



TA-21

DEPARTMENT OF ENERGY
National Nuclear Security Administration
Los Alamos Site Office
Los Alamos, New Mexico 87544



JUN 06 2006

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr. James P. Bearzi, Chief
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East
Building 1
Santa Fe, NM 87505-6303



Dear Mr. Bearzi:

Subject: LAOI-3.2 and 3.2a Final Intermediate Well Completion Reports

Enclosed are two copies of the LAOI-3.2 and 3.2a Final Intermediate Well Completion Reports. If you have any questions regarding this report, please contact me at (505) 667-1968 or Tom Whitacre at (505) 665-5042.

Sincerely

Eugene T. Rodriguez
Acting Assistant Manager
Office of Environmental Stewardship

ES: 2CB-003

Enclosures

cc w/o enclosures:

John Young
NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Tom Whitacre, ES, LASO
Mat Johansen, ES, LASO
David Gregory, ES, LASO
Ellen Louderbough, LC, LANL, MS-A187
Jean Dewart, ENV-WSP, LANL, MS-M992
Mark Everett, ENV-WSP, LANL, MS-M992
Steve Pearson, ENV-WSP, LANL, MS-M992
Matt Riggs, ENV-WSP, LANL, MS-M992
LASO Records Center



**FINAL
COMPLETION REPORT
INTERMEDIATE WELLS
LAOI-3.2 AND LAOI-3.2a
LOS ALAMOS NATIONAL
LABORATORY
LOS ALAMOS, NEW MEXICO
PROJECT NO. 49436**

Prepared for:

The U.S. Department of Energy and the
National Nuclear Security Administration through the
U.S. Army Corps of Engineers
Sacramento District

Prepared by:



8300 Jefferson NE, Suite B
Albuquerque, New Mexico 87113

June 2006

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS.....	iii
ABSTRACT.....	iv
1.0 INTRODUCTION	1
2.0 PRELIMINARY ACTIVITIES	3
2.1 Administrative Preparation	3
2.2 Site Preparation	3
3.0 DRILLING ACTIVITIES	3
4.0 SAMPLING ACTIVITIES	5
4.1 Core Sampling	5
4.2 Groundwater Sampling	5
5.0 BOREHOLE LOGGING	6
6.0 HYDROGEOLOGY	7
6.1 Stratigraphy.....	7
6.2 Groundwater	9
6.3 Preliminary Hydrochemistry.....	9
7.0 WELL DESIGN AND CONSTRUCTION	9
7.1 Well Design	9
7.2 Well Construction.....	9
8.0 POST-INSTALLATION ACTIVITIES	11
8.1 Well Development	11
8.2 Aquifer Testing	12
8.3 Dedicated Sampling System Installation	13
8.4 Wellhead Completion	13
8.5 Geodetic Survey.....	13
8.6 Site Restoration.....	13
9.0 DEVIATIONS FROM PLANNED ACTIVITIES	14
10.0 CHARACTERIZATION WELL LAOI-3.2a	14
10.1 Drilling Activities	15
10.2 Sampling Activities.....	15
10.2.1 Core Sampling.....	15
10.2.2 Groundwater Sampling	17
10.3 Borehole Logging	17
10.4 Hydrogeology	18
10.4.1 Stratigraphy.....	18
10.4.2 Groundwater	18
10.4.3 Preliminary Hydrochemistry.....	18
10.5 Well Design and Construction.....	18
10.6 Post-Installation Activities.....	21
10.6.1 Well Development.....	21
10.6.2 Aquifer Testing	22
10.6.3 Pump Installation	23
10.6.4 Wellhead Completion	23
10.6.5 Geodetic Survey.....	23
10.6.6 Site Restoration	23
10.7 Deviations from Planned Activities	24
11.0 ACKNOWLEDGEMENTS.....	24
12.0 REFERENCES	24

TABLE OF CONTENTS (continued)

Appendices

- A Borehole Video Log (DVD)
- B Geophysical Logging Files (on report CD)
- C Lithologic Log
- D Groundwater Analytical Results
- E Aquifer Testing Reports
- F Deviations from Planned Activities

Figures

- 1.0-1 Site Location Map
- 6.1-1 Borehole Summary Data Sheet (LAOI-3.2)
- 7.2-1 Well Schematic (LAOI-3.2)
- 8.1-1 Water Quality Parameters During Development (LAOI-3.2)
- 10.4-1 Borehole Summary Data Sheet (LAOI-3.2a)
- 10.5-1 Well Schematic (LAOI-3.2a)
- 10.6-1 Water Quality Parameters During Development (LAOI-3.2a)

Tables

- 3.0-1 Chronology of Activities for LAOI-3.2
- 4.1-1 Core Samples at LAOI-3.2
- 4.2-1 Groundwater Samples at LAOI-3.2
- 5.1-1 Borehole Logging at LAOI-3.2
- 7.2-1 Annular Fill Materials at LAOI-3.2
- 8.1-1 Final Water Quality Parameters at LAOI-3.2
- 8.5-1 Geodetic Data for LAOI-3.2
- 10.1-1 Chronology of Activities for LAOI-3.2a
- 10.2-1 Core Samples at LAOI-3.2a(plugged) and LAOI-3.2a
- 10.2-2 Groundwater Samples at LAOI-3.2a(plugged) and LAOI-3.2a
- 10.3-1 Borehole Logging at LAOI-3.2a(plugged) and LAOI-3.2a
- 10.5-1 Annular Fill Materials at LAOI-3.2a
- 10.6-1 Final Water Quality Parameters at LAOI-3.2a
- 10.6-2 Geodetic Data for LAOI-3.2a and LAOI-3.2a(plugged)

LIST OF ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
ASTM	American Society of Testing and Materials
bgs	below ground surface
BMPs	best management practices
DOE	U.S. Department of Energy
DTW	depth to water
EES-6	Earth and Environmental Sciences Group 6
ft	foot/feet
ft ³	cubic feet
gal.	gallon/gallons
hr	hour
hrs	hours
ID	inner diameter
in.	inch/inches
Kleinfelder	Kleinfelder, Inc.
LANL	Los Alamos National Laboratory
lbs/ac	pounds per acre
mm	millimeter/millimeters
mS/cm	microSiemens per centimeter
ND	not detected
NM	not measured
NMED	New Mexico Environment Department
NTUs	nephelometric turbidity units
OD	outer diameter
ppm	parts per million
psi	pounds per square inch
RCTs	Radiation Control Technicians
TD	total depth
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
Spectrum	Spectrum Exploration, Inc.

ABSTRACT

Intermediate wells LAOI-3.2 and LAOI-3.2a were installed in Los Alamos Canyon in the northern portion of Los Alamos National Laboratory (LANL) in accordance with the “Final Drilling Plan for Characterization Wells R-6, R-18, R-33 and R-34” and the “Drilling Work Plan for Intermediate Well LAOI-3.2a,” respectively. The work was funded and directed by the US Department of Energy and contracted by the US Army Corps of Engineers. Kleinfelder, Inc. conducted the drilling, installation, testing and sampling activities with technical assistance from LANL. The wells were installed to monitor perched intermediate groundwater zones in Los Alamos Canyon.

Core samples were collected at regular intervals for stratigraphic and geochemical analysis. The stratigraphy encountered at LAOI-3.2 included, in descending order, Quaternary Alluvium, Otowi Member of the Bandelier Tuff and the Guaje Pumice Bed. At LAOI-3.2a, the Puye Formation and the Cerros del Rio basalt were encountered below the Guaje Pumice Bed.

LAOI-3.2 was drilled in February 2005 with a target depth of 300 feet (ft) below ground surface (bgs); however, drilling was halted at 165 ft bgs to install a perched intermediate zone monitoring well for groundwater encountered in the Guaje Pumice Bed. LAOI-3.2 was installed to 165 ft bgs with a single screened interval from 153.3 to 162.8 ft bgs; the water level after well installation was 135.95 ft bgs. Perchlorate was tentatively detected in the perched intermediate zone screening sample at LAOI-3.2 at 0.0074 parts per million (ppm), but was not detected in the three other LAOI-3.2 samples. Nitrate (as nitrogen) was detected at 1.25 and 1.37 ppm in both of the groundwater samples collected near the end of well development from LAOI-3.2, but not in the alluvial or perched zone screening samples collected during drilling. The average hydraulic conductivity for the perched intermediate zone at LAOI-3.2 is 12.5 ft per day.

LAOI-3.2a was drilled to reach the original LAOI-3.2 target depth of 300 ft bgs to identify potential deeper perched water zones. An initial corehole for LAOI-3.2a was cored in December 2005. However, the corehole had to be abandoned due to complications that occurred at the end of drilling; the abandoned corehole is called LAOI-3.2a(plugged). In January 2006, LAOI-3.2a was cored to 266.9 ft bgs and a well was installed to 194.1 ft bgs with a single screened interval between 181.4 and 191 ft bgs in the Puye Formation. The water level in LAOI-3.2a was 177.50 ft bgs after well installation and development. Perchlorate was detected in the screening sample from LAOI-3.2a(plugged) and in the final sample from LAOI-3.2a at 0.0046 and 0.0006 ppm, respectively. Nitrate (as nitrogen) was detected at 3.46 and 3.11 ppm in the LAOI-3.2a(plugged) and LAOI-3.2a samples, respectively. The average hydraulic conductivity of the perched intermediate zone at LAOI-3.2a is 13.2 ft per day.

1.0 INTRODUCTION

This completion report summarizes the site preparation, drilling, well construction, well development, aquifer testing and related activities for Intermediate Wells LAOI-3.2 and LAOI-3.2a drilled at Los Alamos National Laboratory (LANL). The work was funded and directed by the U.S. Department of Energy (DOE) and contracted by the U.S. Army Corps of Engineers (USACE). Kleinfelder, Inc. (Kleinfelder) conducted the drilling, installation, testing and sampling activities for both wells, with technical assistance from LANL personnel.

LAOI-3.2 was called for in the “Los Alamos Canyon and Pueblo Canyon, Intermediate and Regional Aquifer Groundwater Work Plan” (LANL 2003). It was designated as a Phase I corehole to be drilled to investigate the presence of perched groundwater observed in the Puye Formation on the video log from Otowi-4. The scope of work at LAOI-3.2 was outlined in the “Sampling and Analysis Plan for Drilling and Testing Regional Characterization Wells R-6 and R-18 and Intermediate Characterization Well LAOI-3.2” (LANL 2004) and in the “Final Drilling Plan for Characterization Wells R-6, R-18, R-33 and R-34” (Kleinfelder 2004a).

LAOI-3.2 was cored in February 2005 with a target depth of 300 feet (ft) below ground surface (bgs); however, drilling was halted at 165 ft bgs to install a perched intermediate zone monitoring well for groundwater encountered in the Guaje Pumice Bed. LAOI-3.2 was installed to 165 ft bgs with a single screened interval from 153.3 to 162.8 ft bgs; the water level after well installation was 135.95 ft bgs.

A second well, LAOI-3.2a, was then drilled in order to reach the original LAOI-3.2 target depth of 300 ft bgs to identify potential deeper perched water zones. LAOI-3.2a was drilled in accordance with “Drilling Work Plan for Intermediate Well LAOI-3.2a” (Kleinfelder 2005a). An initial corehole for LAOI-3.2a was cored in December 2005. However, the corehole, called LAOI-3.2a(plugged), had to be abandoned due to complications that occurred at the end of drilling. In January 2006, LAOI-3.2a was cored to 266.9 ft bgs. A well was installed to 194.1 ft bgs with a single screened interval between 181.4 and 191 ft bgs in the Puye Formation. The water level in LAOI-3.2a was 177.50 ft bgs after installation and development.

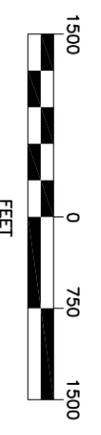
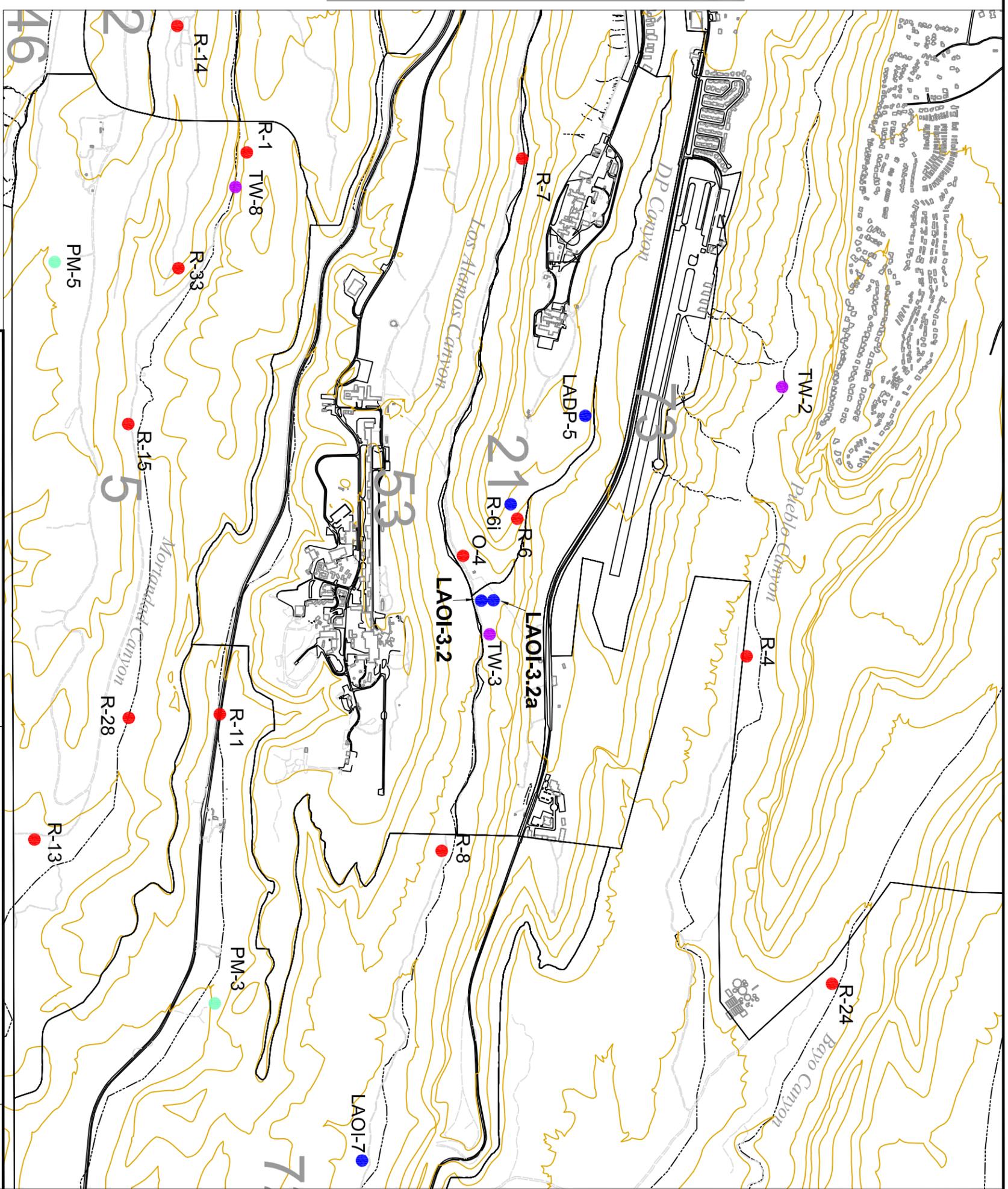
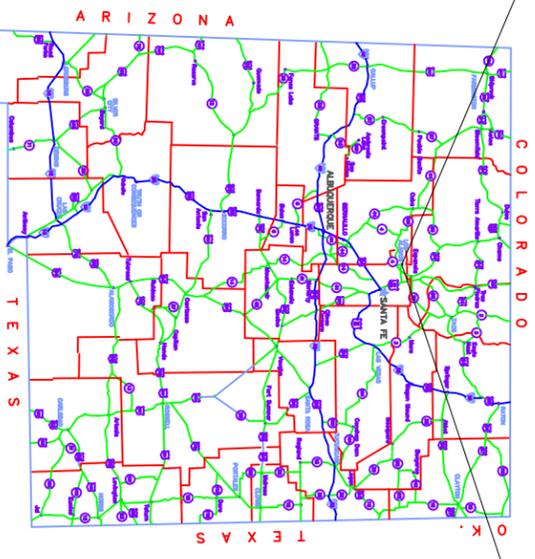
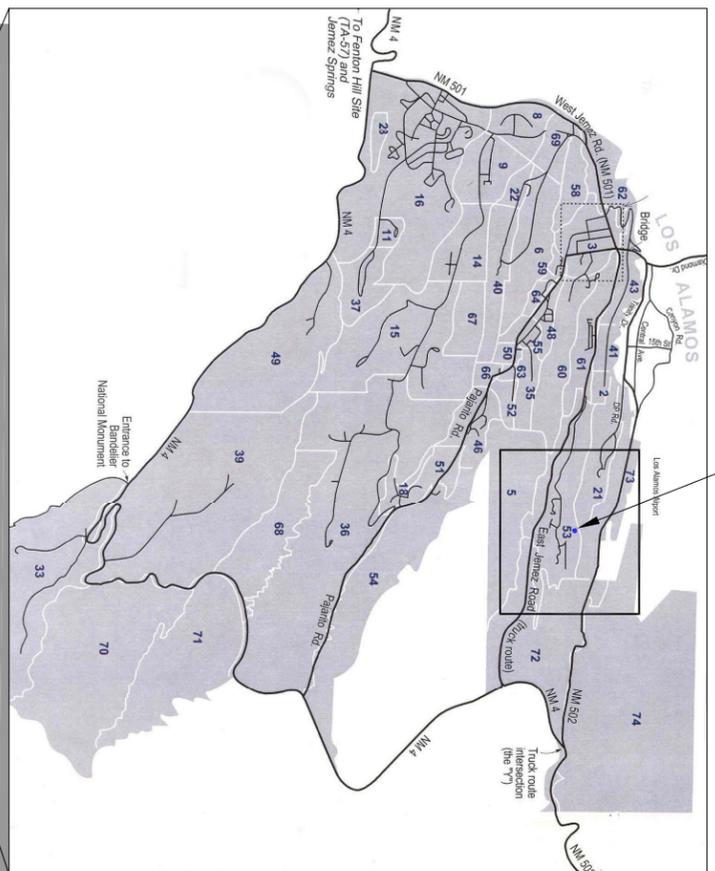
The wells are located east of regional well R-6 at the confluence of Los Alamos and DP canyons, as shown in Figure 1.0-1. Post-installation activities for both wells included well development, aquifer testing, groundwater sampling, pump installation and wellhead surveying. Site restoration will commence once approval to discharge drilling fluids has been obtained from the New Mexico Environment Department (NMED).

The information presented in this report was compiled from field reports and activity summaries generated by Kleinfelder, LANL and subcontractor personnel. Original records, including field reports, field logs and survey records, are on file in Kleinfelder’s Albuquerque office and will be submitted to the LANL Records Processing Facility at the completion of the project. Results of these activities are discussed briefly and are shown in tables and figures contained in this report. Detailed analysis and interpretation of geologic, geochemical and aquifer data will be included in separate technical documents to be prepared by LANL.

The main body of this report describes the key activities conducted during the drilling and construction of LAOI-3.2. Section 10 of this report provides a summary of drilling and installation activities for LAOI-3.2a.

Legend

- = Regional aquifer wells
- = Intermediate perched zone wells
- = Older test wells
- = Water supply wells
- 58** = Technical area identification
- = 100-ft contours



KLEINFELDER	
Drawn By: C. Bhongir	Date: May 2006
Project No.: 49436	Filename: Figure 1.0-1.dwg
Scale: 1" = 1500'	Revision: -

SITE LOCATION MAP
Intermediate Wells LAOI-3.2 and LAOI-3.2a
Los Alamos Canyon
Los Alamos, New Mexico

FIGURE 1.0-1

2.0 PRELIMINARY ACTIVITIES

Preliminary activities included the preparation of administrative planning documents and drill site preparation.

2.1 Administrative Preparation

Kleinfelder received contractual authorization for LAOI-3.2 as a notice to proceed on June 3, 2004. The following documents were prepared to guide implementation of the scope of work for LAOI-3.2: Project Management Plan (Kleinfelder 2003a), Contractor's Quality Management Plan (Kleinfelder 2003b), Final Drilling Plan for Characterization Wells R-6, R-18, R-33 and R-34 (Kleinfelder 2004a), Storm Water Pollution Prevention Plan (Kleinfelder 2004b) and Site-Specific Health and Safety Plan (Kleinfelder 2004c).

2.2 Site Preparation

Site grading was not required for LAOI-3.2. Radiation control technicians (RCTs) from LANL's Health, Safety and Radiation Protection Group-1 screened the site and equipment prior to drilling. Best management practices, also known as BMPs, consisted of hay bales that were installed around the perimeter of the drill site to control storm water and prevent erosion. The BMPs were inspected and repaired as required by the National Pollutant Discharge Elimination System, Construction General Permit as summarized in the Storm Water Pollution Prevention Plan (Kleinfelder 2004b).

An office trailer, generators and safety lighting equipment were moved to the site during the mobilization of drilling equipment. Safety barriers and signs were installed at the drill pad entrance. During drilling, cuttings were bagged and stored on pallets at the drill site; water generated from the borehole was stored onsite in 55-gallon (gal.) drums.

3.0 DRILLING ACTIVITIES

Spectrum Exploration, Inc. (Spectrum) drilled LAOI-3.2 to 165 ft bgs from February 2 to 17, 2005, with a Stratostar 15 hollow-stem auger drill rig. The rig was equipped with 8.25-inch (in.) outer diameter (OD)/4.5-in. inner diameter (ID) augers and a 3.0-in. OD 5-ft-long split-spoon sampler. The drill crew and two site geologists conducted the coring generally in 12-hour (hr) shifts, with 10 days on and 4 days off. A chronology of drilling and associated activities for LAOI-3.2 is presented in Table 3.0-1. No fluids were introduced at LAOI-3.2, but 2,475 gal. of water were removed from the corehole during coring.

On February 2, 2005, Spectrum began drilling with the auger rig and collecting core in 5-ft-long runs. At approximately 15 ft bgs, a boulder was encountered and the rig was pulled off of the original location, which was backfilled with bentonite. They moved the rig 4 ft to the north and began collecting core from 15 ft bgs. The core run from 15 to 17.5 ft bgs was saturated.

On February 3, the crew drilled to 18 ft bgs; water was measured at 15.8 ft bgs. On February 4, the hole was advanced to 25 ft bgs; the crew pulled the augers up a few feet and measured water at 22.2 ft bgs. The hole was drilled to 45 ft bgs and two bags of bentonite chips were added that filled the hole from 45 to 39 ft bgs. The depth to water (DTW) was measured at 12.9 ft bgs and a groundwater sample was collected. Based on moisture observations of the core, the perched alluvial saturated zone extended from approximately 15 to 25 ft bgs. The crew then over-drilled

Table 3.0-1
Chronology of Activities for LAOI-3.2

TASK	LAOI-3.2 DATES											
	Feb-05	Mar-05	Apr-Jun	Jul-05	Aug-05	Sep-Oct	Nov-05					
DRILLING/SAMPLING												
Mobilization	2/1											
Coring	2/2 - 17											
Groundwater Screening Sampling	2/4	2/15										
LOGGING												
Geophysical Logging		2/17										
WELL CONSTRUCTION												
WELL DEVELOPMENT		2/25 - 3/1										
GROUNDWATER WELL SAMPLING				7/15 - 23								
AQUIFER TESTING				7/23								
PUMP INSTALLATION					8/2-5							
SITE RESTORATION^(a)											11/9	

^(a) Site Restoration will begin in Summer 2006 after NMED permission to discharge is received and noise restrictions for the spotted owl mating system are lifted.

the hole with 15-in. OD augers to 40 ft bgs and plugged the hole to 20 ft bgs with bentonite to seal off the perched alluvial zone.

On February 7, Spectrum redrilled the hole and added two more bags of bentonite in an attempt to seal off the perched zone. However, water was still present at 13.5 ft bgs in the hole. At that point, project personnel decided to set conductor casing to seal off the shallow water zone.

On February 8, Spectrum prepared 12-in. OD conductor casing to be installed in the borehole. On February 9, the crew planned to drill to 60 ft bgs with 15-in. augers in preparation for installing the conductor casing. However, after drilling to 42 ft bgs, the borehole was producing water and project personnel decided to set casing to 40 ft bgs instead. The crew set up berms of hay bales covered with black plastic to contain the water and cuttings. On February 10, 12-in. OD conductor casing was set to 37.5 ft bgs.

On February 14, the hole was advanced and cored to 110 ft bgs with 8.25-in. OD augers. A water level measurement was attempted on the morning of February 15 and the hole was dry. The crew augered and collected core to 150 ft bgs; saturation was encountered at approximately 140 ft bgs. A sample from the perched intermediate zone groundwater was collected.

On February 16, DTW was measured between 133.4 and 134.3 ft bgs and the borehole depth was 145 ft bgs, indicating 5 ft of slough had accumulated in the hole. On the 17th, project personnel instructed the crew to advance the hole to 155 ft bgs and run a gamma log. Then the project personnel directed the crew to drill an additional 10 ft to a final total depth (TD) of 165 ft bgs and set a groundwater monitoring well with a 10-ft screened interval. The crew advanced the hole and collected core to 165 ft bgs.

4.0 SAMPLING ACTIVITIES

This section describes the core and groundwater sampling activities at LAOI-3.2.

4.1 Core Sampling

Lithologic core was continuously collected at LAOI-3.2 using a 3.0-in. OD split-spoon sampler. The drilling plan specified that core samples were to be collected for laboratory analysis every 10 ft to a depth of 100 ft bgs and at 50-ft intervals thereafter. Radiological screening samples were to be collected every 50 ft. Samples were generally collected as specified in the drilling plan. Table 4.1-1 shows the core samples collected and submitted for laboratory analysis.

The core from LAOI-3.2 was labeled and archived in core boxes and submitted to the Field Support Facility. LANL RCTs screened all core before it was removed from the site.

4.2 Groundwater Sampling

Two screening groundwater samples were collected from the open hole at LAOI-3.2, one from the shallow perched zone from 12.9 to 15.9 ft bgs (GWL2-04-53835) and one from perched intermediate zone groundwater at approximately 140 ft bgs (GWL2-04-53836). Two final samples were collected from the completed well near the end of well development, one from 158.8 ft bgs (EU05070G32L01) and one from 152.3 ft bgs (EU05070G32L02). Table 4.2-1 summarizes the information for the four groundwater samples collected from LAOI-3.2.

**Table 4.1-1
Core Samples at LAOI-3.2**

Sample Number	Date	Sample Interval (ft bgs)	Radio-logical Screening	Anions, Moisture	Metals	H ³ ^a	D ² H + O ¹⁸ O ¹⁶ ^b	Am ²⁴¹ + GS + ISO Pu + Sr ⁹⁰ ^c
GWL2-04-53841	2/2/05	3.9-5.2	X	X	X	X	X	X
GWL2-04-53842	2/2/05	14.4-18.2	X	X	X	X	X	X
GWL2-04-53843	2/4/05	27.5-29.1	X	X	X	X	X	X
GWL2-04-53844	2/7/05	36.1-37.5	X	X	X	X	X	X
GWL2-04-53845	2/14/05	43.2-44.7	X	X	X	X	X	X
GWL2-04-53846	2/14/05	53.4-57.0	X	X	X	X	X	X
GWL2-04-53847	2/14/05	66.3-67.7	X	X	X	X	X	X
GWL2-04-53848	2/15/05	75.9-77.3	X	X	X	X	X	X
GWL2-04-53849	2/16/05	85.8-87.3	X	X	X	X	X	X
GWL2-04-53850	2/16/05	94.2-98.3	X	X	X	X	X	X
GWL2-04-53851	2/16/05	143.3-144.8	X	X	X	X	X	X

^atritium^bdeuterium and oxygen isotopes^camericium-241, gamma spectroscopy, plutonium isotopes and strontium-90

**Table 4.2-1
Groundwater Samples at LAOI-3.2**

Sample Number	Date	Sample Depth (ft bgs)	Corehole Depth (ft bgs)	Water-bearing Unit
GWL2-04-53835	2/4/05	~12.9 to 15.9 ^a	39	Quaternary alluvium
GWL2-04-53836	2/15/05	~140 ^a	150	Otowi Member/Guaje Pumice Bed
EU05070G32L01	7/23/05	158.8 ^b	164.5	Guaje Pumice Bed
EU05070G32L02	7/23/05	152.3 ^b	164.5	Guaje Pumice Bed

^a Sample collected with disposable plastic bailer just below water level in open corehole^b Sample collected from completed well near the end of well development

5.0 BOREHOLE LOGGING

Video logs were not run at LAOI-3.2. However, a video log was run at LAOI-3.2a(plugged) and that log is included in Appendix A. A gamma log was run at LAOI-3.2 on February 17, 2005, from 0 to 152 ft bgs. Table 5.1-1 contains key information related to the gamma log run.

**Table 5.1-1
Borehole Logging at LAOI-3.2**

Operator	Date	Tools	Cased Footage (ft bgs)	Drilled Depth (ft bgs)	Logged Interval (ft bgs)	Remarks
Kleinfelder	2/17/05	Gamma	0-37.5	155	0-152	8.25-in. augers in hole from surface to TD.

