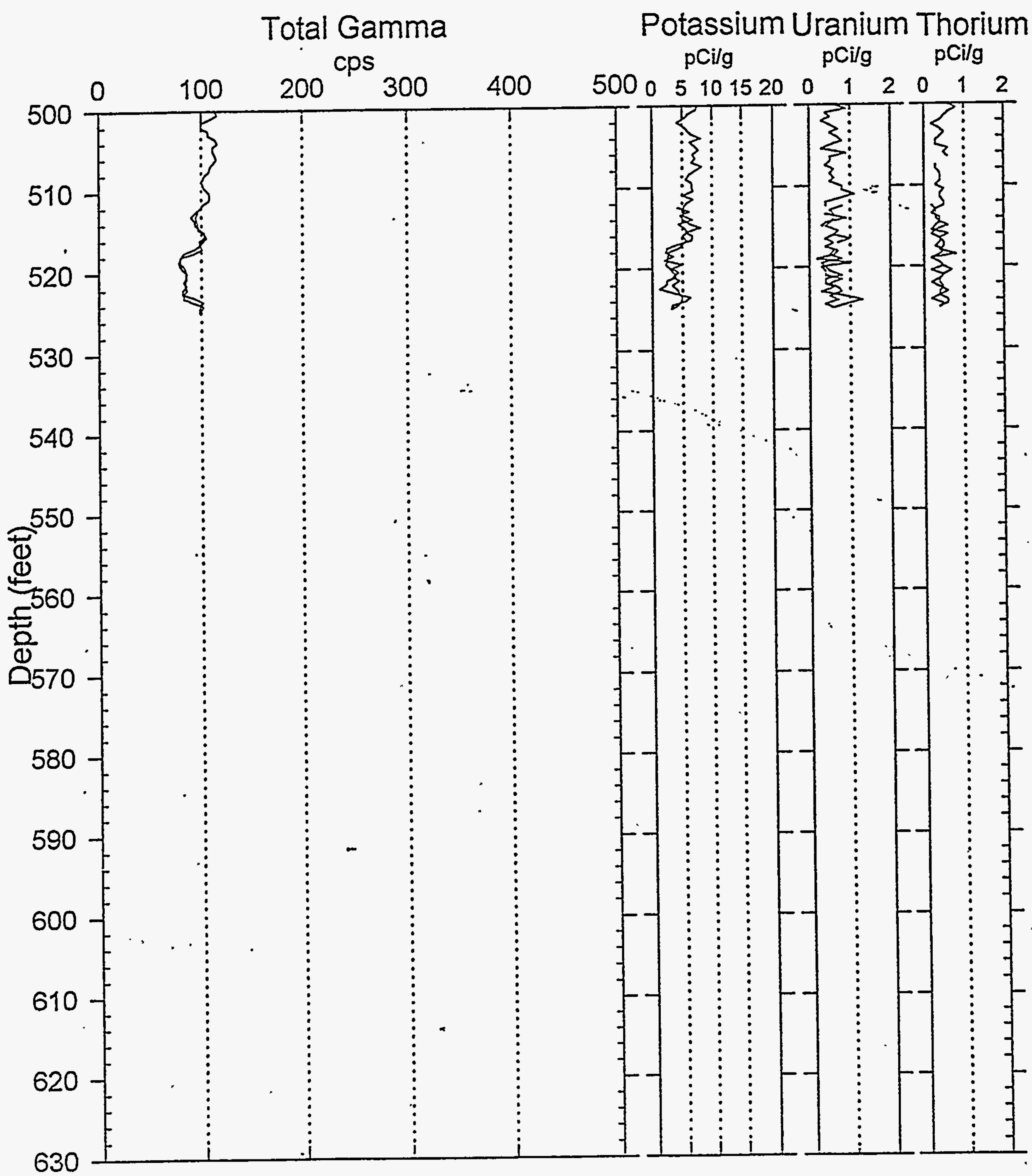


RLS Spectral KUT Processed Data

Borehole: 699-37-47A

Log Date : Oct. 14, 1996

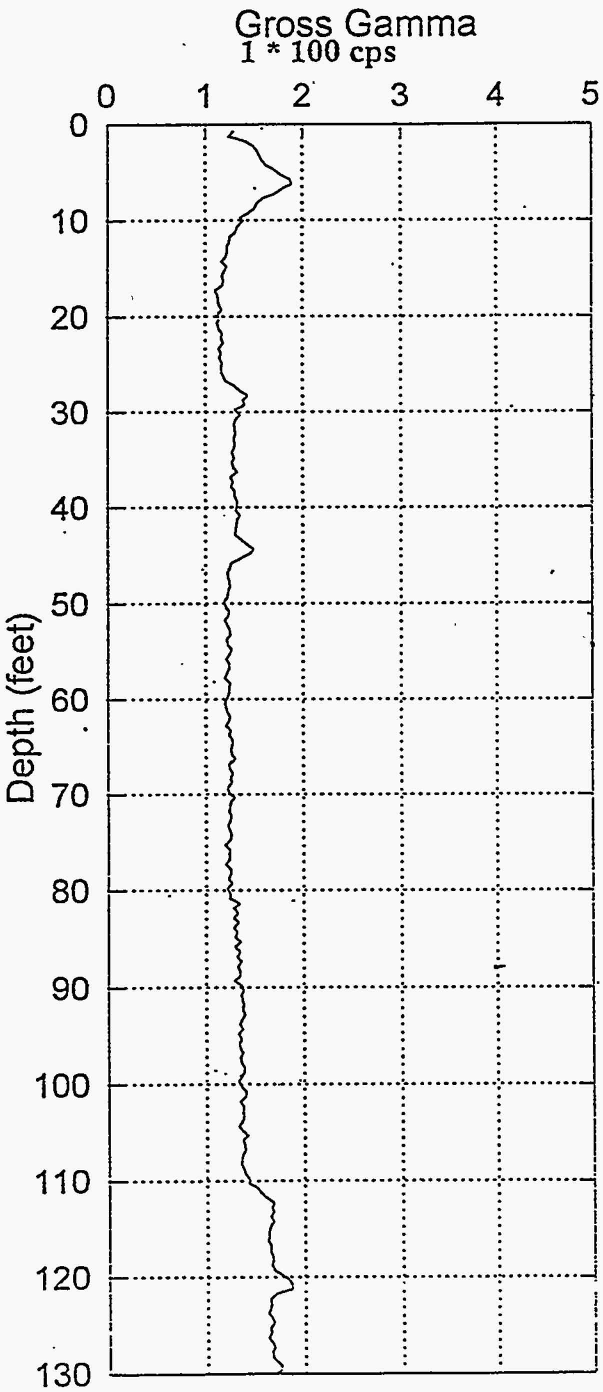
Analysis Date: Oct. 14, 1996

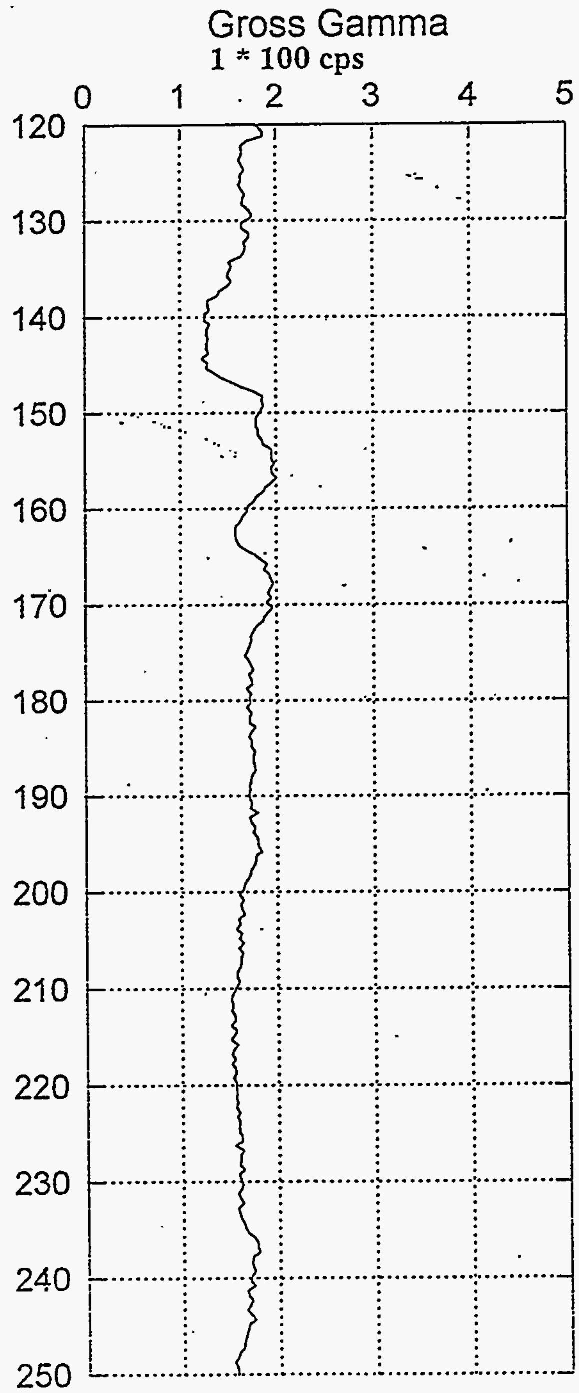


RLS Gamma-Ray Borehole Survey

Location : Eastern Hanford Site; 600 Area Log Date Aug. 23, 1996

Borehole: 699-37-47A

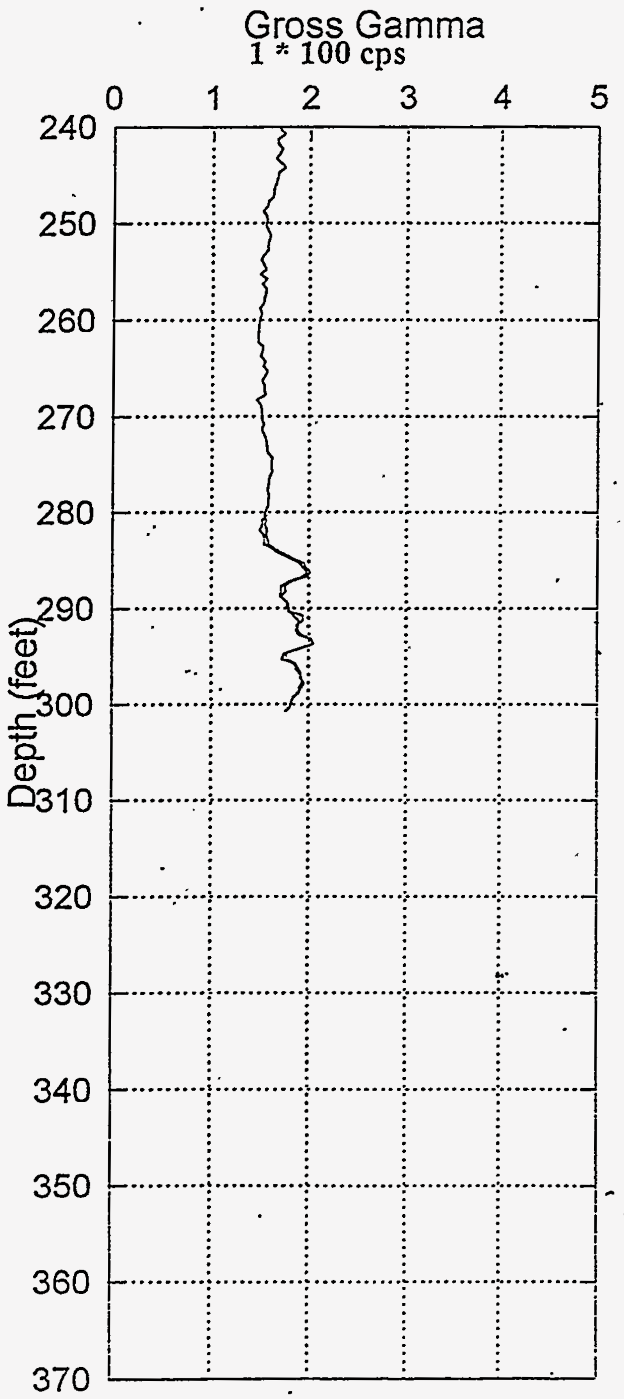


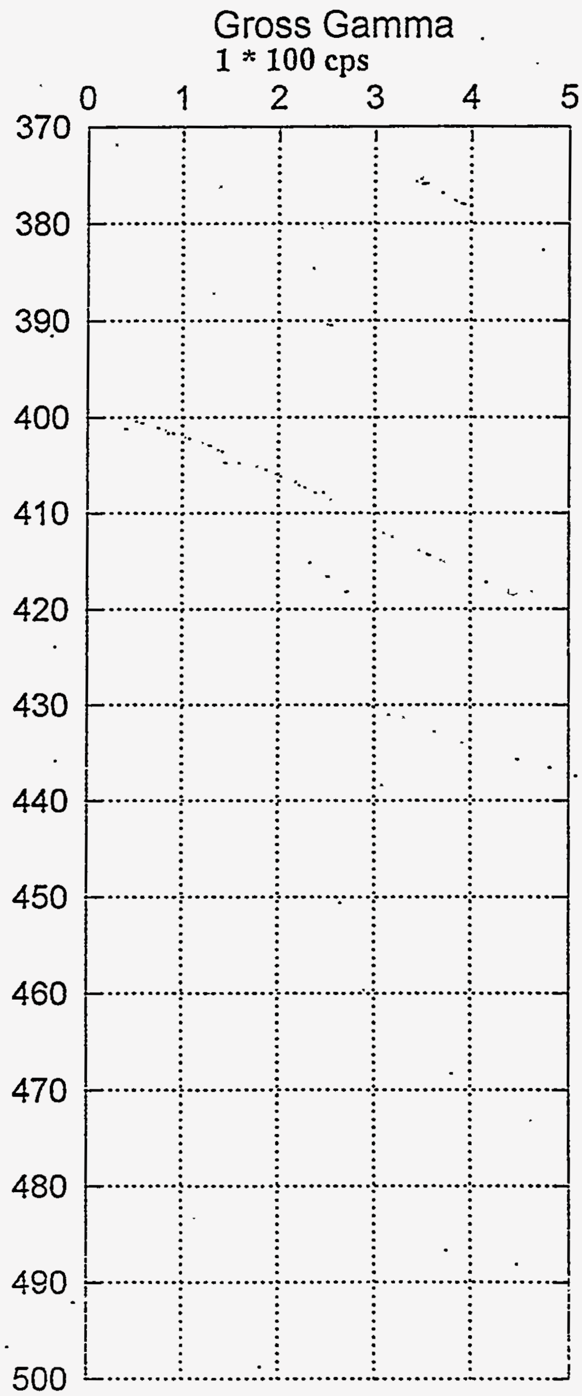


RLS Gamma-Ray Borehole Survey

Location : Eastern Hanford Site; 600 Area Log Date Aug. 23, 1996

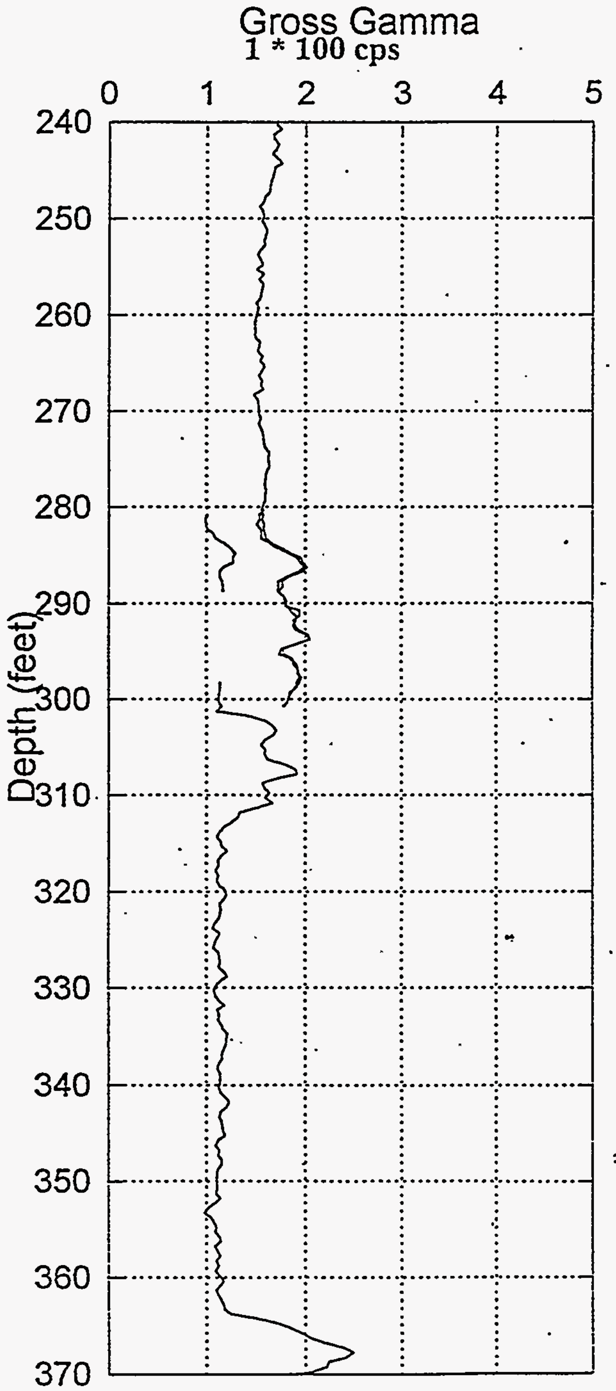
Borehole: 699-37-47A

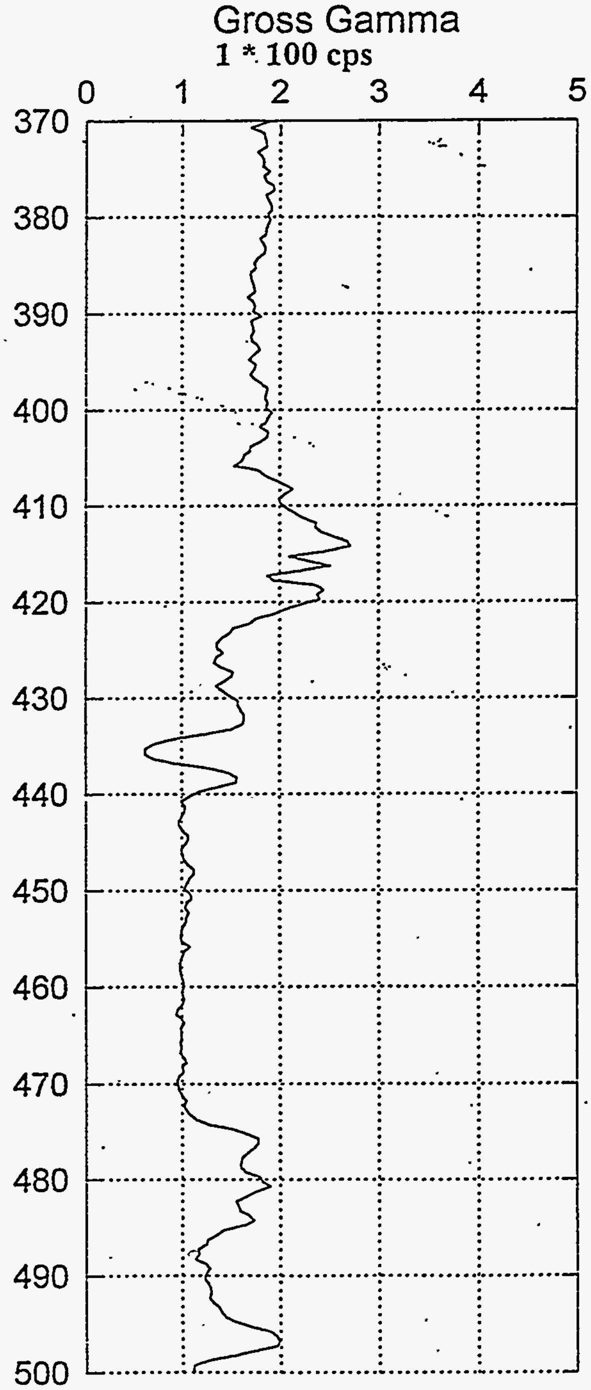




RLS Gamma-Ray Borehole Survey

Location : Eastern Hanford Site; 600 Area
Log Dates Aug. 23, 1996
Oct. 14, 1996
Borehole: 699-37-47A

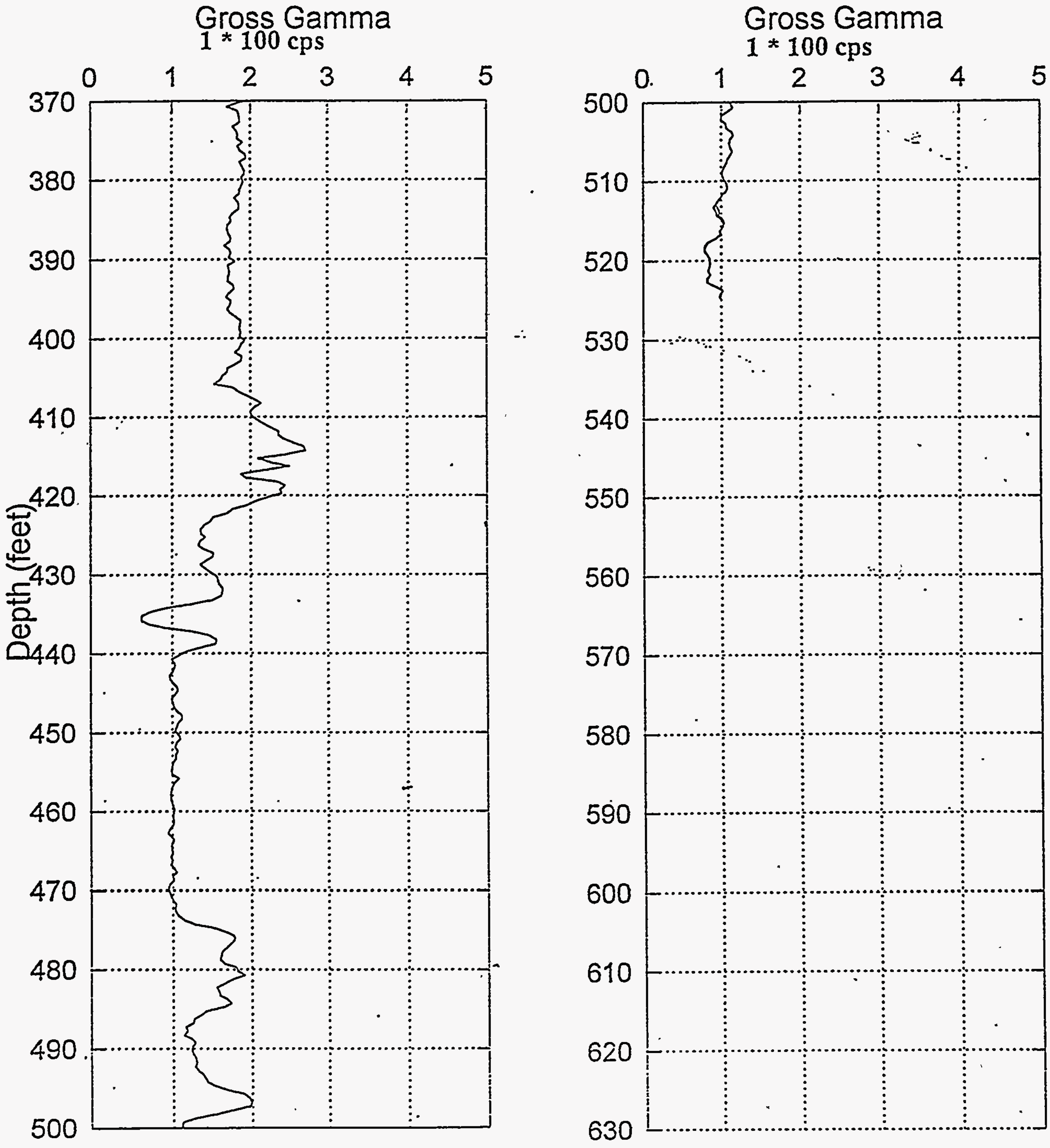




RLS Gamma-Ray Borehole Survey

Location : Eastern Hanford Site; 600 Area
Log Dates Aug. 23, 1996
Oct. 14, 1996

Borehole: 699-37-47A



Appendix F

Aquifer Testing

Appendix F

Aquifer Testing

This appendix contains the

- Well Development Record
- Slug Testing Results and Analysis
- K-V Associates Flowmeter Results.

Aquifer Test Data

Well Development
699-37-47A

page 1 of 1

Data for Well 11/7/96
Pumping Well 699-37-47A
Observation Wells N/A

Location Hanford Site Area
Type of Aquifer Test step drawdown (development)
How Q Measured Rotometer (FL-75F) + volumetric verification
How W.L.'s Measured Keller PT (S/N 94117) + E-tape → DIM-94463-P
Rad./Dist. of/From Pumping Well 4"
Meas. Point for W.L.'s TOC
Elevation of Meas. Point NA

Depth of Pump/Airpipe 335.6 ft bgs (stickup = 3.48 ft)
Pump On: date 11/7/96 time 1100 PST
Pump Off: date 11/7/96 time 1140 PST
Duration of Aquifer Test 40 min

Time t = ___ at t' = 0					Water Level Data Static Water Level 15.92/315.50					Roto Meter Discharge		Recorded By	Comments
Day	Clock Time	t	t'	t/t'	PT Reading	Conversions or Corrections	Water Level	s or s'	Turbidity (NTU)	Reading	Q		
312	1048				15.92		315.50						Flow control valve set @ ~5 gpm
	1058				15.93								
	1103				↖	Note → Pressure xducer must have been hanging up on riser.							start pump
	1102				16.37		315.50			5			5 gal – 1 min, 4 sec
	1104				16.38				7.36				
	1107				16.40								
	1110				16.39								Increase Q to 10 gpm
	1111				16.39		315.495		9.65	10			5 gal = 29.89 sec
	1118				16.40				10.9				
	1120				16.40				4.98				~~Increase to 20 gpm~~
	1122												Increase to 20 gpm
	1123				16.40		315.49			20			5 gal = 14.33 sec
	1126				16.40				4.87				
	1130				16.41		315.485		7.43				
	1132				16.41				3.23				
	1135									23			Increase flow rate to max.
	1137				16.41				2.8				
	1140				16.42								Stop pump
	1142				16.44		315.47						
	1250				16.48		315.43						

Page ______

Slug Testing

Date 1/8/96 Page ______

Measuring Device ______

Measured By ______

3.7.1 slug testing @ 699-37-47A

		Well Number	Time (PST)	Held	Cut	D/W or PSI
				P (ft)		
0915	Arrive on location. Dump yesterdays development data					
	and overnight baseline to Han-gw\37-47A\Dev-bsln.dat	~~Run slug # 1~~	~~[illegible]~~	~~17.54~~		
0930	Initial slug testing program. Same Xducer config as pump (see	• Run Slug #1				
	program used for development)	Inject slug #1	1130	17.56	} Note: [illegible] by [illegible] reset prior to next test.	
	Testing will incorporate 3 separate slugging rods:		1132	17.56		
	ID Diam (in) Length (ft)	withdraw slug #1	1133			
	slug #1 2 5.8	reinject slug #1	1135	17.56		
	Slug #2 3 6.6		1138	17.56		
	Slug #3 3.5 6.2	withdraw slug	1139	17.54		
			1140	17.54		
0947	D/W = 315.39 Pressure reading = 17.53 D/B_{mean} = 342.2	• Run Slug #2				
1010	Having trouble finding WL with small slug. Will run big	Inject Slug #2	1150	17.57		
	slug to locate + then start testing.		1151	17.58		
1130	reinstall shackle to keep it from hanging up on	~~withdraw slug #2~~	1152	17.58		
	transducer cable	withdraw slug #2	1153	17.58		
1130	start testing. see facing page.	reinject slug #2	1155	17.58		
			1156	17.58		
			1157	17.58		
		withdraw slug #2	1158		→ recovers	within ~5-10 sec
1200	Dump data from first 2 tests to Han-gw\37-47A\test1-2.dat	• Run Slug #3				
1240	Checked data. Only getting ≈ 0.10 ft of response from		1303	17.59		
	slug #2. Try running slug #3 → this will be	Inject Slug #3	1306			
	a tight fit.		1308	17.59		
			1309	17.59		
		withdraw slug #3	1310			
		reinject slug #3	1311:20	17.59		
			1312	17.59		
		withdraw slug #3	1314	17.59		
			1315	17.59		
1315	Dump data from slug #3 tests to Han-gw\37-47A\Test3.dat					

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Date December 18, 1996

To B.A. Williams

From F.A. Spane, Jr.

Subject Slug Test Analysis Results for Well 699-37-47A

BACKGROUND

This letter report presents the analysis results of slug tests conducted at well 699-37-47A, following well completion and developmental pumping. The field tests were performed in support of the Hanford Integrated Groundwater Project, and specifically pertains to Tri-Party Agreement milestone M-24. The purpose of the slug tests was to provide initial hydraulic property estimates for the unconfined aquifer in proximity to well 699-37-47A. The depth interval tested represents the upper 27 ft of the unconfined aquifer, from approximately 311 to 338 ft bgs. Preliminary geologic information indicates that hydrogeologic unit E of the Ringold Formation occurs between a depth of 311 to 367 ft bgs. Underlying unit E are discernable fine-grained silt and clay units occurring between 367 to 412 ft bgs and 427 to 437 (Lower Mud Unit) ft bgs.

The tests were conducted on November 8, 1996, following well completion and development activities. The well has a 4-in. diameter well screen completion, which is surrounded by a 2-in. annular well sandpack. Slug testing was conducted by removing a slugging rod (slug withdrawal test) of known displacement volume. Slug withdrawal tests were employed rather than slug injection tests (i.e., by rapidly immersing the slugging rod) because of their reported superior results for unconfined aquifer tests where the water table occurs within the well screen section (e.g., Bouwer 1989). In total, six slug withdrawal tests were conducted. For the first two tests (1A and 1B), the slugging rod displacement volume was 0.127 ft^3. For the second (2A and 2B) and third set (3A and 3B) of tests, slugging rods with displacement volumes of 0.324 ft^3 and 0.414 ft^3 were utilized, respectively. Different sized slugging rods were used during testing to impart varying stress levels during testing, which are useful for assessing the effectiveness of well development and the presence of dynamic skin effects (Butler et al. 1996). The similarity in test responses for the three different slug rod sizes used indicates that the well had been adequately developed and that skin effects did not adversely effect the slug test response.

All six slug tests exhibited complete recovery patterns within ≈ 5 secs of test initiation, which is indicative of highly transmissive test formation conditions. Because of the existing high transmissivity conditions, the test formation was recoverying as the slugging rod was being removed to initiate the test, so a "full" stress level associated with the

E54-1900-001 (4/96)

slugging rod volume could not be applied during the test. Because of the lower stress levels and associated small test responses observed during the first four tests (tests 1A, 1B, 2A and 2B), quantitative analysis efforts were focused on the two higher stress slug withdrawal test results (i.e., tests 3A and 3B).

ANALYSIS METHODS

Analytical methods used in the analysis of the slug withdrawal tests conducted at well 699-37-47A include the type-curve matching method for unconfined and confined aquifers, as presented in Hyder et al. (1994), Hyder and Butler (1995), Spane and Wurstner (1993), and Spane (1996), and the semi-empirical straight-line analysis method described in Bouwer and Rice (1976) and Bouwer (1989). Because the type-curve analytical methods can use all or any part of the slug test response in the analysis procedure, they are particularly useful in the analysis of highly transmissive unconfined aquifer tests (e.g., as exhibited at well 699-37-47A). They also do not have any of the inherent analytical weaknesses of the commonly used Bouwer and Rice method (e.g., assumption of steady-state flow, isotropic conditions, etc.), as originally described in Bouwer and Rice, 1976 and Bouwer, 1989 for unconfined aquifer slug tests. These analytical limitations are discussed in Hyder and Butler (1995), Brown et al. (1995), and Bouwer (1996).

Because of the ease of application, the type-curve method described in Spane (1996) was used for final analysis of the slug test responses for tests 3A and 3B. The method presented in Spane (1996) pertains to the analysis of slug interference tests; however, the general procedure of converting available pumping test type curves to an equivalent slug test response also applies. It should be noted that the analytical methods presented in Spane (1996) and Hyder and Butler (1995) both account for the effects of well partial penetration, anisotropy, wellbore storage, and aquifer elasticity effects (storativity); and, as a consequence, provide similar results. For comparison purposes, tests 3A and 3B were also analyzed using the Bouwer and Rice (1976) method. Test analysis results are presented in Table 1.

Several analytical assumptions were made to facilitate the type-curve analysis of the slug test results. These assumptions include:

- only test data reflective of laminar flow conditions were the focus of the type-curve analysis
- a vertical anisotropy (K_D) value of 0.1 was assumed
- a storativity value of 0.0001 was used as an initial test

match parameter

- the well screen interval was assumed to be equivalent to the test interval section.

All standard hydrologic test analysis methods assume that laminar flow conditions exist within the aquifer and well during testing. Laminar flow conditions during testing were determined by calculating flow velocities within the well casing (based on timed/fluid pressure measurements obtained in the well column), and then determining the Reynolds Number based on standard fluid mechanics relationships. Laminar flow conditions were assumed to exist when Reynolds Numbers ≤ 2,000 were indicated. It should be noted that the Reynolds Number calculations are based on steady flow condition assumptions and, therefore, some uncertainty exists as to what threshold Reynolds Number value is indicative of laminar flow for test responses, with exponentially decreasing flow rate characteristics.

To standardize the slug test type-curve matching analysis for all slug test responses, a vertical anisotropy (K_D) of 0.1 was assumed. Previous investigations by the author have indicated that single-well slug test responses are relatively insensitive to vertical anisotropy; and, therefore, the use of an assumed (constant) value of 0.1 is not expected to have any significant impact on the determination of transmissivity (T) and hydraulic conductivity (K_e) from the type-curve matching analysis.

To facilitate the unconfined aquifer slug-test type-curve analysis, an elastic storage value of 0.0001 was utilized for all initial analysis runs. After initial matches were made through adjustments of transmissivity, additional adjustments of storativity were then attempted to improve the overall match of the test response pattern. In both test cases, slight modifications (i.e., decreasing S) were made to input storativity values, but no significant improvement in the final analysis matches was observed. It should be noted, however, that other factors influence the shape of the slug test curve (e.g., skin effects, vertical anisotropy). For this reason, storativity value used in the final slug test analyses is considered to be of qualitative value, and should not be used (as in the case for transmissivity) for quantitative applications.

For the slug test analysis, the well screen interval (rather than the sandpack interval) was used to represent the test interval for the analyses. This was based on the assumption that the formation materials within the screened interval have a higher permeability than the sandpack; and, therefore, test response transmission is expected to propagate faster laterally from the well screen to the surrounding test formation, than vertically within the sandpack zone. In reality, only small differences exist between individual well site well screen and sandpack interval lengths (i.e., in comparison to the aquifer thickness relationship); and, subsequently, no significant differences in analysis results would be expected.

ANALYSIS RESULTS

Figures 1 through 4 present the analysis results for slug tests 3A and 3B. Fluid flow analysis of the tests indicates that flow conditions were near the laminar/turbulent flow boundary (i.e., $R_e \approx 2{,}000$) for most of the recovery response. As shown in Figures 2 and 4, predicted type-curve analyses were not able to match the later-time test response (i.e., generally between 2.5 to 4 sec). The reason for this is not readily apparent, but may be attributed, in part, to heterogeneous formation response or flow turbulence in the vicinity of the well.

As shown in Table 1, analysis results indicate that a significantly higher range for hydraulic conductivity (160.7 to 196.4 ft/d) was obtained from type-curve analyses, in comparison to estimates obtained with the Bouwer and Rice method (99.9 to 114.1 ft/d). As noted previously, because of its semi-empirical nature, analytical results obtained using the Bouwer and Rice method (i.e., in contrast to results obtained using the type-curve matching method) are expected to be subject to error. Bouwer and Rice (1976) indicated that the estimate of hydraulic conductivity and transmissivity using their analysis method should be accurate to within 10 to 25%. Recently however, Hyder and Butler (1995) report that the errors as great as 100% can occur under certain test site conditions. For these reasons, greater credence is afforded the analytical results obtained using the type-curve matching approach, which has more rigorous analytical basis.

Based on the overall better type-curve match result obtained for test 3B, best estimate values for hydraulic conductivity and transmissivity of 196.4 ft/d and 11,000 ft^2/d, respectively are assigned for the unconfined aquifer in proximity to well 699-37-47A. It should be noted, however, that because of the very rapid recovery of the slug test responses (i.e., $\leq$ 5 sec), the cited best estimate values should be considered to be very qualitative in nature.

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TABLE 1. Comparison of Test Analysis Results for Slug Withdrawal Test 3A and 3B Conducted at Well 699-37-47A.

TEST	TEST PARAMETERS			ANALYSIS METHODS			
				BOUWER AND RICE		TYPE CURVE	
	r_c / r_w ft	b ft	H_o (observed) ft	K_e ft/d	T ft^2/d	K_e ft/d	T ft^2/d
3A	.230 /.333	56	0.227	99.9	5595	160.7	9000
3B	.230 /.333	56	0.221	114.1	6390	196.4	11000
BEST ESTIMATE VALUE:						196.4	11000

Note: r_c = effective well casing radius; calculated from well completion information as described in Bouwer (1989)

r_w = radial distance to undisturbed portion of aquifer (Bouwer 1989)

b = aquifer thickness

K_e = equivalent hydraulic conductivity, determined by dividing T by b; K_e is an assigned average value for the entire aquifer thickness

T = transmissivity

F.9

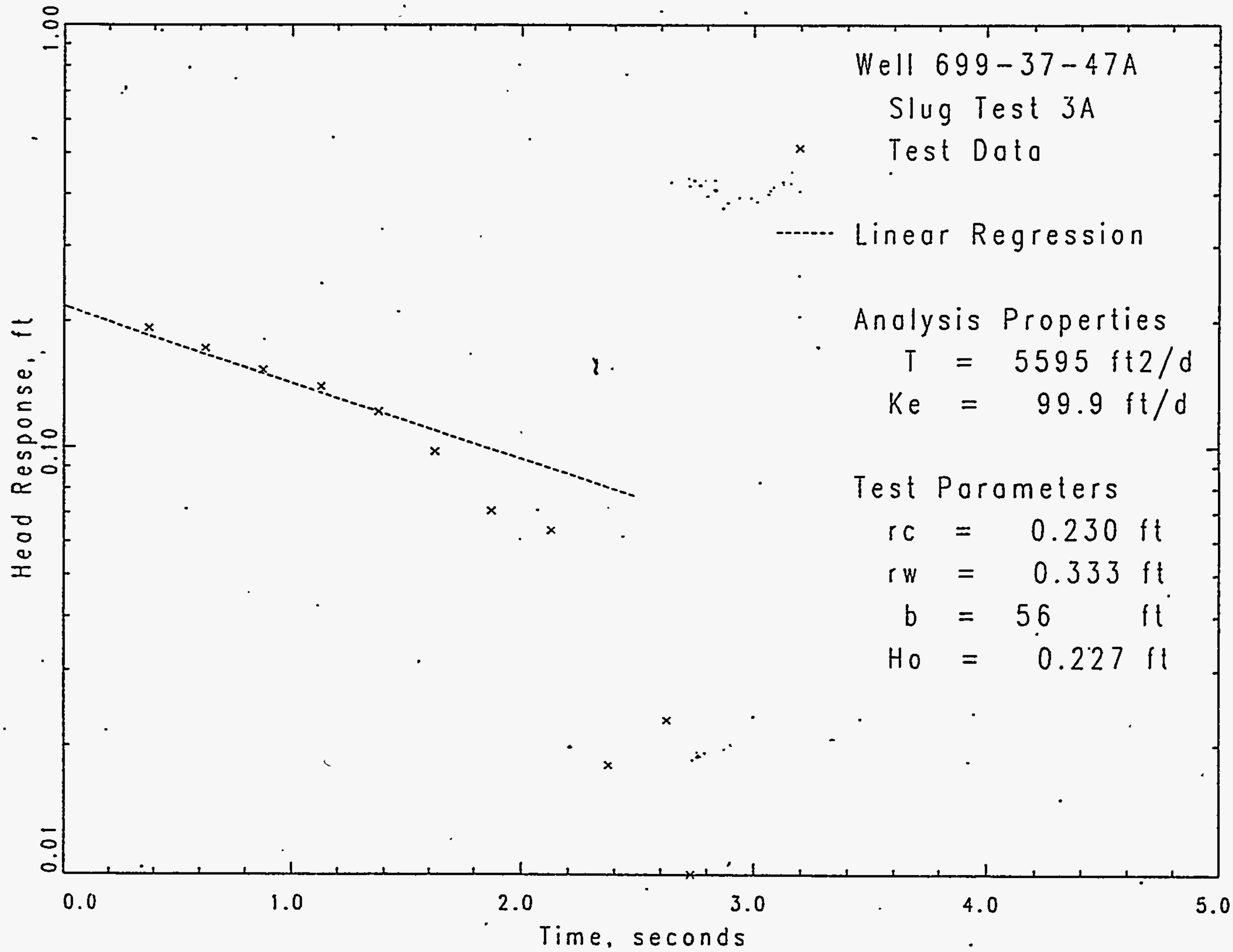


FIGURE 1. Slug Withdrawal Test 3A Analysis - Bouwer and Rice Method.