6.0 HYDROGEOLOGY

A brief description of the hydrogeology encountered at LAOI-3.2 is presented below. LANL's Earth and Environmental Science Group 6 (EES-6) staff and site geologists identified the LAOI-3.2 and LAOI-3.2a geologic contacts. Drilling observations, video logs and water level measurements were used to describe groundwater.

6.1 Stratigraphy

Borehole stratigraphy for both LAOI-3.2 and LAOI-3.2a is presented below in order of youngest to oldest geologic units. LAOI-3.2 was drilled to a TD of 165 ft bgs in the Guaje Pumice Bed; LAOI-3.2a was drilled to 266.9 ft bgs in the Cerros del Rio basalt. The entire stratigraphic section from both wells is presented in this section for completeness. Some samples collected from LAOI-3.2a(plugged) were also used to compile the lithologic log. The lithologic descriptions were derived as follows:

- 0 to 165 ft bgs interval is from LAOI-3.2.
- 165 to 200 ft bgs interval is from LAOI-3.2a.
- 200 to 229.2 ft bgs interval is from LAOI-3.2a(plugged).
- 229.2 to 266.9 ft bgs interval is from LAOI-3.2a.

Figure 6.1-1 shows the stratigraphy at LAOI-3.2; a detailed lithologic log for both wells is presented in Appendix C.

Quaternary Alluvium, Qal, (0 to 26.8 ft bgs)

Quaternary alluvium consisted predominantly of unconsolidated, poorly sorted silty/clayey sand with a gravel lens from 13.8 to 19.7 ft bgs. The sand was angular to subrounded and comprised of felsic crystals and intermediate composition volcanics. The gravel was composed of intermediate composition volcanics and tuff fragments.

Otowi Member of the Bandelier Tuff, Qbo (26.8 to 147 ft bgs)

The ash flows of the Otowi Member contained yellowish brown to very pale orange non to poorly welded vitric tuff. The tuff deposits contained 10 to 25% felsic crystals, 5 to 20% lithics and 2 to 15% vitric pumice in a fine ash matrix.

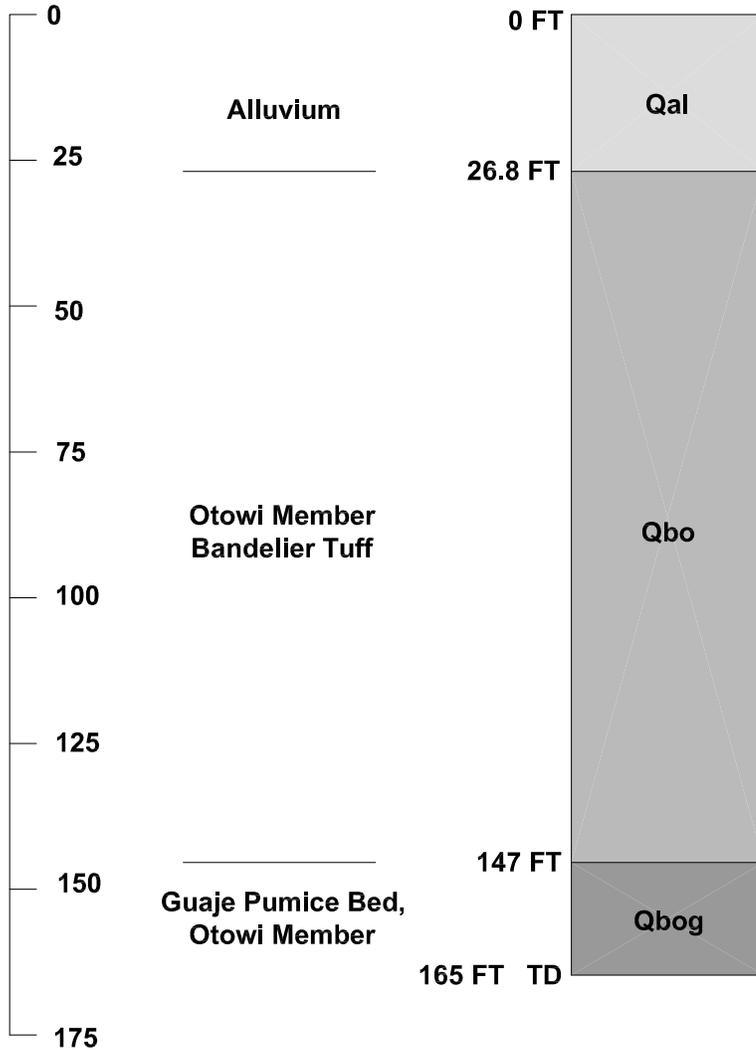
Guaje Pumice Bed of the Otowi Member, Qbog (147 to 170 ft bgs)

The Guaje Pumice Bed was white to very light gray, non-welded vitric pumice with felsic phenocrysts and 2 to 10% lithics.

Puye Formation, Tpf (170 to 266.5 ft bgs)

The Puye Formation consisted of a coarse-grained facies in the upper 30 ft that was underlain by a fine-grained facies in the lower 66.5 ft. The upper coarse facies contained medium dark gray to dark yellowish brown conglomerate comprised of 50 to 95% gravel with 5 to 50% sand. The gravel was predominantly angular to subangular, intermediate composition volcanic clasts that ranged from 15 to 30 millimeters (mm) in size. The sand was also composed of intermediate composition volcanics with lesser amounts of felsic and mafic crystals. The fine-grained facies contained two sets of coarsening-upward sequences of siltstone/claystone deposits overlain by

DEPTH (ft)



DRILLING INFORMATION

DRILLING COMPANY/PERSONNEL

Spectrum Exploration
Dave Starnes

DRILL RIG Stratastar 15

DRILLING METHOD

HOLLOW-STEM AUGER

DRILLING FLUID TYPE

BENTONITE WATER
 POLYMER None

DRILLING BEGAN

DATE 02/02/05 TIME 08:10

DRILLING END

DATE 02/17/05 TIME 16:30

Note:
Geologic contacts are preliminary and
subject to change.



KLEINFELDER

BOREHOLE SUMMARY DATA SHEET

Intermediate Well LAOI-3.2

Los Alamos Canyon

Los Alamos, New Mexico

FIGURE

6.1-1

G:\Environ\49436 - DOE Mordantad Canyon\DOE-LANL_2005-06_Drilling\Project Plans\Fact Sheets\LAOI-3.2\Figure\Revision\Figure 6.1-1.dwg

sandstone. The sandstones were moderate brown to moderate yellowish brown, poorly to well indurated, and moderately sorted. They contained between 70 and 90% subangular to subrounded sand and 5 to 30% silt/clay; the lower sandstone interval contained 5% gravel.

The siltstone/claystone deposits were moderate brown to yellowish brown, well sorted and poorly to well indurated. They contained 70 to 85% silt/clay, 10 to 30% sand and the upper siltstone/sandstone unit had 5 to 10% gravel.

Cerros del Rio basalt, Tb4 (266.5 to 266.9 ft bgs)

The Cerros del Rio basalt was black and vesicular; the aphanitic groundmass contained 2% olivine phenocrysts that were pale yellow to pale greenish yellow and up to 0.5 mm in size.

6.2 Groundwater

Perched alluvial groundwater was present in the surficial alluvium from approximately 15 to 25 ft bgs during drilling. Perched intermediate groundwater was encountered at approximately 140 ft bgs in the lower portion of the Otowi Member and extended to approximately 200 ft bgs in the Puye Formation, based upon moisture observations in core.

6.3 Preliminary Hydrochemistry

Perchlorate was tentatively detected in the perched intermediate zone screening sample at LAOI-3.2 at 0.0074 parts per million (ppm), but was not detected in the other LAOI-3.2 samples. Nitrate (as nitrogen) was detected at 1.25 and 1.37 ppm in both groundwater samples collected near the end of well development from LAOI-3.2. The concentration of total organic carbon (TOC) in LAOI-3.2 near the end of development was 0.52 ppm. Appendix D contains a brief summary of the analytical results.

7.0 WELL DESIGN AND CONSTRUCTION

This section summarizes the well design and well construction activities at LAOI-3.2.

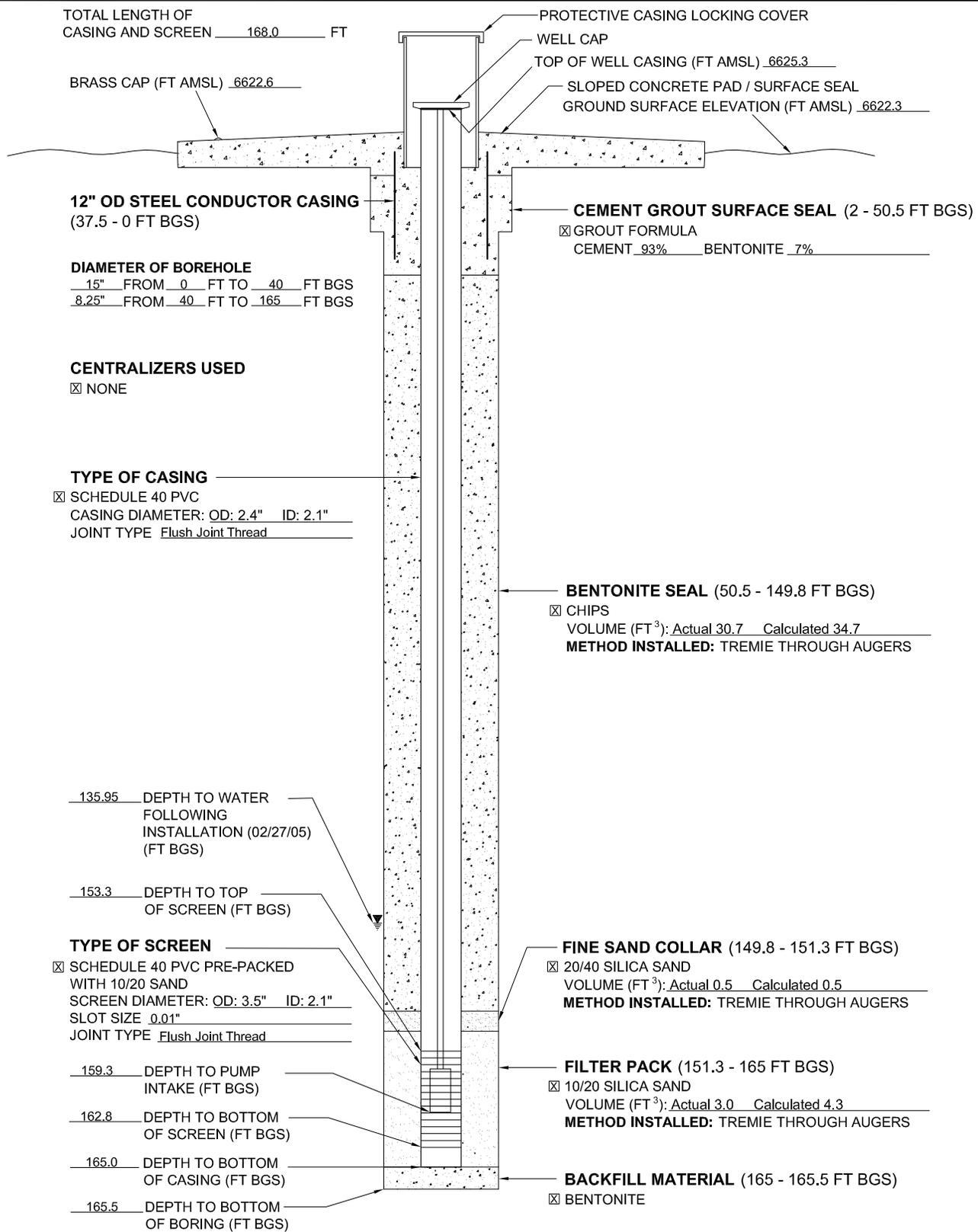
7.1 Well Design

LAOI-3.2 was designed in accordance with LANL Standard Operating Procedure 05.01, Well Construction, Revision 3 (LANL 2001). DOE and LANL provided an approved well design to Kleinfelder; the NMED reviewed and concurred with the well design prior to well installation. The well was designed with a single screened interval to monitor perched intermediate zone groundwater quality within the Guaje Pumice Bed.

7.2 Well Construction

LAOI-3.2 was constructed of 2.4-in. OD/2.1-in. ID schedule 40 PVC casing with flush joint threads. The well screen is a 9.5-ft-long section of 3.5-in. OD/2.1-in. ID PVC prepacked screen containing 10/20 sand and 0.01-in. slots. The casing and screen were factory-cleaned and also decontaminated onsite. The screened interval in the completed well is 153.3 to 162.8 ft bgs. Figure 7.2-1 is an as-built schematic showing construction details for the completed well.

An initial attempt at well construction through the augers was unsuccessful because bentonite bridged inside the augers at approximately 90 ft bgs. After multiple attempts to break through the bridge, the drill crew reversed the augers and unscrewed the PVC below the bridge. The augers



WELL COMPLETION BEGAN
DATE 02/25/05 TIME 10:20

WELL COMPLETION FINISHED
DATE 03/01/05 TIME 15:45

WELL DEVELOPMENT INFORMATION
DEVELOPMENT METHOD
 SWABBING BAILING PUMPING
TOTAL PURGE VOLUME 1.197 GALLONS

FINAL PARAMETER MEASUREMENTS
pH 6.63
TEMPERATURE 13.7 °C
SPECIFIC CONDUCTANCE 141 μS/cm
TURBIDITY 2 NTUs



Drawn By: C. Bhongir	Date: April 2006
Project No.: 49436	Filename: Figure 7.2-1.dwg
Scale: Not-to-scale	Revision: -

WELL SCHEMATIC
Intermediate Well LAOI-3.2
Los Alamos Canyon
Los Alamos, New Mexico

FIGURE
7.2-1

G:\Environ\49436 - DOE Mordantad Canyon\DOE-LANL_2005-06_Drilling\Project Plans\Fact Sheets\LAOI-3.2\Figure\Revision\Figure 7.2-1.dwg

and 100 ft of PVC well casing were removed. The drill crew then over-drilled and removed the casing and screen from the borehole.

The second attempt to install the well was successful. Spectrum ran the augers back in the hole to approximately 165.5 ft bgs with a 4-in. thick wooden plug in the bottom. When the plug was knocked out, the downhole formation immediately began heaving into the augers. One-quarter bucket of bentonite Pel-plug was added through the augers and the driller inserted the center plug into the bottom of the auger string. The well screen and casing were placed into the hole through the augers. The formation again began heaving and entered the hole, pushing the casing up approximately 15 ft above ground surface. The driller used the rig tophead to push the casing back down and pulled several auger flights from the borehole.

The primary filter pack of 10/20 sand was added through a tremie inside the augers to the borehole from 165 to 151.3 ft bgs and was followed by 1.5 ft of the 20/40 fine sand collar. From 149.8 to 50.5 ft bgs, bentonite chips were added, again through the augers via a tremie. From 50.5 to 2 ft bgs, a cement grout seal consisting of 93% cement and 7% bentonite was mixed and poured in the borehole. Table 7.2-1 summarizes the volumes of annular fill materials used to complete LAOI-3.2.

**Table 7.2-1
Annular Fill Materials at LAOI-3.2**

Material	Volume
Surface seal: cement slurry	25.4 ft ³
Bentonite seal: bentonite chips	30.7 ft ³
Fine sand collar: 20/40 silica sand	0.5 ft ³
Primary filter: 10/20 silica sand	3.0 ft ³
Bentonite backfill	0.2 ft ³

ft³ = cubic feet

8.0 POST-INSTALLATION ACTIVITIES

This section describes the activities that were performed after the well was installed, including well development, aquifer testing, pump installation, wellhead construction and surveying.

8.1 Well Development

The well was initially developed by bailing and swabbing to remove formation fines. The swabbing tool was a 12.5-ft long, 1.25-in. OD pipe with a 1.75-in. circular leather disc at the bottom. It was lowered into the well and drawn across the screened interval intermittently during the initial stages of development. A 19.7-ft-long, 1.2-in. OD stainless steel bailer was then used to bail water from the well. Approximately 500 gal. of water were removed during swabbing and bailing. During the final stage of well development, a 1.75-in. OD Grundfos submersible pump was used. The pump intake was staged over 2 days within and slightly above the screened interval at the following approximate depths: 155, 159.4, 161.4, 158.8 and 152.3 ft bgs. Approximately 697 gal. of water were removed by pumping over the 2-day period.

During the pumping phase of well development, pH, temperature, specific conductance and turbidity were measured. Samples were also collected near the end of development to measure TOC. The primary objective of development was to remove suspended sediment from the water until turbidity was less than 5 nephelometric turbidity units (NTUs) for three consecutive

samples. Water quality parameters measured over the course of development are shown in Figure 8.1-1.

The TOC concentration at the end of well development on July 23, 2005 was 0.52 ppm. Table 8.1-1 shows the volume of water removed during well development and aquifer testing and the resultant water quality parameters and TOC level.

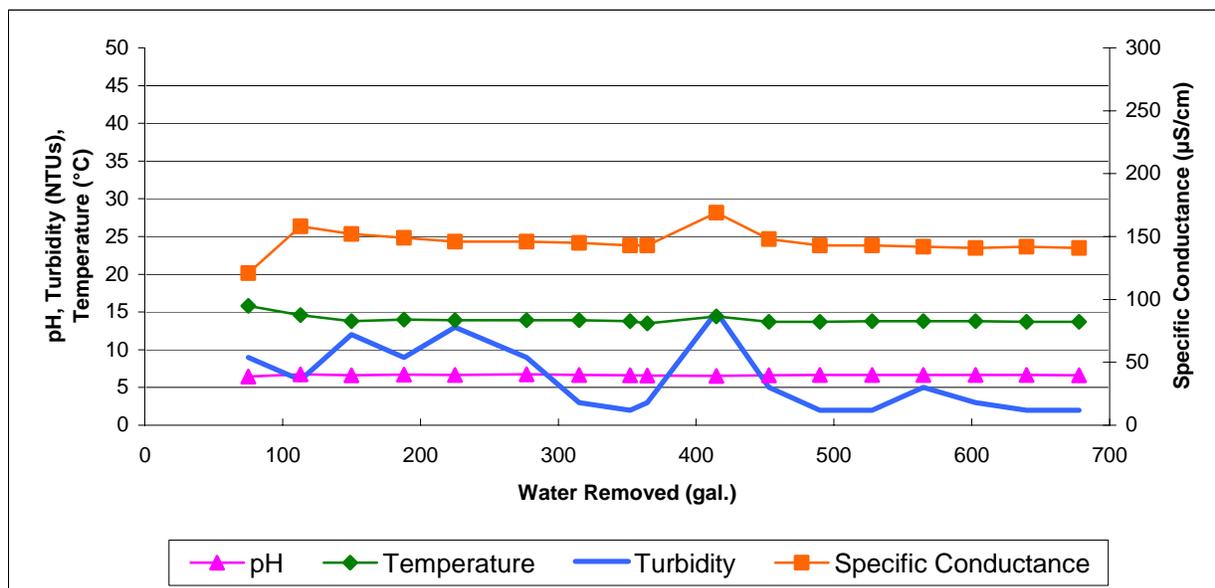


Figure 8.1-1. Water Quality Parameters During Development at LAOI-3.2

Table 8.1-1
Final Water Quality Parameters at LAOI-3.2

Method	Water Removed (gal.)	pH	Temperature (°C)	Specific Conductance (µS/cm)	Turbidity (NTUs)	TOC (ppm)
Bailing/Swabbing	500	7.21	13.3	179	off scale	NM
Pumping	697	6.63	13.7	141	2	0.52
Aquifer Test	1,278	NM	NM	NM	NM	NM

NM = Not Measured; µS/cm = microSiemens/centimeter

8.2 Aquifer Testing

A 4-hr pumping test was conducted at LAOI-3.2 on August 5, 2005; an earlier test on August 2, 2005 was terminated due to an equipment malfunction. A written report summarizing the LAOI-3.2 pumping and recovery tests is presented in Appendix E. The following key points were obtained from the pumping and recovery tests at LAOI-3.2:

- Water level changes in LAOI-3.2 were nearly identical to barometric pressure changes, implying essentially a 100% barometrically efficient saturated perched zone.

- Comparison of computed transmissivity and hydraulic conductivity to lower-bound values supports the conclusion that most of the saturated zone transmissivity occurs within the screened interval. This conclusion seems consistent with the lithologic log showing a finer-grained portion of the Guaje Pumice Bed above the screen.
- The average hydraulic conductivity is 12.5 ft per day in the Guaje Pumice Bed at LAOI-3.2.
- All of the observed data showed strong boundary effects, suggesting that the pumped zone is severely limited in areal extent.

8.3 Dedicated Sampling System Installation

A dedicated 1.7-in. OD by 30-in. long Campbell bladder pump, Monoflex model, was installed at LAOI-3.2 on November 9, 2005. The pump intake is set at 159.3 ft bgs.

8.4 Wellhead Completion

A reinforced 2,500 pounds per square inch (psi) concrete pad, 2.3-ft wide by 2.3-ft long by 6-in. thick, was installed around the well casing to provide long-term structural integrity for the well. A brass survey cap was embedded in the northwest corner of the pad. A 4-in. diameter steel casing with locking lid protects the well riser. The pad is slightly elevated with base course gravel graded up around the pad.

8.5 Geodetic Survey

ASTS, Inc. of Albuquerque, New Mexico performed a geodetic survey of the wellhead and the data are presented in Table 8.5-1.

**Table 8.5-1
Geodetic Data for LAOI-3.2**

Description	Northing	Easting	Elevation ^a
Brass cap in LAOI-3.2 pad	1773066.93	1637642.10	6622.6
Top of stainless-steel casing	1773066.63	1537643.27	6625.3
Ground surface	1773066.61	1637540.80	6622.3

^a Measured in ft above mean sea level (amsl) relative to the National Geodetic Vertical Datum of 1929.

8.6 Site Restoration

Site restoration activities have not begun at the LAOI-3.2/LAOI-3.2a site. Site restoration will begin when waste characterization analytical results are received and NMED permission to discharge has been granted. A memorandum will be issued summarizing the analytical results and site restoration activities.

Fluid sample results will be compared to the State of New Mexico Water Quality Control Commission Regulation 3103 groundwater standards and applicable Resource Conservation and Recovery Act regulatory limits. Drilling and development water will be discharged in accordance with the “Workplan Notice of Intent Decision Tree,” revised July 15, 2002.

Site restoration activities will include land-surface application of recovered drilling water and spreading containerized cuttings over the site. The site will then be reseeded. The seed mix will be applied at a rate of 20 pounds per acre (lbs/ac) and will include Indian rice grass, mountain broom, blue stem, sand drop and slender wheat grass seed. Biosol fertilizer will be applied at a rate of 800 lbs/ac.

9.0 DEVIATIONS FROM PLANNED ACTIVITIES

Appendix F compares the actual drilling and well construction activities performed at LAOI-3.2 with the planned activities described in the Drilling Plan (LANL 2004a). For the most part, drilling, sampling and well construction at LAOI-3.2 were performed as specified in the drilling plan. The main deviations from planned activities are:

- Borehole Depth – The planned borehole depth was 300 ft bgs; however, drilling was halted at 165 ft bgs to install a perched intermediate zone monitoring well within the Guaje Pumice Bed.
- Centralizers – Because of the narrower borehole diameter at LAOI-3.2, centralizers could not be used.

10.0 CHARACTERIZATION WELL LAOI-3.2a

Kleinfelder received contractual authorization as a notice to proceed for LAOI-3.2a on May 27, 2005. The following documents were prepared to guide the implementation of the scope of work for LAOI-3.2a: Final Drilling Work Plan for Intermediate Well LAOI-3.2a (Kleinfelder 2005a), Contractor's Quality Management Plan (Kleinfelder 2005b), Site-Specific Health and Safety Plan (Kleinfelder 2005c) and the Storm Water Pollution Prevention Plan (Kleinfelder 2005d).

LAOI-3.2a was drilled to determine if perched water was present between 165 ft bgs, the installed depth of LAOI-3.2, and 300 ft bgs, the target depth of LAOI-3.2. The drilling plan called for core samples to be collected from 150 to 300 ft bgs (Kleinfelder 2005a) and perched water samples to be collected below 150 ft bgs, if free water was encountered. Prior to drilling, BMPs consisting of hay bales were installed around the perimeter of the drill site to control storm water and prevent runoff.

LAOI-3.2a(plugged)

An initial hole was drilled at the LAOI-3.2a site to a depth of 234.4 ft bgs between December 2 and 18, 2005; however, when the drill casing was removed from the hole prior to well construction, the stainless steel casing shoe was not retrieved. Multiple attempts to retrieve the shoe were unsuccessful. Another piece of drilling equipment, called an elevator, was lost downhole while the crew was attempting to retrieve the casing shoe. After attempts to retrieve both pieces of equipment were unsuccessful, project personnel decided to plug and abandon the first hole and move the rig 5 ft to the north to drill a new corehole for the LAOI-3.2a well.

The first corehole is now called LAOI-3.2a(plugged); it was backfilled with bentonite to 9 ft bgs and a cement grout seal was poured to ground surface. No fluids were introduced during drilling, and approximately 750 gal. of water were recovered from the borehole. Logging and sampling activities at LAOI-3.2a(plugged) will be presented as part of the LAOI-3.2a discussion that follows.

LAOI-3.2a

LAOI-3.2a was drilled between January 4 and 12, 2006, to a total depth of 266.9 ft bgs; the monitoring well was constructed between January 18 and 20, 2006.

Section 10.1 describes the drilling activities at LAOI-3.2a; the remainder of this section describes additional activities that were undertaken to complete the monitoring well.

10.1 Drilling Activities

LAOI-3.2a was drilled approximately 37.5 ft north of LAOI-3.2 (Figure 1.0-1). Spectrum drilled LAOI-3.2a to 266.9 ft bgs and completed it with one screened interval from 181.4 to 191 ft bgs in the perched intermediate zone within the Puye Formation. The drill crew and two site geologists carried out the drilling activities in 10-hr shifts, 5 days per week. Table 10.1-1 presents a chronology of drilling and associated activities for LAOI-3.2a. The plan for LAOI-3.2a was to drive casing to approximately 234 ft bgs [TD of LAOI-3.2a(plugged)]; cuttings were to be collected beginning at 150 ft bgs and continuous core was to be collected beginning at 234 ft bgs.

LAOI-3.2a was drilled with a Delta Base 540 track-mounted drill rig using the air-rotary casing hammer technique. Drilling fluids were not used, and approximately 7,778 gal. of water were recovered from LAOI-3.2a.

On December 4, 2005, Spectrum set up to drill LAOI-3.2a and advanced 6 $\frac{5}{8}$ -in. OD casing to 95 ft bgs. They used a 7.5-in. OD hammer bit to drill the borehole. On December 5, the hole was advanced to 185 ft bgs; water was encountered at approximately 150.5 ft bgs.

On December 6, casing was advanced to 200 ft bgs when the compressor hose developed a hole. On December 9, the hose was replaced and casing was advanced to 230 ft bgs; coring began at 229.2 ft bgs. Recovered core averaged 50% of the cored interval. On December 10, coring continued to a depth of 266.9 ft bgs; Cerros del Rio basalt was encountered at 266.5 ft bgs.

10.2 Sampling Activities

This section describes core and groundwater sampling at LAOI-3.2a and LAOI-3.2a(plugged).

10.2.1 Core Sampling

Continuous core was collected at LAOI-3.2a(plugged) from 200 to 234.3 ft bgs and in LAOI-3.2a from 229.2 to 266.9 ft bgs. One sample was collected for chemical analyses from LAOI-3.2a(plugged) and another one from LAOI-3.2a. Table 10.2-1 summarizes the core sample information.

Table 10.2-1
Core Samples at LAOI-3.2a(plugged) and LAOI-3.2a

Sample Number and Corehole	Date	Sample Interval (ft bgs)	Radio-logical Screening	Anions, Moisture, N ¹⁴ &N ¹⁵ ^a	Metals	H ³ ^b	D ² H + O ¹⁸ O ¹⁶ ^c	Am ²⁴¹ + GS + ISO Pu + Sr ⁹⁰ ^d
CALA-06-65449 LAOI-3.2a(plugged)	12/17/05	202.4- 204.5	X	X	X	X	X	X
CALA-06-64560 LAOI-3.2a	1/10/06	251.9- 253.9	X	X	X	X	X	X

^anitrogen 14 and 15 isotopes; ^btritium; ^cdeuterium and oxygen isotopes; ^damericium-241, gamma spectroscopy, plutonium isotopes and strontium-90

Table 10.1.1-1
Chronology of Activities

TASK	LAOI-3.2a DATES				
	Jan-06	Feb-06	Mar-06	Apr-06	May-06
DRILLING/SAMPLING					
Mobilization	1/4				
Drilling	1/4-10				
LOGGING					
Geophysical Logging	1/10-11				
WELL CONSTRUCTION	1/18-20				
WELL DEVELOPMENT		2/1-2			
GROUNDWATER WELL SAMPLING		2/2			
AQUIFER TESTING		2/9-10			
SITE RESTORATION^a					Pending. See footnote.

^a Site restoration will begin when NIMED permission to discharge fluids has been obtained.

The core from LAOI-3.2a and LAOI-3.2a(plugged) was labeled and archived in core boxes and submitted to the Field Support Facility. LANL RCTs screened all core before it was removed from the site.

10.2.2 Groundwater Sampling

One screening groundwater sample was collected from LAOI-3.2s(plugged) and another one from LAOI-3.2a. Sample information is shown in Table 10.2-2.

Table 10.2-2
Groundwater Samples at LAOI-3.2a(plugged) and LAOI-3.2a

Sample Number	Date	Sample Depth (ft bgs)	Corehole Depth (ft bgs)	Water-bearing Unit
EU05070GI32A01 LAOI-3.2a(plugged)	12/14/05	170 ^a	170	Puye Formation
EU05070GI32A02 LAOI-3.2a	2/2/06	~183.8 ^b	194.1	Puye Formation

^a Sample collected from discharge line while drilling.

^b Sample collected from completed well at the end of well development

10.3 Borehole Logging

A video log was run at LAOI-3.2a(plugged) in an attempt to look for the lost casing shoe; no video logs were run at LAOI-3.2a. Appendix A contains the video log of LAOI-3.2a(plugged). Array induction and natural gamma logs were run in both LAOI-3.2a(plugged) and LAOI-3.2a. Table 10.3-1 summarizes the geophysical logging at both holes. Data files from gamma and induction runs at LAOI-3.2a are included in Appendix B on the report CD.

Table 10.3-1
Borehole Logging at LAOI-3.2a(plugged) and LAOI-3.2a

Operator	Date	Tools	Cased Interval (ft bgs)	Borehole Depth (ft bgs)	Logged Interval (ft bgs)	Remarks
LAOI-3.2a(plugged)						
Kleinfelder	12/21/05	Video	Uncased	223	0-221	DTW = 167.5 ft bgs. Moist at 144.5 ft bgs. Water entering at 147, 155 and 160 ft bgs.
Kleinfelder	12/22/05	Induction	Uncased	223	0-223	None
Kleinfelder	12/22/05	Gamma	Uncased	223	0-223	None
LAOI-3.2a						
Kleinfelder	1/10/06	Induction	0-229	266.9	~239-265.5	None
Kleinfelder	1/10/06	Gamma	0-229	266.9	0-264.7	None
Kleinfelder	1/11/06	Induction	0-193	259.8	193-259.8	Slough in bottom of hole

10.4 Hydrogeology

This section addresses LAOI-3.2a stratigraphy, groundwater and preliminary hydrochemistry.

10.4.1 Stratigraphy

See Section 6.0 for a description of the stratigraphy at both LAOI-3.2 and LAOI-3.2a. Figure 10.4-1 presents a summary of the stratigraphy at LAOI-3.2a. Appendix C contains the lithologic log.

10.4.2 Groundwater

With drill casing in place to 230 ft bgs, perched intermediate zone groundwater appeared to stabilize at approximately 172.5 ft bgs in the open borehole after the TD of 266.9 ft bgs was reached. After the initial attempt at well construction, with the screened interval from 221 to 231 ft bgs, the well was dry. After the well was completed with a screened interval from 181.4 to 191 ft bgs, the depth to water stabilized at 177.5 ft bgs.

10.4.3 Preliminary Hydrochemistry

Perchlorate was detected in the screening sample from LAOI-3.2a(plugged) and in the final sample from LAOI-3.2a at 0.0046 and 0.0006 ppm, respectively. Nitrate (as nitrogen) was detected at 3.46 and 3.11 ppm in the LAOI-3.2a(plugged) and LAOI-3.2a samples, respectively. The complete analytical results and a brief summary are presented in Appendix D.

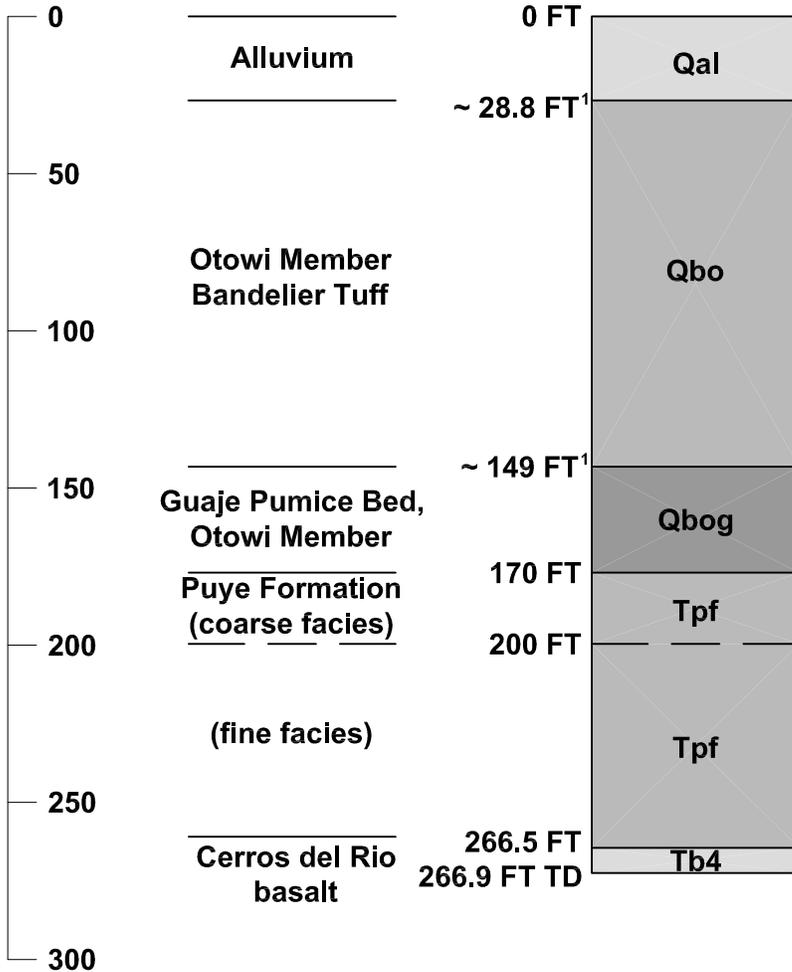
10.5 Well Design and Construction

The LAOI-3.2a well was designed in accordance with LANL ER SOP 05.01, Well Construction, Revision 3 (LANL 2001). DOE and LANL provided an NMED-approved well design to Kleinfelder. The initial well design for LAOI-3.2a called for the well screen to be installed between 221 and 231 ft bgs, based upon a possible productive zone shown on the induction log.

Prior to well installation, the bottom of the borehole was tagged at 250.1 ft bgs, indicating that 16.8 ft of slough had accumulated in the borehole. Bentonite pellets were placed in the bottom of the borehole to 235.7 ft bgs and the well casing was set in the borehole as planned. However, after the primary filter pack, fine sand collar and 5 ft of bentonite were placed in the annulus, the crew was instructed to bail water from the well and measure the recharge rate to assess the yield of the screened interval. The initial DTW was 221.4 ft bgs; it dropped approximately 1 ft over 5 hrs to 222.6 ft bgs. At that point 10 gal. were removed and the DTW dropped to 229.2 ft bgs. The water level stayed essentially the same over the next 5 hrs and by the next morning (14 hrs later) it had dropped to 231.8 ft bgs. Because the water was not recharging, LANL and DOE personnel decided to pull the well and screen and re-install it with a screened interval from approximately 181 to 191 ft bgs. That installation is described below.

LAOI-3.2a was constructed of 3.1-in. ID/3.5-in. OD stainless-steel casing fabricated to American Society of Testing and Materials (ASTM) A312 standards. One nominal 10-ft length of 3.5-in. OD, 0.020-in. rod-based wire-wrapped well screen was used for the screened interval between 181.4 and 191.0 ft bgs. The casing and well screen were factory-cleaned before shipment and delivery to the site. Centralizers were placed at 191.8, 176.3 and 94.9 ft bgs. Figure 10.5-1 is an as-built schematic of LAOI-3.2a.

DEPTH (ft)



DRILLING INFORMATION

DRILLING COMPANY/PERSONNEL

Spectrum Exploration
 D. Starnes, J. Sanchez, B. Parisien,
 S. Pacheco
 DRILL RIG DB-540

DRILLING METHOD

- HOLLOW-STEM AUGER
- MUD/WATER ROTARY
- HQ CORING RIG

DRILLING FLUID TYPE

- BENTONITE
- POLYMER
- WATER
- Air

182.3 ft bgs
 (01/12/06 after TD was reached)

DRILLING BEGAN

DATE 01/04/06 TIME 08:00

DRILLING END

DATE 01/10/06 TIME 10:10

Notes:

1. Contacts above 165 ft bgs are from LAOI-3.2 and have been adjusted for 2 ft higher ground surface at LAOI-3.2a.
2. Geologic contacts are preliminary and subject to change.

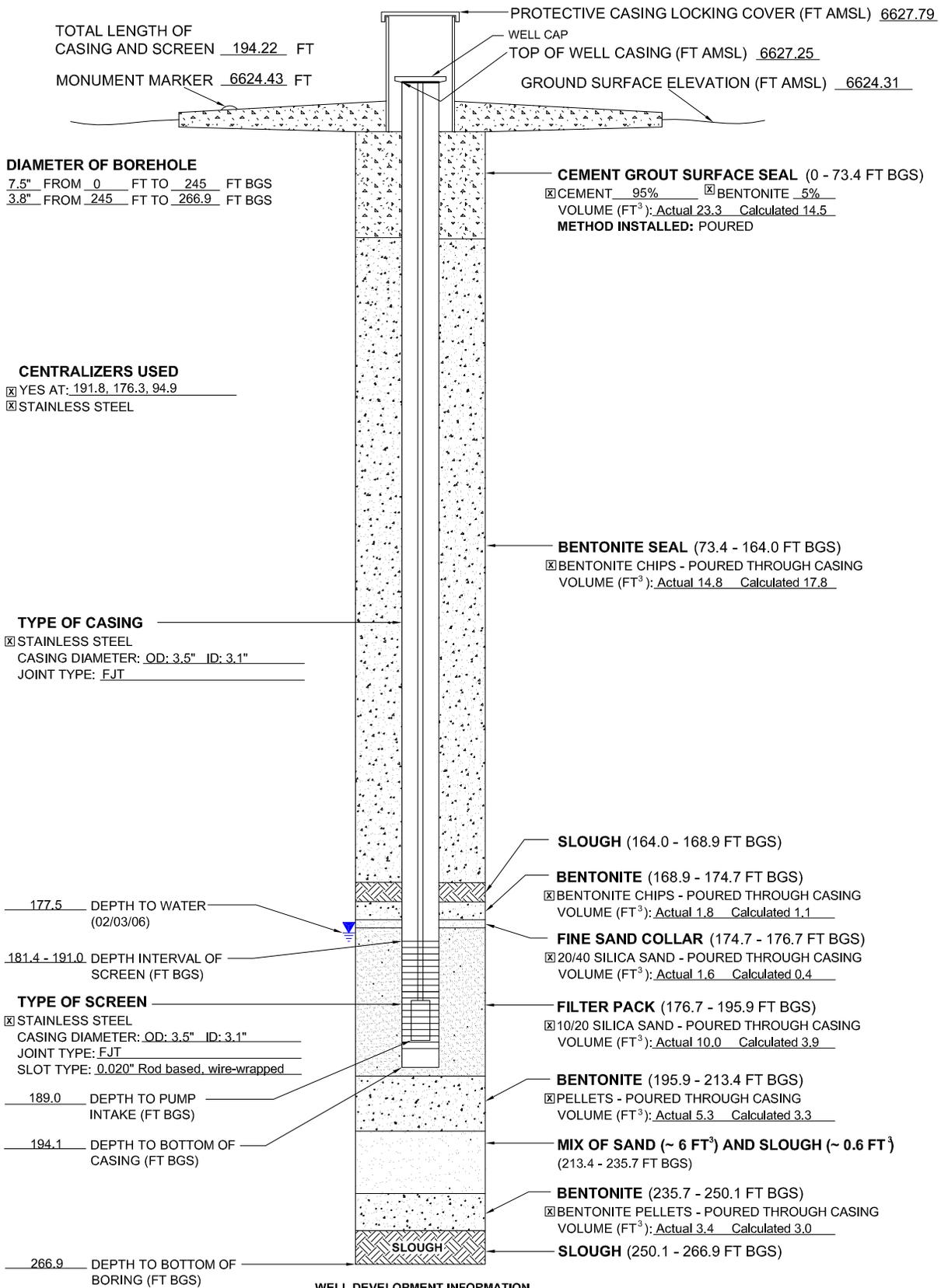


Drawn By: C. Bhongir	Date: May 2006
Project No.: 49436	Filename: Figure 10.4-1.dwg
Scale: not-to-scale	Revision: -

BOREHOLE SUMMARY DATA SHEET
 Intermediate Well LAOI-3.2a
 Los Alamos Canyon
 Los Alamos, New Mexico

FIGURE

10.4-1



WELL DEVELOPMENT INFORMATION

WELL COMPLETION BEGAN
 DATE 01/18/06 TIME 14:45
WELL COMPLETION FINISHED
 DATE 01/20/06 TIME 11:50

WELL DEVELOPMENT BEGAN
 DATE 02/01/06 TIME 10:15
WELL DEVELOPMENT FINISHED
 DATE 02/02/06 TIME 16:10

DEVELOPMENT METHOD
 SWABBING BAILING PUMPING
 TOTAL PURGE VOLUME 3,155 GALLONS

PARAMETER MEASUREMENTS

pH 6.9
 TEMPERATURE 15.1 °C
 SPECIFIC CONDUCTANCE 250 μS/cm
 TURBIDITY 3.9 NTUs



KLEINFELDER

Drawn By: C. Bhongir

Date: May 2006

Project No.: 49436

Filename: Figure 10.5-1.dwg

Scale: not-to-scale

Revision: -

WELL SCHEMATIC
Intermediate Well LAOI-3.2a
 Los Alamos Canyon
 Los Alamos, New Mexico

FIGURE

10.5-1

Prior to well construction, the borehole bottom was tagged at 213.4 ft bgs, indicating that 22.3 ft of filter pack sand, fine sand and slough from the first well construction attempt remained at the bottom of the borehole. Bentonite chips were placed between 213.4 and 195.9 ft bgs prior to well construction. The primary filter pack of 10/20 sand for the screened interval was placed from 195.9 to 176.7 ft bgs. A fine sand collar of 20/40 silica sand was then installed to 174.7 ft bgs. Bentonite was placed to 168.9 ft bgs and construction temporarily ceased so the water level in the well could be monitored. The DTW before bailing was 172.9 ft bgs; after 15 gal. of water were removed, the water level held steady over 2 hrs at approximately 173.2 ft bgs and the crew was given the go-ahead to finish the well installation.

The drill crew pulled the drill casing at this point to facilitate placement of annular materials. Slough was measured at 164 ft bgs after the drill casing was pulled. From that point, a bentonite seal was installed to 73.4 ft bgs. Cement grout slurry was then placed to ground surface. Table 10.5-1 summarizes the amounts of annular fill materials used to complete LAOI-3.2a.

Table 10.5-1
Annular Fill Materials at LAOI-3.2a

Material	Volume
Surface seal: cement grout slurry	23.3 ft ³
Bentonite seal: bentonite chips	16.6 ft ³
Fine sand collar: 20/40 silica sand	1.6 ft ³
Primary filter pack: 10/20 silica sand	10.0 ft ³
Bentonite pellets (backfill)	8.7 ft ³
Mix of sand/slough (installed for first filter pack)	~6.6 ft ³
Water	270 gal.

10.6 Post-Installation Activities

This section describes well development, aquifer testing, pump installation and the geodetic survey. Site restoration activities will commence after NMED permission to discharge is obtained.

10.6.1 Well Development

LAOI-3.2a was developed on February 1 and 2, 2006. Well development consisted of swabbing, bailing and pumping with a submersible pump. A total of 3,155 gal. of water was removed during development. Figure 10.6-1 shows the water quality parameters during development at LAOI-3.2a. Note that after approximately 2,000 gal. of water had been removed, the turbidity increased to 150 NTUs after the pump was turned off overnight; the turbidity measurements quickly returned to less than 5 NTUs.

Table 10.6-1 shows the volume of water removed during development and aquifer testing and the accompanying water quality parameters. TOC was measured at 0.92 ppm and was not detected (<0.1 ppm) in two samples collected near the end of development.

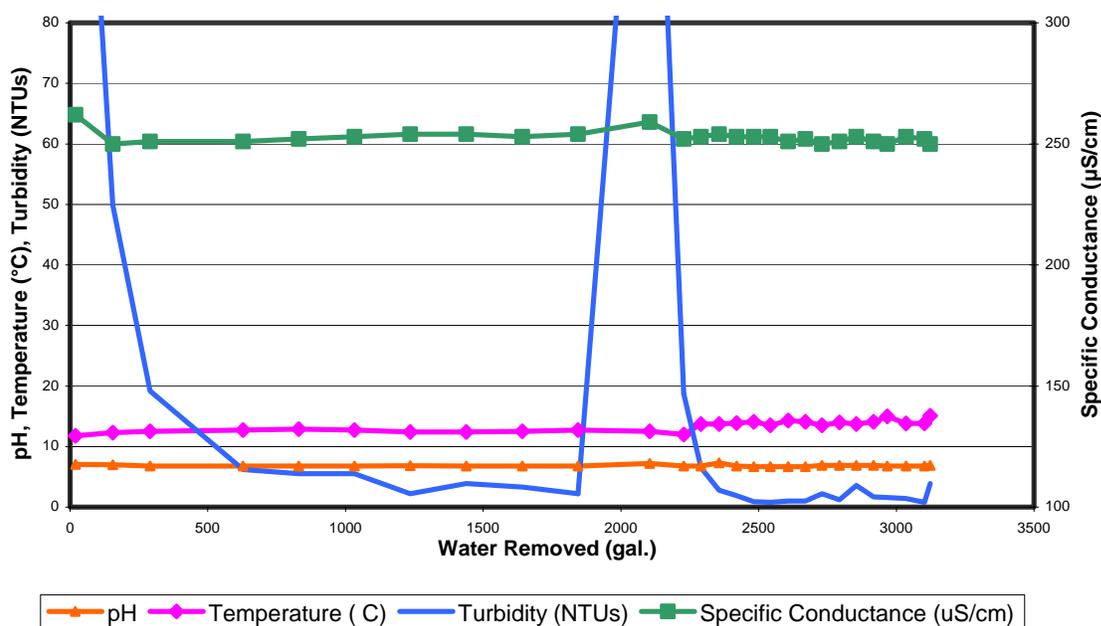


Figure 10.6-1. Water Quality Parameters During Development at LAOI-3.2a

**Table 10.6-1
Final Water Quality Parameters at LAOI-3.2a**

Method	Water Removed (gal.)	pH	Temperature (°C)	Specific Conductance (µS/cm)	Turbidity (NTUs)	TOC (ppm)
Bailing/Swabbing	20	7.4	11.4	317	Off scale	NM
Pumping	3,135	6.9	15.1	250	2.1	0.92 ND (<0.1)
Aquifer Testing	3,797	NM	NM	NM	NM	NM

ND = Not Detected

10.6.2 Aquifer Testing

A 24-hour constant rate pumping test was conducted at LAOI-3.2a on February 9 and 10, 2006; two trial tests were conducted on February 7. A written report summarizing the pumping and recovery tests is included in Appendix E. The key results from the LAOI-3.2a pumping and recovery tests are as follows:

- The barometric efficiency of LAOI-3.2a is essentially 100%.
- The static water level measured in LAOI-3.2a was 44 ft lower than that in LAOI-3.2, suggesting minimal hydraulic connection between the two zones.

- Five days after 3,135 gal. were withdrawn from LAOI-3.2a (over 2 days of pumping development), the water level at LAOI-3.2a was still depressed by 2.41 ft. Similarly, test pumping, which removed 3,797 gal. of water over a 3-day period, resulted in a water level decrease of 1.03 ft after 6 days of recovery. These results suggest severe lateral limits to the saturated perched intermediate zone.
- The average hydraulic conductivity of the perched intermediate zone in the Puye Formation at LAOI-3.2a is 13.2 ft per day.

10.6.3 Pump Installation

A dedicated 1.7-in. OD by 30-in. long Campbell bladder pump, Monoflex model, was installed at LAOI-3.2a. The pump intake is set at 189 ft bgs.

10.6.4 Wellhead Completion

A reinforced 4,000 psi concrete pad, 5-ft wide by 5-ft long by 6-in. thick, was installed around the well casing to provide long-term structural integrity for the well. A brass survey cap was embedded in the northwest corner of the pad. An 11-in. diameter steel casing with locking lid protects the well riser. The pad is slightly elevated, with base course gravel graded up around the concrete pad.

10.6.5 Geodetic Survey

ASTS Inc. of Albuquerque, New Mexico performed a geodetic survey of LAOI-3.2a and LAOI-3.2a(plugged). The survey data are presented in Table 10.6-2.

**Table 10.6-2
Geodetic Data for LAOI-3.2a and LAOI-3.2a(plugged)**

Description	Northing	Easting	Elevation ^a
LAOI-3.2a			
Brass cap in LAOI-3.2a pad	1773100.91	1637619.97	6624.43
Top of stainless-steel casing	1773100.10	1637621.99	6627.25
Ground surface	1773102.25	1637619.20	6624.31
LAOI-3.2a(plugged)	Pending	Pending	Pending

^a Measured in ft above mean sea level (amsl) relative to the National Geodetic Vertical Datum of 1929.

10.6.6 Site Restoration

Fluids produced during drilling and development were containerized and sampled in accordance with the July 12, 2005 “Waste Characterization Strategy Form” prepared for the 2005 well drilling program at LANL (Appendix C in Kleinfelder 2005a). Remaining site restoration activities at LAOI-3.2a will be conducted as specified in Section 8.6.

10.7 Deviations from Planned Activities

Appendix F compares the actual drilling and well construction activities performed at LAOI-3.2a with the planned activities described in the Drilling Plan (Kleinfelder 2005a). The deviations are as follows:

- Planned Depth – Target depth was 300 ft bgs; LAOI-3.2a was drilled to 266.9 ft bgs.
- Core – Drilling plan called for coring to begin at 150 ft bgs, just below the top of the Guaje Pumice Bed (147 ft bgs); when drilling started, LANL scientists approved core collection beginning at 170 ft bgs, the top of Puye Formation and the TD of LAOI-3.2. However, cores samples were collected from 200 to 234.3 ft bgs in LAOI-3.2a(plugged) and from 229.2 to 266.9 ft bgs at LAOI-3.2a. Core was not collected in the interval between 170 and 200 ft bgs in the Upper Puye Formation.
- Core Samples – The Drilling Plan called for samples for geochemical analysis to be collected at 50-ft intervals beginning at 150 ft bgs and continuing to TD. Samples were not collected in either LAOI-3.2a(plugged) or LAOI-3.2a at 150 ft bgs, but were collected from 202.4 to 204.5 ft bgs in LAOI-3.2a(plugged) and from 251.9 to 253.9 ft bgs in LAOI-3.2a. Note that a sample was collected for geochemical analysis from 143.3 to 144.8 ft bgs in LAOI-3.2 in 2005.

11.0 ACKNOWLEDGEMENTS

D. Schafer of Schafer and Associates conducted the aquifer tests and wrote the reports presented in Appendix E.

ASTS Inc. conducted the final geodetic survey of the wells and borehole.

P. Longmire of Los Alamos National Laboratory contributed the geochemistry section of this report.

Spectrum Exploration, Inc. drilled the coreholes at LAOI-3.2 and LAOI-3.2a.

12.0 REFERENCES

ASTM 2005, A312-05, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

Kleinfelder 2003a, Project Management Plan for DOE Monitoring Well Installation at Los Alamos National Laboratory, Contract Number 03-0029L-033-1009, Los Alamos, New Mexico, October 29, 2003.

Kleinfelder 2003b, Final Contractor's Quality Management Plan, Revision 1, Monitoring Well Installation, Los Alamos National Laboratory, USACE Task Order DACW05-03-F-0090, Contract GS-10F-0029L, November 24, 2003.

Kleinfelder 2004a, Final Drilling Plan for Characterization Wells, R-6, R-18, R-33 and R-34, Los Alamos National Laboratory, Los Alamos, New Mexico, July 8, 2004.

Kleinfelder 2004b, Storm Water Pollution Prevention Plan, Characterization Well R-6 and Intermediate Characterization Well LAOI-3.2, DP and Los Alamos Canyons, Los Alamos National Laboratory, Los Alamos, New Mexico, July 26, 2004.

Kleinfelder 2004c, Site-Specific Health and Safety Plan, Characterization Wells R-6 and LAOI-3.2, Los Alamos National Laboratory, Los Alamos, New Mexico, August 9, 2004.

Kleinfelder 2005a, Final Kleinfelder Drilling Work Plan for Intermediate Well LAOI-3.2a, Los Alamos National Laboratory, Los Alamos, New Mexico, October 31, 2005.

Kleinfelder 2005b, Contractor Quality Management Plan for the DOE Monitoring Well Installation at Los Alamos National Laboratory, W91238-04-F-0096, Revision 3, May 20, 2005.

Kleinfelder 2005c, Site-Specific Health and Safety Plan, Intermediate Well LAOI-3.2a, Los Alamos National Laboratory, Los Alamos, New Mexico, July 2005.

Kleinfelder 2005d, Storm Water Pollution Prevention Plan for Characterization and Intermediate Wells R-10, R-10a, R-16a, R-17, R-23i, R-24, R-27, R-3, CdV-16-2(i)r, LADP-5, LAOI-3.2a and LAOI-7, Los Alamos National Laboratory, Los Alamos, New Mexico, July 2005.

LANL 2001, Environmental Restoration Project Standard Operating Procedure 05.01, Well Construction, Revision 3, Los Alamos National Laboratory Report, Los Alamos, New Mexico, April 27, 2001.

LANL 2003, Los Alamos Canyon and Pueblo Canyon, Intermediate and Regional Aquifer Groundwater Work Plan, Los Alamos National Laboratory report, Los Alamos, New Mexico, LA-UR-03-9191.

LANL 2004, Sampling and Analysis Plan for Drilling and Testing Regional Characterization Wells R-6 and R-18 and Intermediate Characterization Well LAOI-3.2, Los Alamos National Laboratory report, Los Alamos, New Mexico, LA-UR-04-4375.

LANL 2005, Sampling and Analysis Plan for Calendar Year 2005 Wells: R-3, R-10, R-10a, R-16a, R-17, R-24, R-27, LAOI-3.2a, LAOI-7, LADP-5, R-23i and CDV-16-2(i)-r, Los Alamos National Laboratory report, Los Alamos, New Mexico, LA-UR-05-3445.

Appendix A

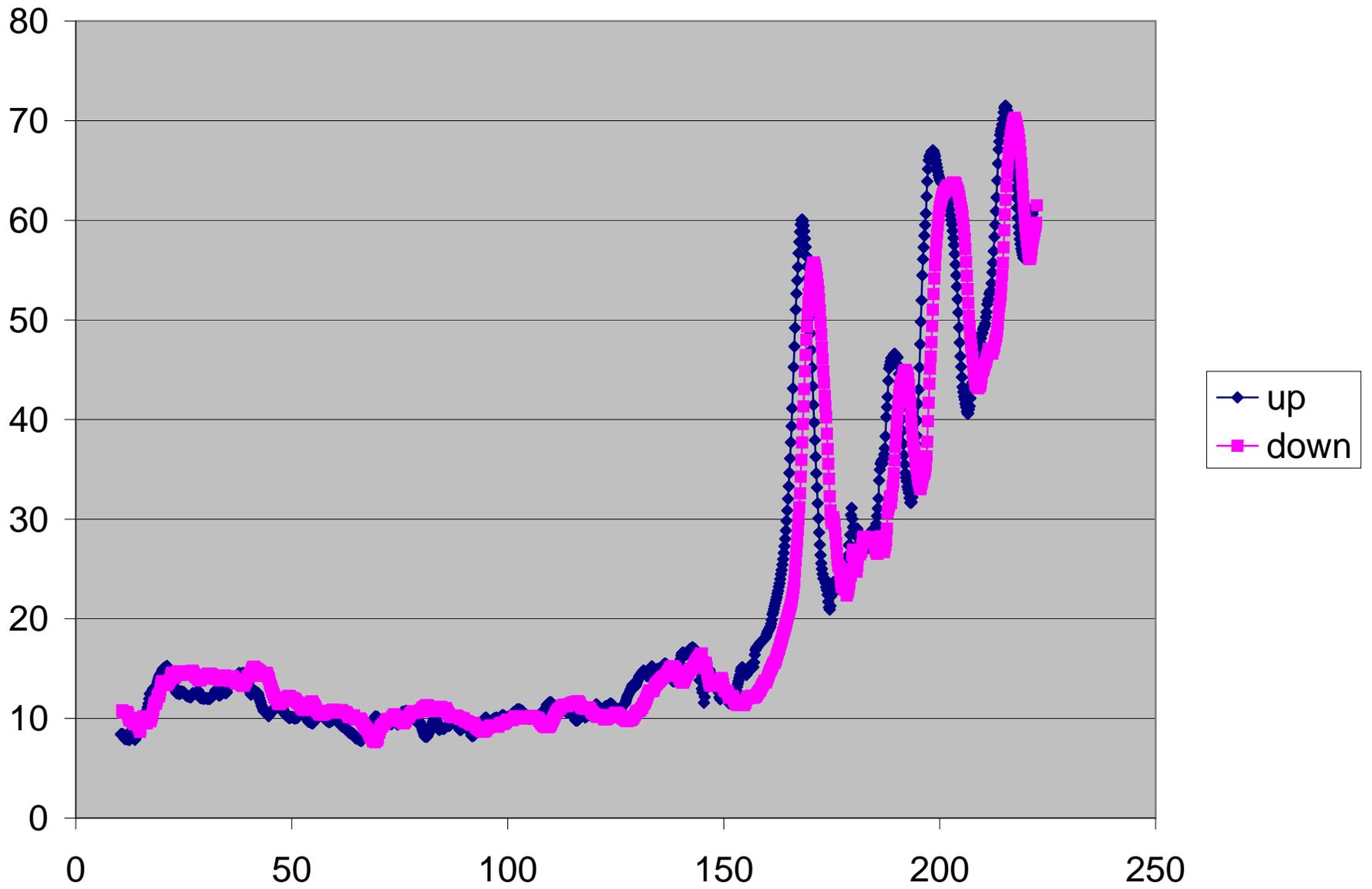
Borehole Video Log LAOI-3.2a(plugged)

***TO VIEW THE VIDEO
THAT ACCOMPANIES
THIS DOCUMENT,
PLEASE CALL THE
HAZARDOUS WASTE
BUREAU AT 505-476-6000
TO MAKE AN
APPOINTMENT***

Appendix B

Geophysical Logging Files

*Geophysical logging spreadsheets and charts
are located on the report CD.*



~VERSION INFORMATION

VERS .2.0 :CWLS LOG ASCII STANDARD-VERSION 2.0
WRAP .NO :ONE LINE PER DEPTH STEP

~WELL INFORMATION

STRT .FT 220.025 :START DEPTH
STOP .FT 10.7481 :STOP DEPTH
STEP .FT -0.163625 :STEP
NULL . -999.25 :NULL VALUE
COMP . kleinfelder :COMPANY
WELL . :WELL
FLD . :FIELD
LOC . Los Alamos :LOCATION
PROV . N/A :PROVINCE
SRVC . N/A :SERVICE COMPANY
DATE . 12-22-05 :DATE
UWI . N/A :UNIQUE WELL ID

~CURVE INFORMATION

DEPT .FT :DEPTH
COND .MS :Cond.
I__R .OHM-M :I. Res.