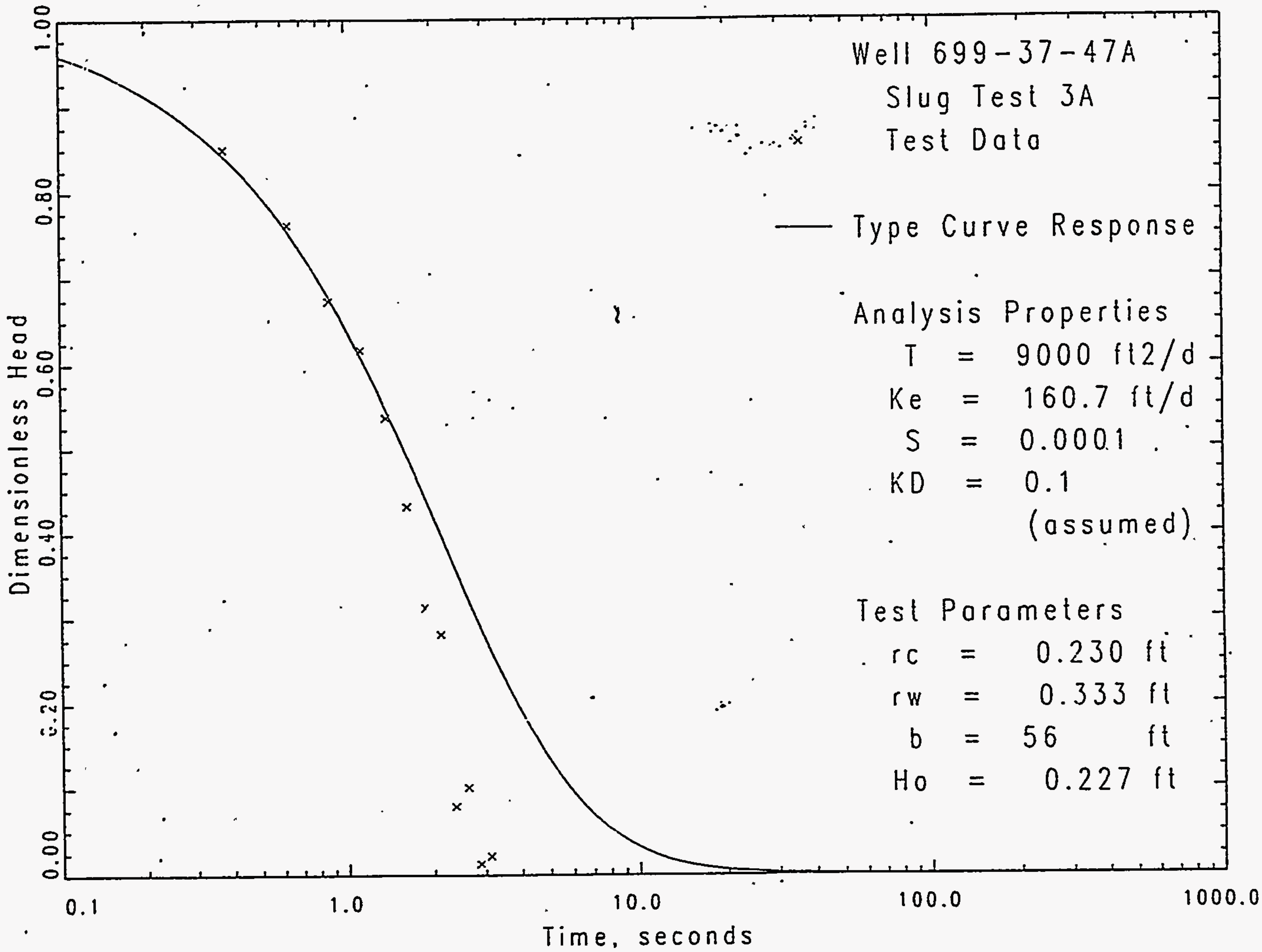


FIGURE 2. Slug Withdrawal Test 3A Analysis - Type-Curve Method.

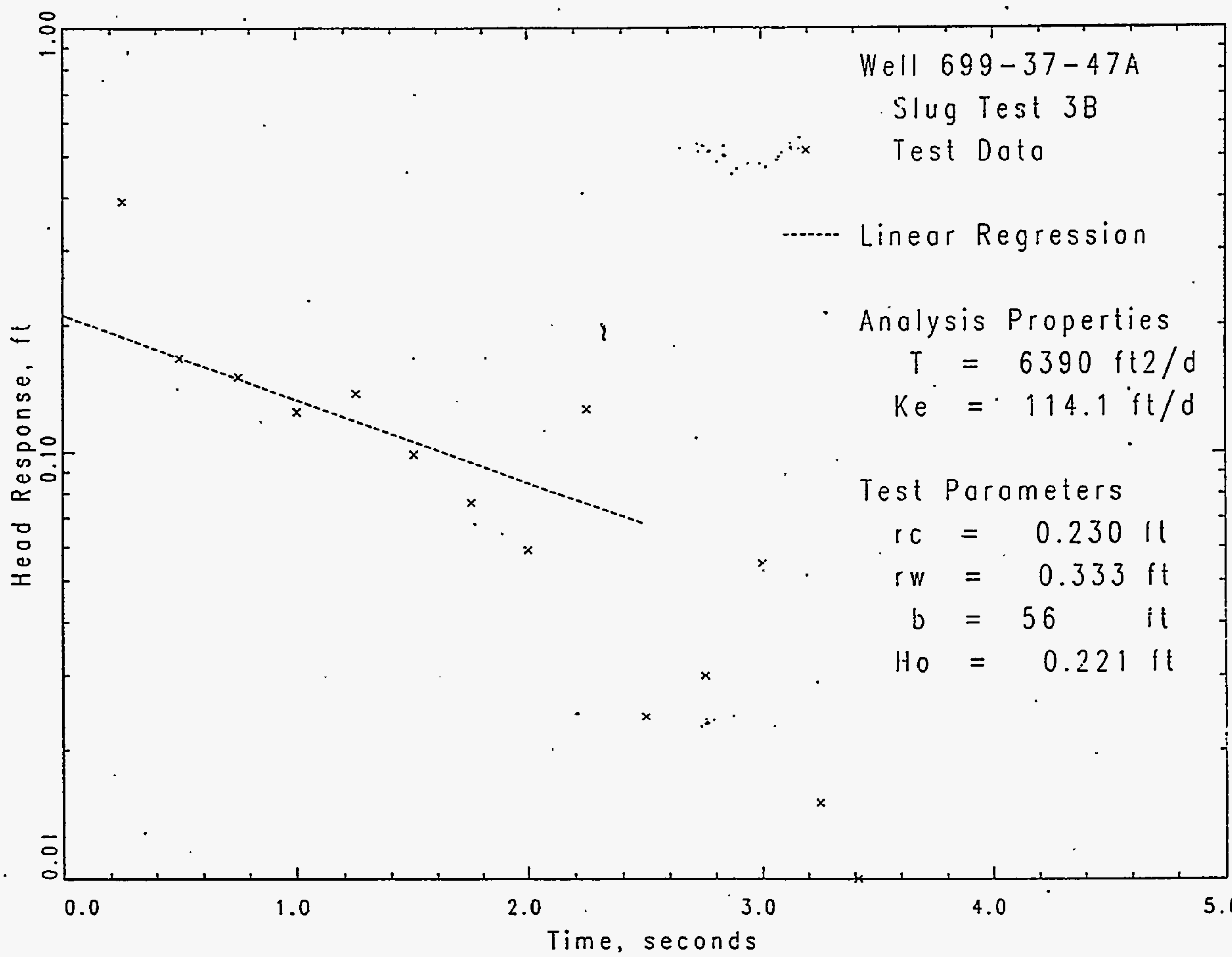


FIGURE 3. Slug Withdrawal Test 3B Analysis - Bouwer and Rice Method.

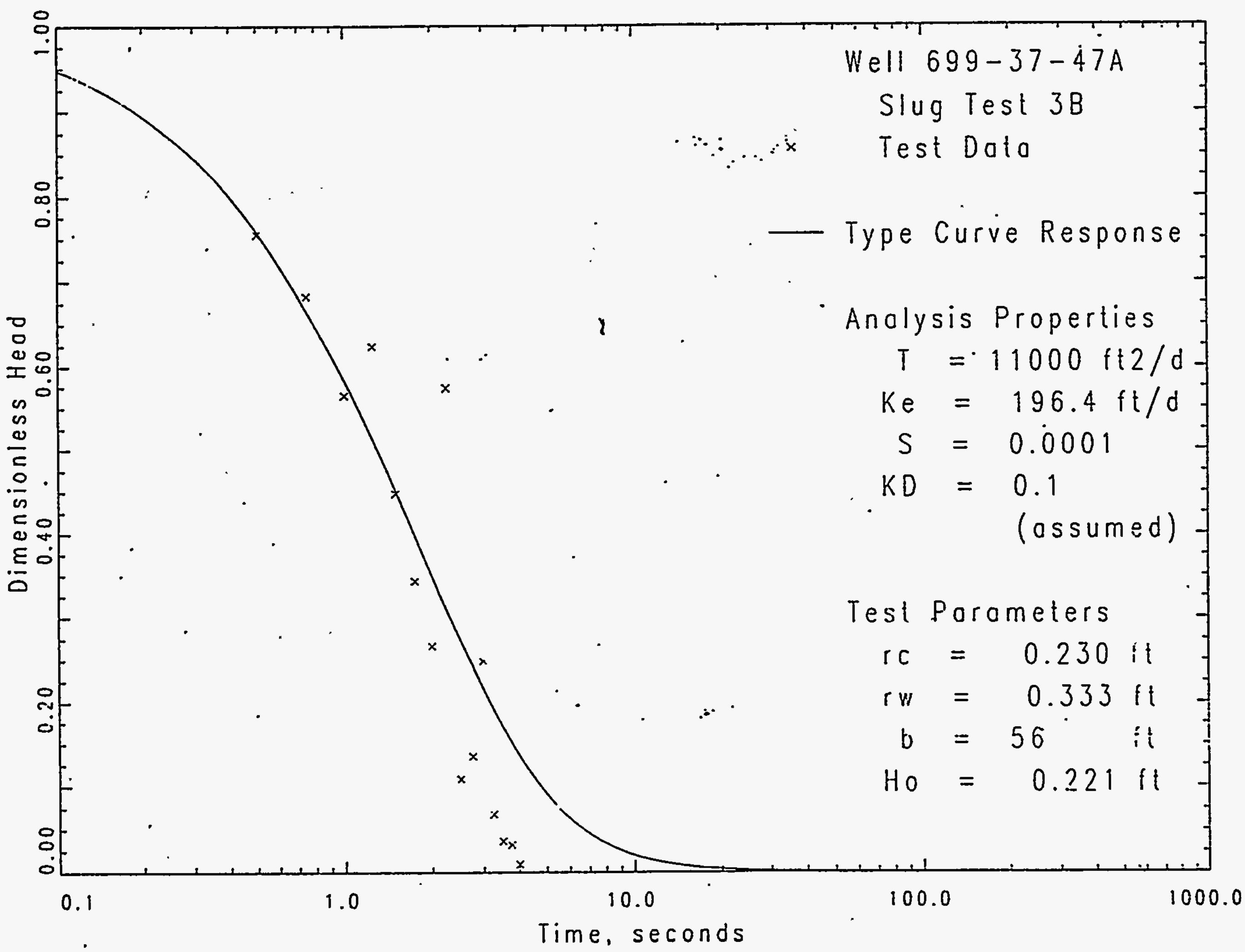


FIGURE 4. Slug Withdrawal Test 3B Analysis - Type-Curve Method.

IN-SITU FLOW MEASUREMENTS

Tot. Dep. = 342.6 ft.TOC

11-11-9 PROBE @ 319.0 ft (BTOC) 3.4ft BWL Declination Correction: 21 HEATER @ 1.6 amps — Dep. Water = 315.6 ft.TO

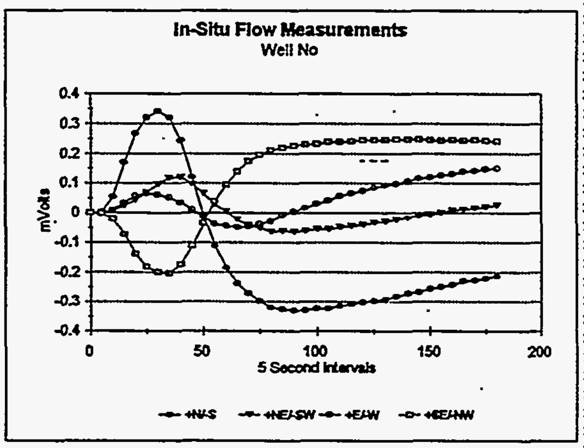
Test 3.4 on11/11/96 @ 1345 NORTH KVFLO25 (25mV) SOUTH@ 1445 11/11/96 — Screened Interval = 30 ft.

WELL NO: 699-37-47A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-11-96	1345	1348
TEST 2	SOUTH	11-11-96	1445	1448

TEST NO. 1 - TEST NO. 2
2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	0.00295	0.00125	0.00125	-0.00210
10	0.05485	0.00835	0.00835	-0.01965
15	0.16940	0.02385	0.03385	-0.07295
20	0.26895	0.04430	0.05685	-0.13820
25	0.32035	0.06770	0.06565	-0.18210
30	0.34160	0.09615	0.06055	-0.19960
35	0.31970	0.11875	0.05215	-0.20415
40	0.24260	0.11915	0.03415	-0.17390
45	0.11905	0.09695	0.01030	-0.11155
50	-0.00780	0.06550	-0.01355	-0.03535
55	-0.11080	0.02905	-0.03660	0.03955
60	-0.18570	0.00395	-0.04245	0.09440
65	-0.23890	-0.02160	-0.04750	0.13875
70	-0.27230	-0.04210	-0.04540	0.17430
75	-0.29825	-0.05045	-0.03700	0.19520
80	-0.32040	-0.06260	-0.02905	0.21235
85	-0.32580	-0.06010	-0.00895	0.22025
90	-0.33000	-0.06220	0.00405	0.22650
95	-0.33085	-0.05965	0.01615	0.23025
100	-0.32370	-0.05505	0.02960	0.23355
105	-0.32365	-0.05420	0.04135	0.23985
110	-0.31570	-0.04835	0.05595	0.24025
115	-0.30940	-0.04290	0.06480	0.24145
120	-0.30225	-0.03870	0.07355	0.24480
125	-0.29720	-0.03285	0.08570	0.24480
130	-0.29215	-0.02780	0.09285	0.24565
135	-0.28250	-0.02150	0.09830	0.24895
140	-0.27080	-0.01605	0.10755	0.24855
145	-0.26620	-0.00940	0.11505	0.24810
150	-0.25695	-0.00560	0.12050	0.24685
155	-0.25020	0.00115	0.12720	0.24430
160	-0.24390	0.00905	0.13140	0.24560
165	-0.23010	0.01200	0.13850	0.24470
170	-0.22795	0.01580	0.14145	0.24680
175	-0.22175	0.02035	0.14775	0.24390
180	-0.21250	0.02540	0.15065	0.24220
TOTAL	-5.20825	0.0476	1.80495	4.5423



TEST NO. 1

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
316	0	-1.51100	-1.08570	-1.85590	-5.94940	0.00000	0.00000	0.00000	0.00000
316	5	-1.51100	-1.08490	-1.85590	-5.95280	0.00000	0.00080	0.00000	-0.00340
316	10	-1.52860	-1.08660	-1.86180	-5.94690	-0.01760	-0.00090	-0.00590	0.00250
316	15	-1.70190	-1.10830	-1.89360	-5.88500	-0.19090	-0.02260	-0.03770	0.06440
316	20	-2.19160	-1.16360	-2.00320	-5.68320	-0.68060	-0.07790	-0.14730	0.26620
316	25	-2.95670	-1.26660	-2.19070	-5.31070	-1.44570	-0.18090	-0.33480	0.63870
316	30	-3.86410	-1.41310	-2.41930	-4.82680	-2.35310	-0.32740	-0.56340	1.12260
316	35	-4.83350	-1.61480	-2.65120	-4.30530	-3.32250	-0.52910	-0.79530	1.64410
316	40	-5.76440	-1.86760	-2.87550	-3.77620	-4.25340	-0.78190	-1.01960	2.17320
316	45	-6.55130	-2.13880	-3.07220	-3.31750	-5.04030	-1.05310	-1.21630	2.63190
316	50	-7.11050	-2.38080	-3.20780	-2.98850	-5.59950	-1.29510	-1.35190	2.96090
316	55	-7.43530	-2.58170	-3.27980	-2.80690	-5.92430	-1.49600	-1.42390	3.14250
316	60	-7.56840	-2.71230	-3.26810	-2.77340	-6.05740	-1.62660	-1.41220	3.17600
316	65	-7.56090	-2.79770	-3.21120	-2.83280	-6.04990	-1.71200	-1.35530	3.11660
316	70	-7.46040	-2.84120	-3.11910	-2.95420	-5.94940	-1.75550	-1.26320	2.99520
316	75	-7.30970	-2.84120	-2.99940	-3.11580	-5.79870	-1.75550	-1.14350	2.83360
316	80	-7.12470	-2.82190	-2.86880	-3.29070	-5.61370	-1.73620	-1.01290	2.65870
316	85	-6.90620	-2.77340	-2.72570	-3.47240	-5.39520	-1.68770	-0.86980	2.47700
316	90	-6.68610	-2.71900	-2.59760	-3.64400	-5.17510	-1.63330	-0.74170	2.30540
316	95	-6.45850	-2.65120	-2.47460	-3.80560	-4.94750	-1.56550	-0.61870	2.14380
316	100	-6.23330	-2.57920	-2.35740	-3.95380	-4.72230	-1.49350	-0.50150	1.99560
316	105	-6.01900	-2.51060	-2.24770	-4.08270	-4.50800	-1.42490	-0.39180	1.86670
316	110	-5.80470	-2.43690	-2.14560	-4.20740	-4.29370	-1.35120	-0.28970	1.74200
316	115	-5.60460	-2.36490	-2.05680	-4.31460	-4.09360	-1.27920	-0.20090	1.63480
316	120	-5.42130	-2.29960	-1.98320	-4.40080	-3.91030	-1.21390	-0.12730	1.54860
316	125	-5.24210	-2.22850	-1.90700	-4.48950	-3.73110	-1.14280	-0.05110	1.45990
316	130	-5.06880	-2.16320	-1.84000	-4.56740	-3.55780	-1.07750	0.01590	1.38200
316	135	-4.90980	-2.10200	-1.78640	-4.63270	-3.39880	-1.01630	0.06950	1.31670
316	140	-4.74910	-2.04260	-1.73450	-4.69550	-3.23810	-0.95690	0.12140	1.25390
316	145	-4.61600	-1.98740	-1.68600	-4.74990	-3.10500	-0.90170	0.16990	1.19950
316	150	-4.47700	-1.93380	-1.64500	-4.80430	-2.96600	-0.84810	0.21090	1.14510
316	155	-4.34890	-1.88100	-1.60480	-4.85540	-2.83790	-0.79530	0.25110	1.09400
316	160	-4.23000	-1.82830	-1.57460	-4.89890	-2.71900	-0.74260	0.28130	1.05050
316	165	-4.10360	-1.78730	-1.53950	-4.93830	-2.59260	-0.70160	0.31640	1.01110
316	170	-4.00480	-1.74540	-1.51690	-4.97510	-2.49380	-0.65970	0.33900	0.97430
316	175	-3.90360	-1.70360	-1.49090	-5.01020	-2.39260	-0.61790	0.36500	0.93920
316	180	-3.80560	-1.66760	-1.47170	-5.04290	-2.29460	-0.58190	0.38420	0.90650

TEST NO.2

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
316	0	-1.53910	-1.08130	-1.84630	-5.94820	0.00000	0.00000	0.00000	0.00000
316	5	-1.54500	-1.08300	-1.84880	-5.94740	-0.00590	-0.00170	-0.00250	0.00080
316	10	-1.66640	-1.09890	-1.86890	-5.90640	-0.12730	-0.01760	-0.02260	0.04180
316	15	-2.06880	-1.15160	-1.95170	-5.73790	-0.52970	-0.07030	-0.10540	0.21030
316	20	-2.75760	-1.24780	-2.10730	-5.40560	-1.21850	-0.16650	-0.26100	0.54260
316	25	-3.62550	-1.39760	-2.31240	-4.94530	-2.08640	-0.31630	-0.46610	1.00290
316	30	-4.57540	-1.60100	-2.53080	-4.42640	-3.03630	-0.51970	-0.68450	1.52180
316	35	-5.50100	-1.84790	-2.74590	-3.89580	-3.96190	-0.76660	-0.89960	2.05240
316	40	-6.27770	-2.10150	-2.93420	-3.42720	-4.73860	-1.02020	-1.08790	2.52100
316	45	-6.81750	-2.32830	-3.08320	-3.09320	-5.27840	-1.24700	-1.23690	2.85500
316	50	-7.12300	-2.50740	-3.17110	-2.91660	-5.58390	-1.42610	-1.32480	3.03160
316	55	-7.24180	-2.63540	-3.19700	-2.88480	-5.70270	-1.55410	-1.35070	3.06340
316	60	-7.22510	-2.71580	-3.17360	-2.96100	-5.68600	-1.63450	-1.32730	2.98720
316	65	-7.11120	-2.75010	-3.10660	-3.10910	-5.57210	-1.66880	-1.26030	2.83910
316	70	-6.94390	-2.75260	-3.01870	-3.30160	-5.40480	-1.67130	-1.17240	2.64660
316	75	-6.74130	-2.73590	-2.91580	-3.50500	-5.20220	-1.65460	-1.06950	2.44320
316	80	-6.51200	-2.69230	-2.80110	-3.71420	-4.97290	-1.61100	-0.95480	2.23400
316	85	-6.28270	-2.64880	-2.69820	-3.91170	-4.74360	-1.56750	-0.85190	2.03650
316	90	-6.05420	-2.59020	-2.59610	-4.09580	-4.51510	-1.50890	-0.74980	1.85240
316	95	-5.82490	-2.52750	-2.49730	-4.26490	-4.28580	-1.44620	-0.65100	1.68330
316	100	-5.61400	-2.46470	-2.40700	-4.41970	-4.07490	-1.38340	-0.56070	1.52850
316	105	-5.39980	-2.39780	-2.32080	-4.56120	-3.86070	-1.31650	-0.47450	1.38700
316	110	-5.20140	-2.33580	-2.24790	-4.68670	-3.66230	-1.25450	-0.40160	1.26150
316	115	-5.01390	-2.27470	-2.17680	-4.79630	-3.47480	-1.19340	-0.33050	1.15190
316	120	-4.84490	-2.21780	-2.12070	-4.88920	-3.30580	-1.13650	-0.27440	1.05900
316	125	-4.67580	-2.15840	-2.06880	-4.97790	-3.13670	-1.07710	-0.22250	0.97030
316	130	-4.51260	-2.10320	-2.01610	-5.05750	-2.97350	-1.02190	-0.16980	0.89070
316	135	-4.37290	-2.05460	-1.97340	-5.12940	-2.83380	-0.97330	-0.12710	0.81880
316	140	-4.23560	-2.00610	-1.94000	-5.19140	-2.69650	-0.92480	-0.09370	0.75680
316	145	-4.11170	-1.96420	-1.90650	-5.24490	-2.57260	-0.88290	-0.06020	0.70330
316	150	-3.99120	-1.91820	-1.87640	-5.29680	-2.45210	-0.83690	-0.03010	0.65140
316	155	-3.87660	-1.87890	-1.84960	-5.34280	-2.33750	-0.79760	-0.00330	0.60540
316	160	-3.77030	-1.84200	-1.82780	-5.38890	-2.23120	-0.76070	0.01850	0.55930
316	165	-3.67150	-1.80690	-1.80690	-5.42650	-2.13240	-0.72560	0.03940	0.52170
316	170	-3.57700	-1.77260	-1.79020	-5.45750	-2.03790	-0.69130	0.05610	0.48070
316	175	-3.48820	-1.73990	-1.77680	-5.49680	-1.94910	-0.65860	0.06950	0.45140
316	180	-3.40870	-1.71400	-1.76340	-5.52610	-1.86960	-0.63270	0.08290	0.42210

KVA Flowmeter Measurements

Well Number: 699–37–47A

Test No.: A37–3.4

Date: 11–11–96

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: S 33.5° E

Probe No. : 2D–1
Controller No.: B
Computer Interface No.: 2

Flowrate Calculation:

Clibration Curve Date: October 1995

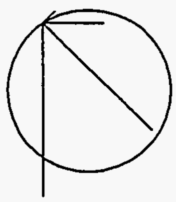
Calibration Cuve: Assumed Effective Porosity @ 20%

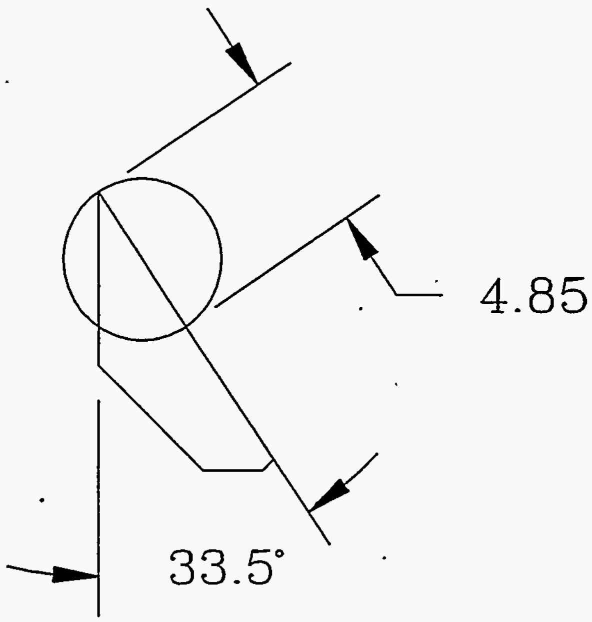
$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}} \quad 1.0 \text{ ft./day}$$

Vector Fit Calculation:

100–(((A+B+C+D)/Cal.Vector Length)x100)= %

100–((( )/ x100)= %





IN-SITU FLOW MEASUREMENTS Tot. Dep. = 342.6 ft.TOC

11-12-9 **PROBE @ 323.0 ft (BTOC) 7.4ft BWL Declination Correction: 21 HEATER @ 1.6 amps** **Dep. Water = 315.6 ft.TO**

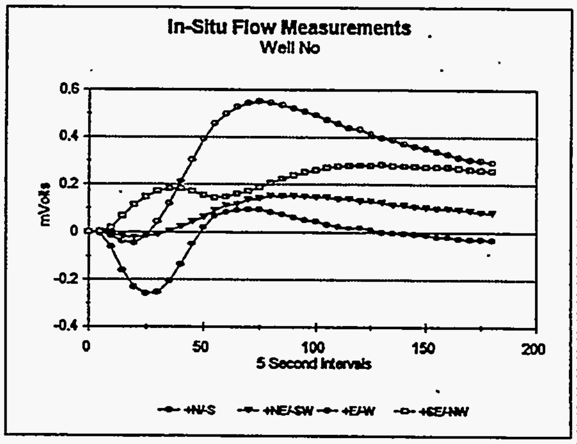
Test 7.4 on11/12/96 @ 0810 NORTH KVFLO25 (25mV) SOUTH@ 0910 11/12/96 **Screened Interval = 30 ft.**

WELL NO: 699-37-47A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-12-96	810	813
TEST 2	SOUTH	11-12-96	910	913

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00710	0.00168	0.00165	-0.00080
10	-0.06365	-0.00586	-0.01680	0.01845
15	-0.16175	-0.01882	-0.03690	0.06665
20	-0.23260	-0.02307	-0.04660	0.11315
25	-0.25870	-0.01597	-0.01560	0.14590
30	-0.25380	-0.01262	0.04350	0.17065
35	-0.20780	0.00408	0.11965	0.18285
40	-0.13670	0.02128	0.21305	0.18290
45	-0.05040	0.04433	0.30520	0.17120
50	0.01820	0.06313	0.39025	0.15450
55	0.06635	0.09078	0.45725	0.14400
60	0.08445	0.11043	0.49710	0.14775
65	0.09235	0.11668	0.52725	0.16115
70	0.09625	0.13473	0.54325	0.17170
75	0.09420	0.14063	0.55165	0.18675
80	0.08335	0.15113	0.54660	0.20470
85	0.07495	0.15023	0.53530	0.22400
90	0.06330	0.15153	0.52190	0.23905
95	0.05030	0.14983	0.50810	0.25120
100	0.04615	0.14653	0.49345	0.26165
105	0.03315	0.14568	0.47290	0.27005
110	0.02565	0.13858	0.45575	0.27675
115	0.01730	0.13938	0.43815	0.27965
120	0.01815	0.12893	0.43270	0.28090
125	0.01020	0.13103	0.41220	0.27925
130	-0.00145	0.12478	0.39630	0.28430
135	-0.00225	0.11388	0.38965	0.28015
140	-0.00475	0.11308	0.37245	0.27845
145	-0.00810	0.10598	0.36200	0.27760
150	-0.01230	0.10258	0.35355	0.27510
155	-0.02025	0.09718	0.33895	0.27380
160	-0.02065	0.09758	0.32845	0.27380
165	-0.02655	0.09468	0.31630	0.26755
170	-0.03070	0.08883	0.30500	0.26380
175	-0.02940	0.08248	0.30040	0.26125
180	-0.03280	0.08083	0.29370	0.25915
TOTAL	-0.6874	3.18514	12.1077	7.57895



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.55120	-0.95617	-1.79250	-6.07470	0.00000	0.00000	0.00000	0.00000
317	5	-1.56290	-0.95700	-1.79250	-6.07300	-0.01170	-0.00083	0.00000	0.00170
317	10	-1.72290	-0.97879	-1.83020	-6.02440	-0.17170	-0.02262	-0.03770	0.05030
317	15	-2.17380	-1.03240	-1.94750	-5.83590	-0.62260	-0.07623	-0.15500	0.23880
317	20	-2.89780	-1.12130	-2.14030	-5.50070	-1.34660	-0.16513	-0.34780	0.57400
317	25	-3.78700	-1.24110	-2.36820	-5.05820	-2.23580	-0.28493	-0.57570	1.01650
317	30	-4.73310	-1.39110	-2.59610	-4.57470	-3.18190	-0.43493	-0.80360	1.50000
317	35	-5.63310	-1.57130	-2.80900	-4.09870	-4.08190	-0.61513	-1.01650	1.97600
317	40	-6.39150	-1.77240	-2.99670	-3.69230	-4.84030	-0.81623	-1.20420	2.38240
317	45	-6.90430	-1.97430	-3.11910	-3.43250	-5.35310	-1.01813	-1.32660	2.64220
317	50	-7.19350	-2.15870	-3.18020	-3.32770	-5.64230	-1.20253	-1.38770	2.74700
317	55	-7.30160	-2.31540	-3.18360	-3.34780	-5.75040	-1.35923	-1.39110	2.72690
317	60	-7.29230	-2.43360	-3.15170	-3.44510	-5.74110	-1.47743	-1.35920	2.62960
317	65	-7.20440	-2.52410	-3.08720	-3.59250	-5.65320	-1.56793	-1.29470	2.48220
317	70	-7.05020	-2.56770	-3.00340	-3.77100	-5.49900	-1.61153	-1.21090	2.30370
317	75	-6.86080	-2.59280	-2.90870	-3.95370	-5.30960	-1.63663	-1.11620	2.12100
317	80	-6.66800	-2.58690	-2.81740	-4.12220	-5.11680	-1.63073	-1.02490	1.95250
317	85	-6.45940	-2.57020	-2.73020	-4.27970	-4.90820	-1.61403	-0.93770	1.79500
317	90	-6.25150	-2.53750	-2.64810	-4.42050	-4.70030	-1.58133	-0.85560	1.65420
317	95	-6.04620	-2.49560	-2.56180	-4.55120	-4.49500	-1.53943	-0.76930	1.52350
317	100	-5.83840	-2.44360	-2.48470	-4.66850	-4.28720	-1.48743	-0.69220	1.40620
317	105	-5.64900	-2.39080	-2.41600	-4.76320	-4.09780	-1.43463	-0.62350	1.31150
317	110	-5.46300	-2.33550	-2.34980	-4.85120	-3.91180	-1.37933	-0.55730	1.22350
317	115	-5.28700	-2.27690	-2.28860	-4.92830	-3.73580	-1.32073	-0.49610	1.14640
317	120	-5.10180	-2.21900	-2.22490	-5.00460	-3.55060	-1.26283	-0.43240	1.07010
317	125	-4.94510	-2.15790	-2.17210	-5.06320	-3.39390	-1.20173	-0.37960	1.01150
317	130	-4.80160	-2.10670	-2.12930	-5.11170	-3.25040	-1.15053	-0.33680	0.96300
317	135	-4.65580	-2.05140	-2.08150	-5.16110	-3.10460	-1.09523	-0.28900	0.91360
317	140	-4.51420	-2.00110	-2.03800	-5.20720	-2.96300	-1.04493	-0.24550	0.86750
317	145	-4.38350	-1.94910	-1.99770	-5.24660	-2.83230	-0.99293	-0.20520	0.82810
317	150	-4.26370	-1.90310	-1.96260	-5.28010	-2.71250	-0.94693	-0.17010	0.79460
317	155	-4.15720	-1.85780	-1.93570	-5.30360	-2.60600	-0.90163	-0.14320	0.77110
317	160	-4.04160	-1.81340	-1.90640	-5.33210	-2.49040	-0.85723	-0.11390	0.74260
317	165	-3.94610	-1.77230	-1.87960	-5.35890	-2.39490	-0.81613	-0.08710	0.71580
317	170	-3.85140	-1.73290	-1.85360	-5.38400	-2.30020	-0.77673	-0.06110	0.69070
317	175	-3.75160	-1.69610	-1.83100	-5.40410	-2.20040	-0.73993	-0.03850	0.67060
317	180	-3.67120	-1.66090	-1.81090	-5.42170	-2.12000	-0.70473	-0.01840	0.65300

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.53740	-0.96181	-1.79130	-6.04850	0.00000	0.00000	0.00000	0.00000
317	5	-1.53490	-0.96600	-1.79460	-6.04320	0.00250	-0.00419	-0.00330	0.00530
317	10	-1.58180	-0.97271	-1.79540	-6.03310	-0.04440	-0.01090	-0.00410	0.01340
317	15	-1.83650	-1.00040	-1.87250	-5.94100	-0.29910	-0.03859	-0.08120	0.10550
317	20	-2.41880	-1.08080	-2.04590	-5.69880	-0.88140	-0.11899	-0.25460	0.34770
317	25	-3.25580	-1.21480	-2.33580	-5.32180	-1.71840	-0.25299	-0.54450	0.72470
317	30	-4.21170	-1.37150	-2.68190	-4.88780	-2.67430	-0.40969	-0.89060	1.15870
317	35	-5.20370	-1.58510	-3.04710	-4.43620	-3.66630	-0.62329	-1.25580	1.61030
317	40	-6.10430	-1.82060	-3.42160	-4.02990	-4.56690	-0.85879	-1.63030	2.01660
317	45	-6.78970	-2.06860	-3.72830	-3.74670	-5.25230	-1.10679	-1.93700	2.29980
317	50	-7.21610	-2.29060	-3.95950	-3.60850	-5.67870	-1.32879	-2.16820	2.43800
317	55	-7.42050	-2.50260	-4.09690	-3.60760	-5.88310	-1.54079	-2.30560	2.43890
317	60	-7.44740	-2.66010	-4.14470	-3.71240	-5.91000	-1.69829	-2.35340	2.33410
317	65	-7.37530	-2.76310	-4.14050	-3.88660	-5.83790	-1.80129	-2.34920	2.15990
317	70	-7.22890	-2.84280	-4.08870	-4.08620	-5.69150	-1.88099	-2.29740	1.96030
317	75	-7.03540	-2.87970	-4.01080	-4.29900	-5.49800	-1.91789	-2.21950	1.74750
317	80	-6.82090	-2.89480	-3.90940	-4.50340	-5.28350	-1.93299	-2.11810	1.54310
317	85	-6.59550	-2.87630	-3.79960	-4.69950	-5.05810	-1.91449	-2.00830	1.34700
317	90	-6.36430	-2.84620	-3.69070	-4.87040	-4.82690	-1.88439	-1.89940	1.17610
317	95	-6.13300	-2.80090	-3.57680	-5.02540	-4.59560	-1.83909	-1.78550	1.02110
317	100	-5.91690	-2.74230	-3.47040	-5.16360	-4.37950	-1.78049	-1.67910	0.88290
317	105	-5.70150	-2.68780	-3.36060	-5.27510	-4.16410	-1.72599	-1.56930	0.77140
317	110	-5.50050	-2.61830	-3.26010	-5.37650	-3.96310	-1.65649	-1.46880	0.67000
317	115	-5.30780	-2.56130	-3.16370	-5.45940	-3.77040	-1.59949	-1.37240	0.58710
317	120	-5.12430	-2.48250	-3.08910	-5.53820	-3.58690	-1.52069	-1.29780	0.50830
317	125	-4.95170	-2.42560	-2.99530	-5.59350	-3.41430	-1.46379	-1.20400	0.45300
317	130	-4.78490	-2.36190	-2.92070	-5.65210	-3.24750	-1.40009	-1.12940	0.39440
317	135	-4.63750	-2.28480	-2.85960	-5.69320	-3.10010	-1.32299	-1.06830	0.35330
317	140	-4.49090	-2.23290	-2.78170	-5.73590	-2.95350	-1.27109	-0.99040	0.31060
317	145	-4.35350	-2.16670	-2.72050	-5.77360	-2.81610	-1.20489	-0.92920	0.27290
317	150	-4.22530	-2.11390	-2.66850	-5.80210	-2.68790	-1.15209	-0.87720	0.24440
317	155	-4.10290	-2.05780	-2.61240	-5.82300	-2.56550	-1.09599	-0.82110	0.22350
317	160	-3.98650	-2.01420	-2.56210	-5.85150	-2.44910	-1.05239	-0.77080	0.19500
317	165	-3.87920	-1.96730	-2.51100	-5.86580	-2.34180	-1.00549	-0.71970	0.18070
317	170	-3.77620	-1.91620	-2.46240	-5.88340	-2.23880	-0.95439	-0.67110	0.16310
317	175	-3.67900	-1.86670	-2.43060	-5.89840	-2.14160	-0.90489	-0.63930	0.14810
317	180	-3.59180	-1.82820	-2.39710	-5.91180	-2.05440	-0.86639	-0.60580	0.13470

KVA Flowmeter Measurements

Well Number: 699-37-47A

Test No.: A37-7.4

Date: 11-12-96

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: S 79.1° E

Probe No. : 2D-1
Controller No.: B
Computer Interface No.: 2

Flowrate Calculation:

Clibration Curve Date: October 1995

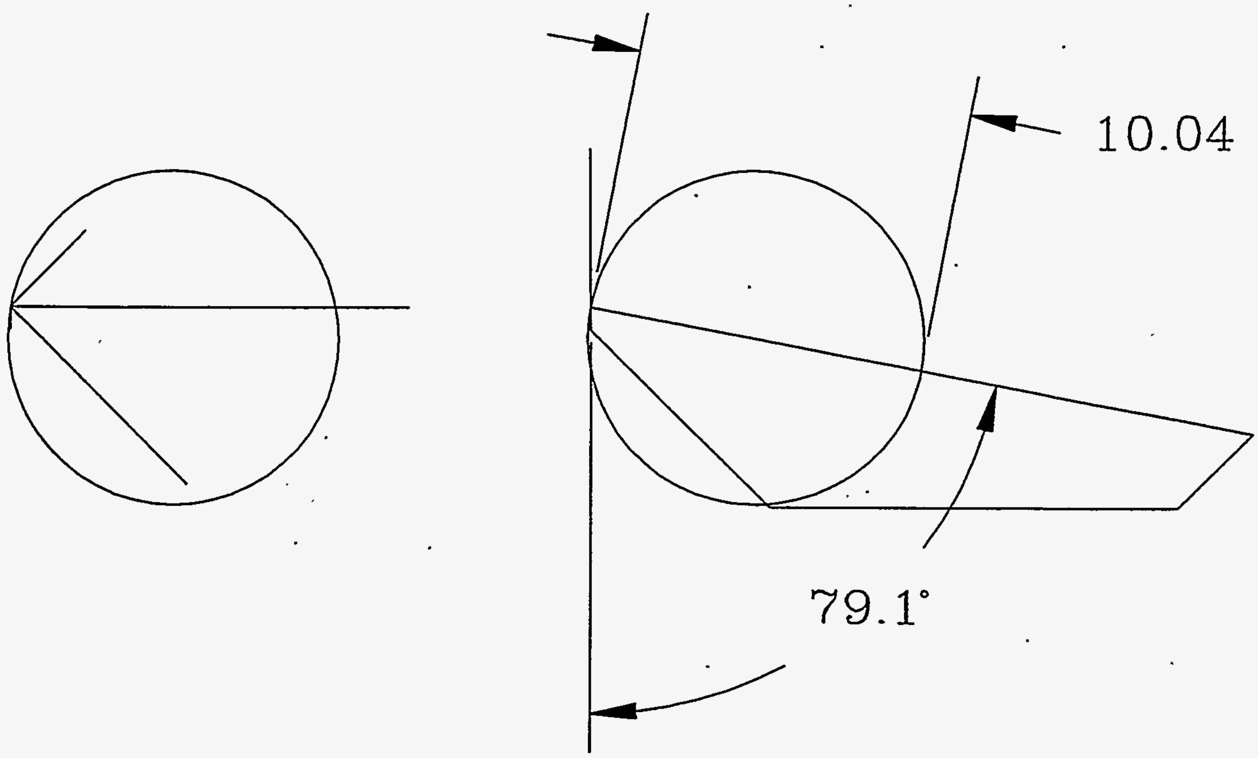
Calibration Cuve: Assumed Effective Porosity @ 20%

$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}} \quad 2.4 \text{ ft./day}$$

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-((( )/ x100)= %



IN-SITU FLOW MEASUREMENTS

Tot. Dep. = 342.6 ft.TOC

11-12-9 **PROBE @ 327.0 ft (BTOC) 11.4ft BWL Declination Correction: 2 HEATER @ 1.6 amps**

Dep. Water = 315.6 ft.TO

Test 11.4 on11/12/96 @ 1015 NORTH KVFLO25 (25mV) SOUTH@ 1115 11/12/96

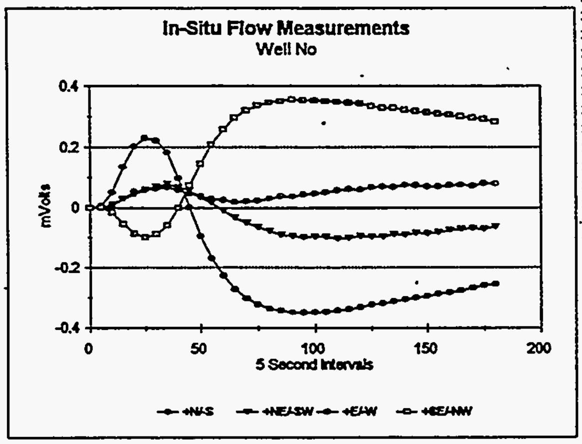
Screened Interval = 30 ft.