~PARAMETER INFORMATION

ELEV . :ELEVATION
STE . :STE
DENS . :DENSITY
CASI . :CASING TO1
OPER . :OPERATING RIG TIME
WGT1 . :WGT1
CASI . :CASING SIZE1
CASI . :CASING TO2
WGT2 . :WGT2
CASI . :CASING SIZE2
WELL . laoi3.2a :WELL ID
CASI . :CASING TO3
K.B. . :K.B.
WGT3 . :WGT3
TYPE . :TYPE LOG
CASI . :CASING SIZE3
CASI . :CASING TO4
SALI . :SALINITY
TITL . :TITLE
WGT4 . :WGT4
TOP . :TOP LOGGED INTERVAL
CASI . :CASING SIZE4
WITN . Rick Smith :WITNESSED BY
CASI . :CASING TO5
DRIL . :DRILLING MEAS. FROM
WGT5 . :WGT5
CASI . :CASING SIZE5
CTY . :CTY
WGT6 . :WGT6
CASI . :CASING SIZE6
MAX. . :MAX. REC. TEMP.
D.F. . :D.F.
CASI . :CASING TO6
OTHE . :OTHER SERVICES
BIT1 . 7.5" :BIT1
DEPT . :DEPTH-DRILLER

```

BIT2 . :BIT2
RUN . :RUN No
RUN1 . :RUN1
BIT3 . :BIT3
RUN2 . :RUN2
PERM . :PERMANENT DATUM
TWP . :TWP
BIT4 . :BIT4
LOG . :LOG MEAS. FROM
BIT . 0 :BIT FROM1
RUN3 . :RUN3
BIT5 . :BIT5
CASI . :CASING FROM1
TYPE . g.w @ 164ft :TYPE FLUID IN HOLE
RUN4 . :RUN4
FLD . :FLD
BIT6 . :BIT6
BIT . 223 :BIT TO1
CASI . :CASING FROM2
BIT . :BIT FROM2
CO . :CO
RGE . :RGE
BIT . :BIT TO2
DEPT . :DEPTH-LOGGER
CASI . :CASING FROM3
BIT . :BIT FROM3
RUN5 . :RUN5
SEC . :SEC
BIT . :BIT TO3
G.L. . :G.L.
CASI . :CASING FROM4
BIT . :BIT FROM4
RUN6 . :RUN6
BIT . :BIT TO4
BTM . :BTM LOGGED INTERVAL
CASI . :CASING FROM5
BIT . :BIT FROM5
STAT . :STATE
BIT . :BIT TO5
LEVE . :LEVEL
CASI . :CASING FROM6
BIT . :BIT FROM6
COUN . :COUNTRY
RECO . cember hardison :RECORDED BY
FILI . :FILING No
BIT . :BIT TO6
~OTHER
~A
220.025 57.0374 17.5324
219.861 55.9418 17.8757
219.698 55.5639 17.9973
219.534 55.8914 17.8918
219.37 56.9744 17.5517
219.207 58.1079 17.2094
219.043 59.3169 16.8586
218.88 60.5259 16.5219
218.716 61.6719 16.2148

```

218.552	63.0069	15.8713
218.389	64.304	15.5511
218.225	65.5508	15.2553
218.061	65.979	15.1563
217.898	65.9664	15.1592
217.734	66.1427	15.1188
217.571	66.4702	15.0443
217.407	67.5784	14.7976
217.243	68.5859	14.5802
217.08	69.3793	14.4135
216.916	69.6186	14.364
216.752	69.4801	14.3926
216.589	69.3164	14.4266
216.425	69.9083	14.3045
216.262	70.4498	14.1945
216.098	70.6639	14.1515
215.934	70.6639	14.1515
215.771	70.5002	14.1844
215.607	70.1098	14.2633
215.443	69.606	14.3666
215.28	69.2156	14.4476
215.116	68.9889	14.4951
214.953	68.5607	14.5856
214.789	67.7925	14.7509
214.625	67.1125	14.9004
214.462	66.0294	15.1448
214.298	64.3796	15.5329
214.134	62.6668	15.9574
213.971	61.206	16.3383
213.807	59.7829	16.7272
213.644	58.4983	17.0945
213.48	57.1508	17.4976
213.316	55.841	17.908
213.153	54.8587	18.2287
212.989	53.889	18.5567
212.825	52.957	18.8832
212.662	52.5918	19.0144
212.498	52.3903	19.0875
212.335	52.0755	19.2029
212.171	51.748	19.3244
212.007	51.6347	19.3668
211.844	50.7909	19.6886
211.68	50.3753	19.851
211.516	49.733	20.1074
211.353	49.2796	20.2924
211.189	49.2041	20.3235
211.026	48.99	20.4123
210.862	48.6122	20.571
210.698	48.524	20.6084
210.535	48.4107	20.6566
210.371	47.8062	20.9178
210.207	47.6424	20.9897
210.044	47.2017	21.1857
209.88	47.0253	21.2651
209.717	46.8113	21.3624
209.553	46.2823	21.6065
209.389	45.8163	21.8263

209.226	45.2622	22.0935
209.062	44.557	22.4432
208.898	44.4184	22.5132
208.735	44.2673	22.59
208.571	43.7887	22.8369
208.408	43.4235	23.029
208.244	43.1213	23.1904
208.08	42.3279	23.6251
207.917	41.3455	24.1864
207.753	40.9425	24.4245
207.589	40.5395	24.6673
207.426	40.3758	24.7673
207.262	40.4514	24.721
207.099	40.9174	24.4395
206.935	41.2196	24.2603
206.771	41.6604	24.0036
206.608	42.0382	23.7879
206.444	42.4286	23.569
206.28	42.8316	23.3472
206.117	43.6376	22.916
205.953	44.5821	22.4305
205.79	45.4889	21.9834
205.626	46.6853	21.42
205.462	48.1462	20.7701
205.299	49.6197	20.1533
205.135	50.9672	19.6205
204.971	52.3525	19.1013
204.808	53.5867	18.6613
204.644	54.695	18.2832
204.481	55.7403	17.9404
204.317	56.7729	17.614
204.153	57.579	17.3675
203.99	58.322	17.1462
203.826	58.9391	16.9667
203.662	59.3169	16.8586
203.499	59.7325	16.7413
203.335	60.3244	16.577
203.172	60.9289	16.4126
203.008	61.4704	16.268
202.844	61.9112	16.1522
202.681	62.3898	16.0283
202.517	62.8432	15.9126
202.353	63.095	15.8491
202.19	63.3973	15.7735
202.026	63.5484	15.736
201.863	63.5106	15.7454
201.699	63.6366	15.7142
201.535	63.6492	15.7111
201.372	63.7247	15.6925
201.208	63.7751	15.6801
201.044	63.901	15.6492
200.881	64.0648	15.6092
200.717	64.3796	15.5329
200.554	64.77	15.4392
200.39	65.0974	15.3616
200.226	65.513	15.2641
200.063	65.9664	15.1592

199.899	66.3065	15.0815
199.735	66.6465	15.0045
199.572	66.9487	14.9368
199.408	67.0999	14.9032
199.245	67.0621	14.9116
199.081	67.0243	14.92
198.917	66.8606	14.9565
198.754	66.6843	14.996
198.59	66.6213	15.0102
198.426	66.5331	15.0301
198.263	65.8405	15.1882
198.099	64.7574	15.4422
197.936	63.4603	15.7579
197.772	61.7979	16.1818
197.608	60.4503	16.5425
197.445	59.3799	16.8407
197.281	58.3346	17.1425
197.117	57.1508	17.4976
196.954	55.8536	17.9039
196.79	53.8134	18.5827
196.627	51.3198	19.4856
196.463	48.99	20.4123
196.299	46.3831	21.5596
196.136	44.091	22.6804
195.972	42.3656	23.604
195.808	40.7914	24.515
195.645	39.1164	25.5647
195.481	38.0963	26.2492
195.318	37.114	26.944
195.154	35.905	27.8513
194.99	34.8975	28.6553
194.827	34.1041	29.322
194.663	32.8699	30.423
194.499	32.0387	31.2122
194.336	31.9128	31.3354
194.172	31.8372	31.4098
194.009	32.0009	31.2491
193.845	32.4165	30.8485
193.681	32.744	30.54
193.518	33.0336	30.2722
193.354	33.4366	29.9073
193.19	33.9404	29.4634
193.027	34.3434	29.1177
192.863	35.0864	28.5011
192.7	35.9428	27.822
192.536	36.9377	27.0726
192.372	38.0208	26.3014
192.209	39.3305	25.4255
192.045	40.3003	24.8137
191.881	41.8493	23.8953
191.718	43.285	23.1027
191.554	44.2169	22.6158
191.39	44.9222	22.2607
191.227	45.8919	21.7903
191.063	46.2193	21.636
190.9	46.4083	21.5479
190.736	46.7735	21.3796

190.572	47.0253	21.2651
190.409	47.0128	21.2708
190.245	46.6853	21.42
190.081	46.4334	21.5362
189.918	46.4712	21.5187
189.754	46.3957	21.5537
189.591	46.0934	21.6951
189.427	45.7408	21.8623
189.263	45.6148	21.9227
189.1	44.7585	22.3421
188.936	43.222	23.1364
188.772	41.7485	23.9529
188.609	41.0055	24.387
188.445	39.2424	25.4827
188.282	37.5674	26.6188
188.118	36.7614	27.2024
187.954	36.3584	27.504
187.791	35.6531	28.048
187.627	35.8798	27.8708
187.463	35.8924	27.861
187.3	35.6783	28.0282
187.136	35.3509	28.2878
186.973	34.3938	29.075
186.809	32.8825	30.4113
186.645	31.3838	31.8635
186.482	30.5904	32.69
186.318	29.7467	33.6172
186.154	29.1673	34.2849
185.991	28.9029	34.5986
185.827	28.7014	34.8415
185.664	28.6132	34.9489
185.5	28.4495	35.15
185.336	28.651	34.9028
185.173	28.4117	35.1968
185.009	28.0717	35.6231
184.845	27.7442	36.0435
184.682	27.4798	36.3904
184.518	27.0138	37.0181
184.355	26.7745	37.3489
184.191	27.0516	36.9664
184.027	27.2783	36.6592
183.864	27.2027	36.761
183.7	27.0768	36.932
183.536	27.0642	36.9492
183.373	27.1523	36.8293
183.209	27.1145	36.8806
183.046	27.5176	36.3404
182.882	27.8702	35.8806
182.718	27.5931	36.2409
182.555	27.3035	36.6254
182.391	27.3664	36.5411
182.227	27.7191	36.0763
182.064	27.7694	36.0108
181.9	28.651	34.9028
181.737	28.6888	34.8568
181.573	28.5628	35.0105
181.409	27.9835	35.7353

181.246	28.4495	35.15
181.082	28.5251	35.0569
180.918	29.0792	34.3889
180.755	29.0666	34.4038
180.591	30.5904	32.69
180.428	30.6534	32.6228
180.264	29.2681	34.1669
180.1	27.316	36.6085
179.937	27.2783	36.6592
179.773	26.5982	37.5965
179.609	25.7796	38.7904
179.446	25.3514	39.4455
179.282	24.9736	40.0423
179.119	24.558	40.7199
178.955	24.3313	41.0993
178.791	24.6462	40.5743
178.628	24.2558	41.2273
178.464	24.1676	41.3777
178.3	23.8024	42.0126
178.137	23.8276	41.9682
177.973	23.1727	43.1542
177.81	23.0342	43.4138
177.646	23.1727	43.1542
177.482	23.7898	42.0348
177.319	23.5127	42.5302
177.155	22.883	43.7005
176.991	22.7949	43.8695
176.828	22.9334	43.6045
176.664	23.1349	43.2247
176.501	23.4749	42.5986
176.337	23.5505	42.4619
176.173	23.349	42.8284
176.01	23.0342	43.4138
175.846	22.4548	44.5338
175.682	21.4222	46.6807
175.519	20.7925	48.0944
175.355	20.8176	48.0362
175.192	21.1955	47.1799
175.028	21.8629	45.7395
174.864	22.543	44.3597
174.701	22.9208	43.6285
174.537	23.2608	42.9907
174.373	23.6764	42.2361
174.21	23.9157	41.8135
174.046	23.8528	41.9239
173.883	24.0794	41.5292
173.719	24.4824	40.8456
173.555	25.0869	39.8614
173.392	25.7544	38.8283
173.228	26.7241	37.4194
173.064	27.7442	36.0435
172.901	28.4369	35.1656
172.737	29.2807	34.1522
172.574	30.2126	33.0987
172.41	31.7365	31.5095
172.246	33.5122	29.8399
172.083	35.4642	28.1974

171.919	37.3659	26.7624
171.755	39.2802	25.4581
171.592	41.3455	24.1864
171.428	43.3731	23.0557
171.265	45.4007	22.0261
171.101	47.3024	21.1406
170.937	49.0404	20.3914
170.774	50.7153	19.7179
170.61	52.1384	19.1797
170.446	53.5112	18.6877
170.283	54.8083	18.2454
170.119	55.9669	17.8677
169.956	56.8989	17.575
169.792	57.8056	17.2994
169.628	58.6116	17.0615
169.465	59.2791	16.8693
169.301	59.7451	16.7378
169.137	60.0473	16.6535
168.974	60.1607	16.6222
168.81	59.871	16.7026
168.647	59.2036	16.8909
168.483	58.2716	17.161
168.319	57.113	17.5092
168.156	55.8032	17.9201
167.992	54.3423	18.4019
167.828	53.0452	18.8519
167.665	51.4961	19.4189
167.501	49.7456	20.1023
167.338	47.9321	20.8628
167.174	46.0052	21.7367
167.01	43.8139	22.8238
166.847	41.6982	23.9819
166.683	39.8721	25.0802
166.519	38.1593	26.2059
166.356	36.5095	27.3901
166.192	34.9857	28.5831
166.029	33.5374	29.8175
165.865	32.1647	31.09
165.701	30.9431	32.3174
165.538	29.7844	33.5746
165.374	28.8273	34.6893
165.21	27.9457	35.7836
165.047	27.1145	36.8806
164.883	26.3841	37.9016
164.72	25.7796	38.7904
164.556	25.1499	39.7616
164.392	24.6084	40.6366
164.229	24.1676	41.3777
164.065	23.7268	42.1464
163.901	23.3364	42.8515
163.738	22.9334	43.6045
163.574	22.6186	44.2115
163.411	22.2911	44.8609
163.247	21.9637	45.5297
163.083	21.6362	46.2187
162.92	21.334	46.8735
162.756	21.0066	47.6042

162.592	20.7421	48.2112
162.429	20.5028	48.7738
162.265	20.2887	49.2885
162.102	19.9991	50.0024
161.938	19.785	50.5434
161.774	19.5835	51.0635
161.611	19.3945	51.5609
161.447	19.1553	52.205
161.283	18.2485	54.799
161.12	17.9463	55.7219
160.956	17.9085	55.8395
160.793	17.8077	56.1554
160.629	17.8077	56.1554
160.465	17.8077	56.1554
160.302	17.7196	56.4348
160.138	17.6062	56.7981
159.974	17.5181	57.0839
159.811	17.1906	58.1712
159.647	16.5106	60.5673
159.484	16.5106	60.5673
159.32	16.5987	60.2456
159.156	16.6491	60.0633
158.993	16.6491	60.0633
158.829	16.6743	59.9726
158.665	16.6491	60.0633
158.502	16.6365	60.1088
158.338	16.5987	60.2456
158.175	16.5484	60.429
158.011	16.4728	60.7062
157.847	16.3846	61.0328
157.684	16.2587	61.5056
157.52	16.1831	61.7927
157.356	16.1957	61.7447
157.193	16.1076	62.0826
157.029	16.1076	62.0826
156.866	16.1076	62.0826
156.702	16.095	62.1312
156.538	16.0698	62.2286
156.375	16.0446	62.3263
156.211	15.969	62.6212
156.047	15.9187	62.8194
155.884	15.9313	62.7697
155.72	15.8935	62.9189
155.557	15.8053	63.2698
155.393	15.8053	63.2698
155.229	15.6038	64.0869
155.066	15.3897	64.9784
154.902	15.1001	66.2249
154.738	14.7097	67.9826
154.575	14.3444	69.7134
154.411	14.2185	70.3309
154.248	14.1807	70.5183
154.084	14.1429	70.7067
153.92	13.8785	72.0541
153.757	13.5007	74.0705
153.593	13.1858	75.8391
153.429	12.745	78.462

153.266	12.2916	81.3561
153.102	12.1657	82.1983
152.939	12.1657	82.1983
152.775	12.1279	82.4543
152.611	12.1657	82.1983
152.448	12.0901	82.712
152.284	11.7123	85.3801
152.12	11.8761	84.2031
151.957	12.5813	79.483
151.793	12.808	78.0762
151.63	12.9339	77.316
151.466	13.2488	75.4787
151.302	13.0976	76.3496
151.139	12.7828	78.2301
150.975	12.745	78.462
150.811	13.0095	76.8669
150.648	12.7954	78.1531
150.484	12.4176	80.531
150.321	12.1657	82.1983
150.157	11.8635	84.2925
149.993	11.8005	84.7423
149.83	12.405	80.6127
149.666	13.0347	76.7184
149.502	13.6266	73.3859
149.339	14.1052	70.8961
149.175	14.5459	68.7477
149.012	14.76	67.7505
148.848	14.9238	67.0073
148.684	15.0245	66.558
148.521	15.0497	66.4466
148.357	15.0245	66.558
148.193	15.1001	66.2249
148.03	15.1882	65.8405
147.866	15.2134	65.7315
147.703	15.2512	65.5687
147.539	15.1882	65.8405
147.375	14.9741	66.7819
147.212	14.5585	68.6883
147.048	14.0422	71.214
146.884	13.4629	74.2784
146.721	12.7954	78.1531
146.557	12.1657	82.1983
146.394	10.9063	91.6899
146.23	12.4302	80.4494
146.066	12.4176	80.531
145.903	12.5939	79.4035
145.739	13.2488	75.4787
145.575	14.483	69.0466
145.412	13.9666	71.5993
145.248	14.7097	67.9826
145.085	15.4275	64.8193
144.921	15.8935	62.9189
144.757	16.3217	61.2683
144.594	16.6113	60.1999
144.43	16.9262	59.0801
144.266	17.1529	58.2993
144.103	17.3166	57.7481

143.939	17.3418	57.6643
143.776	17.3921	57.4973
143.612	17.4803	57.2073
143.448	17.4677	57.2485
143.285	17.3669	57.5806
143.121	17.3418	57.6643
142.957	17.1529	58.2993
142.794	17.0143	58.774
142.63	16.9514	58.9923
142.467	16.8254	59.4339
142.303	16.6995	59.8821
142.139	16.5987	60.2456
141.976	16.4854	60.6598
141.812	16.4224	60.8924
141.648	16.4728	60.7062
141.485	16.3594	61.1268
141.321	16.2209	61.6488
141.158	15.9816	62.5718
140.994	15.7172	63.6247
140.83	15.3016	65.3528
140.667	14.9238	67.0073
140.503	14.5082	68.9268
140.339	14.1681	70.581
140.176	13.8533	72.1851
140.012	13.6266	73.3859
139.849	13.4251	74.4874
139.685	13.3369	74.9798
139.521	13.2866	75.264
139.358	13.1858	75.8391
139.194	13.1858	75.8391
139.03	13.3747	74.768
138.867	13.6644	73.183
138.703	13.8911	71.9888
138.54	14.1052	70.8961
138.376	14.2941	69.9591
138.212	14.483	69.0466
138.049	14.5459	68.7477
137.885	14.76	67.7505
137.721	14.9741	66.7819
137.558	15.1504	66.0047
137.394	15.1504	66.0047
137.231	15.0119	66.6138
137.067	14.8986	67.1206
136.903	14.7726	67.6928
136.74	14.6341	68.3336
136.576	14.5082	68.9268
136.412	14.42	69.3481
136.249	14.3822	69.5303
136.085	14.4326	69.2876
135.922	14.3822	69.5303
135.758	14.357	69.6523
135.594	14.3444	69.7134
135.431	14.2941	69.9591
135.267	14.2059	70.3933
135.103	14.1429	70.7067
134.94	14.1429	70.7067
134.776	14.1052	70.8961

134.613	14.1052	70.8961
134.449	14.1303	70.7697
134.285	14.1052	70.8961
134.122	13.9792	71.5348
133.958	13.8407	72.2508
133.794	13.5384	73.8638
133.631	13.2614	75.407
133.467	13.2236	75.6224
133.304	13.1858	75.8391
133.14	13.1228	76.203
132.976	13.1858	75.8391
132.813	13.2992	75.1928
132.649	13.4125	74.5573
132.485	13.4629	74.2784
132.322	13.5132	74.0015
132.158	13.4503	74.3479
131.995	13.4251	74.4874
131.831	13.4251	74.4874
131.667	13.3495	74.909
131.504	13.3369	74.9798
131.34	13.2488	75.4787
131.176	13.0599	76.5705
131.013	12.9213	77.3914
130.849	12.7198	78.6174
130.686	12.5813	79.483
130.522	12.468	80.2056
130.358	12.4554	80.2867
130.195	12.468	80.2056
130.031	12.5939	79.4035
129.867	12.6821	78.8516
129.704	12.7072	78.6953
129.54	12.6191	79.245
129.377	12.5435	79.7224
129.213	12.4176	80.531
129.049	12.342	81.024
128.886	12.2413	81.6909
128.722	12.1279	82.4543
128.558	12.0524	82.9713
128.395	11.8886	84.1139
128.231	11.7501	85.1056
128.067	11.6368	85.9345
127.904	11.6242	86.0276
127.74	11.5738	86.402
127.577	11.4605	87.2566
127.413	11.4101	87.6418
127.249	11.259	88.8182
127.086	11.133	89.8229
126.922	11.0323	90.6432
126.758	10.9441	91.3734
126.595	10.8811	91.9021
126.431	10.8308	92.3296
126.268	10.8308	92.3296
126.104	10.856	92.1154
125.94	10.9189	91.5841
125.777	10.9189	91.5841
125.613	10.9945	90.9547
125.449	11.2841	88.6199

125.286	11.6116	86.1209
125.122	12.0272	83.145
124.959	12.1783	82.1133
124.795	12.3042	81.2728
124.631	12.2539	81.6069
124.468	12.0524	82.9713
124.304	11.9264	83.8474
124.14	11.8761	84.2031
123.977	11.7879	84.8328
123.813	11.7375	85.1969
123.65	11.7501	85.1056
123.486	11.7375	85.1969
123.322	11.6242	86.0276
123.159	11.4101	87.6418
122.995	11.2338	89.0173
122.831	11.07	90.3338
122.668	10.9063	91.6899
122.504	10.856	92.1154
122.341	10.6545	93.8575
122.177	10.7048	93.4158
122.013	11.1708	89.5191
121.85	11.6368	85.9345
121.686	12.0272	83.145
121.522	12.2791	81.4395
121.359	12.2791	81.4395
121.195	12.0901	82.712
121.032	11.8635	84.2925
120.868	11.7375	85.1969
120.704	11.5738	86.402
120.541	11.4227	87.5452
120.377	11.2841	88.6199
120.213	11.07	90.3338
120.05	10.856	92.1154
119.886	10.7804	92.761
119.723	10.793	92.6528
119.559	10.8182	92.4371
119.395	10.7552	92.9783
119.232	10.7426	93.0873
119.068	10.73	93.1965
118.904	10.667	93.7467
118.741	10.667	93.7467
118.577	10.8685	92.0086
118.414	10.9441	91.3734
118.25	10.9441	91.3734
118.086	10.856	92.1154
117.923	10.7804	92.761
117.759	10.667	93.7467
117.595	10.5789	94.5279
117.432	10.5285	94.9802
117.268	10.4907	95.3222
117.105	10.3774	96.3634
116.941	10.3774	96.3634
116.777	10.3648	96.4804
116.614	10.4907	95.3222
116.45	10.6545	93.8575
116.286	10.9441	91.3734
116.123	11.2086	89.2174

115.959	11.536	86.685
115.796	11.8761	84.2031
115.632	12.002	83.3195
115.468	11.9642	83.5826
115.305	11.8005	84.7423
115.141	11.6368	85.9345
114.977	11.536	86.685
114.814	11.4479	87.3526
114.65	11.3723	87.933
114.487	11.4982	86.9699
114.323	11.6242	86.0276
114.159	11.7501	85.1056
113.996	11.6997	85.472
113.832	11.5864	86.3081
113.668	11.6368	85.9345
113.505	11.6242	86.0276
113.341	11.6242	86.0276
113.178	11.5738	86.402
113.014	11.6242	86.0276
112.85	11.6997	85.472
112.687	11.6368	85.9345
112.523	11.4982	86.9699
112.359	11.4856	87.0652
112.196	11.4227	87.5452
112.032	11.3849	87.8357
111.869	11.3849	87.8357
111.705	11.3597	88.0305
111.541	11.3597	88.0305
111.378	11.259	88.8182
111.214	11.2464	88.9177
111.05	11.2086	89.2174
110.887	11.196	89.3177
110.723	11.1582	89.6202
110.56	11.0826	90.2312
110.396	10.8685	92.0086
110.232	10.7804	92.761
110.069	10.7426	93.0873
109.905	10.6167	94.1915
109.741	10.5033	95.2079
109.578	10.4907	95.3222
109.414	10.453	95.6668
109.251	10.3144	96.9516
109.087	10.2011	98.0289
108.923	10.3144	96.9516
108.76	10.3144	96.9516
108.596	10.2766	97.3081
108.432	10.3144	96.9516
108.269	10.3648	96.4804
108.105	10.2515	97.5472
107.942	10.2389	97.6672
107.778	10.2011	98.0289
107.614	10.2389	97.6672
107.451	10.1633	98.3933
107.287	10.1885	98.1501
107.123	10.2389	97.6672
106.96	10.3648	96.4804
106.796	10.4152	96.0138

106.633	10.453	95.6668
106.469	10.4907	95.3222
106.305	10.5789	94.5279
106.142	10.6545	93.8575
105.978	10.667	93.7467
105.814	10.793	92.6528
105.651	10.9945	90.9547
105.487	11.1204	89.9246
105.324	11.1078	90.0266
105.16	11.0826	90.2312
104.996	11.0449	90.5399
104.833	11.1078	90.0266
104.669	11.2338	89.0173
104.505	11.2967	88.5211
104.342	11.4605	87.2566
104.178	11.4982	86.9699
104.015	11.3597	88.0305
103.851	11.3849	87.8357
103.687	11.5486	86.5905
103.524	11.5486	86.5905
103.36	11.3723	87.933
103.196	11.3849	87.8357
103.033	11.3219	88.3242
102.869	11.3723	87.933
102.706	11.4479	87.3526
102.542	11.3219	88.3242
102.378	11.3849	87.8357
102.215	11.4479	87.3526
102.051	11.3345	88.2261
101.887	11.133	89.8229
101.724	11.2338	89.0173
101.56	11.2086	89.2174
101.397	11.133	89.8229
101.233	11.196	89.3177
101.069	11.196	89.3177
100.906	11.133	89.8229
100.742	11.0449	90.5399
100.578	11.0323	90.6432
100.415	11.1582	89.6202
100.251	11.3849	87.8357
100.088	11.6368	85.9345
99.9239	11.8886	84.1139
99.7603	12.0272	83.145
99.5967	11.9642	83.5826
99.4331	11.8635	84.2925
99.2694	11.6746	85.6564
99.1058	11.5486	86.5905
98.9422	11.4982	86.9699
98.7786	11.4227	87.5452
98.6149	11.4101	87.6418
98.4513	11.3723	87.933
98.2877	11.3219	88.3242
98.1241	11.2086	89.2174
97.9604	11.133	89.8229
97.7968	11.1204	89.9246
97.6332	11.0323	90.6432
97.4696	11.0826	90.2312

97.3059	11.0071	90.8506
97.1423	10.9063	91.6899
96.9787	10.8182	92.4371
96.8151	10.7048	93.4158
96.6514	10.6293	94.0799
96.4878	10.7426	93.0873
96.3242	10.9567	91.2683
96.1606	11.2841	88.6199
95.9969	11.536	86.685
95.8333	11.6116	86.1209
95.6697	11.6116	86.1209
95.5061	11.6116	86.1209
95.3424	11.4856	87.0652
95.1788	11.2967	88.5211
95.0152	11.1204	89.9246
94.8516	10.9189	91.5841
94.6879	10.6922	93.5258
94.5243	10.5285	94.9802
94.3607	10.3144	96.9516
94.1971	10.0751	99.2542
94.0334	9.98698	100.13
93.8698	9.96179	100.384
93.7062	9.89882	101.022
93.5426	9.86104	101.409
93.3789	9.86104	101.409
93.2153	9.73511	102.721
93.0517	9.64695	103.66
92.8881	9.73511	102.721
92.7244	9.70992	102.987
92.5608	9.7477	102.588
92.3972	9.9492	100.511
92.2336	10.2011	98.0289
92.0699	10.4152	96.0138
91.9063	10.5033	95.2079
91.7427	10.453	95.6668
91.5791	10.4026	96.13
91.4154	10.453	95.6668
91.2518	10.667	93.7467
91.0882	10.9945	90.9547
90.9246	11.1078	90.0266
90.7609	10.9945	90.9547
90.5973	10.7426	93.0873
90.4337	10.4907	95.3222
90.27	10.2766	97.3081
90.1064	10.2137	97.908
89.9428	10.2389	97.6672
89.7792	10.3396	96.7155
89.6155	10.4907	95.3222
89.4519	10.6545	93.8575
89.2883	10.7048	93.4158
89.1247	10.7804	92.761
88.961	10.8685	92.0086
88.7974	10.8685	92.0086
88.6338	11.0071	90.8506
88.4702	11.1708	89.5191
88.3065	11.1078	90.0266
88.1429	10.9567	91.2683

87.9793	10.793	92.6528
87.8157	10.6545	93.8575
87.652	10.4655	95.5516
87.4884	10.3774	96.3634
87.3248	10.3648	96.4804
87.1612	10.3774	96.3634
86.9975	10.453	95.6668
86.8339	10.4655	95.5516
86.6703	10.4404	95.7822
86.5067	10.3774	96.3634
86.343	10.2515	97.5472
86.1794	10.2011	98.0289
86.0158	10.1129	98.8834
85.8522	10.0877	99.1303
85.6885	9.96179	100.384
85.5249	9.87364	101.28
85.3613	9.73511	102.721
85.1977	9.69732	103.121
85.034	9.70992	102.987
84.8704	9.7477	102.588
84.7068	9.93661	100.638
84.5432	10.1255	98.7604
84.3795	10.2766	97.3081
84.2159	10.3774	96.3634
84.0523	10.2515	97.5472
83.8887	10.1255	98.7604
83.725	9.99957	100.004
83.5614	9.81067	101.93
83.3978	9.68473	103.255
83.2342	9.45804	105.73
83.0705	9.31951	107.302
82.9069	9.1432	109.371
82.7433	8.81576	113.433
82.5797	8.65204	115.58
82.416	8.53869	117.114
82.2524	8.41276	118.867
82.0888	8.34979	119.764
81.9252	8.43794	118.512
81.7615	8.41276	118.867
81.5979	8.53869	117.114
81.4343	8.74019	114.414
81.2707	8.9417	111.836
81.107	9.11801	109.673
80.9434	9.20617	108.623
80.7798	9.36988	106.725
80.6162	9.57139	104.478
80.4525	9.70992	102.987
80.2889	9.78548	102.192
80.1253	9.78548	102.192
79.9617	9.81067	101.93
79.798	9.7477	102.588
79.6344	9.64695	103.66
79.4708	9.64695	103.66
79.3072	9.68473	103.255
79.1435	9.68473	103.255
78.9799	9.68473	103.255
78.8163	9.73511	102.721

78.6527	9.70992	102.987
78.489	9.7477	102.588
78.3254	9.77289	102.324
78.1618	9.86104	101.409
77.9982	9.9492	100.511
77.8345	10.0625	99.3784
77.6709	10.0625	99.3784
77.5073	10.0751	99.2542
77.3436	10.0751	99.2542
77.18	10.0877	99.1303
77.0164	10.0751	99.2542
76.8528	10.0877	99.1303
76.6891	10.0374	99.6278
76.5255	10.0877	99.1303
76.3619	9.99957	100.004
76.1983	9.83586	101.669
76.0346	9.65954	103.525
75.871	9.5336	104.892
75.7074	9.36988	106.725
75.5438	9.28173	107.739
75.3801	9.31951	107.302
75.2165	9.39507	106.439
75.0529	9.58398	104.341
74.8893	9.73511	102.721
74.7256	9.83586	101.669
74.562	9.93661	100.638
74.3984	9.99957	100.004
74.2348	9.89882	101.022
74.0711	9.87364	101.28
73.9075	9.86104	101.409
73.7439	9.93661	100.638
73.5803	9.96179	100.384
73.4166	10.1507	98.5154
73.253	10.2389	97.6672
73.0894	10.3648	96.4804
72.9258	10.5411	94.8667
72.7621	10.5789	94.5279
72.5985	10.4655	95.5516
72.4349	10.5033	95.2079
72.2713	10.5789	94.5279
72.1076	10.667	93.7467
71.944	10.5411	94.8667
71.7804	10.5789	94.5279
71.6168	10.453	95.6668
71.4531	10.3774	96.3634
71.2895	10.4152	96.0138
71.1259	10.6167	94.1915
70.9623	10.6922	93.5258
70.7986	10.9441	91.3734
70.635	11.07	90.3338
70.4714	10.9063	91.6899
70.3078	11.0323	90.6432
70.1441	11.1582	89.6202
69.9805	10.8811	91.9021
69.8169	11.0323	90.6432
69.6533	10.9063	91.6899
69.4896	10.3396	96.7155

69.326	9.96179	100.384
69.1624	9.98698	100.13
68.9988	9.58398	104.341
68.8351	9.3321	107.157
68.6715	9.3321	107.157
68.5079	9.28173	107.739
68.3443	8.91651	112.152
68.1806	8.76538	114.085
68.017	8.76538	114.085
67.8534	8.76538	114.085
67.6898	8.79057	113.758
67.5261	8.81576	113.433
67.3625	8.77798	113.921
67.1989	8.7276	114.579
67.0353	8.60166	116.257
66.8716	8.60166	116.257
66.708	8.65204	115.58
66.5444	8.7276	114.579
66.3808	8.86613	112.789
66.2171	8.95429	111.678
66.0535	9.08023	110.129
65.8899	9.24395	108.179
65.7263	9.43285	106.012
65.5626	9.48323	105.449
65.399	9.5336	104.892
65.2354	9.70992	102.987
65.0717	9.98698	100.13
64.9081	9.96179	100.384
64.7445	9.93661	100.638
64.5809	9.86104	101.409
64.4172	9.89882	101.022
64.2536	9.98698	100.13
64.09	10.1633	98.3933
63.9264	10.327	96.8334
63.7627	10.5033	95.2079
63.5991	10.5285	94.9802
63.4355	10.5285	94.9802
63.2719	10.4655	95.5516
63.1082	10.327	96.8334
62.9446	10.3396	96.7155
62.781	10.2892	97.189
62.6174	10.3144	96.9516
62.4537	10.3144	96.9516
62.2901	10.453	95.6668
62.1265	10.6041	94.3033
61.9629	10.6293	94.0799
61.7992	10.6167	94.1915
61.6356	10.7048	93.4158
61.472	10.8308	92.3296
61.3084	10.856	92.1154
61.1447	10.8811	91.9021
60.9811	10.8811	91.9021
60.8175	10.793	92.6528
60.6539	10.7048	93.4158
60.4902	10.5663	94.6405
60.3266	10.4152	96.0138
60.163	10.3648	96.4804

59.9994	10.3396	96.7155
59.8357	10.327	96.8334
59.6721	10.3396	96.7155
59.5085	10.4655	95.5516
59.3449	10.7426	93.0873
59.1812	10.856	92.1154
59.0176	10.8685	92.0086
58.854	10.9945	90.9547
58.6904	11.196	89.3177
58.5267	11.2464	88.9177
58.3631	11.2841	88.6199
58.1995	11.4101	87.6418
58.0359	11.5108	86.8747
57.8722	11.5738	86.402
57.7086	11.5486	86.5905
57.545	11.4227	87.5452
57.3814	11.3723	87.933
57.2177	11.3723	87.933
57.0541	11.2464	88.9177
56.8905	11.1708	89.5191
56.7269	11.1582	89.6202
56.5632	11.0323	90.6432
56.3996	10.8685	92.0086
56.236	10.7426	93.0873
56.0724	10.73	93.1965
55.9087	10.6922	93.5258
55.7451	10.6545	93.8575
55.5815	10.6922	93.5258
55.4179	10.7552	92.9783
55.2542	10.8308	92.3296
55.0906	10.9063	91.6899
54.927	10.8685	92.0086
54.7634	10.9441	91.3734
54.5997	10.9945	90.9547
54.4361	11.2464	88.9177
54.2725	11.4982	86.9699
54.1089	11.6116	86.1209
53.9452	11.6746	85.6564
53.7816	11.6116	86.1209
53.618	11.5864	86.3081
53.4544	11.4982	86.9699
53.2907	11.4101	87.6418
53.1271	11.4227	87.5452
52.9635	11.3597	88.0305
52.7999	11.1708	89.5191
52.6362	11.0071	90.8506
52.4726	10.9063	91.6899
52.309	10.7804	92.761
52.1453	10.7552	92.9783
51.9817	10.8308	92.3296
51.8181	10.8685	92.0086
51.6545	10.9189	91.5841
51.4908	10.9567	91.2683
51.3272	11.133	89.8229
51.1636	11.3597	88.0305
51	11.5108	86.8747
50.8363	11.5486	86.5905

50.6727	11.662	85.7489
50.5091	11.7375	85.1969
50.3455	11.7879	84.8328
50.1818	11.8886	84.1139
50.0182	12.002	83.3195
49.8546	12.1657	82.1983
49.691	12.1783	82.1133
49.5273	12.2539	81.6069
49.3637	12.3672	80.859
49.2001	12.5813	79.483
49.0365	12.9213	77.3914
48.8728	13.2236	75.6224
48.7092	13.2992	75.1928
48.5456	13.2614	75.407
48.382	13.1354	76.13
48.2183	13.0095	76.8669
48.0547	12.9969	76.9414
47.8911	12.9213	77.3914
47.7275	12.8458	77.8466
47.5638	12.7828	78.2301
47.4002	12.745	78.462
47.2366	12.6317	79.166
47.073	12.4931	80.0439
46.9093	12.4302	80.4494
46.7457	12.3294	81.1068
46.5821	12.2035	81.9438
46.4185	12.2035	81.9438
46.2548	12.0901	82.712
46.0912	11.8886	84.1139
45.9276	11.7123	85.3801
45.764	11.5738	86.402
45.6003	11.4227	87.5452
45.4367	11.4982	86.9699
45.2731	11.5864	86.3081
45.1095	11.5486	86.5905
44.9458	11.4856	87.0652
44.7822	11.4227	87.5452
44.6186	11.3219	88.3242
44.455	11.2338	89.0173
44.2913	11.259	88.8182
44.1277	11.3219	88.3242
43.9641	11.4479	87.3526
43.8005	11.5738	86.402
43.6368	11.7123	85.3801
43.4732	11.7501	85.1056
43.3096	11.9894	83.407
43.146	12.2539	81.6069
42.9823	12.3672	80.859
42.8187	12.002	83.3195
42.6551	12.342	81.024
42.4915	12.5057	79.9633
42.3278	12.3798	80.7767
42.1642	12.3042	81.2728
42.0006	12.6191	79.245
41.837	12.5813	79.483
41.6733	12.5057	79.9633
41.5097	12.5057	79.9633

41.3461	12.7072	78.6953
41.1825	13.0473	76.6444
41.0188	13.5007	74.0705
40.8552	13.8029	72.4485
40.6916	14.0548	71.1502
40.528	14.1429	70.7067
40.3643	14.2941	69.9591
40.2007	14.42	69.3481
40.0371	14.4578	69.1669
39.8735	14.76	67.7505
39.7098	14.7978	67.5776
39.5462	14.7097	67.9826
39.3826	14.5459	68.7477
39.2189	14.5837	68.5696
39.0553	14.4704	69.1067
38.8917	14.4704	69.1067
38.7281	14.4704	69.1067
38.5644	14.5459	68.7477
38.4008	14.3822	69.5303
38.2372	14.2185	70.3309
38.0736	14.0926	70.9594
37.9099	14.0422	71.214
37.7463	14.0044	71.4061
37.5827	14.1052	70.8961
37.4191	14.1303	70.7697
37.2554	14.1681	70.581
37.0918	14.0422	71.214
36.9282	13.9288	71.7935
36.7646	14.1052	70.8961
36.6009	14.1429	70.7067
36.4373	14.017	71.342
36.2737	13.8785	72.0541
36.1101	13.9288	71.7935
35.9464	13.6266	73.3859
35.7828	13.4629	74.2784
35.6192	13.4755	74.2089
35.4556	13.6266	73.3859
35.2919	13.7147	72.9142
35.1283	13.8911	71.9888
34.9647	14.017	71.342
34.8011	13.9666	71.5993
34.6374	13.8533	72.1851
34.4738	13.677	73.1156
34.3102	13.6266	73.3859
34.1466	13.5762	73.6582
33.9829	13.677	73.1156
33.8193	13.8911	71.9888
33.6557	14.08	71.0229
33.4921	14.1807	70.5183
33.3284	14.017	71.342
33.1648	13.8407	72.2508
33.0012	13.6644	73.183
32.8376	13.6014	73.5218
32.6739	13.5132	74.0015
32.5103	13.4629	74.2784
32.3467	13.4251	74.4874
32.1831	13.4503	74.3479

32.0194	13.2236	75.6224
31.8558	13.1228	76.203
31.6922	13.1354	76.13
31.5286	13.1858	75.8391
31.3649	13.1606	75.9843
31.2013	13.2236	75.6224
31.0377	13.2614	75.407
30.8741	13.211	75.6945
30.7104	13.2488	75.4787
30.5468	13.3369	74.9798
30.3832	13.4503	74.3479
30.2196	13.5007	74.0705
30.0559	13.5007	74.0705
29.8923	13.4629	74.2784
29.7287	13.5384	73.8638
29.5651	13.7525	72.7139
29.4014	14.0926	70.9594
29.2378	14.2059	70.3933
29.0742	14.1807	70.5183
28.9106	14.0044	71.4061
28.7469	13.8785	72.0541
28.5833	13.8407	72.2508
28.4197	13.8029	72.4485
28.2561	13.7903	72.5147
28.0924	13.7147	72.9142
27.9288	13.6392	73.3182
27.7652	13.5384	73.8638
27.6016	13.2866	75.264
27.4379	13.1732	75.9116
27.2743	13.2614	75.407
27.1107	13.211	75.6945
26.947	13.2614	75.407
26.7834	13.3747	74.768
26.6198	13.3747	74.768
26.4562	13.3369	74.9798
26.2925	13.4125	74.5573
26.1289	13.4503	74.3479
25.9653	13.551	73.7951
25.8017	13.6644	73.183
25.638	13.6644	73.183
25.4744	13.5762	73.6582
25.3108	13.5762	73.6582
25.1472	13.5384	73.8638
24.9835	13.3747	74.768
24.8199	13.4629	74.2784
24.6563	13.5384	73.8638
24.4927	13.5888	73.59
24.329	13.4629	74.2784
24.1654	13.677	73.1156
24.0018	13.8407	72.2508
23.8382	14.1052	70.8961
23.6745	14.3444	69.7134
23.5109	14.483	69.0466
23.3473	14.5837	68.5696
23.1837	14.5082	68.9268
23.02	14.6215	68.3924
22.8564	14.7222	67.9244

22.6928	14.886	67.1774
22.5292	15.2512	65.5687
22.3655	15.8557	63.0688
22.2019	16.3469	61.1739
22.0383	16.4476	60.7991
21.8747	16.4224	60.8924
21.711	16.3972	60.9859
21.5474	16.4476	60.7991
21.3838	16.435	60.8457
21.2202	16.3594	61.1268
21.0565	16.4224	60.8924
20.8929	16.1831	61.7927
20.7293	15.9816	62.5718
20.5657	15.969	62.6212
20.402	15.8179	63.2195
20.2384	15.566	64.2424
20.0748	15.3897	64.9784
19.9112	15.1504	66.0047
19.7475	14.886	67.1774
19.5839	14.5082	68.9268
19.4203	14.0044	71.4061
19.2567	13.8533	72.1851
19.093	14.0548	71.1502
18.9294	14.3822	69.5303
18.7658	14.42	69.3481
18.6022	14.1052	70.8961
18.4385	13.8785	72.0541
18.2749	13.8281	72.3166
18.1113	13.8533	72.1851
17.9477	13.5384	73.8638
17.784	12.9339	77.316
17.6204	12.5309	79.8025
17.4568	12.2539	81.6069
17.2932	11.9138	83.936
17.1295	11.7123	85.3801
16.9659	11.6242	86.0276
16.8023	11.8257	84.5618
16.6387	11.8383	84.4718
16.475	11.5738	86.402
16.3114	11.196	89.3177
16.1478	11.1204	89.9246
15.9842	10.9441	91.3734
15.8205	10.9189	91.5841
15.6569	11.1708	89.5191
15.4933	11.2967	88.5211
15.3297	10.9189	91.5841
15.166	10.667	93.7467
15.0024	10.3144	96.9516
14.8388	9.64695	103.66
14.6752	9.20617	108.623
14.5115	9.35729	106.869
14.3479	9.65954	103.525
14.1843	9.78548	102.192
14.0206	9.99957	100.004
13.857	10.3396	96.7155
13.6934	10.1255	98.7604
13.5298	9.60917	104.067

13.3661	9.28173	107.739
13.2025	9.35729	106.869
13.0389	9.3321	107.157
12.8753	9.35729	106.869
12.7116	9.40767	106.296
12.548	9.48323	105.449
12.3844	9.35729	106.869
12.2208	9.36988	106.725
12.0571	9.48323	105.449
11.8935	9.69732	103.121
11.7299	9.68473	103.255
11.5663	9.73511	102.721
11.4026	9.65954	103.525
11.239	9.52101	105.031
11.0754	9.44545	105.871
10.9118	9.45804	105.73
10.7481	9.68473	103.255

~VERSION INFORMATION

VERS .2.0 :CWLS LOG ASCII STANDARD-VERSION 2.0
WRAP .NO :ONE LINE PER DEPTH STEP

~WELL INFORMATION

STRT .FT 222.316 :START DEPTH
STOP .FT 10.4209 :STOP DEPTH
STEP .FT -0.163625 :STEP
NULL . -999.25 :NULL VALUE
COMP . kleinfelder :COMPANY
WELL . :WELL
FLD . :FIELD
LOC . Los Alamos :LOCATION
PROV . N/A :PROVINCE
SRVC . N/A :SERVICE COMPANY
DATE . 12-22-05 :DATE
UWI . N/A :UNIQUE WELL ID

~CURVE INFORMATION

DEPT .FT :DEPTH
COND .MS :Cond.
I__R .OHM-M :I. Res.

~PARAMETER INFORMATION

ELEV . :ELEVATION
STE . :STE
DENS . :DENSITY
CASI . :CASING TO1
OPER . :OPERATING RIG TIME
WGT1 . :WGT1
CASI . :CASING SIZE1
CASI . :CASING TO2
WGT2 . :WGT2
CASI . :CASING SIZE2
WELL . laoi3.2a :WELL ID
CASI . :CASING TO3
K.B. . :K.B.
WGT3 . :WGT3
TYPE . :TYPE LOG
CASI . :CASING SIZE3
CASI . :CASING TO4
SALI . :SALINITY
TITL . :TITLE
WGT4 . :WGT4
TOP . :TOP LOGGED INTERVAL
CASI . :CASING SIZE4
WITN . Rick Smith :WITNESSED BY
CASI . :CASING TO5
DRIL . :DRILLING MEAS. FROM
WGT5 . :WGT5
CASI . :CASING SIZE5
CTY . :CTY
WGT6 . :WGT6
CASI . :CASING SIZE6
MAX. . :MAX. REC. TEMP.
D.F. . :D.F.
CASI . :CASING TO6
OTHE . :OTHER SERVICES
BIT1 . 7.5" :BIT1
DEPT . :DEPTH-DRILLER

```

BIT2 . :BIT2
RUN . :RUN No
RUN1 . :RUN1
BIT3 . :BIT3
RUN2 . :RUN2
PERM . :PERMANENT DATUM
TWP . :TWP
BIT4 . :BIT4
LOG . :LOG MEAS. FROM
BIT . 0 :BIT FROM1
RUN3 . :RUN3
BIT5 . :BIT5
CASI . :CASING FROM1
TYPE . g.w @ 164ft :TYPE FLUID IN HOLE
RUN4 . :RUN4
FLD . :FLD
BIT6 . :BIT6
BIT . 223 :BIT TO1
CASI . :CASING FROM2
BIT . :BIT FROM2
CO . :CO
RGE . :RGE
BIT . :BIT TO2
DEPT . :DEPTH-LOGGER
CASI . :CASING FROM3
BIT . :BIT FROM3
RUN5 . :RUN5
SEC . :SEC
BIT . :BIT TO3
G.L. . :G.L.
CASI . :CASING FROM4
BIT . :BIT FROM4
RUN6 . :RUN6
BIT . :BIT TO4
BTM . :BTM LOGGED INTERVAL
CASI . :CASING FROM5
BIT . :BIT FROM5
STAT . :STATE
BIT . :BIT TO5
LEVE . :LEVEL
CASI . :CASING FROM6
BIT . :BIT FROM6
COUN . :COUNTRY
RECO . cember hardison :RECORDED BY
FILI . :FILING No
BIT . :BIT TO6
~OTHER
~A
222.316 61.4327 16.278
222.152 61.4578 16.2713
221.988 61.3823 16.2913
221.825 61.2186 16.3349
221.661 60.9667 16.4024
221.498 60.6141 16.4978
221.334 60.1985 16.6117
221.17 59.7451 16.7378
221.007 59.3169 16.8586

```

220.843	59.1028	16.9197
220.679	58.8635	16.9885
220.516	58.5235	17.0872
220.352	58.2338	17.1721
220.189	57.8182	17.2956
220.025	57.2641	17.4629
219.861	56.6974	17.6375
219.698	56.3448	17.7479
219.534	56.181	17.7996
219.37	56.244	17.7797
219.207	56.5337	17.6886
219.043	56.8485	17.5906
218.88	57.1508	17.4976
218.716	57.6041	17.3599
218.552	58.1079	17.2094
218.389	58.6998	17.0358
218.225	59.3547	16.8479
218.061	60.2362	16.6013
217.898	61.2437	16.3282
217.734	62.2513	16.0639
217.571	63.2713	15.8049
217.407	64.3544	15.5389
217.243	65.299	15.3142
217.08	66.0672	15.1361
216.916	66.848	14.9593
216.752	67.5784	14.7976
216.589	68.1074	14.6827
216.425	68.7119	14.5535
216.262	69.2786	14.4345
216.098	69.732	14.3406
215.934	70.1602	14.2531
215.771	70.7017	14.1439
215.607	71.0291	14.0787
215.443	71.4069	14.0042
215.28	71.4951	13.987
215.116	71.4573	13.9944
214.953	71.281	14.029
214.789	70.8276	14.1188
214.625	70.1728	14.2505
214.462	69.606	14.3666
214.298	69.203	14.4502
214.134	68.9512	14.503
213.971	68.5733	14.5829
213.807	67.8933	14.729
213.644	67.1125	14.9004
213.48	65.6894	15.2232
213.316	64.0018	15.6246
213.153	62.289	16.0542
212.989	60.9163	16.416
212.825	59.5436	16.7944
212.662	58.3346	17.1425
212.498	56.8989	17.575
212.335	55.7277	17.9444
212.171	54.7705	18.258
212.007	53.6749	18.6307
211.844	52.9318	18.8922
211.68	52.8059	18.9373

211.516	52.617	19.0053
211.353	52.0881	19.1983
211.189	51.9495	19.2495
211.026	51.5717	19.3905
210.862	50.7783	19.6935
210.698	50.2871	19.8858
210.535	49.6323	20.1482
210.371	49.3804	20.251
210.207	49.2419	20.3079
210.044	49.0655	20.3809
209.88	48.7003	20.5337
209.717	48.5744	20.587
209.553	48.1588	20.7646
209.389	47.7054	20.962
209.226	47.4283	21.0844
209.062	47.1765	21.197
208.898	47.1387	21.214
208.735	46.7735	21.3796
208.571	46.2571	21.6183
208.408	45.7408	21.8623
208.244	45.1489	22.1489
208.08	44.557	22.4432
207.917	44.431	22.5068
207.753	44.1791	22.6351
207.589	43.7258	22.8698
207.426	43.5117	22.9823
207.262	43.0457	23.2311
207.099	42.1264	23.7381
206.935	41.3455	24.1864
206.771	41.0055	24.387
206.608	40.6151	24.6214
206.444	40.5899	24.6367
206.28	40.8166	24.4998
206.117	41.2448	24.2455
205.953	41.5722	24.0545
205.79	42.013	23.8021
205.626	42.3027	23.6392
205.462	42.756	23.3885
205.299	43.2598	23.1161
205.135	44.2547	22.5965
204.971	45.3	22.0751
204.808	46.3453	21.5772
204.644	47.7306	20.9509
204.481	49.2419	20.3079
204.317	50.7405	19.7081
204.153	52.0755	19.2029
203.99	53.3474	18.745
203.826	54.4809	18.3551
203.662	55.5639	17.9973
203.499	56.6092	17.665
203.335	57.5286	17.3827
203.172	58.2086	17.1796
203.008	58.9391	16.9667
202.844	59.5814	16.7838
202.681	60.0347	16.657
202.517	60.5007	16.5287
202.353	61.08	16.372

202.19	61.6593	16.2181
202.026	62.1001	16.103
201.863	62.5157	15.996
201.699	62.8809	15.9031
201.535	63.1706	15.8301
201.372	63.2965	15.7987
201.208	63.4728	15.7548
201.044	63.5862	15.7267
200.881	63.624	15.7173
200.717	63.6744	15.7049
200.554	63.7121	15.6956
200.39	63.7625	15.6832
200.226	63.9262	15.643
200.063	64.027	15.6184
199.899	64.2914	15.5542
199.735	64.5433	15.4935
199.572	64.8959	15.4093
199.408	65.299	15.3142
199.245	65.6516	15.2319
199.081	66.0294	15.1448
198.917	66.4324	15.0529
198.754	66.6969	14.9932
198.59	66.9487	14.9368
198.426	67.0243	14.92
198.263	66.9361	14.9396
198.099	66.8858	14.9509
197.936	66.6591	15.0017
197.772	66.4954	15.0386
197.608	66.4072	15.0586
197.445	66.0294	15.1448
197.281	65.1352	15.3527
197.117	63.901	15.6492
196.954	62.3898	16.0283
196.79	60.677	16.4807
196.627	59.531	16.798
196.463	58.4605	17.1056
196.299	57.2893	17.4553
196.136	56.0929	17.8276
195.972	54.4809	18.3551
195.808	51.9621	19.2448
195.645	49.8212	20.0718
195.481	47.5669	21.023
195.317	45.2244	22.1119
195.154	43.0079	23.2515
194.99	41.5722	24.0545
194.827	39.8973	25.0644
194.663	38.3734	26.0597
194.499	37.5296	26.6456
194.336	36.5599	27.3524
194.172	35.3131	28.3181
194.008	34.5575	28.9373
193.845	33.3737	29.9637
193.681	32.215	31.0414
193.518	31.7113	31.5345
193.354	31.6357	31.6098
193.19	31.6609	31.5847
193.027	32.1269	31.1266

192.863	32.6432	30.6342
192.699	32.9581	30.3416
192.536	33.2477	30.0772
192.372	33.8145	29.5732
192.209	34.1797	29.2572
192.045	34.633	28.8742
191.881	35.502	28.1674
191.718	36.4088	27.4659
191.554	37.5548	26.6277
191.39	38.8772	25.722
191.227	40.0484	24.9698
191.063	41.0937	24.3346
190.9	42.5797	23.4854
190.736	43.7258	22.8698
190.572	44.5821	22.4305
190.409	45.4259	22.0139
190.245	46.2319	21.6301
190.081	46.3201	21.5889
189.918	46.3453	21.5772
189.754	46.3831	21.5596
189.591	46.6098	21.4547
189.427	46.5594	21.478
189.263	46.2571	21.6183
189.1	46.0178	21.7307
188.936	46.2319	21.6301
188.772	46.1438	21.6714
188.609	45.8163	21.8263
188.445	45.4637	21.9956
188.282	45.1363	22.1551
188.118	43.8895	22.7845
187.954	42.2649	23.6603
187.791	41.2448	24.2455
187.627	40.2499	24.8448
187.463	38.3104	26.1025
187.3	37.1014	26.9531
187.136	36.4843	27.409
186.973	36.0687	27.7248
186.809	35.5902	28.0976
186.645	35.905	27.8513
186.482	35.7287	27.9887
186.318	35.565	28.1175
186.154	34.9605	28.6037
185.991	33.89	29.5072
185.827	32.0765	31.1755
185.664	31.0816	32.1734
185.5	30.3134	32.9887
185.336	29.5326	33.8609
185.173	29.1925	34.2553
185.009	29.0162	34.4635
184.845	28.8525	34.659
184.682	28.7014	34.8415
184.518	28.7769	34.7501
184.355	28.9029	34.5986
184.191	28.5251	35.0569
184.027	28.1472	35.5275
183.864	27.8072	35.9619
183.7	27.5301	36.3238