WELL NO: 699-37-46A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-12-96	1015	1018
TEST 2	SOUTH	11-12-96	1116	1119

$\frac{\text{TEST NO. 1} - \text{TEST NO. 2}}{2}$

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	0.00505	0.00083	0.00005	0.00125
10	0.05115	0.01004	0.00550	-0.01550
15	0.13530	0.02891	0.03060	-0.05405
20	0.20310	0.04400	0.05320	-0.08625
25	0.22985	0.05865	0.05990	-0.09960
30	0.22145	0.07075	0.06325	-0.08915
35	0.18320	0.07911	0.06695	-0.05900
40	0.09890	0.06736	0.05895	0.00050
45	0.00175	0.05685	0.04600	0.07510
50	-0.09380	0.03546	0.03800	0.14550
55	-0.16835	0.01536	0.03045	0.20955
60	-0.22745	-0.00894	0.02585	0.25940
65	-0.27140	-0.03365	0.01915	0.29620
70	-0.30115	-0.04955	0.02165	0.31930
75	-0.32205	-0.06505	0.02380	0.33810
80	-0.33505	-0.07765	0.03090	0.34685
85	-0.34295	-0.09020	0.03845	0.35145
90	-0.34795	-0.09355	0.03720	0.35690
95	-0.34880	-0.09940	0.04520	0.35480
100	-0.34750	-0.09644	0.04770	0.35315
105	-0.34710	-0.09730	0.05105	0.35100
110	-0.34250	-0.10360	0.05775	0.34935
115	-0.33740	-0.10020	0.06235	0.34515
120	-0.33200	-0.09475	0.05860	0.34345
125	-0.32400	-0.09725	0.06820	0.33505
130	-0.31895	-0.09690	0.07030	0.32960
135	-0.31225	-0.08764	0.06740	0.32835
140	-0.30640	-0.09055	0.07575	0.32210
145	-0.29970	-0.08385	0.07415	0.31830
150	-0.29420	-0.08555	0.06990	0.31415
155	-0.28750	-0.08180	0.07080	0.30910
160	-0.28205	-0.07419	0.07410	0.30615
165	-0.27620	-0.07170	0.07535	0.30070
170	-0.26820	-0.06920	0.07245	0.29650
175	-0.25945	-0.06965	0.08080	0.29185
180	-0.25525	-0.06165	0.08000	0.28430
TOTAL	-6.81985	-1.512805	1.8517	8.1296



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.51800	-0.98935	-1.78440	-6.04000	0.00000	0.00000	0.00000	0.00000
317	5	-1.51380	-0.98768	-1.78600	-6.03580	0.00420	0.00167	-0.00160	0.00420
317	10	-1.57410	-0.99773	-1.80950	-6.01990	-0.05610	-0.00838	-0.02510	0.02010
317	15	-1.87320	-1.03880	-1.87900	-5.91100	-0.35520	-0.04945	-0.09460	0.12900
317	20	-2.52490	-1.14680	-2.04740	-5.62200	-1.00690	-0.15745	-0.26300	0.41800
317	25	-3.45560	-1.31100	-2.29540	-5.18550	-1.93760	-0.32165	-0.51100	0.85450
317	30	-4.52120	-1.51540	-2.55760	-4.65610	-3.00320	-0.52605	-0.77320	1.38390
317	35	-5.62280	-1.75670	-2.82400	-4.08640	-4.10480	-0.76735	-1.03960	1.95360
317	40	-6.63900	-2.03150	-3.09460	-3.53940	-5.12100	-1.04215	-1.31020	2.50060
317	45	-7.42640	-2.28200	-3.32240	-3.10880	-5.90840	-1.29265	-1.53800	2.93120
317	50	-7.94080	-2.49980	-3.47990	-2.85660	-6.42280	-1.51045	-1.69550	3.18340
317	55	-8.21050	-2.67740	-3.57040	-2.75530	-6.69250	-1.68805	-1.78600	3.28470
317	60	-8.30020	-2.81480	-3.61230	-2.78460	-6.78220	-1.82545	-1.82790	3.25540
317	65	-8.26250	-2.91190	-3.61060	-2.89940	-6.74450	-1.92255	-1.82620	3.14060
317	70	-8.14270	-2.95800	-3.56790	-3.07440	-6.62470	-1.96865	-1.78350	2.96560
317	75	-7.96680	-2.97980	-3.50670	-3.26290	-6.44880	-1.99045	-1.72230	2.77710
317	80	-7.75650	-2.97140	-3.41790	-3.46150	-6.23850	-1.98205	-1.63350	2.57850
317	85	-7.52860	-2.95470	-3.32830	-3.65500	-6.01060	-1.96535	-1.54390	2.38500
317	90	-7.29990	-2.90270	-3.24790	-3.82670	-5.78190	-1.91335	-1.46350	2.21330
317	95	-7.06290	-2.85160	-3.15400	-3.99590	-5.54490	-1.86225	-1.36960	2.04410
317	100	-6.83580	-2.77790	-3.06940	-4.14000	-5.31780	-1.78855	-1.28500	1.90000
317	105	-6.61300	-2.70750	-2.98310	-4.26990	-5.09500	-1.71815	-1.19870	1.77010
317	110	-6.39940	-2.65140	-2.89520	-4.38380	-4.88140	-1.66205	-1.11080	1.65620
317	115	-6.18990	-2.57350	-2.81640	-4.48350	-4.67190	-1.58415	-1.03200	1.55650
317	120	-5.99480	-2.49140	-2.75440	-4.56810	-4.47680	-1.50205	-0.97000	1.47190
317	125	-5.80290	-2.43020	-2.67570	-4.65360	-4.28490	-1.44085	-0.89130	1.38640
317	130	-5.62530	-2.36410	-2.60870	-4.72310	-4.10730	-1.37475	-0.82430	1.31690
317	135	-5.45440	-2.28450	-2.55840	-4.77670	-3.93640	-1.29515	-0.77400	1.26330
317	140	-5.29360	-2.22750	-2.49060	-4.83450	-3.77560	-1.23815	-0.70620	1.20550
317	145	-5.14030	-2.16130	-2.44360	-4.87720	-3.62230	-1.17195	-0.65920	1.16280
317	150	-4.99530	-2.10270	-2.40430	-4.92160	-3.47730	-1.11335	-0.61990	1.11840
317	155	-4.85800	-2.04660	-2.35900	-4.95930	-3.34000	-1.05725	-0.57460	1.08070
317	160	-4.72730	-1.98040	-2.31130	-4.99370	-3.20930	-0.99105	-0.52690	1.04630
317	165	-4.60080	-1.92930	-2.26860	-5.02720	-3.08280	-0.93995	-0.48420	1.01280
317	170	-4.48520	-1.88070	-2.23840	-5.05320	-2.96720	-0.89135	-0.45400	0.98680
317	175	-4.36710	-1.84140	-2.19070	-5.07920	-2.84910	-0.85205	-0.40630	0.96080
317	180	-4.26490	-1.78520	-2.15630	-5.10940	-2.74690	-0.79585	-0.37190	0.93060

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.49680	-0.98924	-1.78830	-6.02340	0.00000	0.00000	0.00000	0.00000
317	5	-1.50270	-0.98924	-1.79000	-6.02170	-0.00590	0.00000	-0.00170	0.00170
317	10	-1.65520	-1.01770	-1.82440	-5.97230	-0.15840	-0.02846	-0.03610	0.05110
317	15	-2.12260	-1.09650	-1.94410	-5.78630	-0.62580	-0.10726	-0.15580	0.23710
317	20	-2.90990	-1.23470	-2.15770	-5.43290	-1.41310	-0.24546	-0.36940	0.59050
317	25	-3.89410	-1.42820	-2.41910	-4.96970	-2.39730	-0.43896	-0.63080	1.05370
317	30	-4.94290	-1.65680	-2.68800	-4.46120	-3.44610	-0.66756	-0.89970	1.56220
317	35	-5.96800	-1.91480	-2.96180	-3.95180	-4.47120	-0.92556	-1.17350	2.07160
317	40	-6.81560	-2.16810	-3.21640	-3.52380	-5.31880	-1.17686	-1.42810	2.49960
317	45	-7.40870	-2.39560	-3.41830	-3.24240	-5.91190	-1.40636	-1.63000	2.78100
317	50	-7.73200	-2.57060	-3.55980	-3.13100	-6.23520	-1.58136	-1.77150	2.89240
317	55	-7.85260	-2.70800	-3.63520	-3.15780	-6.35580	-1.71876	-1.84690	2.86560
317	60	-7.82410	-2.79680	-3.66790	-3.28680	-6.32730	-1.80756	-1.87960	2.73660
317	65	-7.69850	-2.84450	-3.65280	-3.47520	-6.20170	-1.85526	-1.86450	2.54820
317	70	-7.51920	-2.85880	-3.61510	-3.69640	-6.02240	-1.86956	-1.82680	2.32700
317	75	-7.30150	-2.84960	-3.55820	-3.92250	-5.80470	-1.86036	-1.76990	2.10090
317	80	-7.06520	-2.81600	-3.48360	-4.13860	-5.56840	-1.82676	-1.69530	1.88480
317	85	-6.82150	-2.77420	-3.40910	-4.34130	-5.32470	-1.78496	-1.62080	1.68210
317	90	-6.58280	-2.71550	-3.32620	-4.52390	-5.08600	-1.72626	-1.53790	1.49950
317	95	-6.34410	-2.65270	-3.24830	-4.68890	-4.84730	-1.66346	-1.46000	1.33450
317	100	-6.11960	-2.58490	-3.16870	-4.82970	-4.62280	-1.59566	-1.38040	1.19370
317	105	-5.89760	-2.51280	-3.08910	-4.95530	-4.40080	-1.52356	-1.30080	1.06810
317	110	-5.69320	-2.44410	-3.01460	-5.06590	-4.19640	-1.45486	-1.22630	0.95750
317	115	-5.49390	-2.37300	-2.94500	-5.15720	-3.99710	-1.38376	-1.15670	0.86620
317	120	-5.30960	-2.30180	-2.87550	-5.23840	-3.81280	-1.31256	-1.08720	0.78500
317	125	-5.13370	-2.23560	-2.81600	-5.30710	-3.63690	-1.24636	-1.02770	0.71630
317	130	-4.96620	-2.17020	-2.75320	-5.36570	-3.46940	-1.18096	-0.96490	0.65770
317	135	-4.80870	-2.10910	-2.69710	-5.41680	-3.31190	-1.11986	-0.90880	0.60660
317	140	-4.65960	-2.04630	-2.64600	-5.46210	-3.16280	-1.05706	-0.85770	0.56130
317	145	-4.51970	-1.99350	-2.59580	-5.49720	-3.02290	-1.00426	-0.80750	0.52620
317	150	-4.38570	-1.93150	-2.54800	-5.53330	-2.88890	-0.94226	-0.75970	0.49010
317	155	-4.26180	-1.88290	-2.50450	-5.56090	-2.76500	-0.89366	-0.71620	0.46250
317	160	-4.14200	-1.83190	-2.46340	-5.58940	-2.64520	-0.84266	-0.67510	0.43400
317	165	-4.02720	-1.78580	-2.42320	-5.61200	-2.53040	-0.79656	-0.63490	0.41140
317	170	-3.92760	-1.74220	-2.38720	-5.62960	-2.43080	-0.75296	-0.59890	0.39380
317	175	-3.82700	-1.70200	-2.35620	-5.64630	-2.33020	-0.71276	-0.56790	0.37710
317	180	-3.73320	-1.66180	-2.32020	-5.66140	-2.23640	-0.67256	-0.53190	0.36200

KVA Flowmeter Measurements

Well Number: 699-37-47A

Test No.: A37-11.4

Date: 11-12-96

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: S 24.8° E

Probe No. : 2D-1
Controller No.: B
Computer Interface No.: 2

Flowrate Calculation:

Clibration Curve Date: October 1995

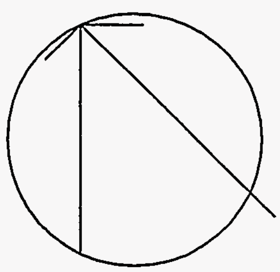
Calibration Cuve: Assumed Effective Porosity @ 20%

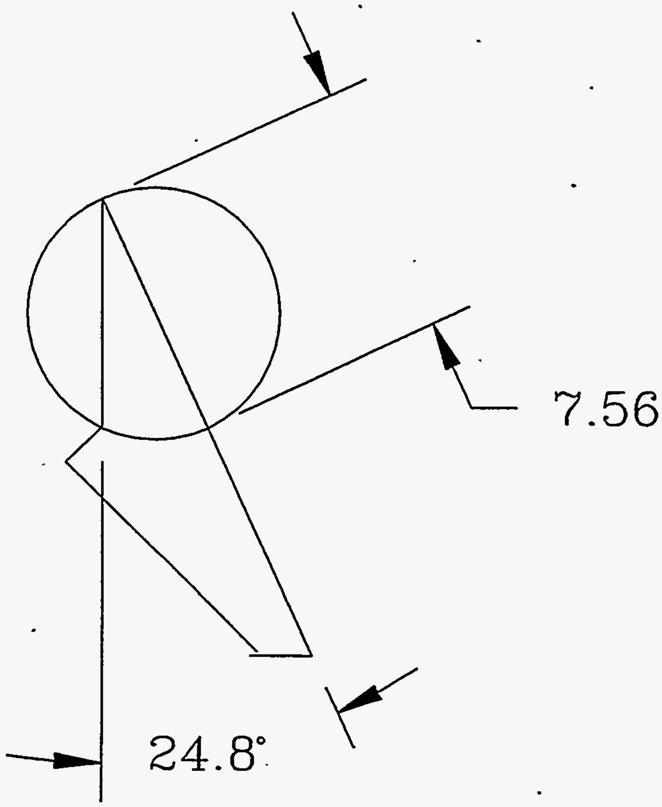
$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}} \quad 1.7 \text{ ft./day}$$

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-((( )/ x100)= %





IN-SITU FLOW MEASUREMENTS

Tot. Dep. = 342.6 ft.TOC

11-12-9 PROBE @ 331.0 ft (BTOC) 15.4ft BWL Declination Correction: 2 HEATER @ 1.6 amps — Dep. Water = 315.6 ft.TO

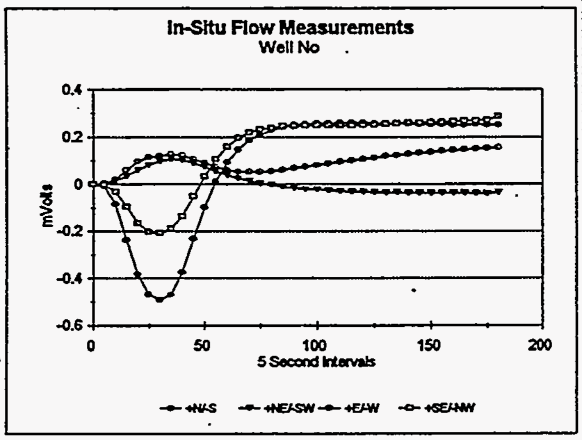
Test 15.4 on11/12/96 @ 1241 NORTH KVFLO25 (25mV) SOUTH@ 1340 11/12/96 — Screened Interval = 30 ft.

WELL NO: 699-37-47A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-12-96	1241	1244
TEST 2	SOUTH	11-12-96	1340	1343

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00875	0.00122	0.00210	-0.00295
10	-0.08375	0.01425	0.02135	-0.03140
15	-0.23910	0.03767	0.06075	-0.09505
20	-0.38275	0.06157	0.09760	-0.16420
25	-0.46660	0.08082	0.11435	-0.20275
30	-0.49260	0.09802	0.11985	-0.20990
35	-0.46840	0.10637	0.12865	-0.19025
40	-0.37430	0.10427	0.12405	-0.13585
45	-0.23190	0.09127	0.10685	-0.05135
50	-0.09625	0.07457	0.09095	0.03320
55	0.01215	0.05572	0.07420	0.10690
60	0.09295	0.03982	0.06040	0.15885
65	0.14780	0.02557	0.05365	0.19605
70	0.18675	0.01387	0.05160	0.21910
75	0.20980	0.00427	0.05200	0.23295
80	0.22740	-0.00203	0.05495	0.23885
85	0.24290	-0.01043	0.06080	0.24510
90	0.25125	-0.01418	0.06750	0.24555
95	0.25300	-0.02133	0.07420	0.24765
100	0.25595	-0.02173	0.08090	0.24725
105	0.25765	-0.02553	0.08715	0.24805
110	0.25845	-0.03013	0.09595	0.24850
115	0.25805	-0.03178	0.10100	0.24890
120	0.25805	-0.03263	0.10640	0.24975
125	0.25725	-0.03303	0.11355	0.25185
130	0.25640	-0.03598	0.11980	0.25355
135	0.25645	-0.03553	0.12230	0.25605
140	0.25645	-0.03808	0.12775	0.25815
145	0.25355	-0.03768	0.13275	0.25815
150	0.25480	-0.03808	0.13695	0.26110
155	0.25270	-0.03808	0.14115	0.26235
160	0.25060	-0.03768	0.14365	0.26490
165	0.25105	-0.03808	0.14825	0.26615
170	0.25270	-0.04018	0.15035	0.26655
175	0.25110	-0.03853	0.15245	0.26950
180	0.25025	-0.03430	0.15575	0.28721
TOTAL	3.11105	0.174275	3.5319	5.23846



TEST NO. 1

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.49140	-0.99384	-1.79430	-6.02580	0.00000	0.00000	0.00000	0.00000
317	5	-1.50560	-0.99300	-1.79680	-6.02840	-0.01420	0.00084	-0.00250	-0.00260
317	10	-1.68900	-0.99635	-1.79930	-6.02580	-0.19760	-0.00251	-0.00500	0.00000
317	15	-2.23670	-1.03490	-1.85540	-5.94210	-0.74530	-0.04106	-0.06110	0.08370
317	20	-3.14690	-1.12610	-2.00690	-5.68930	-1.65550	-0.13226	-0.21260	0.33650
317	25	-4.28750	-1.27100	-2.23470	-5.25560	-2.79610	-0.27716	-0.44040	0.77020
317	30	-5.51590	-1.45350	-2.49170	-4.70300	-4.02450	-0.45966	-0.69740	1.32280
317	35	-6.71000	-1.67120	-2.74790	-4.10100	-5.21860	-0.67736	-0.95360	1.92480
317	40	-7.71320	-1.89980	-3.01000	-3.52070	-6.22180	-0.90596	-1.21570	2.50510
317	45	-8.39630	-2.11330	-3.24440	-3.04520	-6.90490	-1.11946	-1.45010	2.98060
317	50	-8.77730	-2.28990	-3.42610	-2.74040	-7.28590	-1.29606	-1.63180	3.28540
317	55	-8.91380	-2.42560	-3.54840	-2.61060	-7.42240	-1.43176	-1.75410	3.41520
317	60	-8.87360	-2.51600	-3.61870	-2.62480	-7.38220	-1.52216	-1.82440	3.40100
317	65	-8.72540	-2.57130	-3.64050	-2.73370	-7.23400	-1.57746	-1.84620	3.29210
317	70	-8.49930	-2.59470	-3.62870	-2.90620	-7.00790	-1.60086	-1.83440	3.11960
317	75	-8.23300	-2.59550	-3.59110	-3.10960	-6.74160	-1.60166	-1.79680	2.91620
317	80	-7.94580	-2.57380	-3.53660	-3.32310	-6.45440	-1.57996	-1.74230	2.70270
317	85	-7.64270	-2.54280	-3.47220	-3.53160	-6.15130	-1.54896	-1.67790	2.49420
317	90	-7.34460	-2.49840	-3.40180	-3.72750	-5.85320	-1.50456	-1.60750	2.29830
317	95	-7.05900	-2.44990	-3.32900	-3.90920	-5.56760	-1.45606	-1.53470	2.11660
317	100	-6.77680	-2.39380	-3.25700	-4.07500	-5.28540	-1.39996	-1.46270	1.95080
317	105	-6.50800	-2.33520	-3.18580	-4.22240	-5.01660	-1.34136	-1.39150	1.80340
317	110	-6.25180	-2.27990	-3.11550	-4.35380	-4.76040	-1.28606	-1.32120	1.67200
317	115	-6.00560	-2.21880	-3.05100	-4.47190	-4.51420	-1.22496	-1.25670	1.55390
317	120	-5.77620	-2.15930	-2.98990	-4.57570	-4.28480	-1.16546	-1.19560	1.45010
317	125	-5.55510	-2.10070	-2.92790	-4.66530	-4.06370	-1.10686	-1.13360	1.36050
317	130	-5.35080	-2.04710	-2.87020	-4.74480	-3.85940	-1.05326	-1.07590	1.28100
317	135	-5.14980	-1.99100	-2.81990	-4.81600	-3.65840	-0.99716	-1.02560	1.20980
317	140	-4.96890	-1.94080	-2.76800	-4.87800	-3.47750	-0.94696	-0.97370	1.14780
317	145	-4.79560	-1.89060	-2.72030	-4.93660	-3.30420	-0.89676	-0.92600	1.08920
317	150	-4.63060	-1.84200	-2.67510	-4.98600	-3.13920	-0.84816	-0.88080	1.03980
317	155	-4.47660	-1.79590	-2.63240	-5.03370	-2.98520	-0.80206	-0.83810	0.99210
317	160	-4.33090	-1.75160	-2.59390	-5.07470	-2.83950	-0.75776	-0.79960	0.95110
317	165	-4.19190	-1.70890	-2.55700	-5.11150	-2.70050	-0.71506	-0.76270	0.91430
317	170	-4.06210	-1.67370	-2.52100	-5.14760	-2.57070	-0.67986	-0.72670	0.87820
317	175	-3.93560	-1.63020	-2.48670	-5.17520	-2.44420	-0.63636	-0.69240	0.85060
317	180	-3.82090	-1.59580	-2.45490	-5.17520	-2.32950	-0.60196	-0.66060	0.85060

TEST NO.2

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.46690	-1.00490	-1.78950	-6.00910	0.00000	0.00000	0.00000	0.00000
317	5	-1.46360	-1.00650	-1.79620	-6.00580	0.00330	-0.00160	-0.00670	0.00330
317	10	-1.49700	-1.03590	-1.83720	-5.94630	-0.03010	-0.03100	-0.04770	0.06280
317	15	-1.73400	-1.12130	-1.97210	-5.73530	-0.26710	-0.11640	-0.18260	0.27380
317	20	-2.35690	-1.26030	-2.19730	-5.34420	-0.89000	-0.25540	-0.40780	0.66490
317	25	-3.32980	-1.44370	-2.45860	-4.83340	-1.86290	-0.43880	-0.66910	1.17570
317	30	-4.50620	-1.66060	-2.72660	-4.26650	-3.03930	-0.65570	-0.93710	1.74260
317	35	-5.74870	-1.89500	-3.00040	-3.70380	-4.28180	-0.89010	-1.21090	2.30530
317	40	-6.94010	-2.11940	-3.25330	-3.23230	-5.47320	-1.11450	-1.46380	2.77680
317	45	-7.90800	-2.30690	-3.45330	-2.92580	-6.44110	-1.30200	-1.66380	3.08330
317	50	-8.56030	-2.45010	-3.60320	-2.79010	-7.09340	-1.44520	-1.81370	3.21900
317	55	-8.91360	-2.54810	-3.69200	-2.80770	-7.44670	-1.54320	-1.90250	3.20140
317	60	-9.03500	-2.60670	-3.73470	-2.92580	-7.56810	-1.60180	-1.94520	3.08330
317	65	-8.99650	-2.63350	-3.74300	-3.10910	-7.52960	-1.62860	-1.95350	2.90000
317	70	-8.84830	-2.63350	-3.72710	-3.32770	-7.38140	-1.62860	-1.93760	2.68140
317	75	-8.62810	-2.61510	-3.69030	-3.55880	-7.16120	-1.61020	-1.90080	2.45030
317	80	-8.37610	-2.58080	-3.64170	-3.78410	-6.90920	-1.57590	-1.85220	2.22500
317	85	-8.10400	-2.53300	-3.58900	-4.00510	-6.63710	-1.52810	-1.79950	2.00400
317	90	-7.82260	-2.48110	-3.53200	-4.20190	-6.35570	-1.47620	-1.74250	1.80720
317	95	-7.54050	-2.41830	-3.47260	-4.38780	-6.07360	-1.41340	-1.68310	1.62130
317	100	-7.26420	-2.36140	-3.41400	-4.55280	-5.79730	-1.35650	-1.62450	1.45630
317	105	-6.99880	-2.29520	-3.35530	-4.70180	-5.53190	-1.29030	-1.56580	1.30730
317	110	-6.74420	-2.23070	-3.30260	-4.83410	-5.27730	-1.22580	-1.51310	1.17500
317	115	-6.49720	-2.16630	-3.24820	-4.95300	-5.03030	-1.16140	-1.45870	1.05610
317	120	-6.26780	-2.10510	-3.19790	-5.05850	-4.80090	-1.10020	-1.40840	0.95060
317	125	-6.04510	-2.04570	-3.15020	-5.15230	-4.57820	-1.04080	-1.36070	0.85680
317	130	-5.83910	-1.98620	-3.10500	-5.23520	-4.37220	-0.98130	-1.31550	0.77390
317	135	-5.63820	-1.93100	-3.05970	-5.31140	-4.17130	-0.92610	-1.27020	0.69770
317	140	-5.45730	-1.87570	-3.01870	-5.37760	-3.99040	-0.87080	-1.22920	0.63150
317	145	-5.27820	-1.82630	-2.98100	-5.43620	-3.81130	-0.82140	-1.19150	0.57290
317	150	-5.11570	-1.77690	-2.94420	-5.49150	-3.64880	-0.77200	-1.15470	0.51760
317	155	-4.95750	-1.73080	-2.90990	-5.54170	-3.49060	-0.72590	-1.12040	0.46740
317	160	-4.80760	-1.68730	-2.87640	-5.58780	-3.34070	-0.68240	-1.08690	0.42130
317	165	-4.66950	-1.64380	-2.84870	-5.62710	-3.20260	-0.63890	-1.05920	0.38200
317	170	-4.54300	-1.60440	-2.81690	-5.66400	-3.07610	-0.59950	-1.02740	0.34510
317	175	-4.41330	-1.56420	-2.78680	-5.69750	-2.94640	-0.55930	-0.99730	0.31160
317	180	-4.29690	-1.56420	-2.76160	-5.72760	-2.83000	-0.55930	-0.97210	0.28150

KVA Flowmeter Measurements

Well Number: 699-37-47A

Test No.: A37-15.4

Date: 11-12-96

Probe No. : 2D-1
Controller No.: B
Computer Interface No.: 2

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: CAN NOT INTERPRET DATA

Flowrate Calculation:

Clibration Curve Date: October 1995

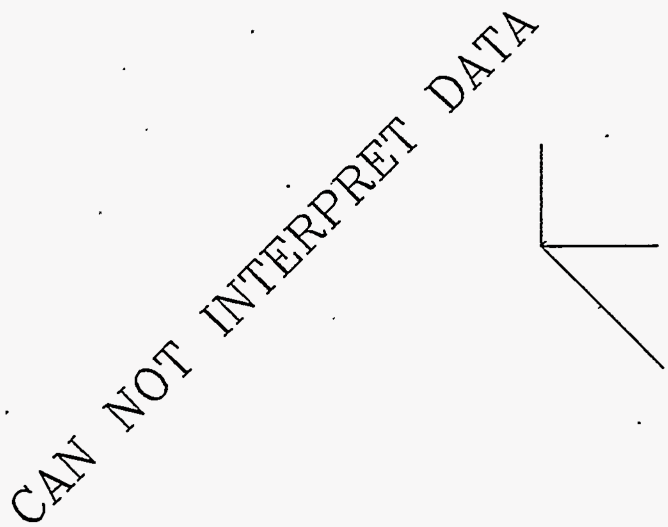
Calibration Cuve: Assumed Effective Porosity @ 20%

$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}}$$ CAN NOT INTERPRET DATA

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-((( )/ x100)= %



IN-SITU FLOW MEASUREMENTS Tot. Dep. = 342.6 ft.TOC

11-12-9 **PROBE @ 335.0 ft (BTOC) 19.4ft BWL Declination Correction: 2 HEATER @ 1.6 amps** **Dep. Water = 315.6 ft.TO**

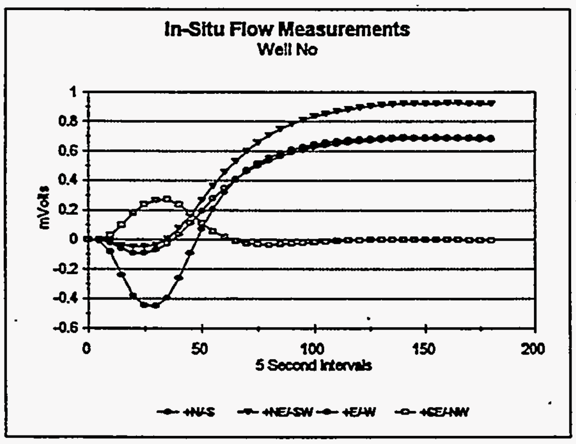
Test 19.4 on11/12/96 @ 1450 NORTH KVFLO25 (25mV) SOUTH@ 1550 11/12/96 **Screened Interval = 30 ft.**

WELL NO: 699-37-47A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-12-96	1450	1453
TEST 2	SOUTH	11-12-96	1539	1542

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00670	0.00002	-0.00045	0.00165
10	-0.08455	-0.01213	-0.02010	0.02890
15	-0.23740	-0.03433	-0.06070	0.09960
20	-0.38015	-0.04813	-0.09335	0.18210
25	-0.44295	-0.04853	-0.09335	0.23820
30	-0.44755	-0.03268	-0.06785	0.26790
35	-0.39355	0.00502	-0.02810	0.27460
40	-0.26040	0.07702	0.03515	0.24115
45	-0.09090	0.16702	0.11345	0.18210
50	0.07495	0.26792	0.19760	0.11385
55	0.20930	0.36627	0.27750	0.05775
60	0.32355	0.45592	0.34915	0.01635
65	0.40690	0.53337	0.41070	-0.00965
70	0.46970	0.60157	0.46050	-0.02595
75	0.51865	0.65897	0.50195	-0.03180
80	0.55760	0.70707	0.53710	-0.03225
85	0.58860	0.74727	0.56640	-0.03015
90	0.61040	0.78207	0.58945	-0.02640
95	0.62795	0.80837	0.60950	-0.02010
100	0.64345	0.83437	0.62710	-0.01760
105	0.65645	0.85442	0.63970	-0.01300
110	0.66770	0.86910	0.65055	-0.00840
115	0.67275	0.88420	0.65765	-0.00465
120	0.67780	0.89591	0.66565	-0.00375
125	0.68450	0.90304	0.67195	-0.00090
130	0.68865	0.91139	0.67610	0.00125
135	0.69365	0.91728	0.67900	-0.00085
140	0.69410	0.92063	0.68115	0.00000
145	0.69370	0.92101	0.68325	0.00165
150	0.69240	0.92394	0.68405	0.00000
155	0.69450	0.92228	0.68365	-0.00045
160	0.69325	0.92648	0.68404	-0.00170
165	0.69370	0.92649	0.68236	-0.00085
170	0.69245	0.92270	0.68155	-0.00255
175	0.69075	0.92017	0.67902	-0.00375
180	0.68905	0.92147	0.67776	-0.00505
TOTAL	13.6623	21.37689	15.68908	1.46725



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.46270	-0.98884	-1.78090	-6.01340	0.00000	0.00000	0.00000	0.00000
317	5	-1.47530	-0.99051	-1.78260	-6.01090	-0.01260	-0.00167	-0.00170	0.00250
317	10	-1.65110	-1.01810	-1.82440	-5.95140	-0.18840	-0.02926	-0.04350	0.06200
317	15	-2.17280	-1.09770	-1.95670	-5.73880	-0.71010	-0.10886	-0.17580	0.27460
317	20	-3.02260	-1.22830	-2.17440	-5.34190	-1.55990	-0.23946	-0.39350	0.67150
317	25	-4.05670	-1.40160	-2.41890	-4.81860	-2.59400	-0.41276	-0.63800	1.19480
317	30	-5.15600	-1.60680	-2.64920	-4.23000	-3.69330	-0.61796	-0.86830	1.78340
317	35	-6.20600	-1.81610	-2.85600	-3.63800	-4.74330	-0.82726	-1.07510	2.37540
317	40	-7.05160	-1.99530	-3.01170	-3.13060	-5.58890	-1.00646	-1.23080	2.88280
317	45	-7.60260	-2.11250	-3.08960	-2.76970	-6.13990	-1.12366	-1.30870	3.24370
317	50	-7.88050	-2.16190	-3.09040	-2.57880	-6.41780	-1.17306	-1.30950	3.43460
317	55	-7.94330	-2.15020	-3.02600	-2.53110	-6.48060	-1.16136	-1.24510	3.48230
317	60	-7.84960	-2.09240	-2.91790	-2.59220	-6.38690	-1.10356	-1.13700	3.42120
317	65	-7.66120	-2.00280	-2.77640	-2.72030	-6.19850	-1.01396	-0.99550	3.29310
317	70	-7.42000	-1.88980	-2.62320	-2.89110	-5.95730	-0.90096	-0.84230	3.12230
317	75	-7.14040	-1.76500	-2.46660	-3.07700	-5.67770	-0.77616	-0.68570	2.93640
317	80	-6.84320	-1.64030	-2.31090	-3.26540	-5.38050	-0.65146	-0.53000	2.74800
317	85	-6.55010	-1.51130	-2.15940	-3.45050	-5.08740	-0.52246	-0.37850	2.56290
317	90	-6.26290	-1.38400	-2.02040	-3.62380	-4.80020	-0.39516	-0.23950	2.38960
317	95	-5.98330	-1.26770	-1.88980	-3.78290	-4.52060	-0.27886	-0.10890	2.23050
317	100	-5.70950	-1.14960	-1.77090	-3.93020	-4.24680	-0.16076	0.01000	2.08320
317	105	-5.45410	-1.04330	-1.66450	-4.06250	-3.99140	-0.05446	0.11640	1.95090
317	110	-5.20880	-0.94195	-1.56570	-4.18060	-3.74610	0.04689	0.21520	1.83280
317	115	-4.98350	-0.84985	-1.47950	-4.28610	-3.52080	0.13899	0.30140	1.72730
317	120	-4.76330	-0.76193	-1.39740	-4.38400	-3.30060	0.22691	0.38350	1.62940
317	125	-4.56070	-0.68407	-1.32790	-4.46950	-3.09800	0.30477	0.45300	1.54390
317	130	-4.36560	-0.60787	-1.26350	-4.54480	-2.90290	0.38097	0.51740	1.46860
317	135	-4.18480	-0.54089	-1.20570	-4.62020	-2.72210	0.44795	0.57520	1.39320
317	140	-4.02230	-0.47558	-1.15290	-4.68380	-2.55960	0.51326	0.62800	1.32960
317	145	-3.86410	-0.42283	-1.10770	-4.73910	-2.40140	0.56601	0.67320	1.27430
317	150	-3.71590	-0.36757	-1.06500	-4.79350	-2.25320	0.62127	0.71590	1.21990
317	155	-3.57610	-0.32068	-1.02900	-4.84040	-2.11340	0.66816	0.75190	1.17300
317	160	-3.44800	-0.27379	-0.99721	-4.88560	-1.98530	0.71505	0.78369	1.12780
317	165	-3.32400	-0.23277	-0.96958	-4.92410	-1.86130	0.75607	0.81132	1.08930
317	170	-3.20680	-0.19425	-0.94111	-4.96350	-1.74410	0.79459	0.83979	1.04990
317	175	-3.10220	-0.16411	-0.91767	-4.99860	-1.63950	0.82473	0.86323	1.01480
317	180	-2.99920	-0.12811	-0.89757	-5.02960	-1.53650	0.86073	0.88333	0.98380