183.536	27.102	36.8977
183.373	27.2027	36.761
183.209	27.5301	36.3238
183.046	27.5931	36.2409
182.882	27.4294	36.4572
182.718	27.442	36.4405
182.555	27.5931	36.2409
182.391	27.5553	36.2906
182.227	27.6435	36.1749
182.064	28.2228	35.4323
181.9	28.248	35.4007
181.737	27.8954	35.8482
181.573	27.7442	36.0435
181.409	28.0969	35.5912
181.246	28.1472	35.5275
181.082	28.7769	34.7501
180.918	29.0414	34.4336
180.755	29.0666	34.4038
180.591	28.5754	34.9951
180.428	28.4117	35.1968
180.264	28.7769	34.7501
180.1	29.117	34.3442
179.937	29.2051	34.2406
179.773	30.0237	33.307
179.609	31.132	32.1213
179.446	30.4141	32.8795
179.282	28.4117	35.1968
179.119	27.4546	36.4238
178.955	27.3664	36.5411
178.791	26.3841	37.9016
178.628	25.8804	38.6393
178.464	25.3766	39.4064
178.3	25.1247	39.8014
178.137	24.5958	40.6574
177.973	24.8099	40.3065
177.81	24.8099	40.3065
177.646	24.2935	41.1632
177.482	24.1802	41.3562
177.319	24.0543	41.5727
177.155	23.7268	42.1464
176.991	23.0971	43.2954
176.828	23.1853	43.1308
176.664	23.5127	42.5302
176.501	23.8779	41.8797
176.337	23.2986	42.921
176.173	22.9334	43.6045
176.01	23.0845	43.319
175.846	23.349	42.8284
175.682	23.412	42.7132
175.519	23.7016	42.1912
175.355	23.6638	42.2586
175.192	23.412	42.7132
175.028	23.0468	43.3901
174.864	22.2659	44.9117
174.701	21.2962	46.9567
174.537	20.9184	47.8048
174.373	21.1325	47.3205

174.21	21.7118	46.0579
174.046	22.4045	44.634
173.883	22.883	43.7005
173.719	23.1853	43.1308
173.555	23.6261	42.3261
173.392	24.0039	41.6599
173.228	24.0543	41.5727
173.064	24.0417	41.5945
172.901	24.4824	40.8456
172.737	24.9988	40.0019
172.574	25.5655	39.1152
172.41	26.3967	37.8835
172.246	27.442	36.4405
172.083	28.6636	34.8875
171.919	30.0741	33.2512
171.755	31.5853	31.6602
171.592	33.1722	30.1458
171.428	34.5953	28.9057
171.265	36.2576	27.5804
171.101	37.9326	26.3625
170.937	39.6958	25.1916
170.774	41.4715	24.113
170.61	43.3354	23.0758
170.446	45.2118	22.1181
170.283	46.9876	21.2822
170.119	48.6625	20.5497
169.956	50.2871	19.8858
169.792	51.748	19.3244
169.628	53.0452	18.8519
169.465	54.1912	18.4532
169.301	55.3498	18.0669
169.137	56.4077	17.7281
168.974	57.3145	17.4476
168.81	58.1457	17.1982
168.647	58.9013	16.9776
168.483	59.4806	16.8122
168.319	59.9088	16.692
168.156	60.0851	16.6431
167.992	60.0096	16.664
167.828	59.5814	16.7838
167.665	58.8383	16.9957
167.501	57.8308	17.2918
167.338	56.6974	17.6375
167.174	55.2995	18.0834
167.01	53.9645	18.5307
166.847	52.6422	18.9962
166.683	51.0302	19.5962
166.519	49.2041	20.3235
166.356	47.3276	21.1293
166.192	45.2622	22.0935
166.029	43.1213	23.1904
165.865	41.1189	24.3197
165.701	39.3305	25.4255
165.538	37.7059	26.521
165.374	36.0939	27.7055
165.21	34.6456	28.8637
165.047	33.2981	30.0317

164.883	32.0387	31.2122
164.72	30.8675	32.3965
164.556	29.8348	33.5179
164.392	28.8651	34.6439
164.229	28.0213	35.6871
164.065	27.2783	36.6592
163.901	26.6108	37.5787
163.738	25.9811	38.4895
163.574	25.4396	39.3088
163.411	24.898	40.1638
163.247	24.4699	40.8666
163.083	23.9787	41.7037
162.92	23.5505	42.4619
162.756	23.2105	43.084
162.592	22.8075	43.8453
162.429	22.5304	44.3845
162.265	22.1652	45.1158
162.102	21.8881	45.6869
161.938	21.5733	46.3536
161.774	21.2836	46.9845
161.611	20.9688	47.69
161.447	20.6665	48.3874
161.283	20.4398	48.9241
161.12	19.8731	50.3192
160.956	19.4953	51.2944
160.793	19.193	52.1022
160.629	19.0797	52.4117
160.465	18.916	52.8653
160.302	18.7649	53.2911
160.138	18.6893	53.5066
159.974	18.4878	54.0897
159.811	18.2359	54.8368
159.647	18.1226	55.1798
159.484	18.0344	55.4495
159.32	17.9715	55.6438
159.156	17.8959	55.8788
158.993	17.8077	56.1554
158.829	17.7196	56.4348
158.665	17.6566	56.636
158.502	17.6188	56.7575
158.338	17.5181	57.0839
158.175	17.4299	57.3726
158.011	17.304	57.7902
157.847	17.241	58.0012
157.684	17.1403	58.3422
157.52	17.0143	58.774
157.356	16.8632	59.3007
157.193	16.3846	61.0328
157.029	15.629	63.9836
156.866	15.1504	66.0047
156.702	15.1756	65.8951
156.538	15.3393	65.1918
156.375	15.3897	64.9784
156.211	15.3016	65.3528
156.047	14.8356	67.4055
155.884	14.8356	67.4055
155.72	14.9741	66.7819

155.557	14.9238	67.0073
155.393	14.483	69.0466
155.229	14.357	69.6523
155.066	14.5459	68.7477
154.902	14.7474	67.8084
154.738	14.8482	67.3483
154.575	15.0119	66.6138
154.411	15.0875	66.2802
154.248	15.1378	66.0596
154.084	14.9993	66.6697
153.92	14.7474	67.8084
153.757	14.357	69.6523
153.593	14.0548	71.1502
153.429	13.7651	72.6474
153.266	13.4755	74.2089
153.102	13.1858	75.8391
152.939	12.7954	78.1531
152.775	12.4554	80.2867
152.611	12.2413	81.6909
152.448	11.8383	84.4718
152.284	11.6368	85.9345
152.12	11.6746	85.6564
151.957	11.6368	85.9345
151.793	11.6242	86.0276
151.63	11.7375	85.1969
151.466	11.6746	85.6564
151.302	11.4982	86.9699
151.139	11.5864	86.3081
150.975	11.7627	85.0144
150.811	11.9264	83.8474
150.648	12.4554	80.2867
150.484	12.7954	78.1531
150.321	12.745	78.462
150.157	12.5561	79.6425
149.993	12.6191	79.245
149.83	12.4302	80.4494
149.666	12.1153	82.54
149.502	12.0776	82.7982
149.339	12.0398	83.0581
149.175	11.9138	83.936
149.012	12.1153	82.54
148.848	12.5939	79.4035
148.684	13.0851	76.4231
148.521	13.5384	73.8638
148.357	13.8407	72.2508
148.193	13.9162	71.8585
148.03	13.7147	72.9142
147.866	13.5132	74.0015
147.703	13.551	73.7951
147.539	13.7525	72.7139
147.375	13.9288	71.7935
147.212	14.1807	70.5183
147.048	14.357	69.6523
146.884	14.5837	68.5696
146.721	14.8482	67.3483
146.557	14.9363	66.9508
146.394	14.8734	67.2342

146.23	14.5082	68.9268
146.066	14.08 71.0229	
145.903	13.4755	74.2089
145.739	12.9087	77.4669
145.575	12.1531	82.2834
145.412	11.5738	86.402
145.248	12.8458	77.8466
145.085	12.6191	79.245
144.921	12.9717	77.0908
144.757	13.7903	72.5147
144.594	14.5082	68.9268
144.43	13.8281	72.3166
144.266	14.8104	67.5201
144.103	15.4275	64.8193
143.939	15.8935	62.9189
143.776	16.2335	61.601
143.612	16.5609	60.383
143.448	16.7624	59.6572
143.285	16.9765	58.9048
143.121	17.0143	58.774
142.957	17.0269	58.7305
142.794	17.1403	58.3422
142.63	17.0773	58.5573
142.467	16.9765	58.9048
142.303	16.9891	58.8612
142.139	16.9388	59.0362
141.976	16.8128	59.4784
141.812	16.6995	59.8821
141.648	16.6743	59.9726
141.485	16.5609	60.383
141.321	16.3972	60.9859
141.158	16.3972	60.9859
140.994	16.435	60.8457
140.83	16.5232	60.5211
140.667	16.5987	60.2456
140.503	16.6113	60.1999
140.339	16.5232	60.5211
140.176	16.2965	61.363
140.012	15.9438	62.7201
139.849	15.5157	64.451
139.685	15.1378	66.0596
139.521	14.7726	67.6928
139.358	14.4578	69.1669
139.194	14.1807	70.5183
139.03	14.017	71.342
138.867	13.8407	72.2508
138.703	13.7903	72.5147
138.54	13.7147	72.9142
138.376	13.7147	72.9142
138.212	13.7525	72.7139
138.049	13.8785	72.0541
137.885	14.08 71.0229	
137.721	14.2185	70.3309
137.558	14.4578	69.1669
137.394	14.6467	68.2748
137.231	14.8734	67.2342
137.067	15.1001	66.2249

136.903	15.226	65.6771
136.74	15.4023	64.9253
136.576	15.4779	64.6083
136.412	15.5157	64.451
136.249	15.4653	64.661
136.085	15.3519	65.1383
135.922	15.2512	65.5687
135.758	15.1378	66.0596
135.594	15.0119	66.6138
135.431	14.9363	66.9508
135.267	14.9363	66.9508
135.103	14.9993	66.6697
134.94	14.9993	66.6697
134.776	14.9741	66.7819
134.613	14.9363	66.9508
134.449	14.9238	67.0073
134.285	14.8482	67.3483
134.122	14.8734	67.2342
133.958	14.886	67.1774
133.794	14.9615	66.8381
133.631	15.0245	66.558
133.467	15.1882	65.8405
133.304	15.2134	65.7315
133.14	15.0119	66.6138
132.976	14.7222	67.9244
132.813	14.42	69.3481
132.649	14.2563	70.1445
132.485	14.2185	70.3309
132.322	14.2311	70.2687
132.158	14.2689	70.0826
131.994	14.42	69.3481
131.831	14.5585	68.6883
131.667	14.7097	67.9826
131.504	14.7978	67.5776
131.34	14.7726	67.6928
131.176	14.6467	68.2748
131.013	14.5837	68.5696
130.849	14.4578	69.1669
130.685	14.3318	69.7747
130.522	14.2941	69.9591
130.358	14.1429	70.7067
130.195	13.954	71.6639
130.031	13.7525	72.7139
129.867	13.5762	73.6582
129.704	13.3747	74.768
129.54	13.2236	75.6224
129.376	13.1606	75.9843
129.213	13.1858	75.8391
129.049	13.3243	75.0506
128.886	13.3747	74.768
128.722	13.1858	75.8391
128.558	12.9591	77.1657
128.395	12.871	77.6943
128.231	12.6821	78.8516
128.067	12.5057	79.9633
127.904	12.3798	80.7767
127.74	12.2791	81.4395

127.577	12.0901	82.712
127.413	11.8257	84.5618
127.249	11.5864	86.3081
127.086	11.4605	87.2566
126.922	11.4479	87.3526
126.758	11.2967	88.5211
126.595	11.2464	88.9177
126.431	11.1582	89.6202
126.268	10.9945	90.9547
126.104	10.8811	91.9021
125.94	10.8811	91.9021
125.777	10.9567	91.2683
125.613	10.9063	91.6899
125.449	10.8811	91.9021
125.286	10.856	92.1154
125.122	10.8685	92.0086
124.959	10.8811	91.9021
124.795	10.8685	92.0086
124.631	10.9945	90.9547
124.468	11.0826	90.2312
124.304	11.2841	88.6199
124.14	11.4101	87.6418
123.977	11.4605	87.2566
123.813	11.4982	86.9699
123.65	11.4479	87.3526
123.486	11.3723	87.933
123.322	11.2967	88.5211
123.159	11.2086	89.2174
122.995	11.2338	89.0173
122.831	11.2338	89.0173
122.668	11.2086	89.2174
122.504	11.1582	89.6202
122.341	11.1078	90.0266
122.177	10.9441	91.3734
122.013	10.8182	92.4371
121.85	10.7426	93.0873
121.686	10.6167	94.1915
121.522	10.4655	95.5516
121.359	10.4026	96.13
121.195	10.5033	95.2079
121.032	10.7804	92.761
120.868	11.0449	90.5399
120.704	11.3345	88.2261
120.541	11.4101	87.6418
120.377	11.3849	87.8357
120.213	11.2841	88.6199
120.05	11.1708	89.5191
119.886	11.0449	90.5399
119.723	10.9567	91.2683
119.559	10.9063	91.6899
119.395	10.73	93.1965
119.232	10.5789	94.5279
119.068	10.453	95.6668
118.904	10.3648	96.4804
118.741	10.3396	96.7155
118.577	10.3144	96.9516
118.414	10.2515	97.5472

118.25	10.2389	97.6672
118.086	10.1633	98.3933
117.923	10.0877	99.1303
117.759	10.1507	98.5154
117.595	10.3648	96.4804
117.432	10.3648	96.4804
117.268	10.327	96.8334
117.105	10.2766	97.3081
116.941	10.2011	98.0289
116.777	10.0751	99.2542
116.614	10.0374	99.6278
116.45	9.93661	100.638
116.286	9.89882	101.022
116.123	9.78548	102.192
115.959	9.78548	102.192
115.796	9.78548	102.192
115.632	9.83586	101.669
115.468	10.0248	99.753
115.305	10.2137	97.908
115.141	10.4655	95.5516
114.977	10.73	93.1965
114.814	10.856	92.1154
114.65	10.9945	90.9547
114.487	10.9189	91.5841
114.323	10.793	92.6528
114.159	10.6922	93.5258
113.996	10.6545	93.8575
113.832	10.6041	94.3033
113.668	10.5789	94.5279
113.505	10.6922	93.5258
113.341	10.9441	91.3734
113.178	11.0826	90.2312
113.014	11.0323	90.6432
112.85	10.9819	91.059
112.687	10.9819	91.059
112.523	11.0449	90.5399
112.359	11.1078	90.0266
112.196	11.0826	90.2312
112.032	11.133	89.8229
111.869	11.196	89.3177
111.705	11.1708	89.5191
111.541	11.1204	89.9246
111.378	11.133	89.8229
111.214	11.1204	89.9246
111.05	11.1582	89.6202
110.887	11.2338	89.0173
110.723	11.3219	88.3242
110.56	11.3219	88.3242
110.396	11.3597	88.0305
110.232	11.4605	87.2566
110.069	11.6116	86.1209
109.905	11.5864	86.3081
109.741	11.6368	85.9345
109.578	11.5738	86.402
109.414	11.4479	87.3526
109.251	11.3723	87.933
109.087	11.3723	87.933

108.923	11.133	89.8229
108.76	10.9441	91.3734
108.596	10.8811	91.9021
108.432	10.7426	93.0873
108.269	10.6041	94.3033
108.105	10.5411	94.8667
107.942	10.5411	94.8667
107.778	10.5789	94.5279
107.614	10.4404	95.7822
107.451	10.4152	96.0138
107.287	10.3144	96.9516
107.123	10.2137	97.908
106.96	10.2011	98.0289
106.796	10.1885	98.1501
106.633	10.0374	99.6278
106.469	9.91142	100.894
106.305	9.89882	101.022
106.142	9.87364	101.28
105.978	9.99957	100.004
105.814	9.96179	100.384
105.651	9.98698	100.13
105.487	9.99957	100.004
105.324	10.0248	99.753
105.16	9.98698	100.13
104.996	9.96179	100.384
104.833	10.0877	99.1303
104.669	10.2011	98.0289
104.505	10.2766	97.3081
104.342	10.2137	97.908
104.178	10.1633	98.3933
104.015	10.1885	98.1501
103.851	10.3144	96.9516
103.687	10.3774	96.3634
103.524	10.5411	94.8667
103.36	10.7426	93.0873
103.196	10.793	92.6528
103.033	10.7048	93.4158
102.869	10.7552	92.9783
102.706	10.9189	91.5841
102.542	10.9189	91.5841
102.378	10.856	92.1154
102.215	10.9063	91.6899
102.051	10.8308	92.3296
101.887	10.7048	93.4158
101.724	10.5285	94.9802
101.56	10.4655	95.5516
101.397	10.6293	94.0799
101.233	10.5663	94.6405
101.069	10.4026	96.13
100.906	10.3144	96.9516
100.742	10.3144	96.9516
100.578	10.2137	97.908
100.415	10.1633	98.3933
100.251	10.2011	98.0289
100.088	10.1633	98.3933
99.9239	10.0751	99.2542
99.7603	9.98698	100.13

99.5967	9.91142	100.894
99.4331	10.0751	99.2542
99.2694	10.1885	98.1501
99.1058	10.2766	97.3081
98.9422	10.3144	96.9516
98.7786	10.3144	96.9516
98.6149	10.2766	97.3081
98.4513	10.1885	98.1501
98.2877	10.0625	99.3784
98.1241	9.99957	100.004
97.9604	9.98698	100.13
97.7968	9.93661	100.638
97.6332	9.96179	100.384
97.4696	10.0751	99.2542
97.3059	10.0374	99.6278
97.1423	9.99957	100.004
96.9787	10.0248	99.753
96.8151	9.96179	100.384
96.6514	9.93661	100.638
96.4878	9.87364	101.28
96.3242	9.7477	102.588
96.1606	9.65954	103.525
95.9969	9.52101	105.031
95.8333	9.49582	105.309
95.6697	9.48323	105.449
95.5061	9.60917	104.067
95.3424	9.70992	102.987
95.1788	9.89882	101.022
95.0152	10.0625	99.3784
94.8515	10.0751	99.2542
94.6879	9.99957	100.004
94.5243	9.96179	100.384
94.3607	9.7477	102.588
94.197	9.64695	103.66
94.0334	9.49582	105.309
93.8698	9.35729	106.869
93.7062	9.16838	109.07
93.5425	9.06763	110.282
93.3789	9.01726	110.898
93.2153	8.90391	112.31
93.0517	8.82835	113.271
92.888	8.7276	114.579
92.7244	8.63944	115.748
92.5608	8.57648	116.598
92.3972	8.51351	117.46
92.2335	8.3246	120.126
92.0699	8.26163	121.041
91.9063	8.23644	121.412
91.7427	8.22385	121.598
91.579	8.28682	120.674
91.4154	8.53869	117.114
91.2518	8.9417	111.836
91.0882	9.24395	108.179
90.9245	9.40767	106.296
90.7609	9.3321	107.157
90.5973	9.20617	108.623
90.4337	9.1432	109.371

90.27	9.20617	108.623
90.1064	9.40767	106.296
89.9428	9.55879	104.616
89.7792	9.5336	104.892
89.6155	9.3321	107.157
89.4519	9.08023	110.129
89.2883	8.89132	112.469
89.1247	8.86613	112.789
88.961	8.82835	113.271
88.7974	8.89132	112.469
88.6338	9.10541	109.825
88.4702	9.36988	106.725
88.3065	9.49582	105.309
88.1429	9.62176	103.931
87.9793	9.62176	103.931
87.8157	9.73511	102.721
87.652	9.89882	101.022
87.4884	9.98698	100.13
87.3248	9.9492	100.511
87.1612	9.81067	101.93
86.9975	9.62176	103.931
86.8339	9.48323	105.449
86.6703	9.35729	106.869
86.5067	9.26913	107.885
86.343	9.24395	108.179
86.1794	9.26913	107.885
86.0158	9.24395	108.179
85.8522	9.23135	108.326
85.6885	9.15579	109.221
85.5249	9.11801	109.673
85.3613	9.01726	110.898
85.1977	8.9417	111.836
85.034	8.95429	111.678
84.8704	8.99207	111.209
84.7068	9.04245	110.59
84.5432	9.02985	110.744
84.3795	8.91651	112.152
84.2159	8.85354	112.949
84.0523	8.86613	112.789
83.8887	8.99207	111.209
83.725	9.3321	107.157
83.5614	9.65954	103.525
83.3978	9.81067	101.93
83.2342	9.99957	100.004
83.0705	9.99957	100.004
82.9069	9.89882	101.022
82.7433	9.73511	102.721
82.5797	9.55879	104.616
82.416	9.36988	106.725
82.2524	9.23135	108.326
82.0888	9.10541	109.825
81.9251	8.82835	113.271
81.7615	8.57648	116.598
81.5979	8.43794	118.512
81.4343	8.27422	120.857
81.2706	8.14829	122.725
81.107	8.18607	122.159

80.9434	8.16088	122.536
80.7798	8.18607	122.159
80.6161	8.40016	119.045
80.4525	8.60166	116.257
80.2889	8.81576	113.433
80.1253	9.06763	110.282
79.9616	9.24395	108.179
79.798	9.43285	106.012
79.6344	9.64695	103.66
79.4708	9.69732	103.121
79.3071	9.78548	102.192
79.1435	9.83586	101.669
78.9799	9.89882	101.022
78.8163	9.86104	101.409
78.6526	9.7477	102.588
78.489	9.83586	101.669
78.3254	9.93661	100.638
78.1618	9.99957	100.004
77.9981	10.0625	99.3784
77.8345	10.1255	98.7604
77.6709	10.0374	99.6278
77.5073	10.0625	99.3784
77.3436	10.0877	99.1303
77.18	10.2137	97.908
77.0164	10.4026	96.13
76.8528	10.5663	94.6405
76.6891	10.6545	93.8575
76.5255	10.7552	92.9783
76.3619	10.7426	93.0873
76.1983	10.6922	93.5258
76.0346	10.6293	94.0799
75.871	10.6167	94.1915
75.7074	10.667	93.7467
75.5438	10.6293	94.0799
75.3801	10.4404	95.7822
75.2165	10.1885	98.1501
75.0529	9.91142	100.894
74.8893	9.7477	102.588
74.7256	9.45804	105.73
74.562	9.39507	106.439
74.3984	9.40767	106.296
74.2348	9.49582	105.309
74.0711	9.69732	103.121
73.9075	9.86104	101.409
73.7439	9.81067	101.93
73.5803	9.7477	102.588
73.4166	9.69732	103.121
73.253	9.5336	104.892
73.0894	9.43285	106.012
72.9258	9.43285	106.012
72.7621	9.55879	104.616
72.5985	9.60917	104.067
72.4349	9.65954	103.525
72.2713	9.60917	104.067
72.1076	9.81067	101.93
71.944	9.91142	100.894
71.7804	9.96179	100.384

71.6168	9.86104	101.409
71.4531	9.93661	100.638
71.2895	9.83586	101.669
71.1259	9.89882	101.022
70.9623	9.64695	103.66
70.7986	9.77289	102.324
70.635	9.57139	104.478
70.4714	9.57139	104.478
70.3078	9.65954	103.525
70.1441	9.78548	102.192
69.9805	9.89882	101.022
69.8169	10.1507	98.5154
69.6533	10.1507	98.5154
69.4896	9.86104	101.409
69.326	10.2011	98.0289
69.1624	9.99957	100.004
68.9987	9.62176	103.931
68.8351	9.87364	101.28
68.6715	9.70992	102.987
68.5079	9.08023	110.129
68.3442	8.99207	111.209
68.1806	9.01726	110.898
68.017	8.51351	117.46
67.8534	8.45054	118.336
67.6897	8.61426	116.087
67.5261	8.48832	117.809
67.3625	8.23644	121.412
67.1989	8.16088	122.536
67.0352	8.18607	122.159
66.8716	8.13569	122.915
66.708	8.09791	123.489
66.5444	8.00975	124.848
66.3807	7.94679	125.837
66.2171	7.77047	128.692
66.0535	7.73269	129.321
65.8899	7.77047	128.692
65.7262	7.78307	128.484
65.5626	7.85863	127.249
65.399	7.97197	125.439
65.2354	8.02235	124.652
65.0717	7.98457	125.242
64.9081	7.98457	125.242
64.7445	8.02235	124.652
64.5809	8.19866	121.971
64.4172	8.26163	121.041
64.2536	8.45054	118.336
64.09	8.51351	117.46
63.9264	8.53869	117.114
63.7627	8.5261	117.287
63.5991	8.56388	116.769
63.4355	8.51351	117.46
63.2719	8.57648	116.598
63.1082	8.70241	114.911
62.9446	8.82835	113.271
62.781	8.90391	112.31
62.6174	8.99207	111.209
62.4537	9.1432	109.371

62.2901	9.04245	110.59
62.1265	9.08023	110.129
61.9629	9.11801	109.673
61.7992	9.15579	109.221
61.6356	9.19357	108.772
61.472	9.24395	108.179
61.3084	9.36988	106.725
61.1447	9.40767	106.296
60.9811	9.48323	105.449
60.8175	9.57139	104.478
60.6539	9.73511	102.721
60.4902	9.93661	100.638
60.3266	9.99957	100.004
60.163	10.0877	99.1303
59.9994	10.1129	98.8834
59.8357	10.0751	99.2542
59.6721	10.0751	99.2542
59.5085	9.91142	100.894
59.3449	9.78548	102.192
59.1812	9.73511	102.721
59.0176	9.69732	103.121
58.854	9.68473	103.255
58.6904	9.60917	104.067
58.5267	9.64695	103.66
58.3631	9.70992	102.987
58.1995	9.7477	102.588
58.0359	9.77289	102.324
57.8722	9.89882	101.022
57.7086	10.0877	99.1303
57.545	10.1507	98.5154
57.3814	10.1633	98.3933
57.2177	10.2137	97.908
57.0541	10.3774	96.3634
56.8905	10.453	95.6668
56.7268	10.4404	95.7822
56.5632	10.4404	95.7822
56.3996	10.4152	96.0138
56.236	10.3144	96.9516
56.0723	10.2011	98.0289
55.9087	10.1633	98.3933
55.7451	10.1129	98.8834
55.5815	9.99957	100.004
55.4178	9.81067	101.93
55.2542	9.73511	102.721
55.0906	9.64695	103.66
54.927	9.5336	104.892
54.7633	9.48323	105.449
54.5997	9.52101	105.031
54.4361	9.57139	104.478
54.2725	9.62176	103.931
54.1088	9.68473	103.255
53.9452	9.65954	103.525
53.7816	9.69732	103.121
53.618	9.87364	101.28
53.4543	10.1885	98.1501
53.2907	10.4655	95.5516
53.1271	10.667	93.7467

52.9635	10.7804	92.761
52.7998	10.7804	92.761
52.6362	10.8308	92.3296
52.4726	10.856	92.1154
52.309	10.793	92.6528
52.1453	10.793	92.6528
51.9817	10.7426	93.0873
51.8181	10.5663	94.6405
51.6545	10.3774	96.3634
51.4908	10.2515	97.5472
51.3272	10.0877	99.1303
51.1636	10.0248	99.753
51	10.0374	99.6278
50.8363	10.0751	99.2542
50.6727	9.98698	100.13
50.5091	10.0248	99.753
50.3455	10.1129	98.8834
50.1818	10.1255	98.7604
50.0182	10.1129	98.8834
49.8546	10.1507	98.5154
49.691	10.1507	98.5154
49.5273	10.0248	99.753
49.3637	10.0248	99.753
49.2001	10.1255	98.7604
49.0365	10.1885	98.1501
48.8728	10.2515	97.5472
48.7092	10.2892	97.189
48.5456	10.3774	96.3634
48.382	10.453	95.6668
48.2183	10.6545	93.8575
48.0547	10.8308	92.3296
47.8911	10.9945	90.9547
47.7275	11.1078	90.0266
47.5638	11.0449	90.5399
47.4002	11.0449	90.5399
47.2366	11.0449	90.5399
47.073	11.0449	90.5399
46.9093	11.1078	90.0266
46.7457	11.0826	90.2312
46.5821	11.1708	89.5191
46.4185	11.1582	89.6202
46.2548	11.0449	90.5399
46.0912	10.9945	90.9547
45.9276	10.9819	91.059
45.764	10.9567	91.2683
45.6003	10.8811	91.9021
45.4367	10.8308	92.3296
45.2731	10.6922	93.5258
45.1095	10.5033	95.2079
44.9458	10.4026	96.13
44.7822	10.2892	97.189
44.6186	10.2137	97.908
44.455	10.3648	96.4804
44.2913	10.5411	94.8667
44.1277	10.5789	94.5279
43.9641	10.6041	94.3033
43.8004	10.6293	94.0799