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
317	0	-1.48200	-1.01060	-1.79350	-5.99000	0.00000	0.00000	0.00000	0.00000
317	5	-1.48120	-1.01230	-1.79430	-5.99080	0.00080	-0.00170	-0.00080	-0.00080
317	10	-1.50130	-1.01560	-1.79680	-5.98580	-0.01930	-0.00500	-0.00330	0.00420
317	15	-1.71730	-1.05080	-1.84790	-5.91460	-0.23530	-0.04020	-0.05440	0.07540
317	20	-2.28160	-1.15380	-2.00030	-5.68270	-0.79960	-0.14320	-0.20680	0.30730
317	25	-3.19010	-1.32630	-2.24480	-5.27160	-1.70810	-0.31570	-0.45130	0.71840
317	30	-4.28020	-1.56320	-2.52610	-4.74240	-2.79820	-0.55260	-0.73260	1.24760
317	35	-5.43820	-1.84790	-2.81240	-4.16380	-3.95620	-0.83730	-1.01890	1.82620
317	40	-6.55010	-2.17110	-3.09460	-3.58950	-5.06810	-1.16050	-1.30110	2.40050
317	45	-7.44010	-2.46830	-3.32910	-3.11050	-5.95810	-1.45770	-1.53560	2.87950
317	50	-8.04970	-2.71950	-3.49820	-2.78310	-6.56770	-1.70890	-1.70470	3.20690
317	55	-8.38120	-2.90450	-3.59360	-2.62320	-6.89920	-1.89390	-1.80010	3.36680
317	60	-8.51600	-3.02600	-3.62880	-2.60150	-7.03400	-2.01540	-1.83530	3.38850
317	65	-8.49430	-3.09130	-3.61040	-2.67760	-7.01230	-2.08070	-1.81690	3.31240
317	70	-8.37870	-3.11470	-3.55680	-2.81580	-6.89670	-2.10410	-1.76330	3.17420
317	75	-8.19700	-3.10470	-3.48310	-2.99000	-6.71500	-2.09410	-1.68960	3.00000
317	80	-7.97770	-3.07620	-3.39770	-3.17750	-6.49570	-2.06560	-1.60420	2.81250
317	85	-7.74660	-3.02760	-3.30480	-3.36680	-6.26460	-2.01700	-1.51130	2.62320
317	90	-7.50300	-2.96990	-3.21190	-3.54760	-6.02100	-1.95930	-1.41840	2.44240
317	95	-7.25850	-2.90620	-3.12140	-3.71930	-5.77650	-1.89560	-1.32790	2.27070
317	100	-7.01570	-2.84010	-3.03770	-3.87160	-5.53370	-1.82950	-1.24420	2.11840
317	105	-6.78630	-2.77390	-2.95650	-4.01310	-5.30430	-1.76330	-1.16300	1.97690
317	110	-6.56350	-2.70190	-2.87940	-4.14040	-5.08150	-1.69130	-1.08590	1.84960
317	115	-6.34830	-2.64000	-2.80740	-4.25340	-4.86630	-1.62940	-1.01390	1.73660
317	120	-6.13820	-2.57550	-2.74130	-4.35310	-4.65620	-1.56490	-0.94780	1.63690
317	125	-5.94900	-2.51190	-2.68440	-4.44430	-4.46700	-1.50130	-0.89090	1.54570
317	130	-5.76220	-2.45240	-2.62830	-4.52390	-4.28020	-1.44180	-0.83480	1.46610
317	135	-5.59140	-2.39720	-2.57630	-4.59510	-4.10940	-1.38660	-0.78280	1.39490
317	140	-5.42980	-2.33860	-2.52780	-4.66040	-3.94780	-1.32800	-0.73430	1.32960
317	145	-5.27080	-2.28660	-2.48680	-4.71900	-3.78880	-1.27600	-0.69330	1.27100
317	150	-5.12000	-2.23720	-2.44570	-4.77010	-3.63800	-1.22660	-0.65220	1.21990
317	155	-4.98440	-2.18700	-2.40890	-4.81610	-3.50240	-1.17640	-0.61540	1.17390
317	160	-4.85380	-2.14850	-2.37790	-4.85880	-3.37180	-1.13790	-0.58440	1.13120
317	165	-4.73070	-2.10750	-2.34690	-4.89900	-3.24870	-1.09690	-0.55340	1.09100
317	170	-4.61100	-2.06140	-2.31680	-4.93500	-3.12900	-1.05080	-0.52330	1.05500
317	175	-4.50300	-2.02620	-2.28830	-4.96770	-3.02100	-1.01560	-0.49480	1.02230
317	180	-4.39660	-1.99280	-2.26570	-4.99610	-2.91460	-0.98220	-0.47220	0.99390

KVA Flowmeter Measurements

Well Number: 699–37–47A

Test No.: A35–19.4

Date: 11–12–96

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: N 48.9° E

Probe No. : 2D–1
Controller No.: B
Computer Interface No.: 2

Flowrate Calculation:

Clibration Curve Date: October 1995

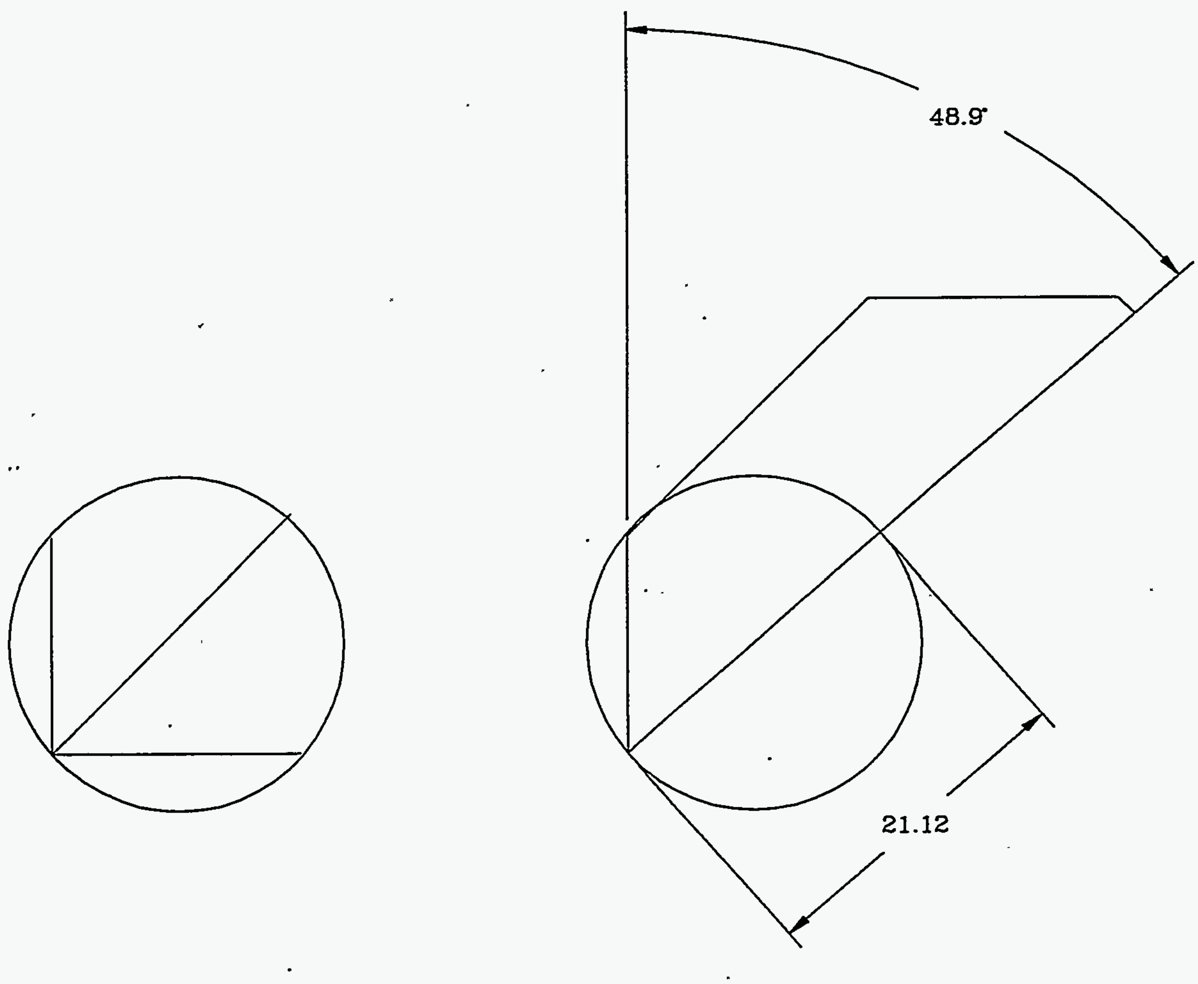
Calibration Cuve: Assumed Effective Porosity @ 20%

$$\text{Flowrate} = \frac{(0.051 \text{ x mV}) - 0.04}{\text{Effective Porosity}} = 5.2 \text{ ft./day}$$

Vector Fit Calculation:

100–(((A+B+C+D)/Cal.Vector Length)x100)= %

100–((( )/ x100)= %



IN-SITU FLOW MEASUREMENTS

Tot. Dep. = 342.6 ft.TOC

11-13-9 PROBE @ 335.0 ft (BTOC) 19.4ft BWL Declination Correction: 2 HEATER @ 1.6 amps Dep. Water = 315.6 ft.TO

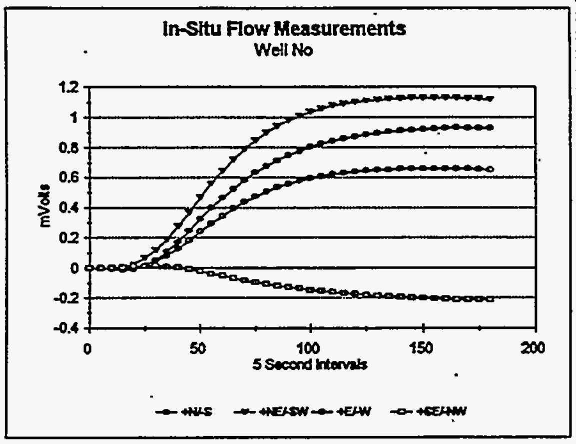
Test 19.4A on11/13/96 @ 0921 NORTH KVFLO25 (25mV SOUTH@ 1025 11/13/96 Screened Interval = 30 ft.

WELL NO: 699-37-47A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-13-96	921	924
TEST 2	SOUTH	11-13-96	1025	1028

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00045	-0.00167	0.00250	0.00175
10	-0.00465	-0.00040	0.00085	0.00215
15	-0.01135	0.00630	-0.00085	0.00635
20	-0.00805	0.02555	0.00375	0.01555
25	0.01785	0.06405	0.02095	0.01565
30	0.05550	0.11980	0.04725	0.01645
35	0.10775	0.19055	0.08455	0.01275
40	0.17345	0.27686	0.13020	0.00525
45	0.24755	0.37146	0.18130	-0.00770
50	0.32625	0.46821	0.24080	-0.01900
55	0.39790	0.55956	0.29400	-0.03535
60	0.46530	0.64416	0.34505	-0.05040
65	0.52355	0.72121	0.39365	-0.06675
70	0.58305	0.78826	0.43555	-0.08180
75	0.63330	0.84816	0.47330	-0.09355
80	0.67565	0.89801	0.50555	-0.10490
85	0.71550	0.94242	0.53400	-0.11705
90	0.74815	0.97842	0.55790	-0.12710
95	0.77585	1.00863	0.57720	-0.13675
100	0.80475	1.03499	0.59565	-0.14600
105	0.82655	1.05803	0.60860	-0.15395
110	0.84455	1.07648	0.62160	-0.16190
115	0.86175	1.08947	0.63040	-0.16820
120	0.87515	1.10246	0.63796	-0.17450
125	0.88650	1.11085	0.64632	-0.18035
130	0.89365	1.11670	0.65052	-0.18540
135	0.90540	1.12302	0.65304	-0.19045
140	0.91120	1.12636	0.65806	-0.19505
145	0.91800	1.12845	0.65766	-0.19755
150	0.91965	1.12969	0.66060	-0.20135
155	0.92550	1.12931	0.65806	-0.20470
160	0.92840	1.12970	0.65933	-0.20720
165	0.93180	1.12845	0.65851	-0.21095
170	0.93095	1.12553	0.65809	-0.21100
175	0.93140	1.12430	0.65513	-0.21435
180	0.93100	1.11967	0.65220	-0.21430
TOTAL	21.6483	27.76296	15.789175	-3.98165



TEST NO. 1

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
318	0	-1.52230	-0.98441	-1.74760	-6.10170	0.00000	0.00000	0.00000	0.00000
318	5	-1.53320	-0.98776	-1.74600	-6.09910	-0.01090	-0.00335	0.00160	0.00260
318	10	-1.65550	-1.00450	-1.77360	-6.06230	-0.13320	-0.02009	-0.02600	0.03940
318	15	-2.08690	-1.05980	-1.88250	-5.88970	-0.56460	-0.07539	-0.13490	0.21200
318	20	-2.86360	-1.15360	-2.07770	-5.52360	-1.34130	-0.16919	-0.33010	0.57810
318	25	-3.85550	-1.27430	-2.30640	-5.01750	-2.33320	-0.28989	-0.55880	1.08420
318	30	-4.93040	-1.40830	-2.52850	-4.43700	-3.40810	-0.42389	-0.78090	1.66470
318	35	-5.98020	-1.54820	-2.72280	-3.83710	-4.45790	-0.56379	-0.97520	2.26460
318	40	-6.85230	-1.66130	-2.86440	-3.30010	-5.33000	-0.67689	-1.11680	2.80160
318	45	-7.43370	-1.72420	-2.93060	-2.90970	-5.91140	-0.73979	-1.18300	3.19200
318	50	-7.73120	-1.72840	-2.90710	-2.68600	-6.20890	-0.74399	-1.15950	3.41570
318	55	-7.80070	-1.68060	-2.82500	-2.61730	-6.27840	-0.69619	-1.07740	3.48440
318	60	-7.71110	-1.59100	-2.69350	-2.66000	-6.18880	-0.60659	-0.94590	3.44170
318	65	-7.52170	-1.47120	-2.53180	-2.78060	-5.99940	-0.48679	-0.78420	3.32110
318	70	-7.25950	-1.33630	-2.35670	-2.94230	-5.73720	-0.35189	-0.60910	3.15940
318	75	-6.97550	-1.19220	-2.17740	-3.12160	-5.45320	-0.20779	-0.42980	2.98010
318	80	-6.66800	-1.04560	-2.00230	-3.30930	-5.14570	-0.06119	-0.25470	2.79240
318	85	-6.36050	-0.90147	-1.83480	-3.49190	-4.83820	0.08294	-0.08720	2.60980
318	90	-6.05730	-0.76407	-1.67810	-3.66530	-4.53500	0.22034	0.06950	2.43640
318	95	-5.76480	-0.63505	-1.53650	-3.82200	-4.24250	0.34936	0.21110	2.27970
318	100	-5.48170	-0.51273	-1.40410	-3.97030	-3.95940	0.47168	0.34350	2.13140
318	105	-5.21610	-0.39795	-1.28940	-4.10270	-3.69380	0.58646	0.45820	1.99900
318	110	-4.96560	-0.29155	-1.17880	-4.22160	-3.44330	0.69286	0.56880	1.88010
318	115	-4.72770	-0.19688	-1.08580	-4.32890	-3.20540	0.78753	0.66180	1.77280
318	120	-4.50650	-0.10640	-0.99949	-4.42690	-2.98420	0.87801	0.74811	1.67480
318	125	-4.29620	-0.02681	-0.92157	-4.51320	-2.77390	0.95760	0.82603	1.58850
318	130	-4.10100	0.04189	-0.85287	-4.59280	-2.57870	1.02630	0.89473	1.50890
318	135	-3.91580	0.11143	-0.79423	-4.66400	-2.39350	1.09584	0.95337	1.43770
318	140	-3.74330	0.17091	-0.73809	-4.73020	-2.22100	1.15532	1.00951	1.37150
318	145	-3.58320	0.22620	-0.69369	-4.78800	-2.06090	1.21061	1.05391	1.31370
318	150	-3.43330	0.27647	-0.64761	-4.84080	-1.91100	1.26088	1.09999	1.26090
318	155	-3.29250	0.32171	-0.61159	-4.89020	-1.77020	1.30612	1.13601	1.21150
318	160	-3.16020	0.36528	-0.57975	-4.93460	-1.63790	1.34969	1.16785	1.16710
318	165	-3.03110	0.40298	-0.54959	-4.97730	-1.50880	1.38739	1.19801	1.12440
318	170	-2.92140	0.43565	-0.52362	-5.01420	-1.39910	1.42006	1.22398	1.08750
318	175	-2.81160	0.46749	-0.50184	-5.05190	-1.28930	1.45190	1.24576	1.04980
318	180	-2.70940	0.49262	-0.48341	-5.08200	-1.18710	1.47703	1.26419	1.01970

TEST NO.2

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
318	0	-1.51960	-1.00770	-1.79930	-6.06310	0.00000	0.00000	0.00000	0.00000
318	5	-1.52960	-1.00770	-1.80270	-6.06400	-0.01000	0.00000	-0.00340	-0.00090
318	10	-1.64350	-1.02700	-1.82700	-6.02800	-0.12390	-0.01930	-0.02770	0.03510
318	15	-2.06150	-1.09570	-1.93250	-5.86380	-0.54190	-0.08800	-0.13320	0.19930
318	20	-2.84480	-1.22800	-2.13690	-5.51610	-1.32520	-0.22030	-0.33760	0.54700
318	25	-3.88850	-1.42570	-2.40000	-5.01020	-2.36890	-0.41800	-0.60070	1.05290
318	30	-5.03870	-1.67120	-2.67470	-4.43130	-3.51910	-0.66350	-0.87540	1.63180
318	35	-6.19300	-1.95260	-2.94360	-3.82400	-4.67340	-0.94490	-1.14430	2.23910
318	40	-7.19650	-2.23830	-3.17650	-3.27200	-5.67690	-1.23060	-1.37720	2.79110
318	45	-7.92610	-2.49040	-3.34490	-2.85570	-6.40650	-1.48270	-1.54560	3.20740
318	50	-8.38100	-2.68810	-3.44040	-2.60940	-6.86140	-1.68040	-1.64110	3.45370
318	55	-8.59380	-2.82300	-3.46470	-2.50800	-7.07420	-1.81530	-1.66540	3.55510
318	60	-8.63900	-2.90260	-3.43530	-2.52060	-7.11940	-1.89490	-1.63600	3.54250
318	65	-8.56610	-2.93690	-3.37080	-2.60850	-7.04650	-1.92920	-1.57150	3.45460
318	70	-8.42290	-2.93610	-3.27950	-2.74010	-6.90330	-1.92840	-1.48020	3.32300
318	75	-8.23940	-2.91180	-3.17570	-2.89590	-6.71980	-1.90410	-1.37640	3.16720
318	80	-8.01660	-2.86490	-3.06510	-3.06090	-6.49700	-1.85720	-1.26580	3.00220
318	85	-7.78880	-2.80960	-2.95450	-3.21920	-6.26920	-1.80190	-1.15520	2.84390
318	90	-7.55090	-2.74420	-2.84560	-3.37250	-6.03130	-1.73650	-1.04630	2.69060
318	95	-7.31380	-2.67560	-2.74260	-3.50990	-5.79420	-1.66790	-0.94330	2.55320
318	100	-7.08850	-2.60600	-2.64710	-3.63970	-5.56890	-1.59830	-0.84780	2.42340
318	105	-6.85650	-2.53730	-2.55830	-3.75620	-5.34690	-1.52960	-0.75900	2.30690
318	110	-6.65200	-2.46780	-2.47370	-3.85920	-5.13240	-1.46010	-0.67440	2.20390
318	115	-6.44850	-2.39910	-2.39830	-3.95390	-4.92890	-1.39140	-0.59900	2.10920
318	120	-6.25410	-2.33460	-2.32710	-4.03930	-4.73450	-1.32690	-0.52780	2.02380
318	125	-6.06650	-2.27180	-2.26590	-4.11390	-4.54690	-1.26410	-0.46660	1.94920
318	130	-5.88560	-2.21480	-2.20560	-4.18340	-4.36600	-1.20710	-0.40630	1.87970
318	135	-5.72390	-2.15790	-2.15200	-4.24450	-4.20430	-1.15020	-0.35270	1.81860
318	140	-5.56300	-2.10510	-2.10590	-4.30150	-4.04340	-1.09740	-0.30660	1.76160
318	145	-5.41650	-2.05400	-2.06070	-4.35430	-3.89690	-1.04630	-0.26140	1.70880
318	150	-5.26990	-2.00620	-2.02050	-4.39950	-3.75030	-0.99850	-0.22120	1.66360
318	155	-5.14080	-1.96020	-1.97940	-4.44220	-3.62120	-0.95250	-0.18010	1.62090
318	160	-5.01430	-1.91740	-1.95010	-4.48160	-3.49470	-0.90970	-0.15080	1.58150
318	165	-4.89200	-1.87720	-1.91830	-4.51680	-3.37240	-0.86950	-0.11900	1.54630
318	170	-4.78060	-1.83870	-1.89150	-4.55360	-3.26100	-0.83100	-0.09220	1.50950
318	175	-4.67170	-1.80440	-1.85380	-4.58460	-3.15210	-0.79670	-0.06450	1.47850
318	180	-4.56870	-1.77000	-1.83950	-4.61480	-3.04910	-0.76230	-0.04020	1.44830

KVA Flowmeter Measurements

Well Number: 699-37-47A

Test No.: A35-19.4A

Date: 11-13-96

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: N 36.5° E

Probe No. : 2D-1
Controller No.: B
Computer Interface No.: 2

Flowrate Calculation:

Clibration Curve Date: October 1995

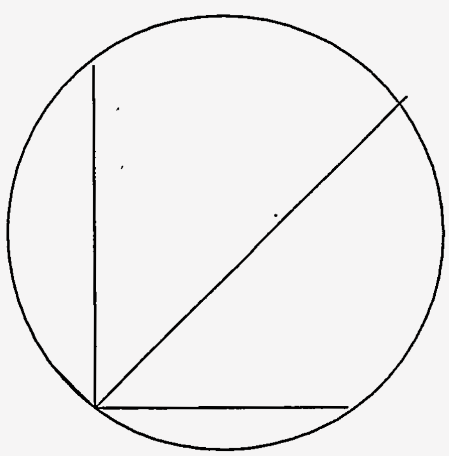
Calibration Cuve: Assumed Effective Porosity @ 20%

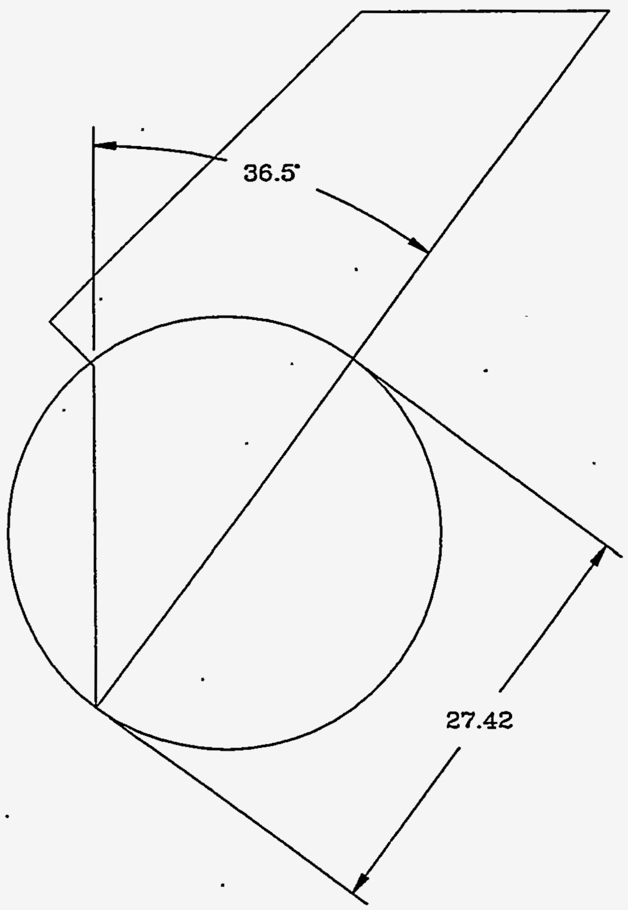
$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}} = 6.8 \text{ ft./day}$$

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-((( )/ x100)= %





IN-SITU FLOW MEASUREMENTS

Tot. Dep. = 342.6 ft.TOC

11-13-9 PROBE @ 333.0 ft (BTOC) 17.4ft BWL Declination Correction: 2 HEATER @ 1.6 amps Dep. Water = 315.6 ft.TO

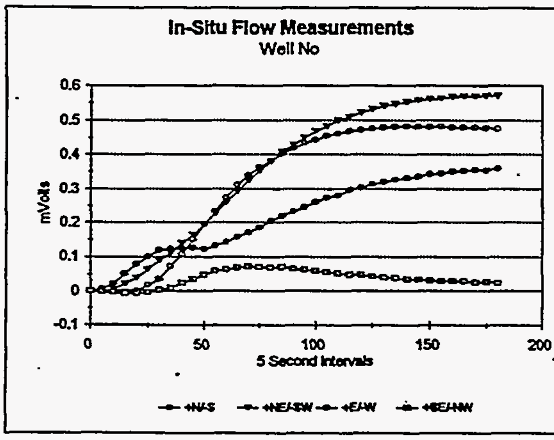
Test 17.4 on11/13/96 @ 1220 NORTH KVFLO25 (25mV) SOUTH@ 1320 11/13/96 Screened Interval = 30 ft.

WELL NO: 699-37-46A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-13-96	1220	1223
TEST 2	SOUTH	11-13-96	. 1320	1323

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	0.00460	-0.00170	0.00040	-0.00375
10	0.02050	0.00290	-0.00505	-0.00375
15	0.05185	0.01880	-0.00380	-0.00875
20	0.07900	0.03840	-0.00040	-0.00835
25	0.10065	0.06355	0.01595	-0.00455
30	0.11895	0.08940	0.03480	0.00305
35	0.12265	0.11155	0.07125	0.00850
40	0.12505	0.13870	0.10730	0.02275
45	0.12580	0.16420	0.15045	0.03410
50	0.12285	0.19560	0.19525	0.04795
55	0.13240	0.22740	0.23380	0.05920
60	0.14290	0.26005	0.27355	0.06340
65	0.15715	0.29275	0.31205	0.06760
70	0.17135	0.32415	0.33885	0.07180
75	0.18650	0.35515	0.36435	0.06970
80	0.20410	0.38155	0.38320	0.06805
85	0.21915	0.40755	0.40285	0.07055
90	0.23385	0.42805	0.41915	0.06465
95	0.24515	0.44980	0.43465	0.06215
100	0.26025	0.46915	0.44430	0.05965
105	0.27450	0.48420	0.45435	0.05585
110	0.28165	0.49925	0.46190	0.05080
115	0.29590	0.51015	0.46855	0.04830
120	0.30305	0.52315	0.47275	0.04830
125	0.31270	0.53150	0.47690	0.04330
130	0.32065	0.54080	0.47940	0.04030
135	0.32700	0.54620	0.48110	0.03865
140	0.33285	0.55165	0.48275	0.03530
145	0.33580	0.55710	0.48230	0.03405
150	0.34250	0.56085	0.48110	0.03110
155	0.34590	0.56295	0.48315	0.02900
160	0.35010	0.56720	0.48025	0.02895
165	0.35175	0.56885	0.47940	0.02860
170	0.35680	0.56885	0.47935	0.02565
175	0.35470	0.57140	0.47855	0.02645
180	0.35935	0.57095	0.47520	0.02315
TOTAL	8.0699	13.13205	11.7899	1.3317



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
318	0	-1.44190	-1.00850	-1.80580	-6.01890	0.00000	0.00000	0.00000	0.00000
318	5	-1.44360	-1.00770	-1.81000	-6.02140	-0.00170	0.00080	-0.00420	-0.00250
318	10	-1.56330	-0.96250	-1.84520	-6.04570	-0.12140	0.04600	-0.03940	-0.02680
318	15	-1.99790	-0.77580	-1.97330	-6.12520	-0.55600	0.23270	-0.16750	-0.10630
318	20	-2.80510	-0.40580	-2.20100	-6.27090	-1.36320	0.60270	-0.39520	-0.25200
318	25	-3.86350	0.10330	-2.48480	-6.46930	-2.42160	1.11180	-0.67900	-0.45040
318	30	-5.02660	0.68090	-2.78370	-6.71620	-3.58470	1.68940	-0.97790	-0.69730
318	35	-6.20050	1.27110	-3.07670	-6.99500	-4.75860	2.27960	-1.27090	-0.97610
318	40	-7.21030	1.80610	-3.33120	-7.26540	-5.76840	2.81460	-1.52540	-1.24650
318	45	-7.93800	2.21130	-3.51530	-7.48730	-6.49610	3.21980	-1.70950	-1.46840
318	50	-8.37840	2.45830	-3.61330	-7.64880	-6.93650	3.46680	-1.80750	-1.62990
318	55	-8.55850	2.56460	-3.63670	-7.75270	-7.11660	3.57310	-1.83090	-1.73380
318	60	-8.56010	2.56210	-3.60240	-7.80210	-7.11820	3.57060	-1.79660	-1.78320
318	65	-8.43870	2.48430	-3.52290	-7.80710	-6.99680	3.49280	-1.71710	-1.78820
318	70	-8.23530	2.35870	-3.41650	-7.77860	-6.79340	3.36720	-1.61070	-1.75970
318	75	-7.99410	2.21640	-3.29770	-7.73170	-6.55220	3.22490	-1.49190	-1.71280
318	80	-7.71360	2.06400	-3.17130	-7.66890	-6.27170	3.07250	-1.36550	-1.65000
318	85	-7.43060	1.91250	-3.04400	-7.59190	-5.98870	2.92100	-1.23820	-1.57300
318	90	-7.14170	1.76760	-2.92180	-7.51570	-5.69980	2.77610	-1.11600	-1.49680
318	95	-6.85870	1.63450	-2.80460	-7.43200	-5.41680	2.64300	-0.99880	-1.41310
318	100	-6.58160	1.51400	-2.69740	-7.35080	-5.13970	2.52250	-0.89160	-1.33190
318	105	-6.31780	1.40010	-2.59360	-7.27210	-4.87590	2.40860	-0.78780	-1.25320
318	110	-6.06490	1.30130	-2.50230	-7.19510	-4.62300	2.30980	-0.69650	-1.17620
318	115	-5.82380	1.20670	-2.41530	-7.11970	-4.38190	2.21520	-0.60950	-1.10080
318	120	-5.59680	1.12550	-2.33490	-7.04440	-4.15490	2.13400	-0.52910	-1.02550
318	125	-5.38250	1.05180	-2.26540	-6.97990	-3.94060	2.06030	-0.45960	-0.96100
318	130	-5.17820	0.98490	-2.19680	-6.91550	-3.73630	1.99340	-0.39100	-0.89660
318	135	-4.98640	0.92290	-2.13980	-6.85350	-3.54450	1.93140	-0.33400	-0.83460
318	140	-4.80640	0.86350	-2.08290	-6.79740	-3.36450	1.87200	-0.27710	-0.77850
318	145	-4.63560	0.81240	-2.03440	-6.74300	-3.19370	1.82090	-0.22860	-0.72410
318	150	-4.47400	0.76380	-1.98910	-6.69360	-3.03210	1.77230	-0.18330	-0.67470
318	155	-4.32490	0.71860	-1.94480	-6.64420	-2.88300	1.72710	-0.13900	-0.62530
318	160	-4.18000	0.67850	-1.90710	-6.59990	-2.73810	1.68700	-0.10130	-0.58100
318	165	-4.04860	0.64080	-1.87110	-6.55880	-2.60670	1.64930	-0.06530	-0.53990
318	170	-3.92210	0.60230	-1.84100	-6.51950	-2.48020	1.61080	-0.03520	-0.50060
318	175	-3.80410	0.57050	-1.81000	-6.48350	-2.36220	1.57900	-0.00420	-0.46460
318	180	-3.69100	0.53950	-1.78070	-6.44830	-2.24910	1.54800	0.02510	-0.42940

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
318	0	-1.42240	-1.00460	-1.80700	-6.03660	0.00000	0.00000	0.00000	0.00000
318	5	-1.43330	-1.00040	-1.81200	-6.03160	-0.01090	0.00420	-0.00500	0.00500
318	10	-1.58480	-0.96440	-1.83630	-6.05590	-0.16240	0.04020	-0.02930	-0.01930
318	15	-2.08210	-0.80950	-1.96690	-6.12540	-0.65970	0.19510	-0.15990	-0.08880
318	20	-2.94360	-0.47870	-2.20140	-6.27190	-1.52120	0.52590	-0.39440	-0.23530
318	25	-4.04530	-0.01990	-2.51790	-6.47790	-2.62290	0.98470	-0.71090	-0.44130
318	30	-5.24500	0.50600	-2.85450	-6.74000	-3.82260	1.51060	-1.04750	-0.70340
318	35	-6.42630	1.05190	-3.22040	-7.02970	-5.00390	2.05650	-1.41340	-0.99310
318	40	-7.44090	1.53260	-3.54700	-7.32860	-6.01850	2.53720	-1.74000	-1.29200
318	45	-8.17010	1.88680	-3.81740	-7.57320	-6.74770	2.89140	-2.01040	-1.53660
318	50	-8.60460	2.07100	-4.00500	-7.76240	-7.18220	3.07560	-2.19800	-1.72580
318	55	-8.80380	2.11370	-4.10550	-7.88880	-7.38140	3.11830	-2.29850	-1.85220
318	60	-8.82640	2.04590	-4.15070	-7.94660	-7.40400	3.05050	-2.34370	-1.91000
318	65	-8.73350	1.90270	-4.14820	-7.96000	-7.31110	2.90730	-2.34120	-1.92340
318	70	-8.55850	1.71430	-4.09540	-7.93990	-7.13610	2.71890	-2.28840	-1.90330
318	75	-8.34760	1.51000	-4.02760	-7.88880	-6.92520	2.51460	-2.22060	-1.85220
318	80	-8.10230	1.30480	-3.93890	-7.82270	-6.67990	2.30940	-2.13190	-1.78610
318	85	-7.84940	1.10130	-3.85090	-7.75070	-6.42700	2.10590	-2.04390	-1.71410
318	90	-7.58990	0.91540	-3.76130	-7.66270	-6.16750	1.92000	-1.95430	-1.62610
318	95	-7.32950	0.73880	-3.67510	-7.57400	-5.90710	1.74340	-1.86810	-1.53740
318	100	-7.08260	0.57960	-3.58720	-7.48780	-5.66020	1.58420	-1.78020	-1.45120
318	105	-6.84730	0.43560	-3.50350	-7.40150	-5.42490	1.44020	-1.69650	-1.36490
318	110	-6.60870	0.30670	-3.42730	-7.31440	-5.18630	1.31130	-1.62030	-1.27780
318	115	-6.39610	0.19030	-3.35360	-7.23400	-4.97370	1.19490	-1.54660	-1.19740
318	120	-6.18340	0.08310	-3.28160	-7.15870	-4.76100	1.08770	-1.47460	-1.12210
318	125	-5.98840	-0.00730	-3.22040	-7.08420	-4.56600	0.99730	-1.41340	-1.04760
318	130	-5.80000	-0.09280	-3.15680	-7.01380	-4.37760	0.91180	-1.34980	-0.97720
318	135	-5.62090	-0.16560	-3.10320	-6.94850	-4.19850	0.83900	-1.29620	-0.91190
318	140	-5.45260	-0.23590	-3.04960	-6.88570	-4.03020	0.76870	-1.24260	-0.84910
318	145	-5.28770	-0.29790	-3.00020	-6.82880	-3.86530	0.70670	-1.19320	-0.79220
318	150	-5.13950	-0.35400	-2.95250	-6.77350	-3.71710	0.65060	-1.14550	-0.73690
318	155	-4.99720	-0.40340	-2.91230	-6.71990	-3.57480	0.60120	-1.10530	-0.68330
318	160	-4.86070	-0.45200	-2.86880	-6.67550	-3.43830	0.55260	-1.06180	-0.63890
318	165	-4.73260	-0.49300	-2.83110	-6.63370	-3.31020	0.51160	-1.02410	-0.59710
318	170	-4.61620	-0.53150	-2.80090	-6.58850	-3.19380	0.47310	-0.99390	-0.55190
318	175	-4.49400	-0.56840	-2.76830	-6.55410	-3.07160	0.43620	-0.96130	-0.51750
318	180	-4.39020	-0.59850	-2.73230	-6.51230	-2.96780	0.40610	-0.92530	-0.47570

KVA Flowmeter Measurements

Well Number: 699-37-47A

Test No.: A35-17.4

Date: 11-13-96

Probe No. : 2D-1
Controller No.: B
Computer Interface No.: 2

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: N 53.3° E

Flowrate Calculation:

Clibration Curve Date: October 1995

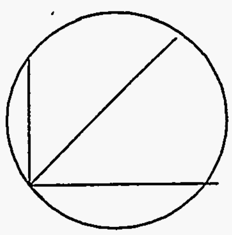
Calibration Cuve: Assumed Effective Porosity @ 20%

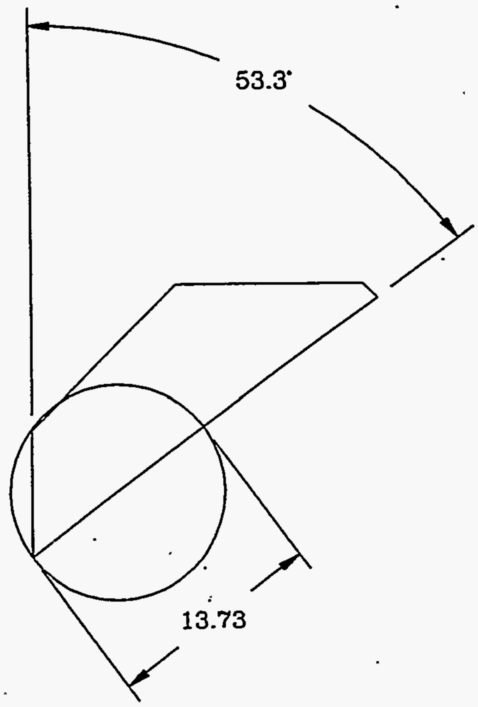
$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}} = 3.3 \text{ ft./day}$$

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-((( )/ x100)= %





IN-SITU FLOW MEASUREMENTS

Tot. Dep. = 342.6 ft.TOC

11-13-9 PROBE @ 323.0 ft (BTOC) 7.4ft BWL Declination Correction: 21 HEATER @ 1.6 amps Dep. Water = 315.6 ft.TO

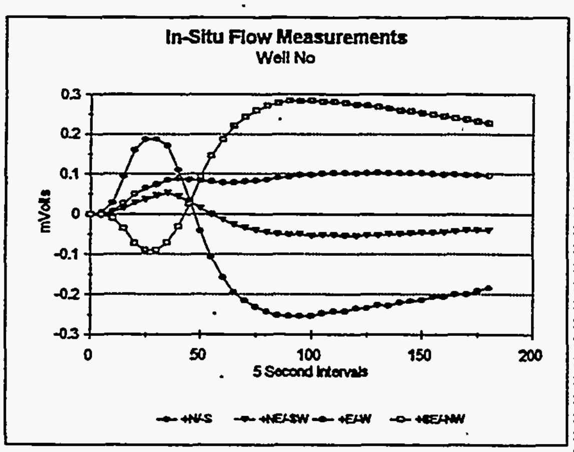
Test 7.4A on11/13/96 @ 1420 NORTH KVFLO25 (25mV) SOUTH@ 1520 11/13/96 Screened Interval = 30 ft.