43.6368	10.667	93.7467
43.4732	10.7552	92.9783
43.3096	10.9567	91.2683
43.1459	11.1582	89.6202
42.9823	11.2967	88.5211
42.8187	11.5864	86.3081
42.6551	11.7879	84.8328
42.4914	12.0398	83.0581
42.3278	12.3294	81.1068
42.1642	12.5561	79.6425
42.0006	12.5435	79.7224
41.8369	12.2539	81.6069
41.6733	12.6695	78.93
41.5097	12.7576	78.3845
41.3461	12.6191	79.245
41.1824	12.6317	79.166
41.0188	12.9087	77.4669
40.8552	12.5561	79.6425
40.6916	12.4302	80.4494
40.5279	12.3798	80.7767
40.3643	12.6191	79.245
40.2007	12.9717	77.0908
40.0371	13.3243	75.0506
39.8734	13.5762	73.6582
39.7098	13.7903	72.5147
39.5462	13.8281	72.3166
39.3826	14.0926	70.9594
39.2189	14.1429	70.7067
39.0553	14.3318	69.7747
38.8917	14.483	69.0466
38.7281	14.5837	68.5696
38.5644	14.4326	69.2876
38.4008	14.4704	69.1067
38.2372	14.4704	69.1067
38.0736	14.4704	69.1067
37.9099	14.5459	68.7477
37.7463	14.5459	68.7477
37.5827	14.3822	69.5303
37.4191	14.1303	70.7697
37.2554	13.8911	71.9888
37.0918	13.7022	72.9812
36.9282	13.5888	73.59
36.7646	13.6644	73.183
36.6009	13.8029	72.4485
36.4373	13.8407	72.2508
36.2737	13.7525	72.7139
36.1101	13.5132	74.0015
35.9464	13.4125	74.5573
35.7828	13.4755	74.2089
35.6192	13.3747	74.768
35.4556	13.211	75.6945
35.2919	13.1858	75.8391
35.1283	13.0095	76.8669
34.9647	12.6317	79.166
34.8011	12.5435	79.7224
34.6374	12.5309	79.8025
34.4738	12.5939	79.4035

34.3102	12.6695	78.93
34.1466	12.7954	78.1531
33.9829	12.745	78.462
33.8193	12.6695	78.93
33.6557	12.4302	80.4494
33.4921	12.342	81.024
33.3284	12.3294	81.1068
33.1648	12.2916	81.3561
33.0012	12.4176	80.531
32.8376	12.5939	79.4035
32.6739	12.7828	78.2301
32.5103	12.8836	77.6183
32.3467	12.808	78.0762
32.1831	12.5435	79.7224
32.0194	12.4554	80.2867
31.8558	12.3798	80.7767
31.6922	12.2161	81.8593
31.5286	12.1783	82.1133
31.3649	12.2413	81.6909
31.2013	12.1279	82.4543
31.0377	11.9516	83.6707
30.874	11.9516	83.6707
30.7104	11.9894	83.407
30.5468	12.002	83.3195
30.3832	11.9642	83.5826
30.2195	12.0524	82.9713
30.0559	12.0524	82.9713
29.8923	12.0398	83.0581
29.7287	11.9894	83.407
29.565	11.9642	83.5826
29.4014	12.0524	82.9713
29.2378	12.0776	82.7982
29.0742	12.0776	82.7982
28.9105	12.0272	83.145
28.7469	12.2413	81.6909
28.5833	12.5057	79.9633
28.4197	12.745	78.462
28.256	12.808	78.0762
28.0924	12.6821	78.8516
27.9288	12.5939	79.4035
27.7652	12.4931	80.0439
27.6015	12.468	80.2056
27.4379	12.4931	80.0439
27.2743	12.4931	80.0439
27.1107	12.5309	79.8025
26.947	12.468	80.2056
26.7834	12.3672	80.859
26.6198	12.1153	82.54
26.4562	12.1531	82.2834
26.2925	12.1657	82.1983
26.1289	12.1783	82.1133
25.9653	12.2161	81.8593
25.8017	12.2916	81.3561
25.638	12.2539	81.6069
25.4744	12.3294	81.1068
25.3108	12.4176	80.531
25.1472	12.5057	79.9633

24.9835	12.6317	79.166
24.8199	12.6569	79.0085
24.6563	12.6317	79.166
24.4927	12.5813	79.483
24.329	12.7198	78.6174
24.1654	12.468	80.2056
24.0018	12.4554	80.2867
23.8382	12.468	80.2056
23.6745	12.5939	79.4035
23.5109	12.5309	79.8025
23.3473	12.5309	79.8025
23.1837	12.6695	78.93
23.02	12.8332	77.923
22.8564	13.1228	76.203
22.6928	13.2614	75.407
22.5292	13.4629	74.2784
22.3655	13.4629	74.2784
22.2019	13.3747	74.768
22.0383	13.4503	74.3479
21.8747	13.551	73.7951
21.711	13.9288	71.7935
21.5474	14.2941	69.9591
21.3838	14.9238	67.0073
21.2202	15.2134	65.7315
21.0565	15.2638	65.5146
20.8929	15.0875	66.2802
20.7293	15.1378	66.0596
20.5657	15.1253	66.1146
20.402	15.0119	66.6138
20.2384	14.9993	66.6697
20.0748	14.8986	67.1206
19.9112	14.6719	68.1576
19.7475	14.5585	68.6883
19.5839	14.4578	69.1669
19.4203	14.3318	69.7747
19.2567	14.1429	70.7067
19.093	13.9288	71.7935
18.9294	13.7022	72.9812
18.7658	13.4125	74.5573
18.6021	12.871	77.6943
18.4385	12.5561	79.6425
18.2749	12.5309	79.8025
18.1113	12.7828	78.2301
17.9476	13.0095	76.8669
17.784	12.8458	77.8466
17.6204	12.5309	79.8025
17.4568	12.3672	80.859
17.2931	12.4302	80.4494
17.1295	12.468	80.2056
16.9659	11.9642	83.5826
16.8023	11.4856	87.0652
16.6386	11.133	89.8229
16.475	10.7552	92.9783
16.3114	10.4655	95.5516
16.1478	10.2892	97.189
15.9841	10.2515	97.5472
15.8205	10.4907	95.3222

15.6569	10.453	95.6668
15.4933	10.1255	98.7604
15.3296	9.91142	100.894
15.166	9.77289	102.324
15.0024	9.55879	104.616
14.8388	9.64695	103.66
14.6751	9.93661	100.638
14.5115	9.81067	101.93
14.3479	9.49582	105.309
14.1843	9.20617	108.623
14.0206	8.66463	115.412
13.857	8.02235	124.652
13.6934	7.84604	127.453
13.5298	8.16088	122.536
13.3661	8.3246	120.126
13.2025	8.41276	118.867
13.0389	8.70241	114.911
12.8753	8.81576	113.433
12.7116	8.45054	118.336
12.548	7.909	126.438
12.3844	7.82085	127.863
12.2208	7.909	126.438
12.0571	7.93419	126.037
11.8935	7.89641	126.64
11.7299	8.02235	124.652
11.5663	8.02235	124.652
11.4026	7.909	126.438
11.239	8.02235	124.652
11.0754	8.34979	119.764
10.9118	8.40016	119.045
10.7481	8.38757	119.224
10.5845	8.43794	118.512
10.4209	8.40016	119.045

~VERSION INFORMATION

VERS .2.0 :CWLS LOG ASCII STANDARD-VERSION 2.0
WRAP .NO :ONE LINE PER DEPTH STEP

~WELL INFORMATION

STRT .FT 10.2573 :START DEPTH
STOP .FT 220.189 :STOP DEPTH
STEP .FT 0.163625 :STEP
NULL . -999.25 :NULL VALUE
COMP . kleinfelder :COMPANY
WELL . :WELL
FLD . :FIELD
LOC . Los Alamos :LOCATION
PROV . N/A :PROVINCE
SRVC . N/A :SERVICE COMPANY
DATE . 12-22-05 :DATE
UWI . N/A :UNIQUE WELL ID

~CURVE INFORMATION

DEPT .FT :DEPTH
COND .MS :Cond.
I__R .OHM-M :I. Res.

~PARAMETER INFORMATION

ELEV . :ELEVATION
STE . :STE
DENS . :DENSITY
CASI . :CASING TO1
OPER . :OPERATING RIG TIME
WGT1 . :WGT1
CASI . :CASING SIZE1
CASI . :CASING TO2
WGT2 . :WGT2
CASI . :CASING SIZE2
WELL . laoi3.2a :WELL ID
CASI . :CASING TO3
K.B. . :K.B.
WGT3 . :WGT3
TYPE . :TYPE LOG
CASI . :CASING SIZE3
CASI . :CASING TO4
SALI . :SALINITY
TITL . :TITLE
WGT4 . :WGT4
TOP . :TOP LOGGED INTERVAL
CASI . :CASING SIZE4
WITN . Rick Smith :WITNESSED BY
CASI . :CASING TO5
DRIL . :DRILLING MEAS. FROM
WGT5 . :WGT5
CASI . :CASING SIZE5
CTY . :CTY
WGT6 . :WGT6
CASI . :CASING SIZE6
MAX. . :MAX. REC. TEMP.
D.F. . :D.F.
CASI . :CASING TO6
OTHE . :OTHER SERVICES
BIT1 . 7.5" :BIT1
DEPT . :DEPTH-DRILLER

```

BIT2 . :BIT2
RUN . :RUN No
RUN1 . :RUN1
BIT3 . :BIT3
RUN2 . :RUN2
PERM . :PERMANENT DATUM
TWP . :TWP
BIT4 . :BIT4
LOG . :LOG MEAS. FROM
BIT . 0 :BIT FROM1
RUN3 . :RUN3
BIT5 . :BIT5
CASI . :CASING FROM1
TYPE . g.w @ 164ft :TYPE FLUID IN HOLE
RUN4 . :RUN4
FLD . :FLD
BIT6 . :BIT6
BIT . 223 :BIT TO1
CASI . :CASING FROM2
BIT . :BIT FROM2
CO . :CO
RGE . :RGE
BIT . :BIT TO2
DEPT . :DEPTH-LOGGER
CASI . :CASING FROM3
BIT . :BIT FROM3
RUN5 . :RUN5
SEC . :SEC
BIT . :BIT TO3
G.L. . :G.L.
CASI . :CASING FROM4
BIT . :BIT FROM4
RUN6 . :RUN6
BIT . :BIT TO4
BTM . :BTM LOGGED INTERVAL
CASI . :CASING FROM5
BIT . :BIT FROM5
STAT . :STATE
BIT . :BIT TO5
LEVE . :LEVEL
CASI . :CASING FROM6
BIT . :BIT FROM6
COUN . :COUNTRY
RECO . cember hardison :RECORDED BY
FILI . :FILING No
BIT . :BIT TO6
~OTHER
~A
10.2573 11.5738 86.402
10.4209 11.6116 86.1209
10.5845 11.4982 86.9699
10.7481 11.4227 87.5452
10.9118 11.2841 88.6199
11.0754 11.196 89.3177
11.239 11.0323 90.6432
11.4026 10.7426 93.0873
11.5663 10.4404 95.7822

```

11.7299	10.5033	95.2079
11.8935	10.6041	94.3033
12.0571	10.6167	94.1915
12.2208	10.5663	94.6405
12.3844	10.4907	95.3222
12.548	10.2766	97.3081
12.7116	9.9492	100.511
12.8753	9.68473	103.255
13.0389	9.60917	104.067
13.2025	9.64695	103.66
13.3661	9.58398	104.341
13.5298	9.36988	106.725
13.6934	9.36988	106.725
13.857	9.26913	107.885
14.0206	9.08023	110.129
14.1843	9.04245	110.59
14.3479	9.49582	105.309
14.5115	9.73511	102.721
14.6751	9.45804	105.73
14.8388	9.08023	110.129
15.0024	8.90391	112.31
15.166	8.74019	114.414
15.3296	8.38757	119.224
15.4933	8.53869	117.114
15.6569	9.20617	108.623
15.8205	9.64695	103.66
15.9841	9.64695	103.66
16.1478	9.81067	101.93
16.3114	9.77289	102.324
16.475	9.30692	107.447
16.6386	9.10541	109.825
16.8023	9.20617	108.623
16.9659	9.23135	108.326
17.1295	9.39507	106.439
17.2932	9.68473	103.255
17.4568	9.68473	103.255
17.6204	9.48323	105.449
17.784	9.5336	104.892
17.9477	9.65954	103.525
18.1113	9.86104	101.409
18.2749	10.0877	99.1303
18.4385	10.3774	96.3634
18.6022	10.793	92.6528
18.7658	11.2338	89.0173
18.9294	11.3219	88.3242
19.093	11.3597	88.0305
19.2567	11.5486	86.5905
19.4203	11.9894	83.407
19.5839	12.3798	80.7767
19.7475	12.4176	80.531
19.9112	12.5435	79.7224
20.0748	13.0095	76.8669
20.2384	13.5132	74.0015
20.402	13.8407	72.2508
20.5657	13.9792	71.5348
20.7293	13.9162	71.8585
20.8929	13.8533	72.1851

21.0565	13.7903	72.5147
21.2202	13.7022	72.9812
21.3838	13.4629	74.2784
21.5474	13.3495	74.909
21.711	13.5132	74.0015
21.8747	13.7022	72.9812
22.0383	13.7525	72.7139
22.2019	13.8785	72.0541
22.3655	13.9666	71.5993
22.5292	14.1807	70.5183
22.6928	14.5459	68.7477
22.8564	14.7474	67.8084
23.02	14.5837	68.5696
23.1837	14.1807	70.5183
23.3473	14.1052	70.8961
23.5109	14.0926	70.9594
23.6745	14.1807	70.5183
23.8382	14.357	69.6523
24.0018	14.5459	68.7477
24.1654	14.6467	68.2748
24.329	14.6341	68.3336
24.4927	14.4578	69.1669
24.6563	14.2311	70.2687
24.8199	14.2185	70.3309
24.9835	14.1429	70.7067
25.1472	14.2185	70.3309
25.3108	14.3318	69.7747
25.4744	14.2689	70.0826
25.638	14.2689	70.0826
25.8017	14.2941	69.9591
25.9653	14.2689	70.0826
26.1289	14.08	71.0229
26.2925	14.1052	70.8961
26.4562	14.1303	70.7697
26.6198	14.1052	70.8961
26.7834	14.0044	71.4061
26.947	13.9666	71.5993
27.1107	13.8911	71.9888
27.2743	13.8281	72.3166
27.4379	13.8281	72.3166
27.6015	13.7147	72.9142
27.7652	13.6014	73.5218
27.9288	13.551	73.7951
28.0924	13.3747	74.768
28.256	13.2236	75.6224
28.4197	13.3369	74.9798
28.5833	13.2992	75.1928
28.7469	13.1606	75.9843
28.9105	13.1606	75.9843
29.0742	13.0851	76.4231
29.2378	13.0347	76.7184
29.4014	13.0347	76.7184
29.5651	13.0851	76.4231
29.7287	13.0473	76.6444
29.8923	13.1606	75.9843
30.0559	13.2488	75.4787
30.2196	13.3873	74.6976

30.3832	13.4503	74.3479
30.5468	13.3369	74.9798
30.7104	13.3369	74.9798
30.8741	13.3243	75.0506
31.0377	13.2866	75.264
31.2013	13.2488	75.4787
31.3649	13.1858	75.8391
31.5286	13.1732	75.9116
31.6922	13.211	75.6945
31.8558	13.1354	76.13
32.0194	13.0599	76.5705
32.1831	13.0851	76.4231
32.3467	13.0095	76.8669
32.5103	12.9213	77.3914
32.6739	12.8332	77.923
32.8376	12.9087	77.4669
33.0012	12.8836	77.6183
33.1648	12.8332	77.923
33.3284	12.8836	77.6183
33.4921	12.9717	77.0908
33.6557	12.871	77.6943
33.8193	12.8332	77.923
33.9829	12.9213	77.3914
34.1466	12.9591	77.1657
34.3102	12.9717	77.0908
34.4738	13.0851	76.4231
34.6374	13.1732	75.9116
34.8011	13.1606	75.9843
34.9647	13.2614	75.407
35.1283	13.211	75.6945
35.2919	13.2992	75.1928
35.4556	13.4755	74.2089
35.6192	13.5132	74.0015
35.7828	13.5762	73.6582
35.9464	13.4251	74.4874
36.1101	13.4125	74.5573
36.2737	13.2866	75.264
36.4373	13.3243	75.0506
36.6009	13.5762	73.6582
36.7646	13.8785	72.0541
36.9282	13.8533	72.1851
37.0918	13.7651	72.6474
37.2554	13.7525	72.7139
37.4191	13.6392	73.3182
37.5827	13.3243	75.0506
37.7463	13.2488	75.4787
37.9099	13.3495	74.909
38.0736	13.3369	74.9798
38.2372	13.4629	74.2784
38.4008	13.5132	74.0015
38.5644	13.5007	74.0705
38.7281	13.3873	74.6976
38.8917	13.2992	75.1928
39.0553	13.2488	75.4787
39.2189	13.2236	75.6224
39.3826	13.1606	75.9843
39.5462	13.2614	75.407

39.7098	13.3369	74.9798
39.8734	13.5007	74.0705
40.0371	13.5132	74.0015
40.2007	13.5762	73.6582
40.3643	13.7525	72.7139
40.5279	13.7273	72.8473
40.6916	13.5888	73.59
40.8552	13.551	73.7951
41.0188	13.7273	72.8473
41.1824	13.8281	72.3166
41.3461	13.9162	71.8585
41.5097	13.954	71.6639
41.6733	14.0422	71.214
41.8369	14.017	71.342
42.0006	13.9162	71.8585
42.1642	13.7651	72.6474
42.3278	13.6266	73.3859
42.4915	13.6644	73.183
42.6551	13.7273	72.8473
42.8187	13.4503	74.3479
42.9823	13.4125	74.5573
43.146	13.5384	73.8638
43.3096	13.4629	74.2784
43.4732	13.0095	76.8669
43.6368	13.1858	75.8391
43.8005	13.1858	75.8391
43.9641	13.2236	75.6224
44.1277	13.1732	75.9116
44.2913	13.4125	74.5573
44.455	13.4251	74.4874
44.6186	13.4251	74.4874
44.7822	13.4503	74.3479
44.9458	13.2992	75.1928
45.1095	13.211	75.6945
45.2731	13.0976	76.3496
45.4367	12.9087	77.4669
45.6003	12.745	78.462
45.764	12.5561	79.6425
45.9276	12.4176	80.531
46.0912	12.2916	81.3561
46.2548	12.2539	81.6069
46.4185	12.1153	82.54
46.5821	11.9264	83.8474
46.7457	11.8635	84.2925
46.9093	11.8257	84.5618
47.073	11.7627	85.0144
47.2366	11.6116	86.1209
47.4002	11.6116	86.1209
47.5638	11.536	86.685
47.7275	11.4479	87.3526
47.8911	11.536	86.685
48.0547	11.6242	86.0276
48.2183	11.662	85.7489
48.382	11.7375	85.1969
48.5456	11.7879	84.8328
48.7092	11.7879	84.8328
48.8728	11.7627	85.0144

49.0365	11.7879	84.8328
49.2001	11.8635	84.2925
49.3637	12.0398	83.0581
49.5273	12.1531	82.2834
49.691	12.2413	81.6909
49.8546	12.342	81.024
50.0182	12.3672	80.859
50.1818	12.3294	81.1068
50.3455	12.2161	81.8593
50.5091	12.1783	82.1133
50.6727	12.2791	81.4395
50.8363	12.2539	81.6069
51	12.2161	81.8593
51.1636	12.2035	81.9438
51.3272	12.2035	81.9438
51.4908	12.1783	82.1133
51.6545	12.0776	82.7982
51.8181	12.0272	83.145
51.9817	12.0776	82.7982
52.1453	12.002	83.3195
52.309	11.8886	84.1139
52.4726	11.7879	84.8328
52.6362	11.5864	86.3081
52.7998	11.5108	86.8747
52.9635	11.4101	87.6418
53.1271	11.3849	87.8357
53.2907	11.2841	88.6199
53.4543	11.196	89.3177
53.618	11.1582	89.6202
53.7816	11.0323	90.6432
53.9452	10.9441	91.3734
54.1088	11.0071	90.8506
54.2725	11.0323	90.6432
54.4361	10.9819	91.059
54.5997	11.0449	90.5399
54.7634	11.0826	90.2312
54.927	11.1204	89.9246
55.0906	11.1078	90.0266
55.2542	11.07	90.3338
55.4179	11.0323	90.6432
55.5815	10.8811	91.9021
55.7451	10.856	92.1154
55.9087	10.8685	92.0086
56.0724	10.7552	92.9783
56.236	10.667	93.7467
56.3996	10.5411	94.8667
56.5632	10.5663	94.6405
56.7269	10.4655	95.5516
56.8905	10.3774	96.3634
57.0541	10.3396	96.7155
57.2177	10.327	96.8334
57.3814	10.2389	97.6672
57.545	10.1885	98.1501
57.7086	10.1507	98.5154
57.8722	10.2011	98.0289
58.0359	10.2137	97.908
58.1995	10.2137	97.908

58.3631	10.1885	98.1501
58.5267	10.3396	96.7155
58.6904	10.4152	96.0138
58.854	10.5285	94.9802
59.0176	10.4907	95.3222
59.1812	10.4907	95.3222
59.3449	10.6167	94.1915
59.5085	10.5789	94.5279
59.6721	10.6041	94.3033
59.8357	10.6922	93.5258
59.9994	10.7426	93.0873
60.163	10.6922	93.5258
60.3266	10.6293	94.0799
60.4902	10.5789	94.5279
60.6539	10.4655	95.5516
60.8175	10.3774	96.3634
60.9811	10.3774	96.3634
61.1447	10.3144	96.9516
61.3084	10.2389	97.6672
61.472	10.2766	97.3081
61.6356	10.327	96.8334
61.7992	10.3774	96.3634
61.9629	10.4152	96.0138
62.1265	10.453	95.6668
62.2901	10.4404	95.7822
62.4537	10.4026	96.13
62.6174	10.4152	96.0138
62.781	10.453	95.6668
62.9446	10.4655	95.5516
63.1082	10.4907	95.3222
63.2719	10.453	95.6668
63.4355	10.4655	95.5516
63.5991	10.5033	95.2079
63.7627	10.3774	96.3634
63.9264	10.4907	95.3222
64.09	10.3648	96.4804
64.2536	10.4404	95.7822
64.4172	10.4655	95.5516
64.5809	10.5033	95.2079
64.7445	10.4907	95.3222
64.9081	10.5411	94.8667
65.0717	10.5033	95.2079
65.2354	10.2892	97.189
65.399	10.2515	97.5472
65.5626	10.2389	97.6672
65.7262	10.2515	97.5472
65.8899	10.1885	98.1501
66.0535	10.2892	97.189
66.2171	10.3396	96.7155
66.3807	10.3396	96.7155
66.5444	10.4026	96.13
66.708	10.3396	96.7155
66.8716	10.2137	97.908
67.0352	10.1885	98.1501
67.1989	10.0374	99.6278
67.3625	10.1255	98.7604
67.5261	10.0625	99.3784

67.6898	10.1129	98.8834
67.8534	10.3144	96.9516
68.017	10.1885	98.1501
68.1806	10.0751	99.2542
68.3443	10.0625	99.3784
68.5079	9.9492	100.511
68.6715	9.86104	101.409
68.8351	9.70992	102.987
68.9988	9.87364	101.28
69.1624	9.96179	100.384
69.326	9.93661	100.638
69.4896	9.69732	103.121
69.6533	9.73511	102.721
69.8169	9.68473	103.255
69.9805	9.24395	108.179
70.1441	9.49582	105.309
70.3078	9.35729	106.869
70.4714	9.19357	108.772
70.635	9.31951	107.302
70.7986	9.7477	102.588
70.9623	9.64695	103.66
71.1259	9.83586	101.669
71.2895	10.0751	99.2542
71.4531	9.9492	100.511
71.6168	9.86104	101.409
71.7804	9.98698	100.13
71.944	9.93661	100.638
72.1076	9.83586	101.669
72.2713	9.9492	100.511
72.4349	9.78548	102.192
72.5985	9.91142	100.894
72.7621	10.0248	99.753
72.9258	10.0751	99.2542
73.0894	9.93661	100.638
73.253	9.9492	100.511
73.4166	9.89882	101.022
73.5803	9.96179	100.384
73.7439	9.9492	100.511
73.9075	10.0374	99.6278
74.0711	10.0248	99.753
74.2348	10.1255	98.7604
74.3984	10.2389	97.6672
74.562	10.1255	98.7604
74.7256	10.0248	99.753
74.8893	9.98698	100.13
75.0529	9.81067	101.93
75.2165	9.78548	102.192
75.3801	9.81067	101.93
75.5438	9.86104	101.409
75.7074	9.87364	101.28
75.871	9.81067	101.93
76.0346	9.73511	102.721
76.1983	9.5336	104.892
76.3619	9.43285	106.012
76.5255	9.35729	106.869
76.6891	9.16838	109.07
76.8528	9.23135	108.326

77.0164	9.24395	108.179
77.18	9.26913	107.885
77.3436	9.31951	107.302
77.5073	9.45804	105.73
77.6709	9.40767	106.296
77.8345	9.48323	105.449
77.9981	9.58398	104.341
78.1618	9.58398	104.341
78.3254	9.65954	103.525
78.489	9.78548	102.192
78.6526	9.77289	102.324
78.8163	9.69732	103.121
78.9799	9.7477	102.588
79.1435	9.69732	103.121
79.3071	9.64695	103.66
79.4708	9.62176	103.931
79.6344	9.60917	104.067
79.798	9.62176	103.931
79.9616	9.70992	102.987
80.1253	9.65954	103.525
80.2889	9.69732	103.121
80.4525	9.69732	103.121
80.6162	9.73511	102.721
80.7798	9.77289	102.324
80.9434	9.78548	102.192
81.107	9.82326	101.799
81.2707	9.83586	101.669
81.4343	9.83586	101.669
81.5979	9.87364	101.28
81.7615	9.89882	101.022
81.9252	9.91142	100.894
82.0888	9.78548	102.192
82.2524	9.64695	103.66
82.416	9.40767	106.296
82.5797	9.26913	107.885
82.7433	9.08023	110.129
82.9069	8.91651	112.152
83.0705	8.81576	113.433
83.2342	8.57648	116.598
83.3978	8.53869	117.114
83.5614	8.57648	116.598
83.725	8.5261	117.287
83.8887	8.47573	117.984
84.0523	8.43794	118.512
84.2159	8.48832	117.809
84.3795	8.47573	117.984
84.5432	8.53869	117.114
84.7068	8.70241	114.911
84.8704	8.89132	112.469
85.034	9.1432	109.371
85.1977	9.26913	107.885
85.3613	9.28173	107.739
85.5249	9.28173	107.739
85.6885	9.28173	107.739
85.8522	9.26913	107.885
86.0158	9.26913	107.885
86.1794	9.20617	108.623

86.343	9.26913	107.885
86.5067	9.26913	107.885
86.6703	9.24395	108.179
86.8339	9.19357	108.772
86.9975	9.20617	108.623
87.1612	9.24395	108.179
87.3248	9.24395	108.179
87.4884	9.35729	106.869
87.652	9.43285	106.012
87.8157	9.49582	105.309
87.9793	9.45804	105.73
88.1429	9.60917	104.067
88.3065	9.57139	104.478
88.4702	9.58398	104.341
88.6338	9.62176	103.931
88.7974	9.62176	103.931
88.961	9.68473	103.255
89.1247	9.82326	101.799
89.2883	9.82326	101.799
89.4519	9.81067	101.93
89.6155	9.96179	100.384
89.7792	10.0625	99.3784
89.9428	10.2389	97.6672
90.1064	10.2389	97.6672
90.27	10.2892	97.189
90.4337	10.2892	97.189
90.5973	10.3396	96.7155
90.7609	10.1885	98.1501
90.9245	10.1129	98.8834
91.0882	10.0751	99.2542
91.2518	10.0625	99.3784
91.4154	10.0625	99.3784
91.579	10.1885	98.1501
91.7427	10.2011	98.0289
91.9063	10.1633	98.3933
92.0699	10.1633	98.3933
92.2335	10.2515	97.5472
92.3972	10.2137	97.908
92.5608	10.2892	97.189
92.7244	10.4152	96.0138
92.8881	10.4907	95.3222
93.0517	10.3774	96.3634
93.2153	10.3774	96.3634
93.3789	10.2892	97.189
93.5426	10.2892	97.189
93.7062	10.2766	97.3081
93.8698	10.2137	97.908
94.0334	10.2011	98.0289
94.1971	10.1507	98.5154
94.3607	10.1255	98.7604
94.5243	10.0248	99.753
94.6879	9.98698	100.13
94.8516	9.93661	100.638
95.0152	9.93661	100.638
95.1788	9.96179	100.384
95.3424	9.93661	100.638
95.5061	9.9492	100.511

95.6697	10.0248	99.753
95.8333	10.0374	99.6278
95.9969	10.2137	97.908
96.1606	10.2515	97.5472
96.3242	10.3144	96.9516
96.4878	10.4026	96.13
96.6514	10.5285	94.9802
96.8151	10.6041	94.3033
96.9787	10.73	93.1965
97.1423	10.7804	92.761
97.3059	10.8685	92.0086
97.4696	10.856	92.1154
97.6332	10.8182	92.4371
97.7968	10.7426	93.0873
97.9604	10.8308	92.3296
98.1241	10.8182	92.4371
98.2877	10.7552	92.9783
98.4513	10.7048	93.4158
98.6149	10.7804	92.761
98.7786	10.9189	91.5841
98.9422	10.9567	91.2683
99.1058	11.0071	90.8506
99.2694	11.0449	90.5399
99.4331	11.0071	90.8506
99.5967	10.8811	91.9021
99.7603	10.8308	92.3296
99.9239	10.9063	91.6899
100.088	10.9567	91.2683
100.251	10.9819	91.059
100.415	11.196	89.3177
100.578	11.259	88.8182
100.742	11.3597	88.0305
100.906	11.4856	87.0652
101.069	11.3849	87.8357
101.233	11.3849	87.8357
101.397	11.4101	87.6418
101.56	11.3345	88.2261
101.724	11.3849	87.8357
101.887	11.3597	88.0305
102.051	11.4605	87.2566
102.215	11.4982	86.9699
102.378	11.3849	87.8357
102.542	11.3849	87.8357
102.706	11.3849	87.8357
102.869	11.3597	88.0305
103.033	11.196	89.3177
103.196	11.259	88.8182
103.36	11.2086	89.2174
103.524	11.259	88.8182
103.687	11.2086	89.2174
103.851	11.1582	89.6202
104.015	11.196	89.3177
104.178	11.259	88.8182
104.342	11.2841	88.6199
104.505	11.196	89.3177
104.669	11.196	89.3177
104.833	11.2338	89.0173