WELL NO: 699-37-47A

	DIRECTION:	DATE:	Start TIME:	End TIME:
TEST 1	NORTH	11-13-96	1420	1423
TEST 2	SOUTH	11-13-96	1520	1523

TEST NO. 1 - TEST NO. 2
2

5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	0.00375	0.00000	-0.00120	-0.00040
10	0.02890	0.00550	0.00710	-0.00965
15	0.09375	0.01425	0.02720	-0.03635
20	0.16020	0.02805	0.04855	-0.07275
25	0.18735	0.03680	0.06440	-0.09030
30	0.18815	0.04640	0.07280	-0.08945
35	0.17175	0.05225	0.08490	-0.07020
40	0.11105	0.04470	0.08905	-0.03125
45	0.03525	0.03215	0.08615	0.02615
50	-0.04135	0.01460	0.08315	0.09185
55	-0.10625	-0.00055	0.08105	0.14500
60	-0.15775	-0.01350	0.07895	0.18725
65	-0.19415	-0.02650	0.07900	0.22115
70	-0.21505	-0.03360	0.08105	0.24375
75	-0.23135	-0.03985	0.08320	0.25915
80	-0.24305	-0.04570	0.08695	0.27175
85	-0.25185	-0.04910	0.09160	0.27885
90	-0.25265	-0.05155	0.09200	0.28465
95	-0.25350	-0.04990	0.09700	0.28385
100	-0.25305	-0.05450	0.09700	0.28465
105	-0.24630	-0.05280	0.10040	0.28255
110	-0.24255	-0.05240	0.10245	0.28170
115	-0.24210	-0.05445	0.10205	0.27835
120	-0.23415	-0.05530	0.10245	0.27415
125	-0.23460	-0.05280	0.10205	0.27165
130	-0.22615	-0.05280	0.10375	0.26870
135	-0.22820	-0.04985	0.10250	0.26500
140	-0.21945	-0.04945	0.10250	0.25950
145	-0.21605	-0.04775	0.10250	0.25790
150	-0.21315	-0.04690	0.10210	0.25325
155	-0.20520	-0.04735	0.10045	0.24945
160	-0.20555	-0.04525	0.09875	0.24530
165	-0.19890	-0.04315	0.09960	0.23945
170	-0.19890	-0.04065	0.09795	0.23690
175	-0.19175	-0.04105	0.09750	0.23230
180	-0.18385	-0.04105	0.09540	0.22730
TOTAL	-4.7067	-0.85305	3.0423	6.30115



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
318	0	-1.41710	-1.01700	-1.79960	-5.99970	0.00000	0.00000	0.00000	0.00000
318	5	-1.41710	-1.01700	-1.80120	-6.00050	0.00000	0.00000	-0.00160	-0.00080
318	10	-1.44800	-1.02110	-1.80880	-5.99300	-0.03090	-0.00410	-0.00920	0.00670
318	15	-1.67400	-1.05880	-1.86570	-5.91090	-0.25690	-0.04180	-0.06610	0.08880
318	20	-2.22480	-1.14670	-2.02050	-5.67320	-0.80770	-0.12970	-0.22090	0.32650
318	25	-3.06600	-1.29070	-2.25410	-5.26560	-1.64890	-0.27370	-0.45450	0.73410
318	30	-4.05360	-1.47820	-2.52440	-4.75250	-2.63650	-0.46120	-0.72480	1.24720
318	35	-5.07230	-1.70000	-2.79640	-4.20430	-3.65520	-0.68300	-0.99680	1.79540
318	40	-6.03310	-1.95110	-3.06180	-3.67950	-4.61600	-0.93410	-1.26220	2.32020
318	45	-6.79900	-2.18960	-3.28270	-3.26100	-5.38190	-1.17260	-1.48310	2.73870
318	50	-7.29700	-2.39800	-3.42840	-2.99650	-5.87990	-1.38100	-1.62880	3.00320
318	55	-7.55400	-2.55960	-3.50040	-2.90360	-6.13690	-1.54260	-1.70080	3.09610
318	60	-7.63270	-2.67420	-3.50960	-2.93790	-6.21560	-1.65720	-1.71000	3.06180
318	65	-7.57910	-2.75210	-3.47440	-3.06090	-6.16200	-1.73510	-1.67480	2.93880
318	70	-7.43930	-2.79560	-3.40580	-3.24000	-6.02220	-1.77860	-1.60620	2.75970
318	75	-7.24930	-2.81400	-3.32120	-3.44600	-5.83220	-1.79700	-1.52160	2.55370
318	80	-7.03170	-2.80980	-3.22330	-3.65350	-5.61460	-1.79280	-1.42370	2.34620
318	85	-6.80150	-2.78810	-3.11950	-3.85940	-5.38440	-1.77110	-1.31990	2.14030
318	90	-6.55880	-2.75290	-3.02410	-4.05280	-5.14170	-1.73590	-1.22450	1.94690
318	95	-6.32610	-2.71190	-2.92620	-4.23270	-4.90900	-1.69490	-1.12660	1.76700
318	100	-6.09760	-2.66920	-2.83830	-4.39340	-4.68050	-1.65220	-1.03870	1.60630
318	105	-5.86990	-2.61560	-2.75120	-4.53910	-4.45280	-1.59860	-0.95160	1.46060
318	110	-5.65820	-2.56290	-2.67260	-4.66550	-4.24110	-1.54590	-0.87300	1.33420
318	115	-5.46230	-2.50930	-2.60140	-4.78180	-4.04520	-1.49230	-0.80180	1.21790
318	120	-5.26390	-2.45660	-2.53450	-4.88560	-3.84680	-1.43960	-0.73490	1.11410
318	125	-5.09070	-2.40050	-2.47420	-4.97350	-3.67360	-1.38350	-0.67460	1.02620
318	130	-4.91570	-2.34780	-2.41560	-5.05300	-3.49860	-1.33080	-0.61600	0.94670
318	135	-4.76160	-2.29340	-2.36450	-5.12320	-3.34450	-1.27640	-0.56490	0.87650
318	140	-4.60680	-2.24480	-2.31430	-5.18770	-3.18970	-1.22780	-0.51470	0.81200
318	145	-4.46450	-2.19540	-2.27080	-5.24120	-3.04740	-1.17840	-0.47120	0.75850
318	150	-4.33060	-2.14940	-2.22890	-5.29150	-2.91350	-1.13240	-0.42930	0.70820
318	155	-4.19920	-2.10420	-2.19210	-5.33670	-2.78210	-1.08720	-0.39250	0.66300
318	160	-4.08700	-2.05820	-2.15860	-5.37770	-2.66990	-1.04120	-0.35900	0.62200
318	165	-3.96990	-2.01800	-2.12430	-5.41450	-2.55280	-1.00100	-0.32470	0.58520
318	170	-3.87030	-1.97530	-2.09580	-5.44800	-2.45320	-0.95830	-0.29620	0.55170
318	175	-3.76810	-1.93760	-2.06990	-5.47810	-2.35100	-0.92060	-0.27030	0.52160
318	180	-3.66690	-1.90330	-2.04480	-5.50680	-2.24980	-0.88630	-0.24520	0.49310

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW	THERM. 1 mV +N/-S	THERM. 2 mV +NE/-SW	THERM. 3 mV +E/-W	THERM. 4 mV +SE/-NW
318	0	-1.45370	-1.02270	-1.81020	-6.01060	0.00000	0.00000	0.00000	0.00000
318	5	-1.46120	-1.02270	-1.80940	-6.01060	-0.00750	0.00000	0.00080	0.00000
318	10	-1.54240	-1.03780	-1.83360	-5.98460	-0.08870	-0.01510	-0.02340	0.02600
318	15	-1.89810	-1.09300	-1.93070	-5.84910	-0.44440	-0.07030	-0.12050	0.16150
318	20	-2.58180	-1.20850	-2.12820	-5.53860	-1.12810	-0.18580	-0.31800	0.47200
318	25	-3.47730	-1.37000	-2.39350	-5.09590	-2.02360	-0.34730	-0.58330	0.91470
318	30	-4.46650	-1.57670	-2.68060	-4.58450	-3.01280	-0.55400	-0.87040	1.42610
318	35	-5.45240	-1.81020	-2.97680	-4.07480	-3.99870	-0.78750	-1.16660	1.93580
318	40	-6.29180	-2.04620	-3.25050	-3.62790	-4.83810	-1.02350	-1.44030	2.38270
318	45	-6.90610	-2.25960	-3.46560	-3.32420	-5.45240	-1.23690	-1.65540	2.68640
318	50	-7.25090	-2.43290	-3.60530	-3.19110	-5.79720	-1.41020	-1.79510	2.81950
318	55	-7.37810	-2.56420	-3.67310	-3.20450	-5.92440	-1.54150	-1.86290	2.80610
318	60	-7.35380	-2.65290	-3.67810	-3.32330	-5.90010	-1.63020	-1.86790	2.68730
318	65	-7.22740	-2.70480	-3.64300	-3.51410	-5.77370	-1.68210	-1.83280	2.49650
318	70	-7.04580	-2.73410	-3.57850	-3.73840	-5.59210	-1.71140	-1.76830	2.27220
318	75	-6.82320	-2.74000	-3.49820	-3.97520	-5.36950	-1.71730	-1.68800	2.03540
318	80	-6.58220	-2.72410	-3.40780	-4.20790	-5.12850	-1.70140	-1.59760	1.80270
318	85	-6.33440	-2.69560	-3.31330	-4.42800	-4.88070	-1.67290	-1.50310	1.58260
318	90	-6.09010	-2.65550	-3.21870	-4.63300	-4.63640	-1.63280	-1.40850	1.37760
318	95	-5.85570	-2.61780	-3.13080	-4.81130	-4.40200	-1.59510	-1.32060	1.19930
318	100	-5.62810	-2.56590	-3.04290	-4.97360	-4.17440	-1.54320	-1.23270	1.03700
318	105	-5.41390	-2.51570	-2.96260	-5.11510	-3.96020	-1.49300	-1.15240	0.89550
318	110	-5.20970	-2.46380	-2.88810	-5.23980	-3.75600	-1.44110	-1.07790	0.77080
318	115	-5.01470	-2.40610	-2.81610	-5.34940	-3.56100	-1.38340	-1.00590	0.66120
318	120	-4.83220	-2.35170	-2.75000	-5.44480	-3.37850	-1.32900	-0.93980	0.56580
318	125	-4.65810	-2.30060	-2.68890	-5.52770	-3.20440	-1.27790	-0.87870	0.48290
318	130	-4.50000	-2.24790	-2.63370	-5.60130	-3.04630	-1.22520	-0.82350	0.40930
318	135	-4.34180	-2.19940	-2.58010	-5.66410	-2.88810	-1.17670	-0.76990	0.34650
318	140	-4.20450	-2.15160	-2.52990	-5.71760	-2.75080	-1.12890	-0.71970	0.29300
318	145	-4.06900	-2.10560	-2.48640	-5.76790	-2.61530	-1.08290	-0.67620	0.24270
318	150	-3.94090	-2.06130	-2.44370	-5.80890	-2.48720	-1.03860	-0.63350	0.20170
318	155	-3.82540	-2.01520	-2.40360	-5.84650	-2.37170	-0.99250	-0.59340	0.16410
318	160	-3.71250	-1.97340	-2.36670	-5.87920	-2.25880	-0.95070	-0.55650	0.13140
318	165	-3.60870	-1.93740	-2.33410	-5.90430	-2.15500	-0.91470	-0.52390	0.10630
318	170	-3.50910	-1.89970	-2.30230	-5.93270	-2.05540	-0.87700	-0.49210	0.07790
318	175	-3.42120	-1.86120	-2.27550	-5.95360	-1.96750	-0.83850	-0.46530	0.05700
318	180	-3.33580	-1.82690	-2.24620	-5.97210	-1.88210	-0.80420	-0.43600	0.03850

KVA Flowmeter Measurements

Well Number: 699-37-47A

Test No.: A37-7.4A

Date: 11-13-96

Analysis Type: SUM

No.1 Thermistor Alignment: North

Calculated Vector Angle: S 38.9° E

Probe No. : 2D-1
Controller No.: B
Computer Interface No.: 2

Flowrate Calculation:

Clibration Curve Date: October 1995

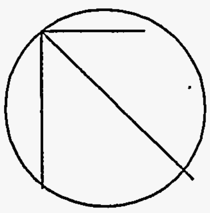
Calibration Cuve: Assumed Effective Porosity @ 20%

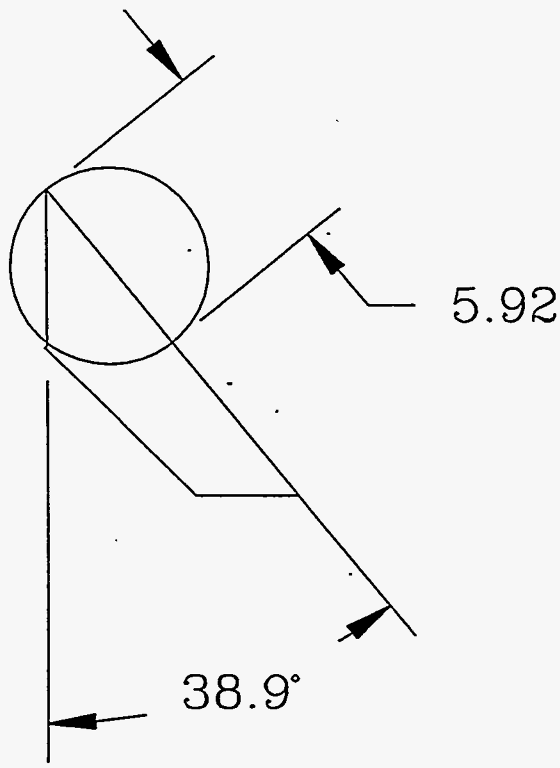
$$\text{Flowrate} = \frac{(0.051 \times \text{mV}) - 0.04}{\text{Effective Porosity}} = 1.3 \text{ ft./day}$$

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-((( )/ x100)= %





FLOWMETER VECTOR ANALYSIS

Well Number: 699-37-47A

Flow Meter Vector Analysis				Best	Symmetry		Quadrant Factor	
Well :	Regional						0	
Test Date:				Theta Av.	24.99	degrees		
				r =	16.60			
				Avg r =	2.37			
				Sdev =	1.43			

Test No.	Theta	n	Sin Theta	Cos Theta	nSin Theta	nCos Theta	Sum nSin Theta	Sum nCos Theta
A37-3.4	303.5	1.00	-0.83	0.55	-0.83	0.55	7.01	15.05
A37-7.4	349.1	2.40	-0.19	0.98	-0.45	2.36		
A37-7.4A	308.9	1.30	-0.78	0.63	-1.01	0.82		
A37-11.4	294.8	1.70	-0.91	0.42	-1.54	0.71		
A37-17.4	36.7	3.30	0.60	0.80	1.97	2.65		
A37-19.4	41.1	5.20	0.66	0.75	3.42	3.92		
A37-19.4A	53.5	6.8	0.80	0.59	5.47	4.04		

Mean Velocity = 2.37 ft./day @ N 65° E

Flow Meter Vector Analysis				Best	Symmetry		Quadrant Factor	
Well :	Regional						360	
Test Date:				Theta Av.	319.11	degrees		
				r =	5.87			
				Avg r =	1.47			
				Sdev =	0.52			

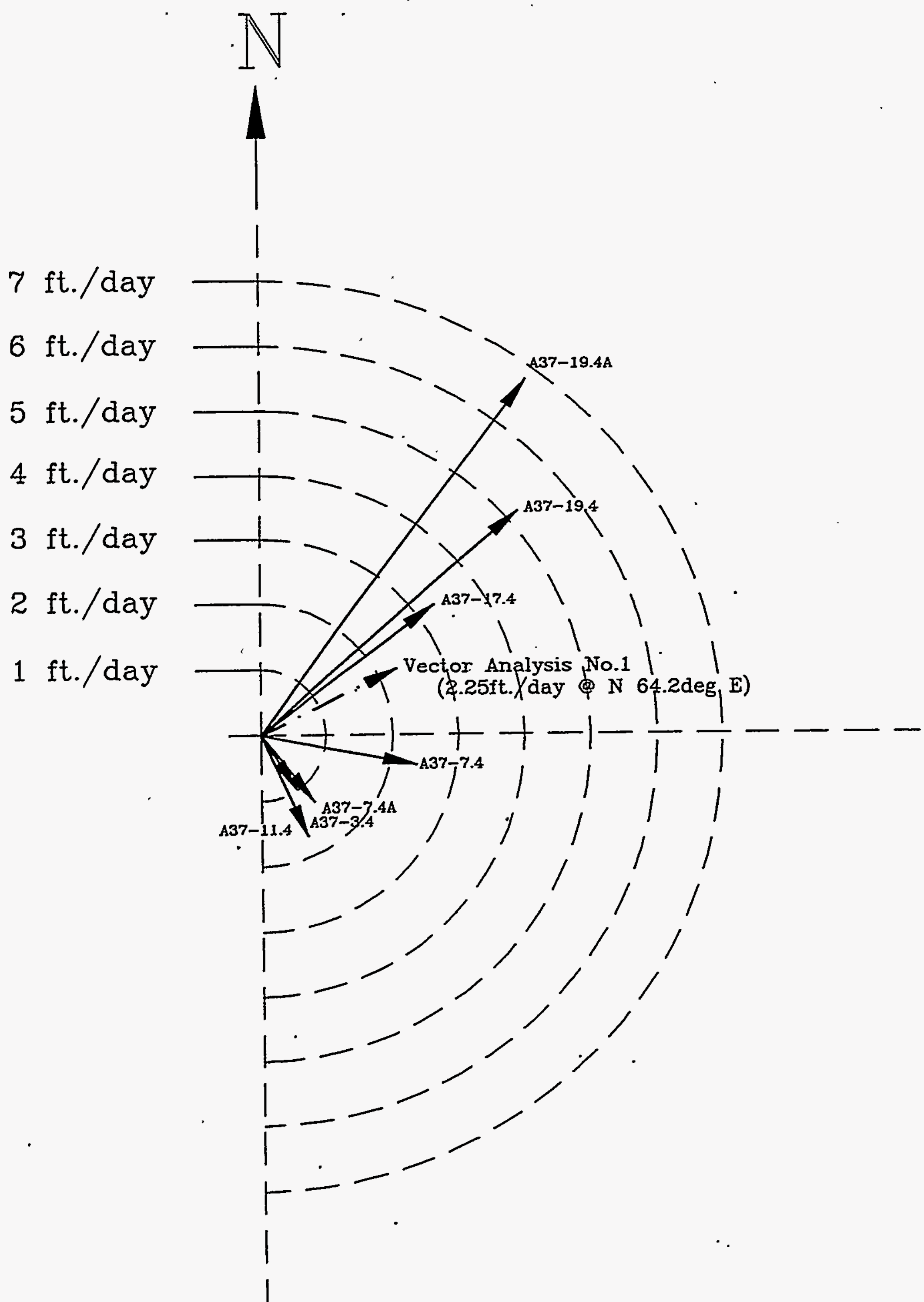
Test No.	Theta	n	Sin Theta	Cos Theta	nSin Theta	nCos Theta	Sum nSin Theta	Sum nCos Theta
A37-3.4	303.5	1.00	-0.83	0.55	-0.83	0.55	-3.84	4.44
A37-7.4	349.1	2.40	-0.19	0.98	-0.45	2.36		
A37-7.4A	308.9	1.30	-0.78	0.63	-1.01	0.82		
A37-11.4	294.8	1.70	-0.91	0.42	-1.54	0.71		

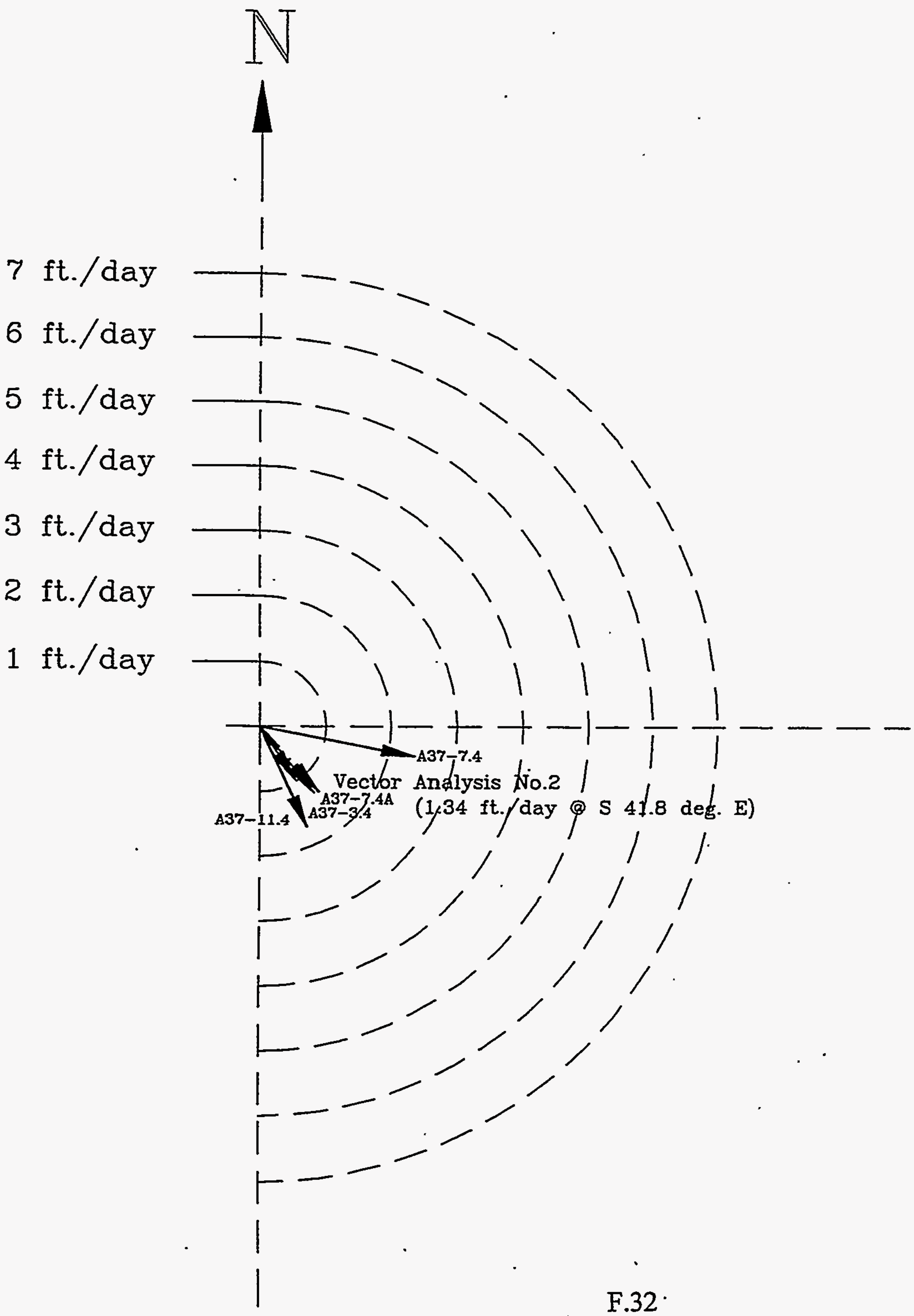
Mean Velocity = 1.47 ft./day @ S 49.1° E

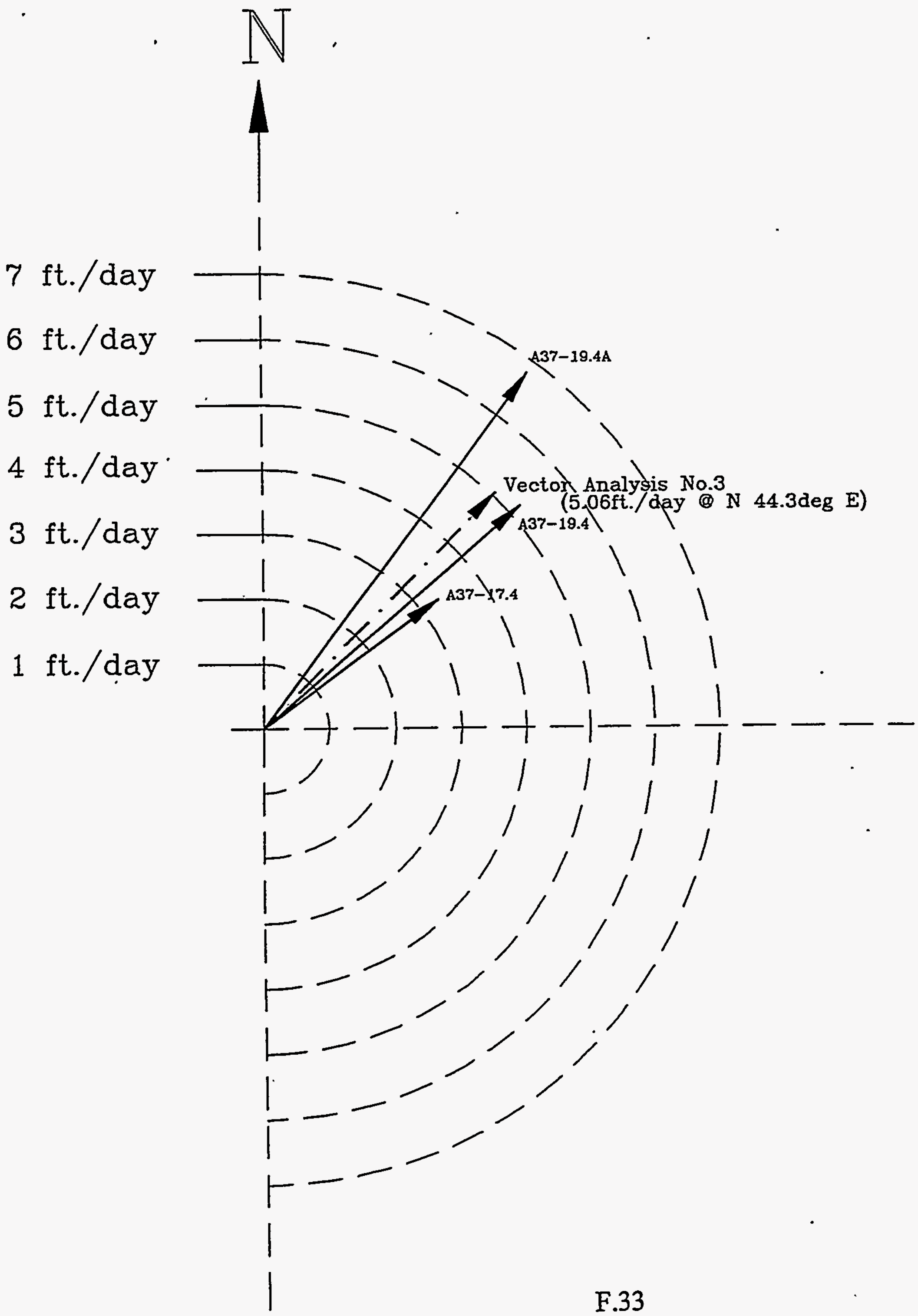
Flow Meter Vector Analysis				Best	Symmetry		Quadrant Factor	
Well :	Regional						0	
Test Date:				Theta Av.	45.66	degrees		
				r =	15.18			
				Avg r =	5.06			
				Sdev =	1.43			

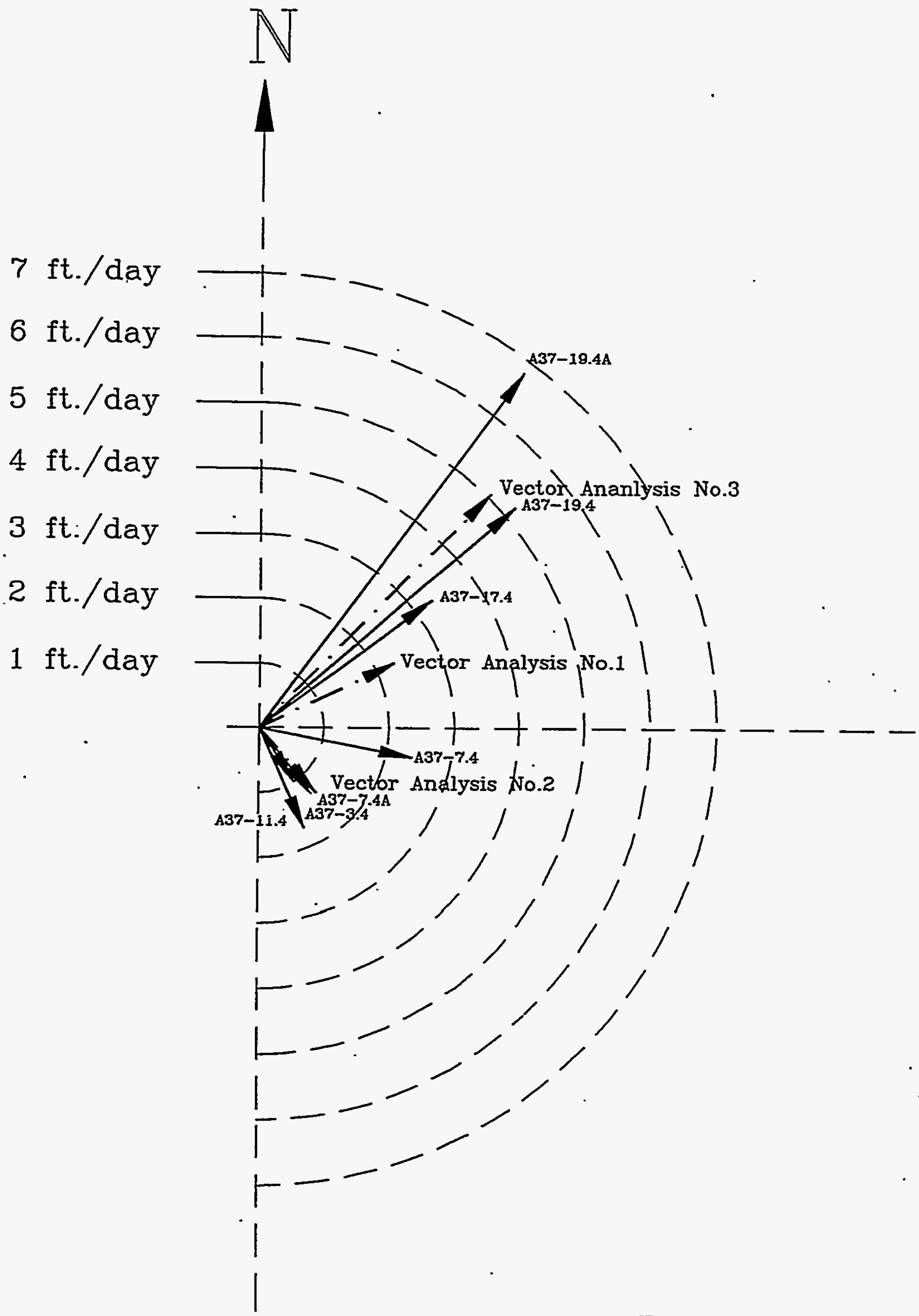
Test No.	Theta	n	Sin Theta	Cos Theta	nSin Theta	nCos Theta	Sum nSin Theta	Sum nCos Theta
A37-17.4	36.7	3.30	0.60	0.80	1.97	2.65	10.86	10.61
A37-19.4	41.1	5.20	0.66	0.75	3.42	3.92		
A37-19.4A	53.5	6.8	0.80	0.59	5.47	4.04		

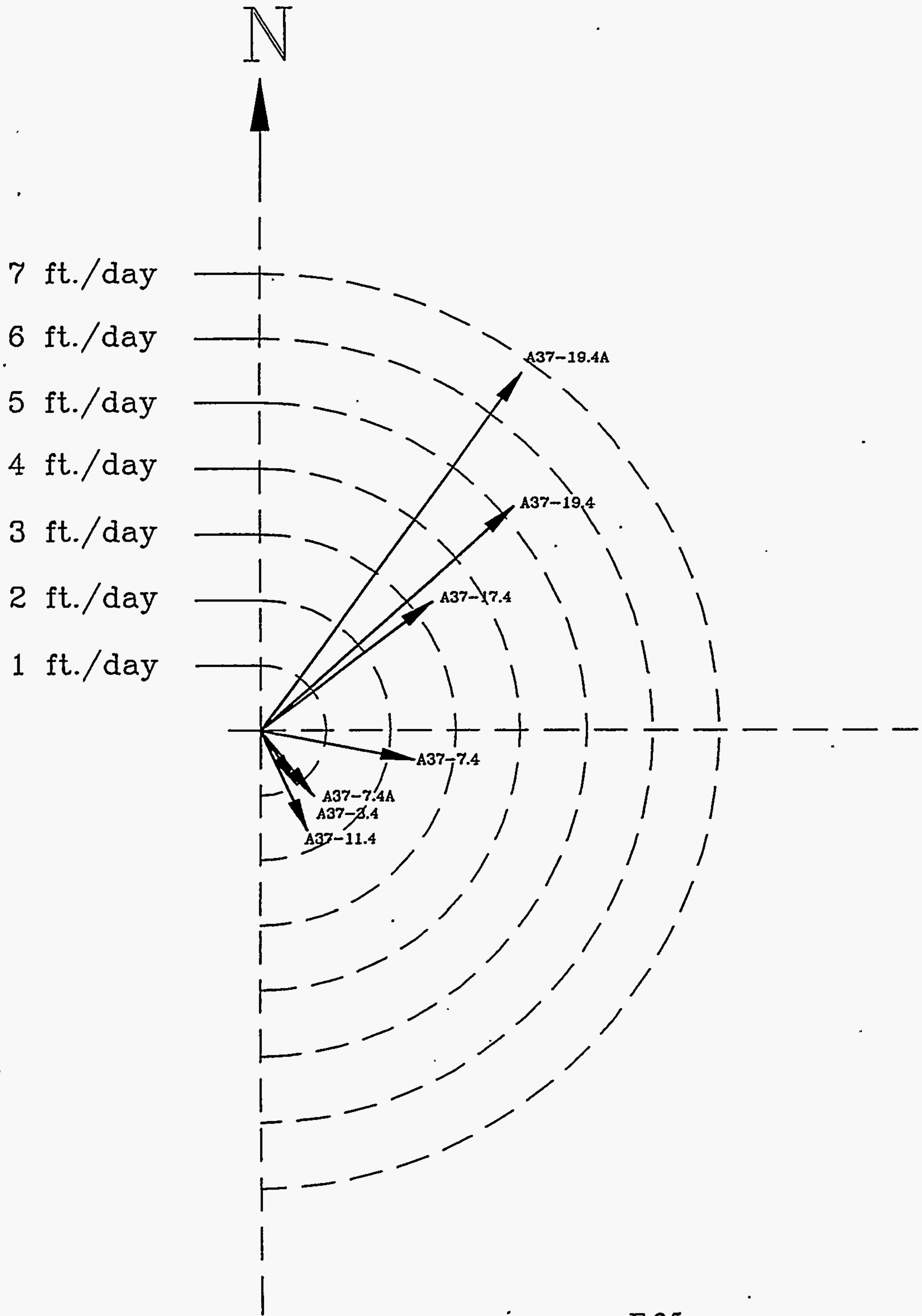
Mean Velocity = 5.1 ft./day @ N 44.3° E


N
7 ft./day
6 ft./day
5 ft./day
4 ft./day
3 ft./day
2 ft./day
1 ft./day
A37-19.4A
A37-19.4
A37-17.4
Vector Analysis No.1
(2.25ft./day @ N 64.2deg E)
A37-7.4
A37-7.4A
A37-3.4
A37-11.4

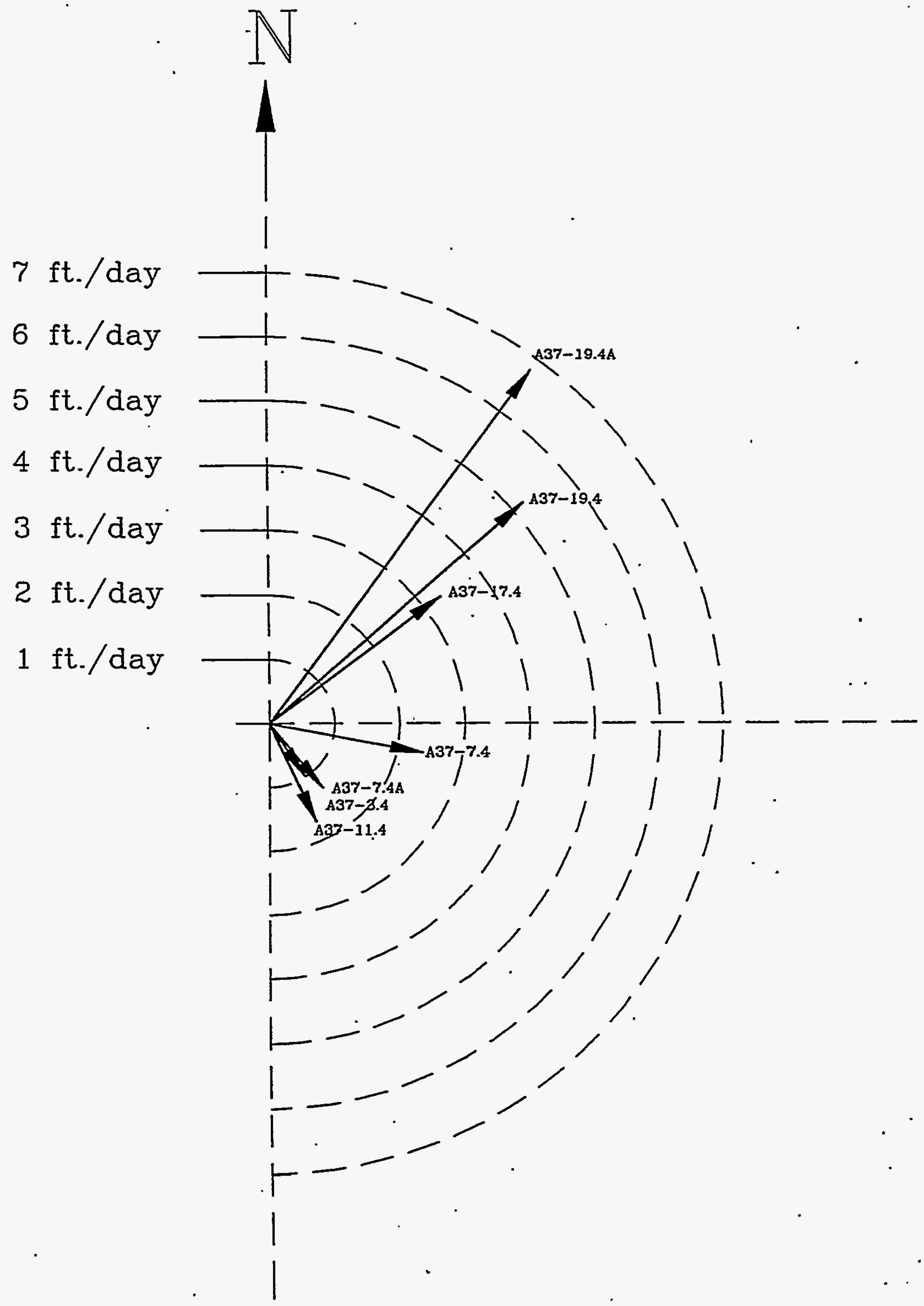

N
7 ft./day
6 ft./day
5 ft./day
4 ft./day
3 ft./day
2 ft./day
1 ft./day
A37-7.4
Vector Analysis No.2
(1.34 ft./day @ S 41.8 deg. E)
A37-7.4A
A37-3.4
A37-11.4


N
7 ft./day
6 ft./day
5 ft./day
4 ft./day
3 ft./day
2 ft./day
1 ft./day
A37-19.4A
Vector Analysis No.3
(5.06ft./day @ N 44.3deg E)
A37-19.4
A37-17.4


N
7 ft./day
6 ft./day
5 ft./day
4 ft./day
3 ft./day
2 ft./day
1 ft./day
A37-19.4A
Vector Ananlysis No.3
A37-19.4
A37-17.4
Vector Analysis No.1
A37-7.4
Vector Analysis No.2
A37-7.4A
A37-3.4
A37-11.4



N
7 ft./day
6 ft./day
5 ft./day
4 ft./day
3 ft./day
2 ft./day
1 ft./day
A37-19.4A
A37-19.4
A37-17.4
A37-7.4
A37-7.4A
A37-3.4
A37-11.4



N
7 ft./day
6 ft./day
5 ft./day
4 ft./day
3 ft./day
2 ft./day
1 ft./day
A37-19.4A
A37-19.4
A37-17.4
A37-7.4
A37-7.4A
A37-3.4
A37-11.4

STANDARD CURVE CALCULATIONS

OCTOBER 1995

SUM METHOD

Flowrate = (0.044 x mV) -0.021

PROBE: 2D-1
CONTROL BOX: B
COMPUTER INTERFACE: 2

Flowrate	mVolts	Calculated Flowrate
0.27	5.09	0.20
0.55	14.83	0.63
0.55	15.39	0.66
0.55	13.76	0.58
1.37	26.58	1.15
2.74	63.08	2.75

	Regression Output:	
Constant	Regression Output:	0.465
Constant		-0.021
Std Err of Y Est		0.134
R Squared		0.983
No. of Observations		6.000
Degrees of Freedom		4.000
X Coefficient(s)	0.035	
X Coefficient(s)	0.044	

Flowrate = (0.049 x mV) -0.075

2D-1
B
2

Flowrate	mVolts	Calculated Flowrate
0.27	5.09	0.17
0.55	14.83	0.65
0.55	15.39	0.68
0.55	13.76	0.60
1.37	26.58	1.23
2.74	63.08	3.02
2.74	55.04	2.62
2.74	51.72	2.46

Regression Output:		
Constant		-0.075
Std Err of Y Est		0.194
R Squared		0.974
No. of Observations		8.000
Degrees of Freedom		6.000
X Coefficient(s)	0.049	
Std Err of Coef.	0.003	

PROBE:
CONTROL BOX:
COMPUTER INTERFACE:

Flowrate = (0.051 x mV) -0.040

2D-1
B
2

Flowrate	mVolts	Calculated Flowrate
0.27	5.09	0.22
0.55	13.76	0.66
1.37	26.58	1.32
2.74	55.04	2.77

Regression Output:		
Constant		-0.040
Std Err of Y Est		0.096
R Squared		0.995
No. of Observations		4.000
Degrees of Freedom		2.000
X Coefficient(s)	0.051	
Std Err of Coef.	0.003	

PROBE 2D-1 w/ compute Int.2

IN-SITU FLOW MEASUREMENTS

10-27-95 Test 11 on 10/27/95 @ 1100 NORTH KVFLO7_5 (7.5mV) SOUTH @ 1200 10/27/95 FLOW RATE =ft/day 0.55

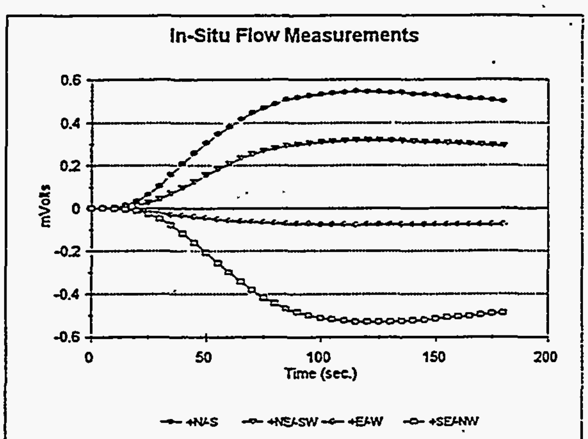
Gear Setup 1:196 Reduction Gear, 24:30 Drive Gear ratio HEATER @ 1.65 amps

WELL NO: CALIBRATION TEST 11

	DIRECTION:	DATE:	Start TIME:	End TIME:
RUN 1	NORTH	10-27-95	1100	1103
RUN 2	SOUTH	10-27-95	1200	1203

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	0.00200	0.00013	-0.00000	-0.00040
10	0.00388	0.00188	0.00025	-0.00165
15	0.01378	0.00540	-0.00175	-0.00495
20	0.03258	0.01293	-0.00999	-0.01220
25	0.06516	0.02560	-0.01174	-0.02635
30	0.10686	0.04325	-0.01999	-0.04775
35	0.15911	0.06835	-0.02849	-0.07860
40	0.21016	0.09516	-0.03414	-0.11765
45	0.25891	0.12356	-0.03904	-0.15950
50	0.30736	0.15515	-0.04539	-0.20670
55	0.34856	0.18381	-0.05004	-0.25415
60	0.38191	0.20836	-0.05594	-0.29920
65	0.41836	0.23286	-0.05884	-0.34250
70	0.44841	0.25265	-0.06259	-0.38205
75	0.46941	0.26756	-0.06594	-0.41640
80	0.48746	0.27981	-0.06779	-0.44215
85	0.50686	0.29120	-0.07079	-0.46730
90	0.51641	0.29856	-0.07134	-0.48415
95	0.52462	0.30370	-0.07269	-0.49795
100	0.53279	0.31031	-0.07544	-0.50950
105	0.53813	0.31334	-0.07384	-0.51770
110	0.54166	0.31607	-0.07584	-0.52335
115	0.54579	0.31846	-0.07635	-0.52770
120	0.54303	0.31794	-0.07574	-0.52985
125	0.54367	0.31818	-0.07599	-0.53010
130	0.53841	0.31607	-0.07587	-0.52795
135	0.53987	0.31619	-0.07574	-0.52610
140	0.53250	0.31282	-0.07587	-0.52260
145	0.53048	0.30979	-0.07412	-0.51845
150	0.52798	0.31091	-0.07549	-0.51465
155	0.52322	0.30603	-0.07463	-0.50930
160	0.51812	0.30315	-0.07400	-0.50580
165	0.51219	0.29927	-0.07449	-0.50080
170	0.50945	0.29726	-0.07449	-0.49605
175	0.50547	0.29450	-0.07400	-0.49140
180	0.49806	0.29037	-0.07425	-0.48575
TOTAL	14.24248	8.100515	-2.04239	-12.97865



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
300	0	-0.30247	0.62196	-0.68756	-3.48560	0.00000	0.00000	0.00000	0.00000
300	5	-0.30272	0.62021	-0.68907	-3.48510	-0.00025	-0.00175	-0.00151	0.00050
300	10	-0.35981	0.55611	-0.71786	-3.45330	-0.05734	-0.06585	-0.03030	0.03230
300	15	-0.53883	0.31924	-0.83003	-3.31040	-0.23636	-0.30272	-0.14247	0.17520
300	20	-0.81826	-0.08438	-1.02680	-3.03670	-0.51579	-0.70634	-0.33924	0.44890
300	25	-1.12970	-0.55260	-1.23440	-2.68970	-0.82723	-1.17456	-0.54684	0.79590
300	30	-1.43720	-1.01730	-1.44120	-2.33510	-1.13473	-1.63926	-0.75364	1.15050
300	35	-1.72940	-1.46400	-1.64350	-2.01140	-1.42693	-2.08596	-0.95594	1.47420
300	40	-1.94330	-1.83430	-1.81260	-1.77950	-1.64083	-2.45626	-1.12504	1.70610
300	45	-2.03510	-2.07720	-1.92800	-1.68410	-1.73263	-2.69916	-1.24044	1.80150
300	50	-2.02210	-2.18860	-1.98780	-1.73520	-1.71963	-2.81056	-1.30024	1.75040
300	55	-1.93970	-2.19660	-1.99060	-1.90220	-1.63723	-2.81856	-1.30304	1.58340
300	60	-1.82360	-2.13250	-1.95380	-2.14810	-1.52113	-2.75446	-1.26624	1.33750
300	65	-1.68610	-2.02010	-1.88020	-2.43150	-1.38363	-2.64206	-1.19264	1.05410
300	70	-1.54490	-1.88090	-1.78830	-2.72520	-1.24243	-2.50286	-1.10074	0.76040
300	75	-1.41120	-1.72990	-1.68840	-3.01120	-1.10873	-2.35186	-1.00084	0.47440
300	80	-1.28320	-1.57440	-1.58490	-3.26910	-0.98073	-2.19636	-0.89734	0.21650
300	85	-1.16430	-1.41940	-1.48600	-3.50340	-0.86183	-2.04136	-0.79844	-0.01780
300	90	-1.05610	-1.27050	-1.38940	-3.70270	-0.75363	-1.89246	-0.70184	-0.21710
300	95	-0.95798	-1.12820	-1.30200	-3.87420	-0.65551	-1.75016	-0.61444	-0.38860
300	100	-0.86734	-0.99379	-1.22360	-4.01900	-0.56487	-1.61575	-0.53604	-0.53340
300	105	-0.78496	-0.86834	-1.14700	-4.13840	-0.48249	-1.49030	-0.45944	-0.65280
300	110	-0.71060	-0.75066	-1.08040	-4.23700	-0.40813	-1.37262	-0.39284	-0.75140
300	115	-0.64324	-0.64249	-1.01980	-4.31590	-0.34077	-1.26445	-0.33224	-0.83030
300	120	-0.58566	-0.54384	-0.96449	-4.37830	-0.28319	-1.16580	-0.27693	-0.89270
300	125	-0.53057	-0.45095	-0.91592	-4.42760	-0.22810	-1.07291	-0.22836	-0.94200
300	130	-0.48350	-0.36707	-0.87210	-4.46490	-0.18103	-0.98903	-0.18454	-0.97930
300	135	-0.43717	-0.28844	-0.83253	-4.49270	-0.13470	-0.91040	-0.14497	-1.00710
300	140	-0.40112	-0.21758	-0.79647	-4.51270	-0.09865	-0.83954	-0.10891	-1.02710
300	145	-0.36206	-0.15223	-0.76367	-4.52620	-0.05959	-0.77419	-0.07611	-1.04060
300	150	-0.33176	-0.09014	-0.73388	-4.53420	-0.02929	-0.71210	-0.04632	-1.04860
300	155	-0.30397	-0.03555	-0.70659	-4.53700	-0.00150	-0.65751	-0.01903	-1.05140
300	160	-0.27968	0.01502	-0.68205	-4.53670	0.02279	-0.60694	0.00551	-1.05110
300	165	-0.25564	0.06210	-0.66001	-4.53350	0.04683	-0.55986	0.02755	-1.04790
300	170	-0.23461	0.10541	-0.63998	-4.52800	0.06786	-0.51655	0.04758	-1.04240
300	175	-0.21458	0.14547	-0.62146	-4.52020	0.08789	-0.47649	0.06610	-1.03460
300	180	-0.19780	0.18253	-0.60693	-4.51070	0.10467	-0.43943	0.08063	-1.02510

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
300	0	-0.49356	0.38137	-0.81934	-3.47970	0.00000	0.00000	0.00000	0.00000
300	5	-0.49781	0.37937	-0.82084	-3.47840	-0.00425	-0.00200	-0.00150	0.00130
300	10	-0.55866	0.31176	-0.85014	-3.44410	-0.06510	-0.06961	-0.03080	0.03560
300	15	-0.75749	0.06786	-0.95832	-3.29460	-0.26393	-0.31351	-0.13898	0.18510
300	20	-1.07450	-0.35082	-1.13860	-3.00640	-0.58094	-0.73219	-0.31926	0.47330
300	25	-1.45110	-0.84438	-1.34270	-2.63110	-0.95754	-1.22575	-0.52336	0.84860
300	30	-1.84200	-1.34440	-1.53300	-2.23370	-1.34844	-1.72577	-0.71366	1.24600
300	35	-2.23870	-1.84130	-1.71830	-1.84830	-1.74514	-2.22267	-0.89896	1.63140
300	40	-2.55470	-2.26520	-1.87610	-1.53830	-2.06114	-2.64657	-1.05676	1.94140
300	45	-2.74400	-2.56490	-1.98170	-1.35920	-2.25044	-2.94627	-1.16236	2.12050
300	50	-2.82790	-2.73950	-2.02880	-1.31590	-2.33434	-3.12087	-1.20946	2.16380
300	55	-2.82790	-2.80480	-2.02230	-1.38800	-2.33434	-3.18617	-1.20296	2.09170
300	60	-2.77850	-2.78980	-1.97370	-1.54380	-2.28494	-3.17117	-1.15436	1.93590
300	65	-2.71390	-2.72640	-1.89430	-1.74060	-2.22034	-3.10777	-1.07496	1.73910
300	70	-2.63280	-2.62680	-1.79490	-1.95520	-2.13924	-3.00817	-0.97556	1.52450
300	75	-2.54110	-2.50560	-1.68830	-2.17250	-2.04754	-2.88697	-0.86896	1.30720
300	80	-2.44920	-2.37460	-1.58110	-2.37890	-1.95564	-2.75597	-0.76176	1.10080
300	85	-2.36910	-2.24240	-1.47620	-2.56290	-1.87554	-2.62377	-0.65686	0.91680
300	90	-2.28000	-2.10820	-1.37850	-2.72850	-1.78644	-2.48957	-0.55916	0.75120
300	95	-2.19830	-1.97620	-1.28840	-2.87240	-1.70474	-2.35757	-0.46906	0.60730
300	100	-2.12400	-1.85500	-1.20450	-2.99410	-1.63044	-2.23637	-0.38516	0.48560
300	105	-2.05230	-1.73560	-1.13110	-3.09710	-1.55874	-2.11697	-0.31176	0.38260
300	110	-1.98500	-1.62340	-1.06050	-3.18440	-1.49144	-2.00477	-0.24116	0.29530
300	115	-1.92590	-1.52000	-0.99888	-3.25460	-1.43234	-1.90137	-0.17954	0.22510
300	120	-1.86280	-1.42030	-0.94479	-3.31270	-1.36924	-1.80167	-0.12545	0.16700
300	125	-1.80900	-1.32790	-0.89571	-3.36150	-1.31544	-1.70927	-0.07637	0.11820
300	130	-1.75140	-1.23980	-0.85214	-3.40310	-1.25784	-1.62117	-0.03280	0.07660
300	135	-1.70800	-1.16140	-0.81283	-3.43460	-1.21444	-1.54277	0.00651	0.04510
300	140	-1.65720	-1.08380	-0.77652	-3.46160	-1.16364	-1.46517	0.04282	0.01810
300	145	-1.61410	-1.01240	-0.74722	-3.48340	-1.12054	-1.39377	0.07212	-0.00370
300	150	-1.57880	-0.95255	-0.71467	-3.49300	-1.08524	-1.33392	0.10467	-0.01930
300	155	-1.54150	-0.88820	-0.68912	-3.51250	-1.04794	-1.26957	0.13022	-0.03280
300	160	-1.50700	-0.83186	-0.66584	-3.51920	-1.01344	-1.21323	0.15350	-0.03950
300	165	-1.47110	-0.77702	-0.64280	-3.52600	-0.97754	-1.15839	0.17654	-0.04630
300	170	-1.44460	-0.72969	-0.62277	-3.53000	-0.95104	-1.11106	0.19657	-0.05030
300	175	-1.41660	-0.68412	-0.60524	-3.53150	-0.92304	-1.06549	0.21410	-0.05180
300	180	-1.38500	-0.63879	-0.59021	-3.53330	-0.89144	-1.02016	0.22913	-0.05360

KVA Flowmeter Measurements

Calibration Testing

Date: 10-27-95

Flow Rate: 0.55 ft/day

Calibration Test No. : 11

Analysis Type: SUM

No.1 Thermistor Alignment: North

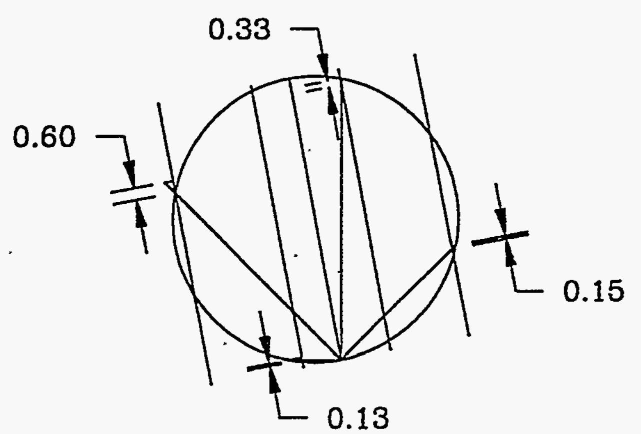
Calculated Vector Angle: N 10.7deg W

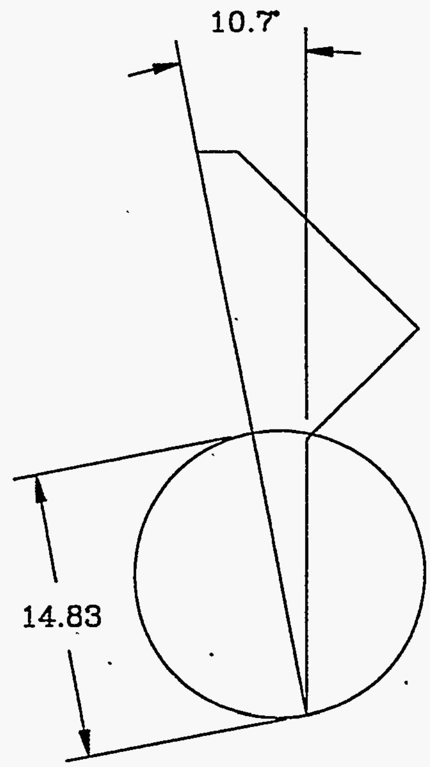
Probe No. : 1
Controller No.: 2
Computer Interface No.: 2

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-(((0.33+0.15+0.13+0.60)x100)= 91.5 %





PROBE 2D-1 w/ compute Int.2

IN-SITU FLOW MEASUREMENTS

10-27-95 ` Test 12 on 10/27/95 @ 1300 NORTH KVFLO7_5 (7.5mV) SOUTH @ 1413 10/27/95 FLOW RATE =ft/day 0.55

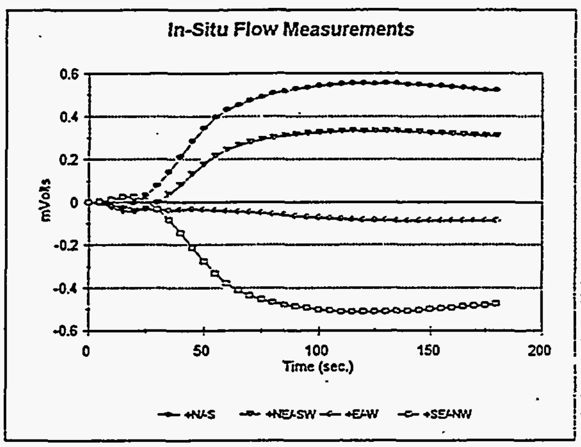
Gear Setup 1:196 Reduction Gear, 24:30 Drive Gear ratio HEATER @ 1.65 amps

WELL NO: CALIBRATION TEST 12

	DIRECTION:	DATE:	Start TIME:	End TIME:
RUN 1	NORTH	10-27-95	1300	1303
RUN 2	SOUTH	10-27-95	1413	1416

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00301	-0.00326	-0.00126	0.00185
10	-0.01578	-0.02292	-0.01140	0.01250
15	-0.02253	-0.04306	-0.02518	0.02530
20	-0.00344	-0.04529	-0.03067	0.02340
25	0.03351	-0.02901	-0.03388	0.00470
30	0.07896	-0.00256	-0.03642	-0.03410
35	0.14231	0.03539	-0.03813	-0.08375
40	0.21256	0.08304	-0.03543	-0.14500
45	0.28596	0.13364	-0.03202	-0.21260
50	0.34541	0.17849	-0.03462	-0.27645
55	0.39741	0.21679	-0.03862	-0.33405
60	0.43361	0.24544	-0.04062	-0.37875
65	0.45516	0.26559	-0.04352	-0.41080
70	0.47441	0.27964	-0.04717	-0.43395
75	0.49091	0.29154	-0.05183	-0.45210
80	0.50696	0.30214	-0.05652	-0.46680
85	0.51631	0.30964	-0.05923	-0.47860
90	0.52771	0.31589	-0.06433	-0.48735
95	0.53461	0.32104	-0.06987	-0.49410
100	0.54261	0.32514	-0.07203	-0.50060
105	0.54796	0.32829	-0.07612	-0.50505
110	0.55250	0.33174	-0.07817	-0.50945
115	0.55673	0.33262	-0.08063	-0.51195
120	0.55649	0.33000	-0.08343	-0.51235
125	0.55386	0.33175	-0.08263	-0.51220
130	0.55510	0.33190	-0.08480	-0.51050
135	0.55559	0.33012	-0.08754	-0.50865
140	0.55025	0.32625	-0.08729	-0.50665
145	0.54823	0.32651	-0.08704	-0.50365
150	0.54446	0.32299	-0.08679	-0.50000
155	0.54384	0.32173	-0.08754	-0.49740
160	0.53669	0.31960	-0.08717	-0.49285
165	0.53356	0.31594	-0.08542	-0.48825
170	0.52993	0.31408	-0.08692	-0.48415
175	0.52345	0.31096	-0.08804	-0.47960
180	0.52356	0.30857	-0.08554	-0.47500
TOTAL	14.64765	8.34034	-2.17782	-13.11895



TEST NO. 1 / BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
300	0	-0.54216	0.31779	-0.85143	-3.49560	0.00000	0.00000	0.00000	0.00000
300	5	-0.55243	0.30627	-0.85795	-3.49040	-0.01027	-0.01152	-0.00652	0.00520
300	10	-0.65135	0.18556	-0.91329	-3.42580	-0.10919	-0.13223	-0.06186	0.06980
300	15	-0.87698	-0.12070	-1.05980	-3.23470	-0.33482	-0.43849	-0.20837	0.26090
300	20	-1.17320	-0.55844	-1.25690	-2.93420	-0.63104	-0.87623	-0.40547	0.56140
300	25	-1.48320	-1.02550	-1.46570	-2.58790	-0.94104	-1.34329	-0.61427	0.90770
300	30	-1.78550	-1.48350	-1.67210	-2.25280	-1.24334	-1.80129	-0.82067	1.24280
300	35	-2.04370	-1.90300	-1.86940	-1.97110	-1.50154	-2.22079	-1.01797	1.52450
300	40	-2.20400	-2.22470	-2.02720	-1.79830	-1.66184	-2.54249	-1.17577	1.69730
300	45	-2.24650	-2.41330	-2.12710	-1.76650	-1.70434	-2.73109	-1.27567	1.72910
300	50	-2.19900	-2.48090	-2.16820	-1.86410	-1.65684	-2.79869	-1.31677	1.63150
300	55	-2.09530	-2.45790	-2.16060	-2.05920	-1.55314	-2.77569	-1.30917	1.43640
300	60	-1.97680	-2.37750	-2.10550	-2.30590	-1.43464	-2.69529	-1.25407	1.18970
300	65	-1.85760	-2.26260	-2.02390	-2.57110	-1.31544	-2.58039	-1.17247	0.92450
300	70	-1.74090	-2.12830	-1.92600	-2.83430	-1.19874	-2.44609	-1.07457	0.66130
300	75	-1.62300	-1.98080	-1.82210	-3.08520	-1.08084	-2.29859	-0.97067	0.41040
300	80	-1.50780	-1.82930	-1.71910	-3.31330	-0.96564	-2.14709	-0.86767	0.18230
300	85	-1.39990	-1.67930	-1.62050	-3.51870	-0.85774	-1.99709	-0.76907	-0.02310
300	90	-1.29420	-1.53160	-1.52830	-3.69850	-0.75204	-1.84939	-0.67687	-0.20290
300	95	-1.20050	-1.39180	-1.44570	-3.85270	-0.65834	-1.70959	-0.59427	-0.35710
300	100	-1.10690	-1.25810	-1.36610	-3.98620	-0.56474	-1.57589	-0.51467	-0.49060
300	105	-1.02330	-1.13240	-1.29650	-4.09800	-0.48114	-1.45019	-0.44507	-0.60240
300	110	-0.94462	-1.01500	-1.23240	-4.19120	-0.40246	-1.33279	-0.38097	-0.69560
300	115	-0.87475	-0.90605	-1.17550	-4.26810	-0.33259	-1.22384	-0.32407	-0.77250
300	120	-0.81464	-0.81239	-1.12520	-4.32770	-0.27248	-1.13018	-0.27377	-0.83210
300	125	-0.76180	-0.71698	-1.07730	-4.37500	-0.21964	-1.03477	-0.22587	-0.87940
300	130	-0.71372	-0.63258	-1.03380	-4.41000	-0.17156	-0.95037	-0.18237	-0.91440
300	135	-0.66614	-0.55695	-0.99921	-4.43660	-0.12398	-0.87474	-0.14778	-0.94100
300	140	-0.62682	-0.48909	-0.96240	-4.45810	-0.08466	-0.80688	-0.11097	-0.96250
300	145	-0.58876	-0.41797	-0.93059	-4.47340	-0.04660	-0.73576	-0.07916	-0.97780
300	150	-0.55670	-0.35811	-0.90054	-4.48190	-0.01454	-0.67590	-0.04911	-0.98630
300	155	-0.51914	-0.30152	-0.87500	-4.48790	0.02302	-0.61931	-0.02357	-0.99230
300	160	-0.49685	-0.24968	-0.85096	-4.48840	0.04531	-0.56747	0.00047	-0.99280
300	165	-0.47431	-0.20360	-0.82892	-4.48640	0.06785	-0.52139	0.02251	-0.99080
300	170	-0.45177	-0.15927	-0.80863	-4.48220	0.09039	-0.47706	0.04280	-0.98660
300	175	-0.42923	-0.11795	-0.79461	-4.47690	0.11293	-0.43574	0.05682	-0.98130
300	180	-0.40620	-0.07939	-0.77458	-4.47070	0.13596	-0.39718	0.07685	-0.97510

TEST NO.2 / BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
300	0	-0.69674	0.15127	-0.94218	-3.41730	0.00000	0.00000	0.00000	0.00000
300	5	-0.70100	0.14626	-0.94619	-3.41580	-0.00426	-0.00501	-0.00401	0.00150
300	10	-0.77438	0.06487	-0.98125	-3.37250	-0.07764	-0.08640	-0.03907	0.04480
300	15	-0.98651	-0.20111	-1.10020	-3.20700	-0.28977	-0.35238	-0.15802	0.21030
300	20	-1.32090	-0.63438	-1.28630	-2.90270	-0.62416	-0.78565	-0.34412	0.51460
300	25	-1.70480	-1.13400	-1.48870	-2.51900	-1.00806	-1.28527	-0.54652	0.89830
300	30	-2.09800	-1.64490	-1.69000	-2.10630	-1.40126	-1.79617	-0.74782	1.31100
300	35	-2.48290	-2.14030	-1.88390	-1.72530	-1.78616	-2.29157	-0.94172	1.69200
300	40	-2.78370	-2.55730	-2.04710	-1.43000	-2.08696	-2.70857	-1.10492	1.98730
300	45	-2.97300	-2.84710	-2.15380	-1.26300	-2.27626	-2.99837	-1.21162	2.15430
300	50	-3.04440	-3.00440	-2.18970	-1.23290	-2.34766	-3.15567	-1.24752	2.18440
300	55	-3.04470	-3.05800	-2.17410	-1.31280	-2.34796	-3.20927	-1.23192	2.10450
300	60	-2.99860	-3.03490	-2.11500	-1.47010	-2.30186	-3.18617	-1.17282	1.94720
300	65	-2.92250	-2.96030	-2.02760	-1.67120	-2.22576	-3.11157	-1.08542	1.74610
300	70	-2.84430	-2.85410	-1.92240	-1.88810	-2.14756	-3.00537	-0.98022	1.52920
300	75	-2.75940	-2.73040	-1.80920	-2.10270	-2.06266	-2.88167	-0.86702	1.31460
300	80	-2.67630	-2.60010	-1.69680	-2.30140	-1.97956	-2.75137	-0.75462	1.11590
300	85	-2.58710	-2.46510	-1.59280	-2.48320	-1.89036	-2.61637	-0.65062	0.93410
300	90	-2.50420	-2.32990	-1.49040	-2.64550	-1.80746	-2.48117	-0.54822	0.77180
300	95	-2.42430	-2.20040	-1.39670	-2.78620	-1.72756	-2.35167	-0.45452	0.63110
300	100	-2.34670	-2.07490	-1.31280	-2.90670	-1.64996	-2.22617	-0.37062	0.51060
300	105	-2.27380	-1.95550	-1.23500	-3.00960	-1.57706	-2.10677	-0.29282	0.40770
300	110	-2.20420	-1.84500	-1.16680	-3.09400	-1.50746	-1.99627	-0.22462	0.32330
300	115	-2.14280	-1.73780	-1.10500	-3.16590	-1.44606	-1.88907	-0.16282	0.25140
300	120	-2.08220	-1.63890	-1.04910	-3.22470	-1.38546	-1.79017	-0.10692	0.19260
300	125	-2.02410	-1.54700	-1.00280	-3.27230	-1.32736	-1.69827	-0.06062	0.14500
300	130	-1.97850	-1.46290	-0.95495	-3.31070	-1.28176	-1.61417	-0.01277	0.10660
300	135	-1.93190	-1.38370	-0.91488	-3.34100	-1.23516	-1.53497	0.02730	0.07630
300	140	-1.88190	-1.30810	-0.87857	-3.36650	-1.18516	-1.45937	0.06361	0.05080
300	145	-1.83980	-1.23750	-0.84726	-3.38720	-1.14306	-1.38877	0.09492	0.02950
300	150	-1.80020	-1.17060	-0.81771	-3.40360	-1.10346	-1.32187	0.12447	0.01370
300	155	-1.76140	-1.11150	-0.79066	-3.41480	-1.06466	-1.26277	0.15152	0.00250
300	160	-1.72880	-1.05540	-0.76737	-3.42440	-1.03205	-1.20667	0.17481	-0.00710
300	165	-1.69600	-1.00200	-0.74883	-3.43160	-0.99926	-1.15327	0.19335	-0.01430
300	170	-1.65520	-0.95395	-0.72554	-3.43560	-0.95846	-1.10522	0.21664	-0.01830
300	175	-1.63070	-0.90638	-0.70938	-3.43940	-0.93396	-1.05765	0.23280	-0.02210
300	180	-1.60790	-0.86305	-0.69425	-3.44240	-0.91115	-1.01432	0.24793	-0.02510

KVA Flowmeter Measurements

Calibration Testing

Date: 10-27-95

Flow Rate: 0.55 ft/day

Calibration Test No. : 12

Analysis Type: SUM

No.1 Thermistor Alignment: North

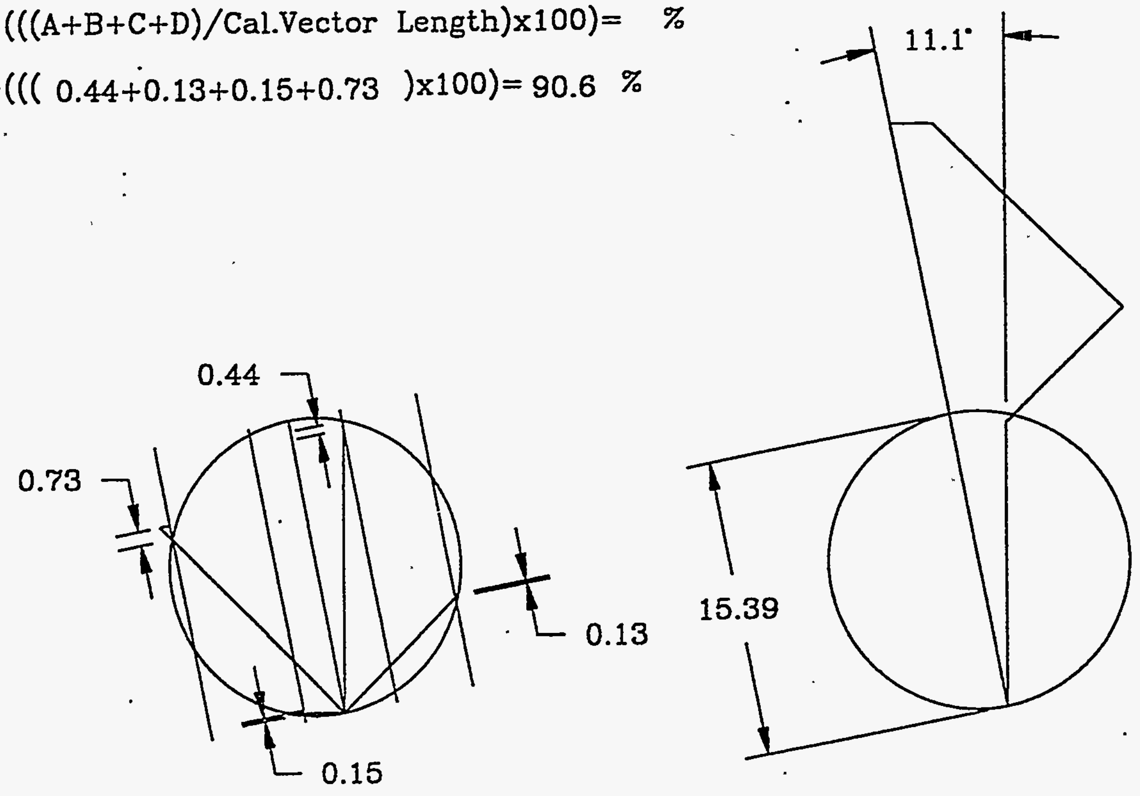
Calculated Vector Angle: N 11.1deg. W

Probe No. : 2D-1
Controller No.: 2
Computer Interface No.: 2

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-(((0.44+0.13+0.15+0.73)x100)= 90.6 %



PROBE 2D-1 w/ compute Int.2

IN-SITU FLOW MEASUREMENTS

10-28-95 | Test 13 on 10/28/95 @ 1055 NORTH KVFLO7_5 (7.5mV) | SOUTH @ 0850 10/28/95 | FLOW RATE =ft/day 0.55

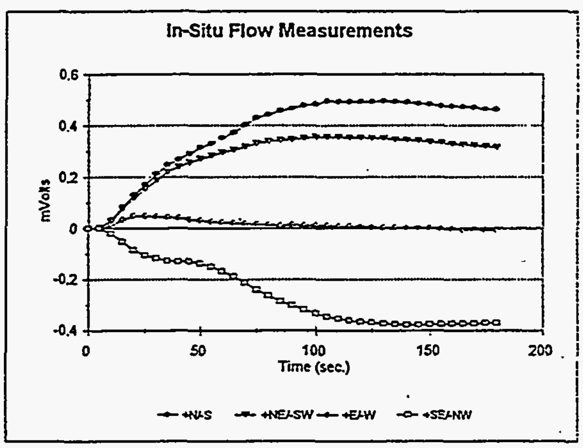
Gear Setup 1:196 Reduction Gear. 24:30 Drive Gear ratio | HEATER @ 1.65 amps

WELL NO: CALIBRATION TEST 13

	DIRECTION:	DATE:	Start TIME:	End TIME:
RUN 1	NORTH	10-28-95	1055	1058
RUN 2	SOUTH	10-38-95	850	853

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	0.00263	0.00301	-0.00140	-0.00150
10	0.03322	0.03045	0.01180	-0.01980
15	0.08300	0.07871	0.03180	-0.05290
20	0.12888	0.12034	0.04675	-0.08515
25	0.17173	0.15496	0.04700	-0.10390
30	0.21323	0.18731	0.04400	-0.11660
35	0.24858	0.21951	0.04260	-0.12715
40	0.26863	0.24032	0.03975	-0.12870
45	0.28948	0.25551	0.03245	-0.12965
50	0.31453	0.27091	0.02935	-0.13760
55	0.33078	0.28222	0.02580	-0.15035
60	0.35423	0.29502	0.02245	-0.16925
65	0.37313	0.30477	0.02145	-0.18795
70	0.40378	0.31782	0.01755	-0.21410
75	0.42933	0.32962	0.01480	-0.24080
80	0.44333	0.33722	0.01345	-0.26390
85	0.45863	0.34376	0.01015	-0.28530
90	0.46688	0.34687	0.01240	-0.30155
95	0.47918	0.35097	0.01025	-0.31785
100	0.48453	0.35462	0.00915	-0.33220
105	0.49463	0.35566	0.00930	-0.34500
110	0.49273	0.35567	0.00715	-0.35355
115	0.49448	0.35392	0.00665	-0.35030
120	0.49413	0.35217	0.00615	-0.36520
125	0.49248	0.35112	0.00380	-0.36910
130	0.49683	0.34996	0.00315	-0.37395
135	0.49308	0.34687	0.00180	-0.37660
140	0.48983	0.34421	0.00115	-0.37720
145	0.48653	0.33986	0.00150	-0.37700
150	0.48268	0.33596	-0.00025	-0.37520
155	0.47715	0.33207	-0.00200	-0.37545
160	0.47479	0.32892	-0.00290	-0.37280
165	0.47315	0.32617	-0.00700	-0.37420
170	0.46991	0.32217	-0.00655	-0.37345
175	0.46399	0.31826	-0.00735	-0.37110
180	0.46261	0.31477	-0.00805	-0.36970
TOTAL	13.716715	10.25165	0.4881	-9.276



TEST NO. 1

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
301	0	-0.69534	-0.27974	-1.45060	-3.68400	0.00000	0.00000	0.00000	0.00000
301	5	-0.69634	-0.28074	-1.45690	-3.68450	-0.00100	-0.00100	-0.00630	-0.00050
301	10	-0.74347	-0.32461	-1.47160	-3.66270	-0.04813	-0.04487	-0.02100	0.02130
301	15	-0.94525	-0.53417	-1.56870	-3.53540	-0.24991	-0.25443	-0.11810	0.14860
301	20	-1.30920	-0.94525	-1.76620	-3.26820	-0.61386	-0.66551	-0.31560	0.41580
301	25	-1.75290	-1.47940	-2.01760	-2.91920	-1.05756	-1.19966	-0.56700	0.76480
301	30	-2.20560	-2.05670	-2.27780	-2.56880	-1.51026	-1.77696	-0.82720	1.11520
301	35	-2.63450	-2.64800	-2.53470	-2.25650	-1.93916	-2.36826	-1.08410	1.42750
301	40	-2.95560	-3.18370	-2.76380	-2.02790	-2.26026	-2.90396	-1.31320	1.65610
301	45	-3.11850	-3.59430	-2.94430	-1.93560	-2.42316	-3.31456	-1.49370	1.74840
301	50	-3.12300	-3.85320	-3.06010	-1.99080	-2.42766	-3.57346	-1.60950	1.69320
301	55	-3.04860	-3.98860	-3.12380	-2.15400	-2.35326	-3.70886	-1.67320	1.53000
301	60	-2.90770	-4.01960	-3.14380	-2.39080	-2.21236	-3.73986	-1.69320	1.29320
301	65	-2.74180	-3.97730	-3.12430	-2.65880	-2.04646	-3.69756	-1.67370	1.02520
301	70	-2.55550	-3.87850	-3.08040	-2.94400	-1.86016	-3.59876	-1.62980	0.74000
301	75	-2.36900	-3.74340	-3.01800	-3.22400	-1.67366	-3.46366	-1.56740	0.46000
301	80	-2.21290	-3.59380	-2.94050	-3.47700	-1.51756	-3.31406	-1.48990	0.20700
301	85	-2.06100	-3.43280	-2.85980	-3.70480	-1.36566	-3.15306	-1.40920	-0.02080
301	90	-1.92690	-3.27020	-2.76810	-3.90080	-1.23156	-2.99046	-1.31750	-0.21680
301	95	-1.79800	-3.10550	-2.68390	-4.07100	-1.10266	-2.82576	-1.23330	-0.38700
301	100	-1.68450	-2.94330	-2.60060	-4.21620	-0.98916	-2.66356	-1.15000	-0.53220
301	105	-1.58040	-2.78980	-2.52090	-4.33710	-0.88506	-2.51006	-1.07030	-0.65310
301	110	-1.49690	-2.64370	-2.44370	-4.43290	-0.80156	-2.36396	-0.99310	-0.74890
301	115	-1.41850	-2.50810	-2.37070	-4.50930	-0.72316	-2.22836	-0.92010	-0.82530
301	120	-1.34850	-2.37870	-2.30180	-4.56950	-0.65316	-2.09896	-0.85120	-0.88550
301	125	-1.28010	-2.25370	-2.24210	-4.61840	-0.58476	-1.97396	-0.79150	-0.93440
301	130	-1.21370	-2.13640	-2.18170	-4.65820	-0.51836	-1.85666	-0.73110	-0.97420
301	135	-1.16130	-2.02860	-2.12730	-4.68680	-0.46596	-1.74886	-0.67670	-1.00280
301	140	-1.11270	-1.92660	-2.07540	-4.70510	-0.41736	-1.64686	-0.62480	-1.02110
301	145	-1.06860	-1.83380	-2.02830	-4.71640	-0.37326	-1.55406	-0.57770	-1.03240
301	150	-1.03000	-1.74710	-1.98350	-4.72190	-0.33466	-1.46736	-0.53290	-1.03790
301	155	-0.99536	-1.66540	-1.94310	-4.72360	-0.30002	-1.38566	-0.49250	-1.03960
301	160	-0.96027	-1.58770	-1.90500	-4.72160	-0.26493	-1.30796	-0.45440	-1.03760
301	165	-0.92267	-1.51320	-1.87440	-4.71990	-0.22733	-1.23346	-0.42380	-1.03590
301	170	-0.89334	-1.44600	-1.83760	-4.71410	-0.19800	-1.16626	-0.38700	-1.03010
301	175	-0.86577	-1.38240	-1.80670	-4.70510	-0.17043	-1.10266	-0.35610	-1.02110
301	180	-0.83895	-1.32270	-1.77870	-4.69580	-0.14361	-1.04296	-0.32810	-1.01180

TEST NO.2

BASE TIME "0" SUBTRACTED

JULIAN DAY	5 SEC SAMPLE	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
301	0	-0.69538	-0.24341	-1.38830	-3.69400	0.00000	0.00000	0.00000	0.00000
301	5	-0.70165	-0.25043	-1.39180	-3.69150	-0.00627	-0.00702	-0.00350	0.00250
301	10	-0.80994	-0.34919	-1.43290	-3.63310	-0.11456	-0.10578	-0.04460	0.06090
301	15	-1.11130	-0.65527	-1.57000	-3.43960	-0.41592	-0.41186	-0.18170	0.25440
301	20	-1.56700	-1.14960	-1.79740	-3.10790	-0.87162	-0.90619	-0.40910	0.58610
301	25	-2.09640	-1.75300	-2.04930	-2.72140	-1.40102	-1.50959	-0.66100	0.97260
301	30	-2.63210	-2.39500	-2.30350	-2.34560	-1.93672	-2.15159	-0.91520	1.34840
301	35	-3.13170	-3.05070	-2.55760	-2.01220	-2.43632	-2.80729	-1.16930	1.68180
301	40	-3.49290	-3.62800	-2.78100	-1.78050	-2.79752	-3.38459	-1.39270	1.91350
301	45	-3.69750	-4.06300	-2.94690	-1.68630	-3.00212	-3.82559	-1.55860	2.00770
301	50	-3.75210	-4.35870	-3.05650	-1.72560	-3.05672	-4.11529	-1.66820	1.96840
301	55	-3.71020	-4.51670	-3.11310	-1.86330	-3.01482	-4.27329	-1.72480	1.83070
301	60	-3.61620	-4.57330	-3.12640	-2.06230	-2.92082	-4.32989	-1.73810	1.63170
301	65	-3.48810	-4.55050	-3.10490	-2.29290	-2.79272	-4.30709	-1.71660	1.40110
301	70	-3.36310	-4.47780	-3.05320	-2.52580	-2.66772	-4.23439	-1.66490	1.16820
301	75	-3.22770	-4.36630	-2.98530	-2.75240	-2.53232	-4.12289	-1.59700	0.94160
301	80	-3.09960	-4.23190	-2.90510	-2.95920	-2.40422	-3.98849	-1.51680	0.73480
301	85	-2.97830	-4.08400	-2.81780	-3.14420	-2.28292	-3.84059	-1.42950	0.54980
301	90	-2.86070	-3.92760	-2.73060	-3.30770	-2.16532	-3.68419	-1.34230	0.38630
301	95	-2.75640	-3.77110	-2.64210	-3.44530	-2.06102	-3.52769	-1.25380	0.24870
301	100	-2.65360	-3.61620	-2.55660	-3.56180	-1.95822	-3.37279	-1.16830	0.13220
301	105	-2.56970	-3.46480	-2.47720	-3.65710	-1.87432	-3.22139	-1.08890	0.03690
301	110	-2.48240	-3.31870	-2.39570	-3.73580	-1.78702	-3.07529	-1.00740	-0.04120
301	115	-2.40750	-3.17960	-2.32170	-3.79870	-1.71212	-2.93619	-0.93340	-0.10470
301	120	-2.33680	-3.04670	-2.25180	-3.84910	-1.64142	-2.80329	-0.86350	-0.15510
301	125	-2.26510	-2.91960	-2.18740	-3.89020	-1.56972	-2.67619	-0.79910	-0.19620
301	130	-2.20740	-2.80000	-2.12570	-3.92030	-1.51202	-2.55659	-0.73740	-0.22630
301	135	-2.14750	-2.68600	-2.06860	-3.94360	-1.45212	-2.44259	-0.68030	-0.24960
301	140	-2.09240	-2.57870	-2.01540	-3.96070	-1.39702	-2.33529	-0.62710	-0.26670
301	145	-2.04170	-2.47720	-1.96900	-3.97240	-1.34632	-2.23379	-0.58070	-0.27840
301	150	-1.99540	-2.38270	-1.92070	-3.98150	-1.30002	-2.13929	-0.53240	-0.28750
301	155	-1.94970	-2.29320	-1.87680	-3.98270	-1.25432	-2.04979	-0.48850	-0.28870
301	160	-1.90990	-2.20920	-1.83690	-3.98600	-1.21452	-1.96579	-0.44860	-0.29200
301	165	-1.86900	-2.12920	-1.79810	-3.98150	-1.17362	-1.88579	-0.40980	-0.28750
301	170	-1.83320	-2.05400	-1.76220	-3.97720	-1.13782	-1.81059	-0.37390	-0.28320
301	175	-1.79380	-1.98260	-1.72970	-3.97290	-1.09842	-1.73919	-0.34140	-0.27890
301	180	-1.76420	-1.91590	-1.70030	-3.96640	-1.06882	-1.67249	-0.31200	-0.27240

KVA Flowmeter Measurements

Calibration Testing

Date: 10-28-95

Flow Rate: 0.55 ft/day

Calibration Test No. : 13

Analysis Type: SUM

No.1 Thermistor Alignment: North

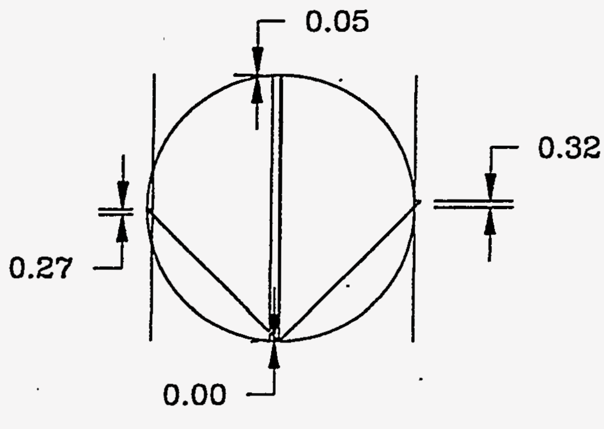
Calculated Vector Angle: N 0.4deg. E

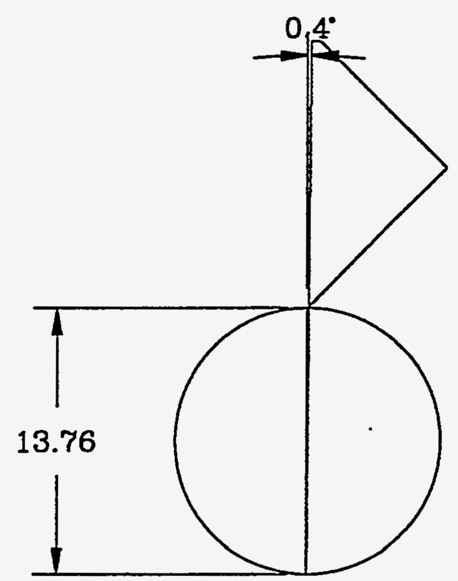
Probe No. : 2D-1
Controller No.: 2
Computer Interface No.: 2

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-(((0.05+0.32+0.00+0.27)x100)= 95.3 %





PROBE 2D-1 w/ compute Int.2

IN-SITU FLOW MEASUREMENTS

10-28-95 Test 14 on 10/28/95 @ 1311 NORTH KVFLO7_5 (7.5mV) SOUTH @ 1505 10/28/95 FLOW RATE =ft/day 0.27

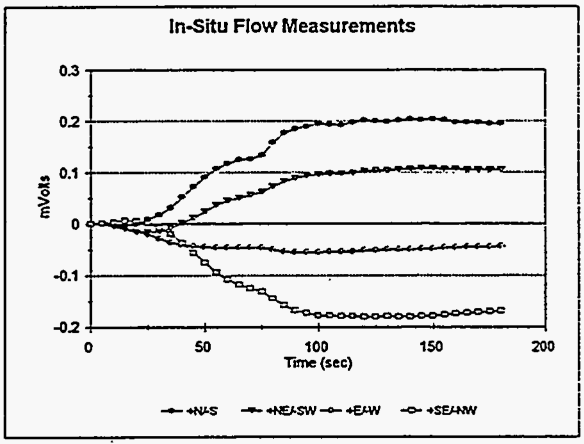
Gear Setup 1:196 Reduction Gear, 24:60 Drive Gear ratio HEATER @ 1.65 amps

WELL NO: CALIBRATION TEST 14

	DIRECTION:	DATE:	Start TIME:	End TIME:
RUN 1	NORTH	10-28-95	1311	1314
RUN 2	SOUTH	10-28-95	1505	1508

(TEST NO. 1 - TEST NO. 2) / 2

5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00026	-0.00013	-0.00045	0.00085
10	-0.00238	-0.00501	-0.00220	0.00310
15	-0.00336	-0.01066	-0.00560	0.00610
20	-0.00135	-0.01593	-0.01265	0.00575
25	0.00909	-0.01623	-0.02065	0.00110
30	0.01814	-0.01458	-0.02905	-0.00740
35	0.03189	-0.00917	-0.03590	-0.02045
40	0.05244	0.00143	-0.04070	-0.03785
45	0.07189	0.01197	-0.04360	-0.05575
50	0.09095	0.02353	-0.04550	-0.07510
55	0.10824	0.03592	-0.04650	-0.09360
60	0.11734	0.04452	-0.04650	-0.10825
65	0.12450	0.05042	-0.04660	-0.11820
70	0.12634	0.05568	-0.04600	-0.12505
75	0.13329	0.06083	-0.04660	-0.13170
80	0.15909	0.07257	-0.04960	-0.14465
85	0.17724	0.08337	-0.05415	-0.15795
90	0.18514	0.08918	-0.05475	-0.16745
95	0.19014	0.09353	-0.05450	-0.17335
100	0.19544	0.09668	-0.05465	-0.17725
105	0.19429	0.09793	-0.05345	-0.17835
110	0.19330	0.09833	-0.05390	-0.17900
115	0.19809	0.09877	-0.05325	-0.17950
120	0.20105	0.10233	-0.05135	-0.17985
125	0.19995	0.10333	-0.05170	-0.18050
130	0.19935	0.10347	-0.04985	-0.17675
135	0.20149	0.10513	-0.04960	-0.17975
140	0.20444	0.10688	-0.04945	-0.18040
145	0.20310	0.10723	-0.04860	-0.17950
150	0.20335	0.10723	-0.04835	-0.17850
155	0.20225	0.10673	-0.04685	-0.17700
160	0.19809	0.10598	-0.04585	-0.17415
165	0.19809	0.10547	-0.04545	-0.17300
170	0.19774	0.10548	-0.04520	-0.17200
175	0.19480	0.10537	-0.04485	-0.17075
180	0.19535	0.10557	-0.04425	-0.16945
TOTAL	4.96859	2.313125	-1.5181	-4.40755



TEST NO. 1

JULIAN DAY	5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
301	0	-0.71046	-0.20399	-1.26760	-3.86730
301	5	-0.72074	-0.21276	-1.27630	-3.86280
301	10	-0.82549	-0.31877	-1.31970	-3.80220
301	15	-1.10990	-0.62827	-1.46430	-3.60750
301	20	-1.53090	-1.11440	-1.69990	-3.29240
301	25	-1.99960	-1.68060	-1.96880	-2.93110
301	30	-2.47300	-2.27450	-2.23940	-2.58800
301	35	-2.88350	-2.85410	-2.50100	-2.29980
301	40	-3.15490	-3.33960	-2.72210	-2.12360
301	45	-3.27340	-3.68840	-2.88050	-2.08530
301	50	-3.26360	-3.89340	-2.96670	-2.17880
301	55	-3.17540	-3.98110	-3.00280	-2.36600
301	60	-3.05140	-3.98390	-2.99500	-2.60430
301	65	-2.90650	-3.92670	-2.95360	-2.86170
301	70	-2.76170	-3.82650	-2.89050	-3.11750
301	75	-2.60880	-3.69720	-2.81200	-3.36110
301	80	-2.46070	-3.55010	-2.72580	-3.58590
301	85	-2.31660	-3.39200	-2.64040	-3.78740
301	90	-2.18480	-3.23230	-2.55040	-3.96430
301	95	-2.06150	-3.07340	-2.46220	-4.11600
301	100	-1.95270	-2.91930	-2.37700	-4.24130
301	105	-1.86380	-2.77470	-2.29450	-4.34250
301	110	-1.78310	-2.63810	-2.21940	-4.42470
301	115	-1.70360	-2.50910	-2.14620	-4.48790
301	120	-1.62970	-2.38000	-2.07750	-4.54020
301	125	-1.56280	-2.26120	-2.01810	-4.58080
301	130	-1.50160	-2.15020	-1.95520	-4.61190
301	135	-1.44120	-2.04340	-1.90080	-4.63650
301	140	-1.38310	-1.94190	-1.85070	-4.65500
301	145	-1.33750	-1.84970	-1.80390	-4.66600
301	150	-1.29890	-1.76580	-1.75880	-4.66930
301	155	-1.26000	-1.68730	-1.71690	-4.66780
301	160	-1.22520	-1.61260	-1.67860	-4.66330
301	165	-1.19110	-1.54170	-1.64850	-4.65950
301	170	-1.15650	-1.47410	-1.61340	-4.65400
301	175	-1.12600	-1.41090	-1.58410	-4.64650
301	180	-1.09690	-1.35130	-1.55630	-4.63820

BASE TIME "0" SUBTRACTED

THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0.00000	0.00000	0.00000	0.00000
-0.01028	-0.00877	-0.00870	0.00450
-0.11503	-0.11478	-0.05210	0.06510
-0.39944	-0.42428	-0.19670	0.25980
-0.82044	-0.91041	-0.43230	0.57490
-1.28914	-1.47661	-0.70120	0.93620
-1.76254	-2.07051	-0.97180	1.27930
-2.17304	-2.65011	-1.23340	1.56750
-2.44444	-3.13561	-1.45450	1.74370
-2.56294	-3.48441	-1.61290	1.78200
-2.55314	-3.68941	-1.69910	1.68850
-2.46494	-3.77711	-1.73520	1.50130
-2.34094	-3.77991	-1.72740	1.26300
-2.19604	-3.72271	-1.68600	1.00560
-2.05124	-3.62251	-1.62290	0.74980
-1.89834	-3.49321	-1.54440	0.50620
-1.75024	-3.34611	-1.45820	0.28140
-1.60614	-3.18801	-1.37280	0.07990
-1.47434	-3.02831	-1.26280	-0.09700
-1.35104	-2.86941	-1.19460	-0.24870
-1.24224	-2.71531	-1.10940	-0.37400
-1.15334	-2.57071	-1.02690	-0.47520
-1.07264	-2.43411	-0.95180	-0.55740
-0.99314	-2.30511	-0.87860	-0.62060
-0.91924	-2.17601	-0.80990	-0.67290
-0.85234	-2.05721	-0.75050	-0.71350
-0.79114	-1.94621	-0.68760	-0.74460
-0.73074	-1.83941	-0.63320	-0.76920
-0.67264	-1.73791	-0.58310	-0.78770
-0.62704	-1.64571	-0.53630	-0.79870
-0.58844	-1.56181	-0.49120	-0.80200
-0.54954	-1.48331	-0.44930	-0.80050
-0.51474	-1.40861	-0.41100	-0.79600
-0.48064	-1.33771	-0.38090	-0.79220
-0.44604	-1.27011	-0.34580	-0.78670
-0.41554	-1.20691	-0.31650	-0.77920
-0.38644	-1.14731	-0.28870	-0.77090

TEST NO.2

JULIAN DAY	5 SEC SAMPLE	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
301	0	-0.61397	-0.16164	-1.37450	-3.78030
301	5	-0.62374	-0.17016	-1.38230	-3.77750
301	10	-0.72423	-0.26639	-1.42220	-3.72140
301	15	-1.00670	-0.56460	-1.56000	-3.53270
301	20	-1.43170	-1.04020	-1.78150	-3.21690
301	25	-1.92130	-1.60580	-2.03440	-2.84630
301	30	-2.41280	-2.20300	-2.28820	-2.48620
301	35	-2.85080	-2.79340	-2.53610	-2.17190
301	40	-3.16330	-3.30010	-2.74760	-1.96090
301	45	-3.32070	-3.67000	-2.90020	-1.88680
301	50	-3.34900	-3.89810	-2.98260	-1.94160
301	55	-3.29540	-4.01060	-3.01670	-2.09180
301	60	-3.18960	-4.03060	-3.00890	-2.30080
301	65	-3.05900	-3.98520	-2.96730	-2.53830
301	70	-2.91790	-3.89550	-2.90540	-2.78040
301	75	-2.77890	-3.77650	-2.82570	-3.01070
301	80	-2.68240	-3.65290	-2.73350	-3.20960
301	85	-2.57460	-3.51640	-2.63900	-3.38450
301	90	-2.45860	-3.36830	-2.54780	-3.54240
301	95	-2.34530	-3.21810	-2.46010	-3.68230
301	100	-2.24710	-3.07030	-2.37460	-3.79980
301	105	-2.15590	-2.92820	-2.29450	-3.89880
301	110	-2.07320	-2.79240	-2.21850	-3.97970
301	115	-2.00330	-2.66430	-2.14660	-4.04190
301	120	-1.93530	-2.54230	-2.08170	-4.09350
301	125	-1.86620	-2.42550	-2.02160	-4.13280
301	130	-1.80380	-2.31480	-1.96240	-4.16740
301	135	-1.74770	-2.21130	-1.90850	-4.19000
301	140	-1.69550	-2.11330	-1.85870	-4.20720
301	145	-1.64720	-2.02180	-1.81360	-4.22000
301	150	-1.60910	-1.93790	-1.76900	-4.22530
301	155	-1.56800	-1.85840	-1.73010	-4.22680
301	160	-1.52490	-1.78220	-1.69350	-4.22800
301	165	-1.49060	-1.71030	-1.66450	-4.22650
301	170	-1.45550	-1.64270	-1.62950	-4.22300
301	175	-1.41910	-1.57930	-1.60130	-4.21800
301	180	-1.35110	-1.52010	-1.57470	-4.21230

BASE TIME "0" SUBTRACTED

THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0.00000	0.00000	0.00000	0.00000
-0.00977	-0.00852	-0.00780	0.00280
-0.11026	-0.10475	-0.04770	0.05890
-0.39273	-0.40296	-0.18550	0.24760
-0.81773	-0.87856	-0.40700	0.56340
-1.30733	-1.44416	-0.65990	0.93400
-1.79883	-2.04136	-0.91370	1.29410
-2.23683	-2.63176	-1.16160	1.60840
-2.54933	-3.13846	-1.37310	1.81940
-2.70673	-3.50836	-1.52570	1.89350
-2.73503	-3.73646	-1.60810	1.83870
-2.68143	-3.84896	-1.64220	1.68850
-2.57563	-3.86896	-1.63440	1.47950
-2.44503	-3.82356	-1.59280	1.24200
-2.30393	-3.73386	-1.53090	0.99990
-2.16493	-3.61486	-1.45120	0.76960
-2.06843	-3.49126	-1.35900	0.57070
-1.96063	-3.35476	-1.26450	0.39580
-1.84463	-3.20666	-1.17330	0.23790
-1.73133	-3.05646	-1.08560	0.09800
-1.63313	-2.90866	-1.00010	-0.01950
-1.54193	-2.76656	-0.92000	-0.11850
-1.45923	-2.63076	-0.84400	-0.19940
-1.38933	-2.50266	-0.77210	-0.26160
-1.32133	-2.38066	-0.70720	-0.31320
-1.25223	-2.26386	-0.64710	-0.35250
-1.18983	-2.15316	-0.58790	-0.38710
-1.13373	-2.04966	-0.53400	-0.40970
-1.08153	-1.95166	-0.48420	-0.42690
-1.03323	-1.86016	-0.43910	-0.43970
-0.99513	-1.77626	-0.39450	-0.44500
-0.95403	-1.69676	-0.35560	-0.44650
-0.91093	-1.62056	-0.31930	-0.44770
-0.87683	-1.54866	-0.29000	-0.44620
-0.84153	-1.48106	-0.25540	-0.44270
-0.80513	-1.41766	-0.22680	-0.43770
-0.77713	-1.35846	-0.20020	-0.43200

KVA Flowmeter Measurements

Calibration Testing

Date: 10-28-95

Flow Rate: 0.27 ft/day

Calibration Test No. : 14

Analysis Type: SUM

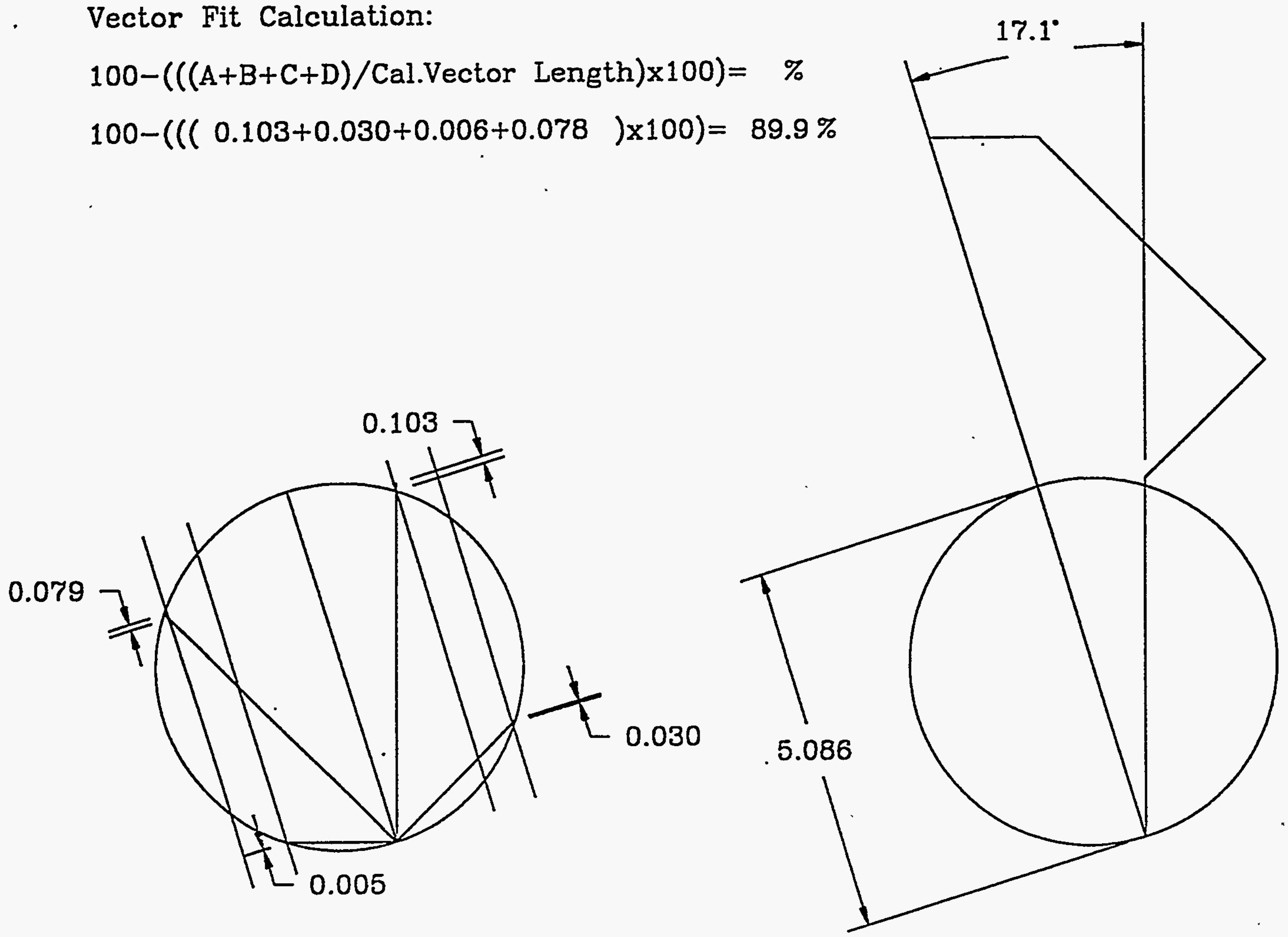
Calculated Vector Angle: N 17.1deg. W

Probe No. : 2D-1
Controller No.: 2
Computer Interface No.: 2

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-(((0.103+0.030+0.006+0.078)x100)= 89.9 %



PROBE 2D-1 w/ compute Int.2

IN-SITU FLOW MEASUREMENTS

10-28-95

Test 15 on 10/28/95 @ 1934 NORTH KVFLO7_5 (7.5mV) SOUTH @ 2100 10/28/95 FLOW RATE =ft/day 1.37

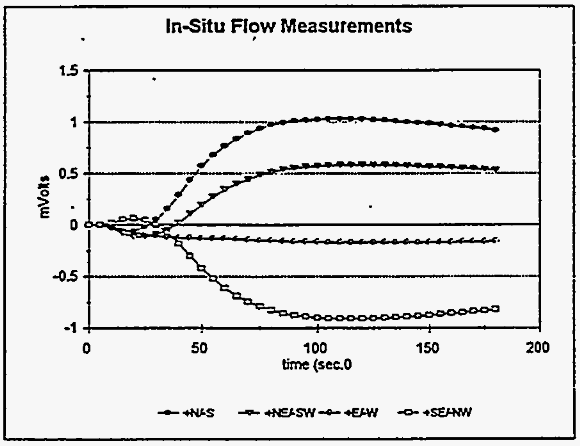
Gear Setup 1:196 Reduction Gear, 60:30 Drive Gear ratio HEATER @ 1.65 amps

WELL NO: CALIBRATION TEST 15

	DIRECTION:	DATE:	Start TIME:	End TIME:
RUN 1	NORTH	10-28-95	1934	1937
RUN 2	SOUTH	10-28-95	2100	2103

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00025	-0.00201	-0.00065	0.00165
10	-0.02769	-0.02995	-0.01345	0.01680
15	-0.06479	-0.08259	-0.04365	0.04915
20	-0.06542	-0.11619	-0.07445	0.06495
25	-0.01997	-0.11499	-0.09490	0.04740
30	0.05263	-0.09334	-0.10785	-0.00295
35	0.15588	-0.05274	-0.11990	-0.07675
40	0.29218	0.01801	-0.12765	-0.17670
45	0.43978	0.10731	-0.12840	-0.29875
50	0.57323	0.19661	-0.12880	-0.41715
55	0.68148	0.27606	-0.13015	-0.52240
60	0.76943	0.34586	-0.13295	-0.61360
65	0.83973	0.40236	-0.14060	-0.68695
70	0.89363	0.44736	-0.14270	-0.74420
75	0.94023	0.48571	-0.14820	-0.79180
80	0.97318	0.51451	-0.15270	-0.82800
85	0.99623	0.53671	-0.15770	-0.85710
90	1.01343	0.55291	-0.16075	-0.87655
95	1.02203	0.56341	-0.16285	-0.88945
100	1.02813	0.57241	-0.16350	-0.89925
105	1.03274	0.57871	-0.16910	-0.90565
110	1.03513	0.58311	-0.16960	-0.90930
115	1.03339	0.58426	-0.17070	-0.91035
120	1.03075	0.58486	-0.17105	-0.90915
125	1.02712	0.58466	-0.17185	-0.90700
130	1.01845	0.58176	-0.17155	-0.90160
135	1.01484	0.57926	-0.17145	-0.89660
140	1.00359	0.57441	-0.16960	-0.89035
145	0.99391	0.57096	-0.17020	-0.88320
150	0.98601	0.56571	-0.16855	-0.87415
155	0.97385	0.56121	-0.16795	-0.86640
160	0.96571	0.55686	-0.16680	-0.85815
165	0.95636	0.55106	-0.16515	-0.84910
170	0.94671	0.54573	-0.16465	-0.84095
175	0.93604	0.54019	-0.16265	-0.83110
180	0.92200	0.53258	-0.15900	-0.82030
TOTAL	26.369655	13.602745	-5.02165	-22.557



TEST NO. 1

JULIAN DAY	5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
301	0	-0.73301	-0.16840	-1.26000	-3.72640
301	5	-0.73401	-0.17216	-1.26230	-3.72390
301	10	-0.81445	-0.24809	-1.29660	-3.68230
301	15	-1.04450	-0.50797	-1.42470	-3.52390
301	20	-1.39810	-0.94251	-1.64870	-3.25250
301	25	-1.78900	-1.46430	-1.92060	-2.93700
301	30	-2.15620	-2.00430	-2.19280	-2.64960
301	35	-2.48120	-2.54110	-2.45940	-2.41880
301	40	-2.68440	-2.99640	-2.70220	-2.29300
301	45	-2.73380	-3.31720	-2.88190	-2.30650
301	50	-2.66410	-3.49890	-2.99720	-2.44710
301	55	-2.52500	-3.56780	-3.05630	-2.67970
301	60	-2.34190	-3.54500	-3.07390	-2.97010
301	65	-2.14210	-3.46130	-3.05560	-3.27840
301	70	-1.95340	-3.34100	-3.00270	-3.58130
301	75	-1.76250	-3.19090	-2.93780	-3.87100
301	80	-1.59030	-3.02930	-2.85960	-4.13210
301	85	-1.44170	-2.86360	-2.77690	-4.36320
301	90	-1.30590	-2.69820	-2.68870	-4.55740
301	95	-1.19240	-2.53980	-2.60070	-4.71830
301	100	-1.08480	-2.38300	-2.51630	-4.85390
301	105	-0.99238	-2.23490	-2.43910	-4.96540
301	110	-0.90291	-2.09250	-2.35990	-5.05540
301	115	-0.83198	-1.96140	-2.28770	-5.12420
301	120	-0.76357	-1.83590	-2.21850	-5.17760
301	125	-0.70192	-1.71810	-2.15490	-5.21640
301	130	-0.65406	-1.61110	-2.09420	-5.24470
301	135	-0.59918	-1.50910	-2.03790	-5.26430
301	140	-0.56359	-1.41610	-1.98550	-5.27430
301	145	-0.52625	-1.32870	-1.93590	-5.27680
301	150	-0.49393	-1.24800	-1.88950	-5.27330
301	155	-0.46586	-1.17180	-1.84690	-5.26600
301	160	-0.43604	-1.10040	-1.80730	-5.25580
301	165	-0.41624	-1.03600	-1.77020	-5.24250
301	170	-0.39444	-0.97457	-1.73610	-5.22770
301	175	-0.37539	-0.91794	-1.70430	-5.20920
301	180	-0.36587	-0.86757	-1.67370	-5.18760

BASE TIME "0" SUBTRACTED

THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0.00000	0.00000	0.00000	0.00000
-0.00100	-0.00376	-0.00230	0.00250
-0.08144	-0.07969	-0.03660	0.04410
-0.31149	-0.33957	-0.16470	0.20250
-0.66509	-0.77411	-0.38870	0.47390
-1.05599	-1.29590	-0.66060	0.78940
-1.42319	-1.83590	-0.93280	1.07680
-1.74819	-2.37270	-1.19940	1.30760
-1.95139	-2.82800	-1.44220	1.43340
-2.00079	-3.14880	-1.62190	1.41990
-1.93109	-3.33050	-1.73720	1.27930
-1.79199	-3.39940	-1.79630	1.04670
-1.60889	-3.37660	-1.81390	0.75630
-1.40909	-3.29290	-1.79560	0.44800
-1.22039	-3.17260	-1.74270	0.14510
-1.02949	-3.02250	-1.67780	-0.14460
-0.85729	-2.86090	-1.59960	-0.40570
-0.70869	-2.69520	-1.51690	-0.63680
-0.57289	-2.52980	-1.42870	-0.83100
-0.45939	-2.37140	-1.34070	-0.99190
-0.35179	-2.21460	-1.25630	-1.12750
-0.25937	-2.06650	-1.17910	-1.23900
-0.16990	-1.92410	-1.09990	-1.32900
-0.09897	-1.79300	-1.02770	-1.39780
-0.03056	-1.66750	-0.95850	-1.45120
0.03109	-1.54970	-0.89490	-1.49200
0.07895	-1.44270	-0.83420	-1.51830
0.13383	-1.34070	-0.77790	-1.53790
0.16942	-1.24770	-0.72550	-1.54790
0.20676	-1.16030	-0.67590	-1.55040
0.23908	-1.07960	-0.62950	-1.54690
0.26715	-1.00340	-0.58690	-1.53960
0.29697	-0.93200	-0.54730	-1.52940
0.31677	-0.86760	-0.51020	-1.51610
0.33857	-0.80617	-0.47610	-1.50130
0.35762	-0.74954	-0.44430	-1.48280
0.36714	-0.69917	-0.41370	-1.46120

TEST NO.2

JULIAN DAY	5 SEC SAMPLE	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
301	0	-0.76425	-0.16438	-1.20380	-3.76460
301	5	-0.76475	-0.16413	-1.20480	-3.76540
301	10	-0.79031	-0.18417	-1.21350	-3.75410
301	15	-0.94616	-0.33877	-1.28120	-3.66040
301	20	-1.29850	-0.70611	-1.44360	-3.42060
301	25	-1.78030	-1.23030	-1.67460	-3.07000
301	30	-2.29270	-1.81360	-1.92090	-2.68190
301	35	-2.82420	-2.43160	-2.16340	-2.30350
301	40	-3.30000	-3.02840	-2.39070	-1.97380
301	45	-3.64460	-3.52780	-2.56890	-1.74720
301	50	-3.84180	-3.88810	-2.68340	-1.65100
301	55	-3.91920	-4.11590	-2.73980	-1.67310
301	60	-3.91200	-4.23270	-2.75180	-1.78110
301	65	-3.85280	-4.26200	-2.71820	-1.94270
301	70	-3.77190	-4.23170	-2.66110	-2.13110
301	75	-3.67420	-4.15830	-2.58520	-2.32560
301	80	-3.56790	-4.05430	-2.49800	-2.51430
301	85	-3.46540	-3.93300	-2.40530	-2.68720
301	90	-3.36400	-3.80000	-2.31100	-2.84250
301	95	-3.26770	-3.66260	-2.21860	-2.97760
301	100	-3.17230	-3.52380	-2.13310	-3.09360
301	105	-3.08910	-3.38830	-2.04470	-3.19230
301	110	-3.00440	-3.25470	-1.96450	-3.27500
301	115	-2.93000	-3.12590	-1.89010	-3.34170
301	120	-2.85630	-3.00160	-1.82020	-3.39750
301	125	-2.78740	-2.88340	-1.75500	-3.44260
301	130	-2.72220	-2.77060	-1.69490	-3.47970
301	135	-2.66010	-2.66360	-1.63880	-3.50930
301	140	-2.60200	-2.56090	-1.59010	-3.53180
301	145	-2.54530	-2.46660	-1.53930	-3.54860
301	150	-2.49720	-2.37540	-1.49620	-3.56320
301	155	-2.44480	-2.29020	-1.45480	-3.57140
301	160	-2.39870	-2.21010	-1.41750	-3.57770
301	165	-2.36020	-2.13410	-1.38370	-3.58250
301	170	-2.31910	-2.06200	-1.35050	-3.58400
301	175	-2.27870	-1.99430	-1.32280	-3.58520
301	180	-2.24110	-1.92870	-1.29950	-3.58520

BASE TIME "0" SUBTRACTED

THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0.00000	0.00000	0.00000	0.00000
-0.00050	0.00025	-0.00100	-0.00080
-0.02606	-0.01979	-0.00970	0.01050
-0.18191	-0.17439	-0.07740	0.10420
-0.53425	-0.54173	-0.23980	0.34400
-1.01605	-1.06592	-0.47080	0.69460
-1.52845	-1.64922	-0.71710	1.08270
-2.05995	-2.26722	-0.95960	1.46110
-2.53575	-2.86402	-1.18690	1.79080
-2.88035	-3.36342	-1.36510	2.01740
-3.07755	-3.72372	-1.47960	2.11360
-3.15495	-3.95152	-1.53600	2.09150
-3.14775	-4.06832	-1.54800	1.98350
-3.08855	-4.09762	-1.51440	1.82190
-3.00765	-4.06732	-1.45730	1.63350
-2.90995	-3.99392	-1.38140	1.43900
-2.80365	-3.88992	-1.29420	1.25030
-2.70115	-3.76862	-1.20150	1.07740
-2.59975	-3.63562	-1.10720	0.92210
-2.50345	-3.49822	-1.01500	0.78700
-2.40805	-3.35942	-0.92930	0.67100
-2.32485	-3.22392	-0.84090	0.57230
-2.24015	-3.09032	-0.76070	0.48960
-2.16575	-2.96152	-0.68630	0.42290
-2.09205	-2.83722	-0.61640	0.36710
-2.02315	-2.71902	-0.55120	0.32200
-1.95795	-2.60622	-0.49110	0.28490
-1.89585	-2.49922	-0.43500	0.25530
-1.83775	-2.39652	-0.38630	0.23280
-1.78105	-2.30222	-0.33550	0.21600
-1.73295	-2.21102	-0.29240	0.20140
-1.68055	-2.12582	-0.25100	0.19320
-1.63445	-2.04572	-0.21370	0.18690
-1.59595	-1.96972	-0.17990	0.18210
-1.55485	-1.89762	-0.14680	0.18060
-1.51445	-1.82992	-0.11900	0.17940
-1.47685	-1.76432	-0.09570	0.17940

KVA Flowmeter Measurements

Calibration Testing

Date: 10-28-95

Flow Rate: 1.37 ft/day

Calibration Test No. : 15

Analysis Type: SUM

No.1 Thermistor Alignment: North

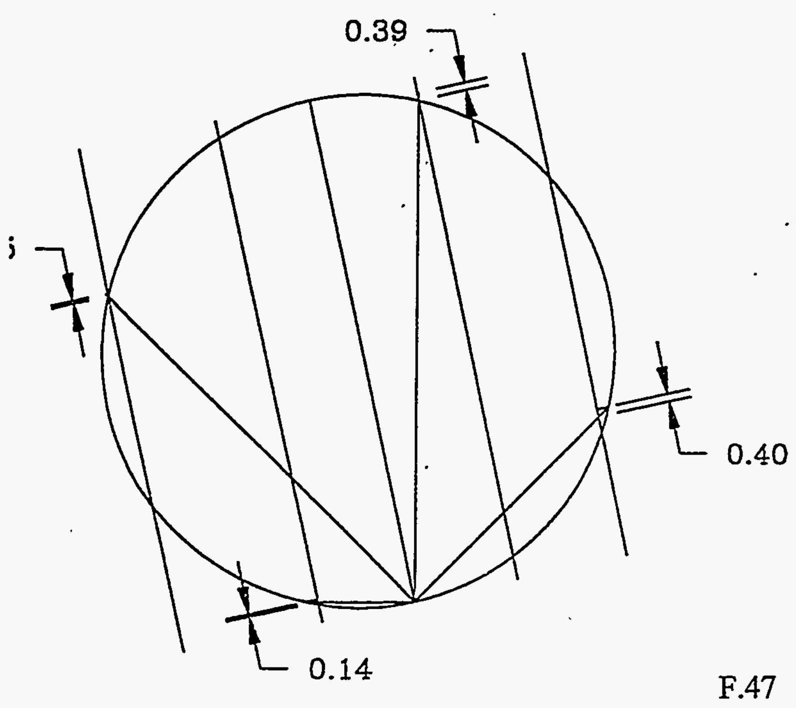
Calculated Vector Angle: N 12.3deg. W

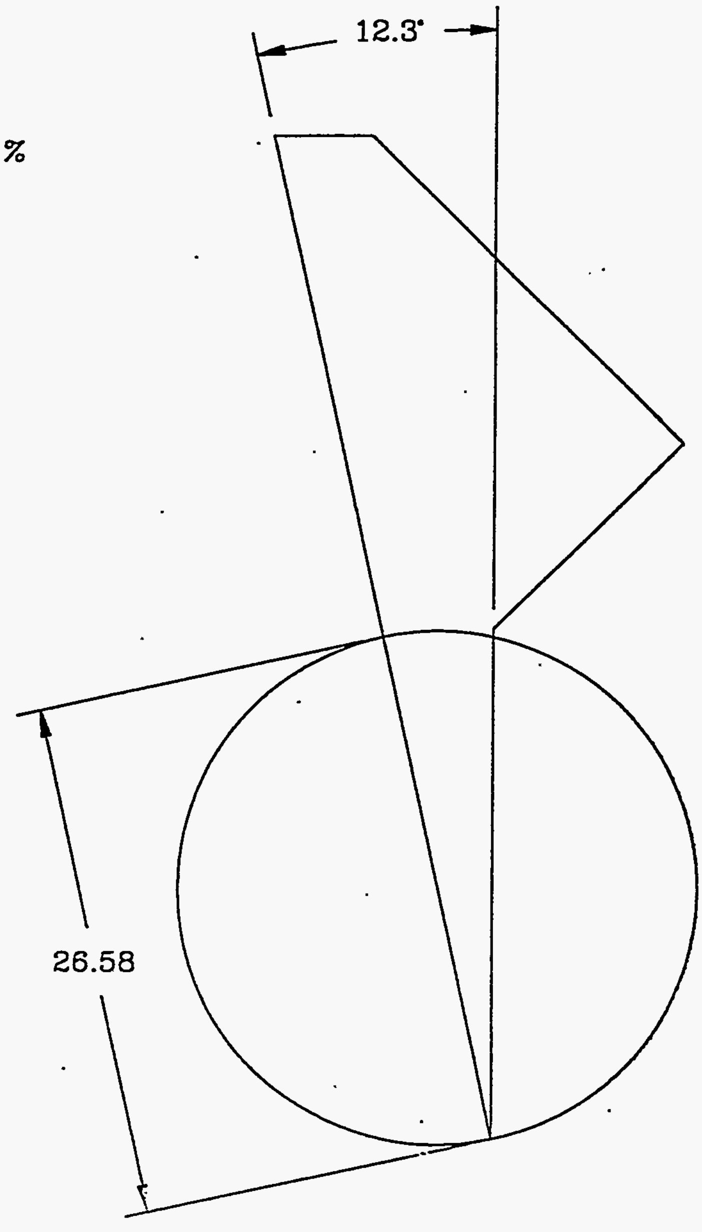
Probe No. : 2D-1
Controller No.: 2
Computer Interface No.: 2

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %

100-(((0.39+0.40+0.14+0.15)x100)= 95.9 %





PROBE 2D-1 w/ compute Int. 2

IN-SITU FLOW MEASUREMENTS

10-29-30 — Test 16 on 10/29/95 @ 0700 NORTH KVFLO7_5 (7.5mV) SOUTH @ 0855 10/29/95 — FLOW RATE =ft/day 2.74

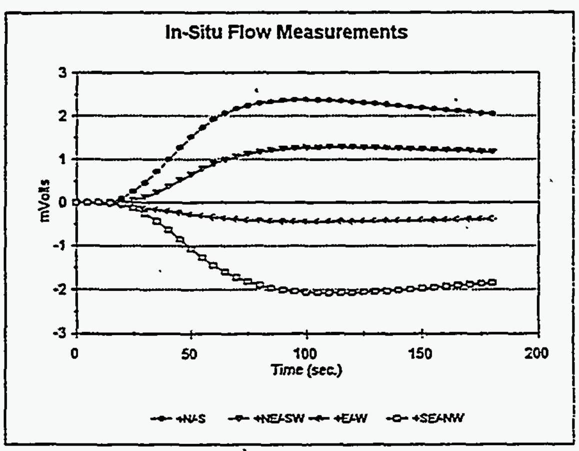
Gear Setup 1:196 Reduction Gear.120:30 Drive Gear ratio HEATER @ 1.65 amps

WELL NO: CALIBRATION TEST 16

	DIRECTION:	DATE:	Start TIME:	End TIME:
RUN 1	NORTH	10-29-95	700	703
RUN 2	SOUTH	10-29-95	855	858

TEST NO. 1 - TEST NO. 2 / 2

5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
0	0.00000	0.00000	0.00000	0.00000
5	-0.00476	-0.00326	-0.00240	0.00075
10	-0.00778	-0.01694	-0.00980	0.00645
15	0.01409	-0.02651	-0.02985	0.00305
20	0.10053	-0.00731	-0.05525	-0.03535
25	0.26014	0.04524	-0.08335	-0.12160
30	0.46523	0.12324	-0.12155	-0.25075
35	0.72379	0.23344	-0.16020	-0.42395
40	1.00479	0.36859	-0.19720	-0.63085
45	1.27834	0.51244	-0.23370	-0.85130
50	1.52344	0.65124	-0.26970	-1.06530
55	1.74079	0.77999	-0.30490	-1.26455
60	1.92194	0.89289	-0.33715	-1.44330
65	2.06613	0.98659	-0.36235	-1.59315
70	2.17435	1.06454	-0.38315	-1.71865
75	2.24719	1.12539	-0.39905	-1.81775
80	2.30499	1.17279	-0.41105	-1.89685
85	2.34261	1.21029	-0.42120	-1.95795
90	2.36873	1.23804	-0.42505	-2.00425
95	2.38175	1.25794	-0.42820	-2.03495
100	2.38191	1.27044	-0.42955	-2.05630
105	2.37754	1.27759	-0.42790	-2.06800
110	2.36729	1.28164	-0.42825	-2.07305
115	2.35301	1.28179	-0.42610	-2.07165
120	2.33660	1.27964	-0.42320	-2.06540
125	2.31779	1.27594	-0.42210	-2.05510
130	2.29513	1.26929	-0.41590	-2.04235
135	2.27435	1.26244	-0.41230	-2.02690
140	2.25117	1.25406	-0.40780	-2.00925
145	2.22582	1.24417	-0.40125	-1.99005
150	2.19727	1.23364	-0.39860	-1.96955
155	2.17244	1.22250	-0.39345	-1.94800
160	2.14803	1.21173	-0.38765	-1.92640
165	2.12357	1.20125	-0.38505	-1.90560
170	2.10016	1.19031	-0.37915	-1.88350
175	2.07747	1.17980	-0.37425	-1.86345
180	2.05705	1.16920	-0.36910	-1.84280
TOTAL	62.96379	32.71402	-11.5167	-52.8976



TEST NO. 1

JULIAN DAY	5 SEC INTEVAL	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
302	0	-0.77907	-0.35581	-1.44580	-3.66840	0.00000	0.00000	0.00000	0.00000
302	5	-0.78835	-0.36484	-1.45310	-3.66490	-0.00928	-0.00903	-0.00730	0.00350
302	10	-0.88488	-0.46965	-1.49950	-3.60770	-0.10581	-0.11384	-0.05370	0.06070
302	15	-1.12990	-0.76854	-1.65590	-3.42820	-0.35083	-0.41273	-0.21010	0.24020
302	20	-1.44680	-1.22670	-1.91270	-3.15560	-0.66773	-0.87089	-0.46690	0.51280
302	25	-1.74840	-1.74970	-2.21780	-2.87680	-0.96933	-1.39389	-0.77200	0.79160
302	30	-2.00800	-2.28450	-2.53350	-2.65460	-1.22893	-1.92869	-1.08770	1.01380
302	35	-2.17420	-2.78930	-2.84340	-2.52300	-1.39513	-2.43349	-1.39760	1.14540
302	40	-2.19750	-3.18820	-3.11170	-2.52820	-1.41843	-2.83239	-1.66590	1.14020
302	45	-2.07570	-3.44040	-3.31630	-2.68720	-1.29663	-3.08459	-1.87050	0.98120
302	50	-1.85050	-3.54980	-3.45550	-2.97380	-1.07143	-3.19399	-2.00970	0.69460
302	55	-1.55710	-3.54200	-3.53920	-3.34670	-0.77803	-3.18619	-2.09340	0.32170
302	60	-1.25150	-3.45200	-3.57460	-3.75890	-0.47243	-3.09619	-2.12880	-0.09050
302	65	-0.96361	-3.31130	-3.56430	-4.16560	-0.18454	-2.95549	-2.11850	-0.49720
302	70	-0.70108	-3.13630	-3.52470	-4.55220	0.07799	-2.78049	-2.07890	-0.88380
302	75	-0.47240	-2.94470	-3.46330	-4.90180	0.30667	-2.58889	-2.01750	-1.23340
302	80	-0.26880	-2.74740	-3.38730	-5.20940	0.51027	-2.39159	-1.94150	-1.54100
302	85	-0.08826	-2.54750	-3.30580	-5.47700	0.69081	-2.19169	-1.86000	-1.80860
302	90	0.06469	-2.35470	-3.21500	-5.70140	0.84376	-1.99889	-1 76920	-2.03300
302	95	0.19382	-2.16970	-3.12580	-5.88590	0.97289	-1.81389	-1.68000	-2.21750
302	100	0.30064	-1.99540	-3.03600	-6.03410	1.07971	-1.63959	-1.59020	-2.36570
302	105	0.39241	-1.83170	-2.95050	-6.15150	1.17148	-1.47589	-1.50470	-2.48310
302	110	0.47340	-1.67770	-2.86800	-6.24530	1.25247	-1.32189	-1.42220	-2.57690
302	115	0.54085	-1.53430	-2.78950	-6.31470	1.31992	-1.17849	-1.34370	-2.64630
302	120	0.59652	-1.40270	-2.71500	-6.36440	1.37559	-1.04689	-1.26920	-2.69600
302	125	0.64591	-1.27880	-2.64910	-6.39770	1.42498	-0.92299	-1.20330	-2.72930
302	130	0.68528	-1.16620	-2.57810	-6.41830	1.46435	-0.81039	-1.13230	-2.74990
302	135	0.72013	-1.06090	-2.51650	-6.42600	1.49920	-0.70509	-1.07070	-2.75760
302	140	0.74797	-0.96436	-2.45780	-6.42550	1.52704	-0.60855	-1.01200	-2.75710
302	145	0.76727	-0.87635	-2.40240	-6.41700	1.54634	-0.52054	-0.95660	-2.74860
302	150	0.78006	-0.79661	-2.35200	-6.40100	1.55913	-0.44080	-0.90620	-2.73260
302	155	0.79260	-0.72189	-2.30280	-6.37970	1.57167	-0.36608	-0.85700	-2.71130
302	160	0.80739	-0.65093	-2.25640	-6.35580	1.58646	-0.29512	-0.81060	-2.68740
302	165	0.81667	-0.58549	-2.21860	-6.33130	1.59574	-0.22968	-0.77280	-2.66290
302	170	0.82444	-0.52556	-2.17720	-6.30190	1.60351	-0.16975	-0.73140	-2.63350
302	175	0.82946	-0.46989	-2.13960	-6.27330	1.60853	-0.11408	-0.69380	-2.60490
302	180	0.83573	-0.41899	-2.10450	-6.24200	1.61480	-0.06318	-0.65870	-2.57360

TEST NO.2

JULIAN DAY	5 SEC SAMPLE	THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW	BASE TIME "0" SUBTRACTED THERM 1 mV +N/-S	THERM 2 mV +NE/-SW	THERM 3 mV +E/-W	THERM 4 mV +SE/-NW
302	0	-0.56850	-0.08673	-1.25210	-3.85290	0.00000	0.00000	0.00000	0.00000
302	5	-0.56825	-0.08924	-1.25460	-3.85090	0.00025	-0.00251	-0.00250	0.00200
302	10	-0.65874	-0.16669	-1.28620	-3.80510	-0.09024	-0.07996	-0.03410	0.04780
302	15	-0.94751	-0.44643	-1.40250	-3.61880	-0.37901	-0.35970	-0.15040	0.23410
302	20	-1.43730	-0.94300	-1.60850	-3.26940	-0.86880	-0.85627	-0.35640	0.58350
302	25	-2.05810	-1.57110	-1.85740	-2.81810	-1.48960	-1.48437	-0.60530	1.03480
302	30	-2.72790	-2.26190	-2.09670	-2.33760	-2.15940	-2.17517	-0.84460	1.51530
302	35	-3.41120	-2.98710	-2.32930	-1.85960	-2.84270	-2.90037	-1.07720	1.99330
302	40	-3.99650	-3.65630	-2.52360	-1.45100	-3.42800	-3.56957	-1.27150	2.40190
302	45	-4.42180	-4.19620	-2.65520	-1.16910	-3.85330	-4.10947	-1.40310	2.68380
302	50	-4.68680	-4.58320	-2.72240	-1.02770	-4.11830	-4.49647	-1.47030	2.82520
302	55	-4.82810	-4.83290	-2.73570	-1.00210	-4.25960	-4.74617	-1.48360	2.85080
302	60	-4.88480	-4.96870	-2.70660	-1.05680	-4.31630	-4.88197	-1.45450	2.79610
302	65	-4.88530	-5.01540	-2.64590	-1.16380	-4.31680	-4.92867	-1.39380	2.68910
302	70	-4.83920	-4.99630	-2.56470	-1.29940	-4.27070	-4.90957	-1.31260	2.55350
302	75	-4.75620	-4.92640	-2.47150	-1.45080	-4.18770	-4.83967	-1.21940	2.40210
302	80	-4.66820	-4.82390	-2.37150	-1.60020	-4.09970	-4.73717	-1.11940	2.25270
302	85	-4.56290	-4.69900	-2.26970	-1.74560	-3.99440	-4.61227	-1.01760	2.10730
302	90	-4.46220	-4.56170	-2.17120	-1.87740	-3.89370	-4.47497	-0.91910	1.97550
302	95	-4.35910	-4.41650	-2.07570	-2.00050	-3.79060	-4.32977	-0.82360	1.85240
302	100	-4.25260	-4.26720	-1.98320	-2.10600	-3.68410	-4.18047	-0.73110	1.74690
302	105	-4.15210	-4.11760	-1.90100	-2.20000	-3.58360	-4.03107	-0.64890	1.65290
302	110	-4.05060	-3.97190	-1.81780	-2.28370	-3.48210	-3.88517	-0.56570	1.56920
302	115	-3.95460	-3.82880	-1.74360	-2.35590	-3.38610	-3.74207	-0.49150	1.49700
302	120	-3.86610	-3.69290	-1.67490	-2.41810	-3.29760	-3.60617	-0.42280	1.43480
302	125	-3.77910	-3.56160	-1.61120	-2.47200	-3.21060	-3.47487	-0.35910	1.38090
302	130	-3.69640	-3.43570	-1.55260	-2.51810	-3.12790	-3.34897	-0.30050	1.33480
302	135	-3.61800	-3.31670	-1.49820	-2.55670	-3.04950	-3.22997	-0.24610	1.29620
302	140	-3.54380	-3.20340	-1.44850	-2.59150	-2.97530	-3.11667	-0.19640	1.26140
302	145	-3.47380	-3.09560	-1.40620	-2.62140	-2.90530	-3.00887	-0.15410	1.23150
302	150	-3.40390	-2.99480	-1.36110	-2.64640	-2.83540	-2.90807	-0.10900	1.20650
302	155	-3.34170	-2.89780	-1.32220	-2.66820	-2.77320	-2.81107	-0.07010	1.18470
302	160	-3.27810	-2.80530	-1.28740	-2.68750	-2.70960	-2.71857	-0.03530	1.16540
302	165	-3.21990	-2.71890	-1.25480	-2.70460	-2.65140	-2.63217	-0.00270	1.14830
302	170	-3.16530	-2.63710	-1.22520	-2.71940	-2.59680	-2.55037	0.02690	1.13350
302	175	-3.11490	-2.56040	-1.19740	-2.73090	-2.54640	-2.47367	0.05470	1.12200
302	180	-3.06780	-2.48830	-1.17260	-2.74090	-2.49930	-2.40157	0.07950	1.11200

KVA Flowmeter Measurements

Calibration Testing

Date: 10-29-95

Probe: 2D-1
Controller: 2
Computer Interface: 2

Flow Rate: 2.74 ft/day

Calibration Test No. 16

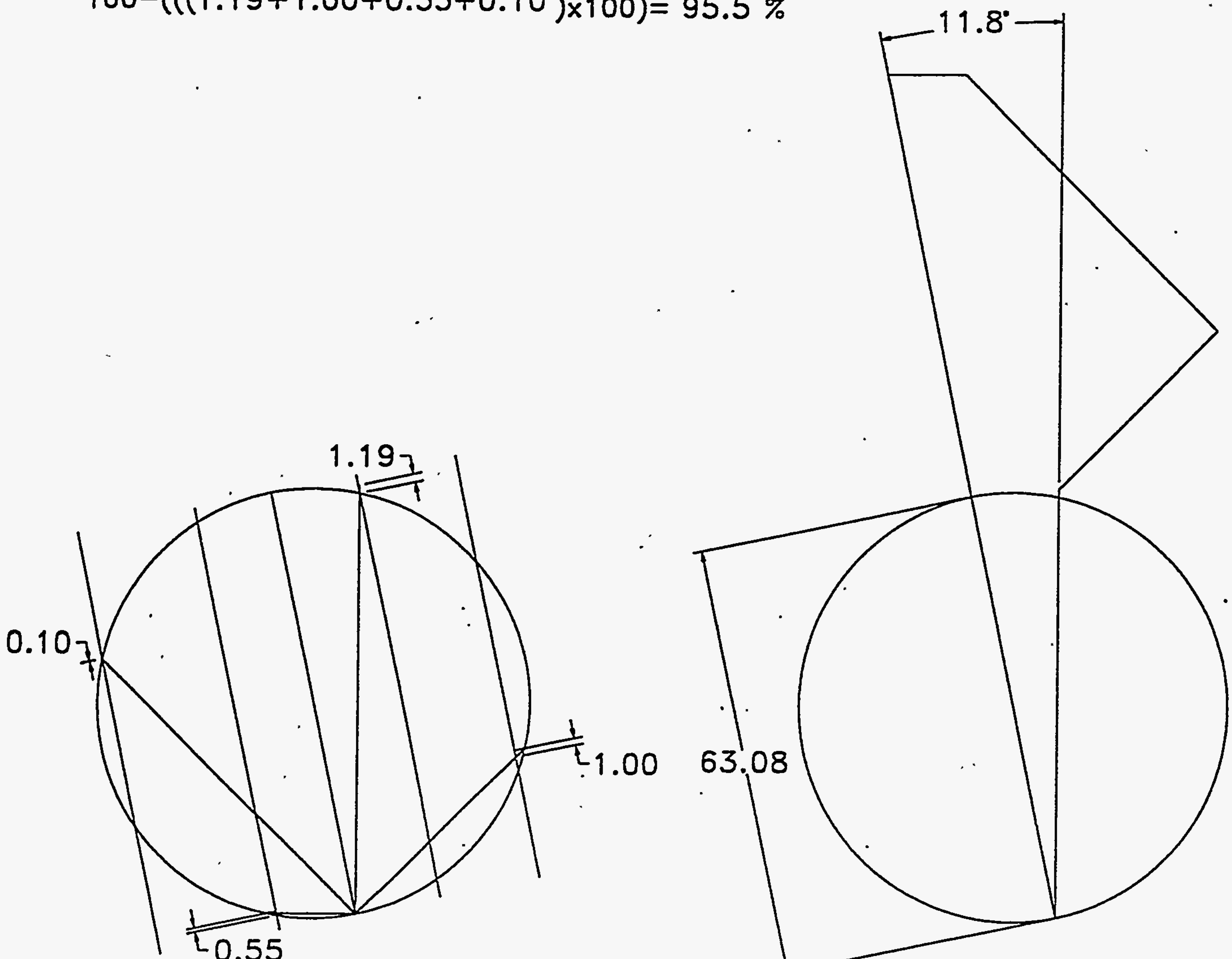
Analysis Type: SUM

No. 1 Thermistor Alignment: NORTH

Calculated Vector Angle: N 11.8deg. W

Vector Fit Calculation:

100-(((A+B+C+D)/Cal.Vector Length)x100)= %
100-(((1.19+1.00+0.55+0.10)x100)= 95.5 %



AQUIFER TEST INFORMATION SHEET

Page ____ of ____

Well Designation	Test(s) Type	Date
699-37-47A	Groundwater Flowmeter	11/11/96

WELL INFORMATION

Total Well Depth: 342.6' TOC

Depth to Water: 315.6' TOC

Well Casing Diameter: 4"

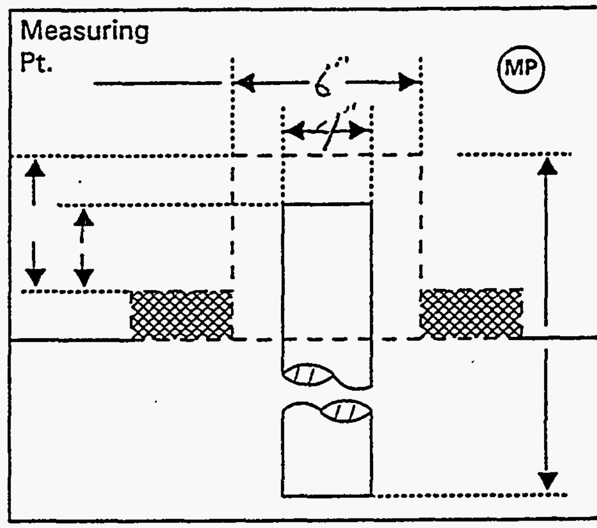
Protective Casing Dia.: 6"

Cement Pad Thickness: 4"

Pad to Measing Point (MP): 41.5"

Screened Interval: 342.6'-312.6' TOC

Hanford Coordinates:



EQUIPMENT INFORMATION

Name	Description	Serial No.	Cal. Due Date	Func. Test Yes	Func. Test No
Control Box	KVA Flowmeter	00106 (B)	N/A	✓	
Interface	Computer/Control Box Interface	2	N/A	✓	
Probe	Flowmeter	2D-1	10/95	✓	
Computer	Laptop	97-118YV2	N/A	✓	

Reference: Field Activity No. 97-110-01

TEST INFORMATION

Datum Point: Top of Casing

Pumping Method: N/A

Slug Volume: N/A

Transducer Measure Units: N/A

Transducer Depth (BWL): N/A

Initial Pressure (PI): N/A

Slug Level (Pmax./min.): N/A

Controlling Document:

Personnel:

F.T.L. J.A. Coates

A.T.L. D.E. Gostovich

Recorder: James A. Coates [signature] 11/11/96

Print and Sign Name Date

A-6000-959 (11/92)

AQUIFER TEST INFORMATION SHEET (Continuation Page)

Page ____ of ____

Well Designation	Test(s) Type	Date
699-37-47A	Groundwater Flowmeter	11/11/96

TEST INFORMATION

Test No.	Test Name	Start Time	End Time	Flow Rate	Comments
3.4A	Probe Test	1124	1127	N/A.	Test. Probe - Functional
1N	A37-3.4	1345	1348	N/A	North Run - Probe @ 319' BTOC.
1S	A37-3.4	1445	1448	N/A	South Run - Probe @ 319' BTOC
					- See FAR #97-110-01 -

JAC

Time	NOTES
1245	Probe to depth @ 319' BTOC.
1520	OFF Site -

JAC

Recorded By: J.A. Coates / J.A. Coates (Sign and Print Name) 11/11/96 (Date)

A-6000-959.1 (11/92)

FIELD ACTIVITY REPORT - WELL SERVICES

Well ID		Page
B2822	FIELD ACTIVITY REPORT - WELL SERVICES	1 of 1

Well Name	Date	Rig Type/Model	Rig No.	Contract/Work Order No.	Report No.
6-37-47A	11/11/96	Pump Setting5T	68B4310	--------N/A-------	97-110 -01

Purpose	Reference	Location
Load equipment and install flow meter -----------------------N/A------------------------	Flow Meter Testing	200 East ------N/A----------

HISTORICAL DATA

Construction Depth	-00--	
Casing Size: 4	Type: SS	Set At: -----
Casing Perforations Schedule: ----------N/A--------		Interval: ---N/A---
Well Screen(s) Type: ---N/A-----		Interval: -------N/A---
Last Recorded Depth-to-Water: --00----	Last Recorded Depth-to-Bottom: ---00----	
Current Depth-to-Water: 315.64	Current Depth-to-Bottom: 342.60	

PUMP SYSTEM CONFIGURATION

	Pre-Maintenance	Post-Maintenance
Pump Type	------N/A------	------N/A------
Pump Model	------N/A------	------N/A------
Tubing Size/Type	------N/A------	------N/A------
Length-Bottom of Tubing to Pump Intake	------N/A------	------N/A------
Tubing Length	------N/A------	------N/A------
Length-Top of Tubing to Reference Point	------N/A------	------N/A------
Pump Intake Set at (Depth)	------N/A------	------N/A------

Reference/Measuring Point: TOP-OF-CASING

		Personnel	Materials Used
Start Time	0700	D.E. Gostovich	-----------N/A-----------
End Time	1300	J. Coates	-----------N/A-----------
Time	N/A	-----------N/A-----------	-----------N/A-----------
Contract Time	N/A	-----------N/A-----------	-----------N/A-----------
Total Time	6	-----------N/A-----------	-----------N/A-----------

WSR ITEM # 1

Description of Operations/Remarks

Went to the pipe yard and loaded the equipment we needed onto a equipment trailer. The trailer was taken to the well site and droped off. The rig was then rigged up on the well and inspected. A prejob and safety meeting was held. Being careful not to drop the pipe into the well was talked about. All of the pipe that were in 20ft joints were checked for alignment. The alignment marks were highlited with a marker to make the marks more visible. The probe was tested before it was installed into the well. The north pin was touched and then all of the other pins in a counter clockwise rotation. The flowmeter probe tested good. The flow meter was then installed to a depth of 319ft. As the meter was being installed the joints were again checked for alignment. The flow meter was set on it's directional plate and the plate aligned north. The rig was rigged down and moved away from the compass so the plate could be set for true north. The well was then let to stablize before the flow meter was ran.------------------

----------------N/A----------------

----------------N/A----------------

----------------N/A----------------

Report By	D.E. Gostovich	Reviewed By	Scott Worley
Title	Engineering Technician	Title	Adv. Plant Engineer
Signature	[signature]	Signature	
		Date	

DISTRIBUTION: White-Field File-Custodian Yellow-Group Files Pink- F.52 oordinator Goldenrod-Team Leader BC-6000-278 (02/95)

AQUIFER TEST INFORMATION SHEET (Continuation Page)

Page ____ of ____

Well Designation	Test(s) Type	Date
699-37-47A	Ground Water Flowmeter	11/12/96

TEST INFORMATION

Test No.	Test Name	Start Time	End Time	Flow Rate	Comments
2N	A37-7.4	0810	0813	N/A	North Run - Probe @ 323' BTOC
2S	A37-7.4	0910	0913	N/A	South Run - Probe @ 323' BTOC
3N	A37-11.4	1015	1018	N/A	North Run - Probe @ 327' BTOC
3S	A37-11.4	1116	1119	N/A	South Run - Probe @ 327' BTOC
4N	A37-15.4	1241	1244	N/A	North Run - Probe @ 331' BTOC
4S	A37-15.4	1340	1343	N/A	South Run - Probe @ 331' BTOC
5N	A37-19.4	1450	1453	N/A	North Run - Probe @ 335' BTOC
5S	A37-19.4	1539	1542	N/A	South Run - Probe @ 335' BTOC
					- See FAR 97-110-02
				JAC	

Time	NOTES
0700	Probe to 323' BTOC
0930	Probe to 327' BTOC
1130	Probe to 331' BTOC
1345	Probe to 335' BTOC.
1610	Off Site
	JAC

Recorded By: JA Coates [signature] 11/12/96
Sign and Print Name | Date

A-6000-959.1 (11/92)

FIELD ACTIVITY REPORT - WELL SERVICES

Well ID		Page
82822	FIELD ACTIVITY REPORT - WELL SERVICES	Page 1 of 1

Well Name	Date	Rig Type/Model	Rig No.	Contract/Work Order No.	Report No.
6-37-47A	11/12/96	Pump Setting5T	68B4310	--------N/A-------	97-110 -02

Purpose	Reference	Location
Support Flow Mwter Testing ----------------------------N/A----------------------------	Flow Meter Testing	200 East -------N/A-------

HISTORICAL DATA

Construction Depth	--00--	
Casing Size: 4	Type: SS	Set At: ------
Casing Perforations Schedule: --------N/A------		Interval: ---N/A---
Well Screen(s) Type: ---N/A-----		Interval: -----N/A---
Last Recorded Depth-to-Water: --00---	Last Recorded Depth-to-Bottom: ---00---	
Current Depth-to-Water: 315.64	Current Depth-to-Bottom: 342.60	

PUMP SYSTEM CONFIGURATION

	Pre-Maintenance	Post-Maintenance
Pump Type	------N/A-------	------N/A-------
Pump Model	------N/A-------	------N/A-------
Tubing Size/Type	------N/A-------	------N/A-------
Length-Bottom of Tubing to Pump Intake	------N/A-------	------N/A-------
Tubing Length	------N/A-------	------N/A-------
Length-Top of Tubing to Reference Point	------N/A-------	------N/A-------
Pump Intake Set at (Depth)	------N/A-------	------N/A-------

Reference/Measuring Point: TOP-OF-CASING

		Personnel	Materials Used
Start Time	0630	D.E. Gostovich	---------------N/A---------------
End Time	1300	J. Coates	---------------N/A---------------
Time	N/A	M.C. Dorsey	---------------N/A---------------
Contract Time	N/A	--------------N/A--------------	---------------N/A---------------
Total Time	6.5	--------------N/A--------------	---------------N/A---------------

WSR ITEM # 1

Description of Operations/Remarks

The rig was then rigged up on the well and inspected. A prejob and safety meeting was held. Being careful not to drop the pipe into the well was talked about. At 0700 the flow meter was lowered 4' to 323'. We came back at 0930 and lowered the flow meter another 4' to 327'. At 1130 the flow meter was lowered another 4' to 331'. The final move at 1345 lowered the flow meter another 4' to 335'. Before the last move the pipe was raised several joints to check for alignment. All the joints were aligned like they suppose to be. The well was left with Jim doing his testing.----------------

--N/A--
--N/A--
--N/A--
--N/A--
--N/A--
--N/A--
--N/A--
--N/A--

Report By: D.E. Gostovich	Reviewed By: Scott Worley
Title: Engineering Technician	Title: Adv. Plant Engineer Date:
Signature: [signature]	Signature:

AQUIFER TEST INFORMATION SHEET (Continuation Page)			Page ____ of ____
Well Designation 699-37-47A	Test(s) Type Groundwater Flowmeter		Date 11/13/96

TEST INFORMATION

Test No.	Test Name	Start Time	End Time	Flow Rate	Comments
6N	A37-19.4A	0921	0924	N/A	North Run - Probe @ 335.0' BTOC
6S	A37-19.4A	1025	1028	N/A	South Run - Probe @ 335.0' BTOC
7N	A37-17.4	1220	1223	N/A	North Run - Probe @ 333.0' BTOC
7S	A37-17.4	1320	1323	N/A	South Run - Probe @ 333.0' BTOC
8N	A37-7.4A	1420	1423	N/A	North Run - Probe @ 323' BTOC
8S	A37-7.4A	1520	1523	N/A	South Run - Probe @ 323' BTOC
					- See FAR 97-010-03 -
			JAC		

Time	NOTES
1035	Probe to 333' BTOC
1330	Probe to 323' BTOC
1600	OFF Site
	JAC

Recorded By: J.A. Coates [signature] 11/13/96

Sign and Print Name Date

A-6000-959.1 (11/92)

Well ID	FIELD ACTIVITY REPORT - WELL SERVICES	Page 1 of 1
B2822		

Well Name	Date	Rig Type/Model	Rig No.	Contract/Work Order No.	Report No.
6-37-47A	11/13/96	Pump Setting5T	68B4310	-------N/A-------	97-010 -03

Purpose	Reference	Location
Support Flow Mwter Testing -----------------N/A-----------------------	Flow Meter Testing	200 East -----N/A--------

HISTORICAL DATA

Construction Depth	-00---	
Casing Size: 4	Type: SS	Set At: -----
Casing Perforations Schedule: --------N/A--------		Interval: ---N/A---
Well Screen(s) Type: ---N/A-----		Interval: -----N/A---
Last Recorded Depth-to-Water: -- 00---	Last Recorded Depth-to-Bottom: --00---	
Current Depth-to-Water: 315.64	Current Depth-to-Bottom: 342.60	

PUMP SYSTEM CONFIGURATION

	Pre-Maintenance	Post-Maintenance
Pump Type	------N/A------	------N/A------
Pump Model	------N/A------	------N/A------
Tubing Size/Type	------N/A------	------N/A------
Length-Bottom of Tubing to Pump Intake	------N/A------	------N/A------
Tubing Length	------N/A------	------N/A------
Length-Top of Tubing to Reference Point	------N/A------	------N/A------
Pump Intake Set at (Depth)	------N/A------	------N/A------

Reference/Measuring Point: TOP-OF-CASING

Start Time: 0700	**Personnel**	**Materials Used**
End Time: 1400	D.K. Gostovich	--------------N/A--------------
Time: N/A	J. Coates	--------------N/A--------------
Contract Time: N/A	M.C. Dorsey	--------------N/A--------------
Total Time: 7	-------------N/A-------------	--------------N/A--------------
	-------------N/A-------------	--------------N/A--------------

Description of Operations/Remarks

WSR ITEM # 1

The rig was then rigged up on the well and inspected. A prejob and safety meeting was held. Being careful not to drop the pipe into the well was talked about. The flow meter was raised 2' to 333'. After the directional shots were completed at 333' we removed 10' of pipe. This well set the flow meter at 323'. Before the last move the pipe was raised several joints to check for alignment. All the joints were aligned like they suppose to be. The well was left with Jim doing his testing.--------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

-----------------------------------N/A-----------------------------------

Report By: D.K. Gostovich	Reviewed By: Scott Worley
Title: Engineering Technician	Title: Adv. Plant Engineer Date:
Signature: D K Gosto[signature]	Signature:

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FIELD ACTIVITY REPORT - WELL SERVICES

Well ID		Page
B2822	FIELD ACTIVITY REPORT - WELL SERVICES	Page 1 of 1

Well Name	Date	Rig Type/Model	Rig No.	Contract/Work Order No.	Report No.
6-37-47A	11/14/96	Pump Setting5T	68B4310	-------N/A-------	97-010 -04.

Purpose	Reference	Location
Support Flow Mwter Testing ------------------------------N/A------------------------------	Flow Meter Testing	200 East -------N/A------ --

HISTORICAL DATA

Construction Depth	-00--	
Casing Size: 4	Type: SS	Set At: -------
Casing Perforations Schedule: ----------N/A-------		Interval: ---N/A---
Well Screen(s) Type: ----N/A------		Interval: -------N/A---
Last Recorded Depth-to-Water: ---00----	Last Recorded Depth-to-Bottom: ---00----	
Current Depth-to-Water: 315.60	Current Depth-to-Bottom: 342.30	

PUMP SYSTEM CONFIGURATION

	Pre-Maintenance	Post-Maintenance
Pump Type	------N/A-------	------N/A------
Pump Model	------N/A--------	-----N/A---- --
Tubing Size/Type	------N/A-------	-----N/A--- --
Length-Bottom of Tubing to Pump Intake	------N/A--------	------N/A---- --
Tubing Length	------N/A-------	------N/A------
Length-Top of Tubing to Reference Point	------N/A-------	------N/A---- --
Pump Intake Set at (Depth)	------N/A-------	------N/A------

Reference/Measuring Point: TOP-OF-CASING

Start Time: 0700	Personnel	Materials Used
End Time: 1000	D.E. Gostovich	------------------N/A------------------
Time: N/A	J. Coates	------------------N/A------------------
Contract Time: N/A	M.C. Dorsey	------------------N/A------------------
Total Time: 3	--------------N/A--------------	------------------N/A------------------
	--------------N/A--------------	------------------N/A------------------

Description of Operations/Remarks

WSR ITEM # 1

The rig was then rigged up on the well and inspected. A prejob and safety meeting was held. Being careful not to drop the pipe into the well was talked about. The flow meter was removed from the well. As the joints were being removed the alignment of the north marks were checked. None of the marks were out of alignment. The pipe was layed out on the equipment trailer as it was being removed. After the flow meter was removed the pipe and flow meter was taken to the pipe yard for storage. The well was secured before we left the well location.------------------N/A------------------

------------------N/A------------------

------------------N/A------------------

------------------N/A------------------

------------------N/A------------------

------------------N/A------------------

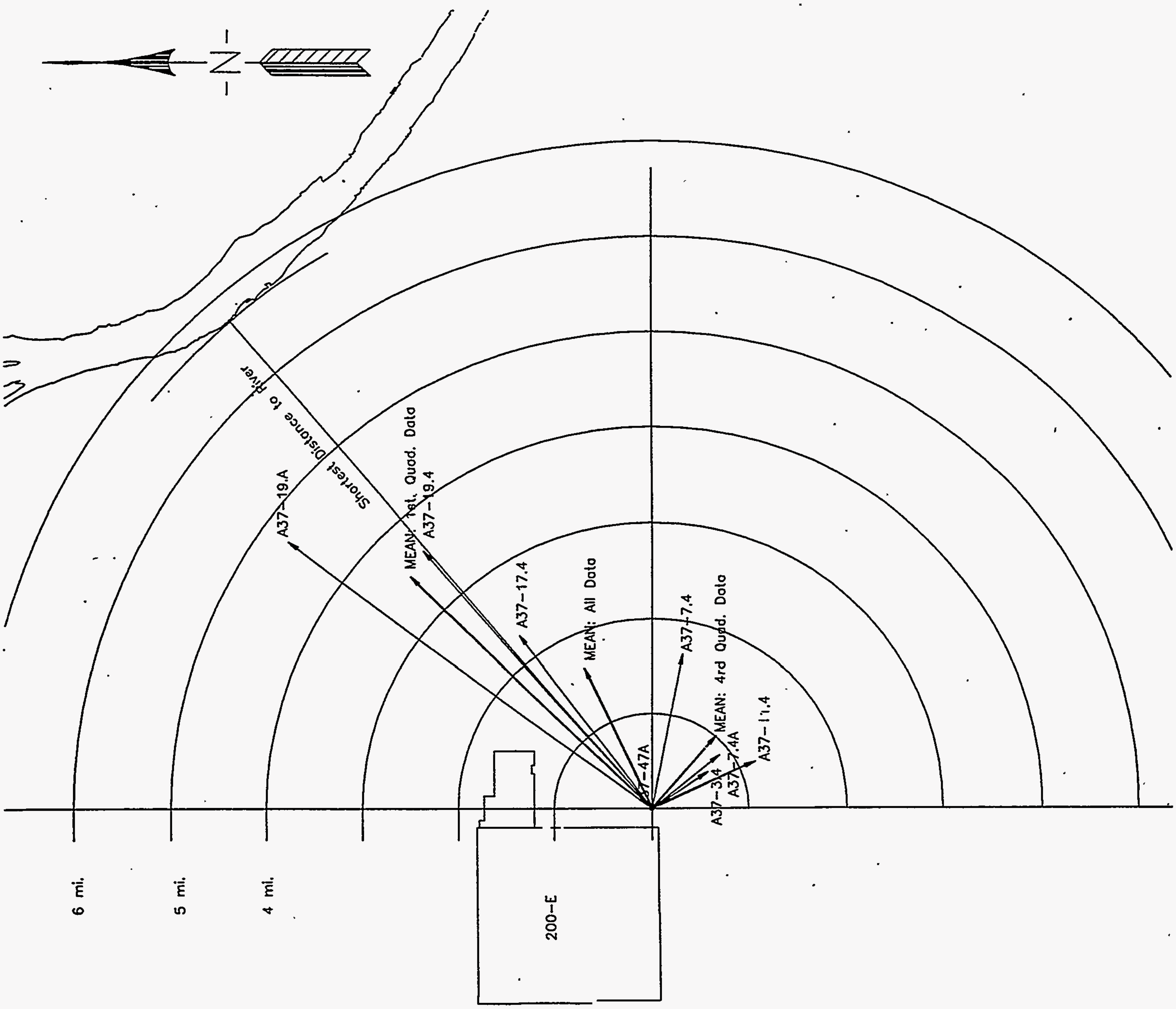
------------------N/A------------------

------------------N/A------------------

------------------N/A------------------

Report By: D.E. Gostovich	Reviewed By: Scott Worley
Title: Engineering Technician	Title: Adv. Plant Engineer Date:
Signature: [signature]	Signature:

DISTRIBUTION: White-Field File Custodian Yellow-Group Files Pink-P F.57 rdinator Goldenrod-Team Leader BC-6000-278 (02/95)


N
Shortest Distance to River
A37-19.A
MEAN: Tot. Quad. Data
A37-19.4
A37-17.4
MEAN: All Data
A37-7.4
MEAN: 4rd Quad. Data
A37-11.4
A37-7.4A
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4 mi.
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