104.996	11.1204	89.9246
105.16	11.3219	88.3242
105.324	11.4605	87.2566
105.487	11.4479	87.3526
105.651	11.3849	87.8357
105.814	11.4227	87.5452
105.978	11.4605	87.2566
106.142	11.4982	86.9699
106.305	11.5108	86.8747
106.469	11.536	86.685
106.633	11.4982	86.9699
106.796	11.4479	87.3526
106.96	11.4856	87.0652
107.123	11.5108	86.8747
107.287	11.4479	87.3526
107.451	11.3597	88.0305
107.614	11.3597	88.0305
107.778	11.2338	89.0173
107.942	11.2086	89.2174
108.105	11.1204	89.9246
108.269	11.1204	89.9246
108.432	11.0071	90.8506
108.596	10.9441	91.3734
108.76	10.9567	91.2683
108.923	10.856	92.1154
109.087	10.8308	92.3296
109.251	10.8182	92.4371
109.414	10.7552	92.9783
109.578	10.7804	92.761
109.741	10.793	92.6528
109.905	10.793	92.6528
110.069	10.856	92.1154
110.232	10.7804	92.761
110.396	10.7552	92.9783
110.56	10.7426	93.0873
110.723	10.73	93.1965
110.887	10.7804	92.761
111.05	10.856	92.1154
111.214	10.7552	92.9783
111.378	10.9063	91.6899
111.541	11.0323	90.6432
111.705	10.9945	90.9547
111.869	11.0323	90.6432
112.032	11.0323	90.6432
112.196	11.0449	90.5399
112.359	11.0826	90.2312
112.523	11.133	89.8229
112.687	11.0826	90.2312
112.85	11.1708	89.5191
113.014	11.0071	90.8506
113.178	11.1708	89.5191
113.341	11.196	89.3177
113.505	11.259	88.8182
113.668	11.1708	89.5191
113.832	11.259	88.8182
113.996	11.2841	88.6199
114.159	11.2841	88.6199

114.323	11.2086	89.2174
114.487	11.2086	89.2174
114.65	11.196	89.3177
114.814	11.259	88.8182
114.977	11.2338	89.0173
115.141	11.2086	89.2174
115.305	11.259	88.8182
115.468	11.1582	89.6202
115.632	11.1204	89.9246
115.796	11.1078	90.0266
115.959	11.0449	90.5399
116.123	11.0826	90.2312
116.286	11.0826	90.2312
116.45	11.1078	90.0266
116.614	11.1582	89.6202
116.777	11.196	89.3177
116.941	11.2086	89.2174
117.105	11.196	89.3177
117.268	11.1582	89.6202
117.432	11.196	89.3177
117.595	11.1078	90.0266
117.759	10.9945	90.9547
117.923	10.9441	91.3734
118.086	10.856	92.1154
118.25	10.8685	92.0086
118.414	10.8308	92.3296
118.577	10.7552	92.9783
118.741	10.8308	92.3296
118.904	10.9189	91.5841
119.068	10.9441	91.3734
119.232	10.9441	91.3734
119.395	10.9819	91.059
119.559	10.9945	90.9547
119.723	10.9945	90.9547
119.886	10.9567	91.2683
120.05	11.0071	90.8506
120.213	10.9819	91.059
120.377	10.9945	90.9547
120.541	11.0071	90.8506
120.704	11.1078	90.0266
120.868	11.07	90.3338
121.032	11.0071	90.8506
121.195	11.0323	90.6432
121.359	10.9945	90.9547
121.522	11.07	90.3338
121.686	11.0826	90.2312
121.85	11.1078	90.0266
122.013	11.196	89.3177
122.177	11.3597	88.0305
122.341	11.5486	86.5905
122.504	11.7375	85.1969
122.668	11.7123	85.3801
122.831	11.662	85.7489
122.995	11.6116	86.1209
123.159	11.5486	86.5905
123.322	11.5738	86.402
123.486	11.536	86.685

123.65	11.536	86.685
123.813	11.6368	85.9345
123.977	11.6746	85.6564
124.14	11.8383	84.4718
124.304	11.8761	84.2031
124.468	11.9138	83.936
124.631	11.9642	83.5826
124.795	12.002	83.3195
124.959	12.0398	83.0581
125.122	12.0776	82.7982
125.286	12.1783	82.1133
125.449	12.3672	80.859
125.613	12.468	80.2056
125.777	12.5561	79.6425
125.94	12.6569	79.0085
126.104	12.6317	79.166
126.268	12.6317	79.166
126.431	12.5939	79.4035
126.595	12.5939	79.4035
126.758	12.5435	79.7224
126.922	12.4931	80.0439
127.086	12.468	80.2056
127.249	12.4302	80.4494
127.413	12.405	80.6127
127.577	12.3798	80.7767
127.74	12.3042	81.2728
127.904	12.2916	81.3561
128.067	12.2413	81.6909
128.231	12.2413	81.6909
128.395	12.2539	81.6069
128.558	12.2413	81.6909
128.722	12.2413	81.6909
128.886	12.2791	81.4395
129.049	12.3294	81.1068
129.213	12.3042	81.2728
129.376	12.3042	81.2728
129.54	12.2791	81.4395
129.704	12.3294	81.1068
129.867	12.2916	81.3561
130.031	12.342	81.024
130.195	12.468	80.2056
130.358	12.6695	78.93
130.522	12.871	77.6943
130.685	12.9213	77.3914
130.849	12.9339	77.316
131.013	13.0095	76.8669
131.176	13.0347	76.7184
131.34	13.0347	76.7184
131.504	13.0599	76.5705
131.667	13.1606	75.9843
131.831	13.1858	75.8391
131.995	13.3243	75.0506
132.158	13.4503	74.3479
132.322	13.5762	73.6582
132.485	13.6266	73.3859
132.649	13.7147	72.9142
132.813	13.8029	72.4485

132.976	13.8407	72.2508
133.14	13.9792	71.5348
133.304	14.08	71.0229
133.467	14.0926	70.9594
133.631	14.1681	70.581
133.794	14.1429	70.7067
133.958	14.0044	71.4061
134.122	14.017	71.342
134.285	13.9666	71.5993
134.449	13.9162	71.8585
134.613	13.9162	71.8585
134.776	14.0044	71.4061
134.94	14.0422	71.214
135.103	14.1052	70.8961
135.267	14.1807	70.5183
135.431	14.1807	70.5183
135.594	14.1807	70.5183
135.758	14.2185	70.3309
135.922	14.2185	70.3309
136.085	14.2311	70.2687
136.249	14.2689	70.0826
136.412	14.2941	69.9591
136.576	14.2311	70.2687
136.74	14.2941	69.9591
136.903	14.2941	69.9591
137.067	14.2311	70.2687
137.231	14.3067	69.8975
137.394	14.3822	69.5303
137.558	14.3822	69.5303
137.721	14.3948	69.4695
137.885	14.5459	68.7477
138.049	14.5963	68.5105
138.212	14.6341	68.3336
138.376	14.7978	67.5776
138.54	14.9238	67.0073
138.703	14.9363	66.9508
138.867	15.0875	66.2802
139.03	15.1756	65.8951
139.194	15.2134	65.7315
139.358	15.2638	65.5146
139.521	15.2134	65.7315
139.685	15.1504	66.0047
139.849	15.1504	66.0047
140.012	15.0875	66.2802
140.176	15.0119	66.6138
140.339	14.9615	66.8381
140.503	14.9363	66.9508
140.667	14.8482	67.3483
140.83	14.8104	67.5201
140.994	14.7222	67.9244
141.158	14.7474	67.8084
141.321	14.7097	67.9826
141.485	14.7222	67.9244
141.648	14.8356	67.4055
141.812	14.9615	66.8381
141.976	15.0623	66.391
142.139	15.1756	65.8951

142.303	15.3016	65.3528
142.467	15.4275	64.8193
142.63	15.5283	64.3987
142.794	15.6038	64.0869
142.957	15.7549	63.4721
143.121	15.7675	63.4215
143.285	15.8179	63.2195
143.448	15.8179	63.2195
143.612	15.9313	62.7697
143.776	15.9313	62.7697
143.939	16.1328	61.9857
144.103	16.2587	61.5056
144.266	16.3091	61.3156
144.43	16.5484	60.429
144.594	16.7373	59.7469
144.757	16.775	59.6124
144.921	16.8254	59.4339
145.085	16.9765	58.9048
145.248	17.1151	58.428
145.412	17.2158	58.0861
145.575	17.4299	57.3726
145.739	17.3166	57.7481
145.903	16.6365	60.1088
146.066	16.8002	59.523
146.23	16.775	59.6124
146.394	16.5484	60.429
146.557	16.4476	60.7991
146.721	16.9262	59.0801
146.884	16.435	60.8457
147.048	16.0068	62.4734
147.212	15.6794	63.778
147.375	15.4653	64.661
147.539	15.3393	65.1918
147.703	15.2764	65.4605
147.866	15.1378	66.0596
148.03	15.0119	66.6138
148.193	14.9238	67.0073
148.357	14.8734	67.2342
148.521	14.76	67.7505
148.684	14.7097	67.9826
148.848	14.6341	68.3336
149.012	14.6845	68.0992
149.175	14.7097	67.9826
149.339	14.6845	68.0992
149.502	14.6467	68.2748
149.666	14.5963	68.5105
149.83	14.5837	68.5696
149.993	14.7474	67.8084
150.157	14.886	67.1774
150.321	14.7978	67.5776
150.484	14.7222	67.9244
150.648	14.4578	69.1669
150.811	14.2059	70.3933
150.975	14.0548	71.1502
151.139	14.1429	70.7067
151.302	14.0548	71.1502
151.466	13.8785	72.0541

151.63	13.9288	71.7935
151.793	13.8281	72.3166
151.957	13.5007	74.0705
152.12	13.4503	74.3479
152.284	13.5762	73.6582
152.448	13.5888	73.59
152.611	13.6014	73.5218
152.775	13.6644	73.183
152.939	13.5007	74.0705
153.102	13.2236	75.6224
153.266	12.9717	77.0908
153.429	12.871	77.6943
153.593	12.5939	79.4035
153.757	12.5561	79.6425
153.92	12.4931	80.0439
154.084	12.405	80.6127
154.248	12.2161	81.8593
154.411	12.1783	82.1133
154.575	12.2791	81.4395
154.738	12.342	81.024
154.902	12.4554	80.2867
155.066	12.5057	79.9633
155.229	12.5435	79.7224
155.393	12.6191	79.245
155.557	12.6695	78.93
155.72	12.7198	78.6174
155.884	12.7954	78.1531
156.047	12.8458	77.8466
156.211	12.9717	77.0908
156.375	13.1732	75.9116
156.538	13.1732	75.9116
156.702	13.0851	76.4231
156.866	13.1606	75.9843
157.029	13.211	75.6945
157.193	13.2992	75.1928
157.356	13.4503	74.3479
157.52	13.4251	74.4874
157.684	13.2488	75.4787
157.847	13.1732	75.9116
158.011	13.1228	76.203
158.175	12.9339	77.316
158.338	13.1732	75.9116
158.502	13.2614	75.407
158.665	13.3873	74.6976
158.829	13.5762	73.6582
158.993	13.5132	74.0015
159.156	13.677	73.1156
159.32	13.8533	72.1851
159.484	14.017	71.342
159.647	13.954	71.6639
159.811	13.7525	72.7139
159.974	13.8281	72.3166
160.138	13.8911	71.9888
160.302	13.8407	72.2508
160.465	13.8785	72.0541
160.629	14.1052	70.8961
160.793	14.3318	69.7747

160.956	14.483	69.0466
161.12	14.6467	68.2748
161.283	14.886	67.1774
161.447	15.1001	66.2249
161.611	15.2764	65.4605
161.774	15.4023	64.9253
161.938	15.3771	65.0317
162.102	15.3142	65.2991
162.265	15.3142	65.2991
162.429	15.4779	64.6083
162.592	15.7172	63.6247
162.756	15.9816	62.5718
162.92	16.1705	61.8409
163.083	16.3469	61.1739
163.247	16.5484	60.429
163.411	16.6869	59.9273
163.574	16.9388	59.0362
163.738	17.1403	58.3422
163.901	17.304	57.7902
164.065	17.5307	57.0429
164.229	17.7196	56.4348
164.392	17.9463	55.7219
164.556	18.1478	55.1032
164.72	18.3619	54.4607
164.883	18.5634	53.8696
165.047	18.79	53.2197
165.21	19.0167	52.5853
165.374	19.1553	52.205
165.538	19.4197	51.494
165.701	19.6086	50.9979
165.865	19.8101	50.4792
166.029	20.0368	49.9081
166.192	20.3139	49.2274
166.356	20.6161	48.5057
166.519	20.9562	47.7186
166.683	21.2962	46.9567
166.847	21.6992	46.0846
167.01	22.1778	45.0902
167.174	22.8704	43.7246
167.338	23.8276	41.9682
167.501	24.8477	40.2452
167.665	25.6789	38.9425
167.828	26.0945	38.3223
167.992	26.6486	37.5255
168.156	27.5679	36.274
168.319	28.7517	34.7805
168.483	30.2504	33.0574
168.647	31.9254	31.323
168.81	33.6759	29.6948
168.974	35.4391	28.2175
169.137	37.24	26.8529
169.301	39.0661	25.5977
169.465	40.7788	24.5225
169.628	42.5545	23.4993
169.792	44.3177	22.5644
169.956	45.8919	21.7903
170.119	47.315	21.1349

170.283	48.7003	20.5337
170.446	49.859	20.0566
170.61	50.7909	19.6886
170.774	51.7102	19.3385
170.937	52.4659	19.06
171.101	53.0956	18.834
171.265	53.6497	18.6394
171.428	54.0401	18.5048
171.592	54.292	18.4189
171.755	54.3423	18.4019
171.919	54.1786	18.4575
172.083	53.8512	18.5697
172.246	53.5489	18.6745
172.41	53.1459	18.8161
172.574	52.6296	19.0007
172.737	52.0755	19.2029
172.901	51.2821	19.5
173.064	49.8338	20.0667
173.228	48.1966	20.7484
173.392	46.8616	21.3394
173.555	45.5519	21.953
173.719	44.4436	22.5004
173.883	43.4613	23.009
174.046	42.4538	23.555
174.21	41.3707	24.1717
174.373	40.2751	24.8293
174.537	39.3935	25.3849
174.701	38.1089	26.2406
174.864	36.5977	27.3241
175.028	35.1116	28.4806
175.192	33.7137	29.6615
175.355	32.1773	31.0779
175.519	30.8297	32.4362
175.682	29.7341	33.6315
175.846	29.2051	34.2406
176.01	29.4066	34.0059
176.173	29.8222	33.532
176.337	29.7844	33.5746
176.501	29.2681	34.1669
176.664	28.7391	34.7957
176.828	27.908	35.8321
176.991	26.7997	37.3138
177.155	25.9811	38.4895
177.319	25.3766	39.4064
177.482	25.0618	39.9014
177.646	25.0114	39.9818
177.81	24.7973	40.327
177.973	23.7898	42.0348
178.137	23.0845	43.319
178.3	22.9208	43.6285
178.464	23.1727	43.1542
178.628	22.7445	43.9667
178.791	22.6689	44.1132
178.955	22.4674	44.5089
179.119	22.5934	44.2608
179.282	22.1652	45.1158
179.446	22.1148	45.2186

179.609	22.3415	44.7598
179.773	22.6186	44.2115
179.937	22.9586	43.5567
180.1	23.5505	42.4619
180.264	23.9283	41.7915
180.428	23.8402	41.946
180.591	25.2507	39.6029
180.755	26.3085	38.0105
180.918	26.107	38.3038
181.082	24.8603	40.2248
181.246	24.6462	40.5743
181.409	24.2054	41.3131
181.573	24.2558	41.2273
181.737	24.218	41.2916
181.9	25.1877	39.7019
182.064	25.7166	38.8853
182.227	26.2582	38.0834
182.391	25.9811	38.4895
182.555	25.9685	38.5082
182.718	26.0567	38.3779
182.882	26.3589	37.9378
183.046	27.1397	36.8463
183.209	27.6813	36.1255
183.373	27.5931	36.2409
183.536	27.316	36.6085
183.7	27.4546	36.4238
183.864	27.4546	36.4238
184.027	27.4042	36.4907
184.191	27.5679	36.274
184.355	27.6183	36.2079
184.518	27.3286	36.5916
184.682	27.1523	36.8293
184.845	27.2405	36.7101
185.009	27.5301	36.3238
185.173	27.5176	36.3404
185.336	27.6435	36.1749
185.5	27.6183	36.2079
185.664	27.3664	36.5411
185.827	26.8879	37.1915
185.991	26.4723	37.7754
186.154	26.2582	38.0834
186.318	26.1448	38.2485
186.482	26.1448	38.2485
186.645	26.3589	37.9378
186.809	26.6108	37.5787
186.973	26.7367	37.4017
187.136	27.6435	36.1749
187.3	27.9709	35.7514
187.463	27.8702	35.8806
187.627	27.5553	36.2906
187.791	27.2405	36.7101
187.954	26.636	37.5432
188.118	26.3841	37.9016
188.282	26.8879	37.1915
188.445	27.1397	36.8463
188.609	27.6561	36.1584
188.772	29.2933	34.1375

188.936	30.3386	32.9614
189.1	30.3637	32.934
189.263	31.069	32.1864
189.427	31.9506	31.2983
189.591	31.409	31.838
189.754	31.3838	31.8635
189.918	32.4543	30.8125
190.081	33.1596	30.1572
190.245	33.6255	29.7393
190.409	34.7212	28.8008
190.572	36.1317	27.6765
190.736	37.4918	26.6725
190.9	38.6127	25.8982
191.063	39.6454	25.2236
191.227	40.5269	24.6749
191.39	41.6352	24.0181
191.554	42.4916	23.5341
191.718	42.882	23.3198
191.881	43.4235	23.029
192.045	43.751	22.8566
192.209	43.7132	22.8764
192.372	43.7887	22.8369
192.536	44.2295	22.6093
192.699	44.4184	22.5132
192.863	44.6325	22.4052
193.027	44.7585	22.3421
193.19	44.5947	22.4242
193.354	44.3932	22.526
193.518	44.2547	22.5965
193.681	43.5621	22.9558
193.845	42.8694	23.3267
194.008	42.0886	23.7594
194.172	40.9677	24.4095
194.336	39.7965	25.1278
194.499	38.852	25.7387
194.663	37.983	26.3276
194.827	37.114	26.944
194.99	36.7362	27.2211
195.154	36.3836	27.4849
195.318	35.6028	28.0877
195.481	35.0235	28.5523
195.645	34.5953	28.9057
195.808	33.9656	29.4416
195.972	33.4366	29.9073
196.136	33.3737	29.9637
196.299	32.7944	30.4931
196.463	32.6306	30.646
196.627	32.9959	30.3068
196.79	33.4996	29.8511
196.954	33.6885	29.6837
197.117	34.2175	29.2249
197.281	34.3812	29.0857
197.445	34.4693	29.0113
197.608	34.5953	28.9057
197.772	35.2627	28.3585
197.936	36.2702	27.5708
198.099	37.983	26.3276

198.263	39.9476	25.0328
198.426	41.7611	23.9457
198.59	43.4991	22.989
198.754	44.9222	22.2607
198.917	46.1438	21.6714
199.081	47.5291	21.0397
199.245	49.0781	20.3757
199.408	50.6775	19.7326
199.572	52.3273	19.1105
199.735	53.889	18.5567
199.899	55.1735	18.1246
200.063	56.307	17.7598
200.226	57.2641	17.4629
200.39	57.8056	17.2994
200.554	58.322	17.1462
200.717	58.7502	17.0212
200.881	59.2287	16.8837
201.044	59.7829	16.7272
201.208	60.1985	16.6117
201.372	60.6141	16.4978
201.535	60.9919	16.3956
201.699	61.2941	16.3148
201.863	61.6971	16.2082
202.026	61.7097	16.2049
202.19	61.4201	16.2813
202.353	61.206	16.3383
202.517	61.0045	16.3922
202.681	61.1178	16.3618
202.844	61.4578	16.2713
203.008	61.6216	16.2281
203.172	61.7475	16.195
203.335	61.9238	16.1489
203.499	62.0498	16.1161
203.662	62.1001	16.103
203.826	62.415	16.0218
203.99	62.6668	15.9574
204.153	62.7676	15.9318
204.317	62.8809	15.9031
204.481	62.8683	15.9063
204.644	62.7298	15.9414
204.808	62.5157	15.996
204.971	62.415	16.0218
205.135	62.289	16.0542
205.299	62.0498	16.1161
205.462	61.8357	16.1719
205.626	61.4956	16.2613
205.79	60.9541	16.4058
205.953	60.4503	16.5425
206.117	59.9844	16.671
206.28	59.3799	16.8407
206.444	58.4479	17.1092
206.608	57.5412	17.3789
206.771	56.4707	17.7083
206.935	55.3121	18.0792
207.099	53.8386	18.574
207.262	52.3021	19.1197
207.426	50.7153	19.7179

207.589	49.3804	20.251
207.753	48.058	20.8082
207.917	47.0757	21.2424
208.08	46.0052	21.7367
208.244	45.1741	22.1366
208.408	44.6325	22.4052
208.571	43.8013	22.8304
208.735	42.882	23.3198
208.898	42.542	23.5062
209.062	42.2649	23.6603
209.226	41.7234	23.9674
209.389	41.8241	23.9097
209.553	41.9123	23.8594
209.717	41.95	23.8379
209.88	42.1767	23.7098
210.044	42.4916	23.5341
210.207	42.5797	23.4854
210.371	42.9575	23.2788
210.535	43.4613	23.009
210.698	44.0658	22.6933
210.862	44.7207	22.361
211.026	44.8466	22.2982
211.189	45.2244	22.1119
211.353	45.4889	21.9834
211.516	45.7282	21.8684
211.68	45.9297	21.7724
211.844	46.3453	21.5772
212.007	46.6853	21.42
212.171	47.1765	21.197
212.335	47.3528	21.1181
212.498	47.0253	21.2651
212.662	47.0379	21.2594
212.825	46.849	21.3452
212.989	46.4838	21.5129
213.153	46.4838	21.5129
213.316	46.8616	21.3394
213.48	47.0757	21.2424
213.644	47.2017	21.1857
213.807	47.655	20.9841
213.971	47.9321	20.8628
214.134	48.3603	20.6781
214.298	48.8137	20.4861
214.462	49.5693	20.1738
214.625	50.4886	19.8064
214.789	51.2569	19.5096
214.953	51.7228	19.3338
215.116	52.3777	19.0921
215.28	53.3978	18.7274
215.443	54.5061	18.3466
215.607	55.7403	17.9404
215.771	57.3271	17.4438
215.934	58.9769	16.9558
216.098	60.4629	16.5391
216.262	61.7853	16.1851
216.425	63.0447	15.8618
216.589	64.0899	15.6031
216.752	65.0471	15.3735

216.916	65.8909	15.1766
217.08	66.6969	14.9932
217.243	67.0369	14.9172
217.407	67.314	14.8558
217.571	67.4147	14.8336
217.734	67.4399	14.828
217.898	67.3895	14.8391
218.061	67.2762	14.8641
218.225	67.1502	14.892
218.389	66.9739	14.9312
218.552	66.7724	14.9762
218.716	66.911	14.9452
218.88	66.9739	14.9312
219.043	67.0621	14.9116
219.207	66.9487	14.9368
219.37	66.8228	14.965
219.534	66.5961	15.0159
219.698	66.2183	15.1016
219.861	65.7397	15.2115
220.025	64.6819	15.4603
220.189	63.7751	15.6801

~VERSION INFORMATION

VERS .2.0 :CWLS LOG ASCII STANDARD-VERSION 2.0
WRAP .NO :ONE LINE PER DEPTH STEP

~WELL INFORMATION

STRT .FT 10.7481 :START DEPTH
STOP .FT 222.479 :STOP DEPTH
STEP .FT 0.163625 :STEP
NULL . -999.25 :NULL VALUE
COMP . kleinfelder :COMPANY
WELL . :WELL
FLD . :FIELD
LOC . Los Alamos :LOCATION
PROV . N/A :PROVINCE
SRVC . N/A :SERVICE COMPANY
DATE . 12-22-05 :DATE
UWI . N/A :UNIQUE WELL ID

~CURVE INFORMATION

DEPT .FT :DEPTH
COND .MS :Cond.
I__R .OHM-M :I. Res.

~PARAMETER INFORMATION

ELEV . :ELEVATION
STE . :STE
DENS . :DENSITY
CASI . :CASING TO1
OPER . :OPERATING RIG TIME
WGT1 . :WGT1
CASI . :CASING SIZE1
CASI . :CASING TO2
WGT2 . :WGT2
CASI . :CASING SIZE2
WELL . laoi3.2a :WELL ID
CASI . :CASING TO3
K.B. . :K.B.
WGT3 . :WGT3
TYPE . :TYPE LOG
CASI . :CASING SIZE3
CASI . :CASING TO4
SALI . :SALINITY
TITL . :TITLE
WGT4 . :WGT4
TOP . :TOP LOGGED INTERVAL
CASI . :CASING SIZE4
WITN . Rick Smith :WITNESSED BY
CASI . :CASING TO5
DRIL . :DRILLING MEAS. FROM
WGT5 . :WGT5
CASI . :CASING SIZE5
CTY . :CTY
WGT6 . :WGT6
CASI . :CASING SIZE6
MAX. . :MAX. REC. TEMP.
D.F. . :D.F.
CASI . :CASING TO6
OTHE . :OTHER SERVICES
BIT1 . 7.5" :BIT1
DEPT . :DEPTH-DRILLER

```

BIT2 . :BIT2
RUN . :RUN No
RUN1 . :RUN1
BIT3 . :BIT3
RUN2 . :RUN2
PERM . :PERMANENT DATUM
TWP . :TWP
BIT4 . :BIT4
LOG . :LOG MEAS. FROM
BIT . 0 :BIT FROM1
RUN3 . :RUN3
BIT5 . :BIT5
CASI . :CASING FROM1
TYPE . g.w @ 164ft :TYPE FLUID IN HOLE
RUN4 . :RUN4
FLD . :FLD
BIT6 . :BIT6
BIT . 223 :BIT TO1
CASI . :CASING FROM2
BIT . :BIT FROM2
CO . :CO
RGE . :RGE
BIT . :BIT TO2
DEPT . :DEPTH-LOGGER
CASI . :CASING FROM3
BIT . :BIT FROM3
RUN5 . :RUN5
SEC . :SEC
BIT . :BIT TO3
G.L. . :G.L.
CASI . :CASING FROM4
BIT . :BIT FROM4
RUN6 . :RUN6
BIT . :BIT TO4
BTM . :BTM LOGGED INTERVAL
CASI . :CASING FROM5
BIT . :BIT FROM5
STAT . :STATE
BIT . :BIT TO5
LEVE . :LEVEL
CASI . :CASING FROM6
BIT . :BIT FROM6
COUN . :COUNTRY
RECO . cember hardison :RECORDED BY
FILI . :FILING No
BIT . :BIT TO6

```

~OTHER

~A

10.7481	10.8182	92.4371
10.9118	10.6293	94.0799
11.0754	10.5789	94.5279
11.239	10.6167	94.1915
11.4026	10.6167	94.1915
11.5663	10.5663	94.6405
11.7299	10.6293	94.0799
11.8935	10.6041	94.3033
12.0571	10.4404	95.7822

12.2208	10.1255	98.7604
12.3844	9.83586	101.669
12.548	9.82326	101.799
12.7116	9.91142	100.894
12.8753	9.78548	102.192
13.0389	9.68473	103.255
13.2025	9.65954	103.525
13.3661	9.5336	104.892
13.5298	9.40767	106.296
13.6934	9.57139	104.478
13.857	9.98698	100.13
14.0206	10.0374	99.6278
14.1843	9.65954	103.525
14.3479	9.3321	107.157
14.5115	9.16838	109.07
14.6751	8.95429	111.678
14.8388	8.63944	115.748
15.0024	8.91651	112.152
15.166	9.62176	103.931
15.3296	9.98698	100.13
15.4933	10.0625	99.3784
15.6569	10.2011	98.0289
15.8205	9.96179	100.384
15.9841	9.5336	104.892
16.1478	9.48323	105.449
16.3114	9.5336	104.892
16.475	9.52101	105.031
16.6386	9.83586	101.669
16.8023	9.91142	100.894
16.9659	9.81067	101.93
17.1295	9.69732	103.121
17.2932	9.73511	102.721
17.4568	9.99957	100.004
17.6204	10.2137	97.908
17.784	10.453	95.6668
17.9477	10.856	92.1154
18.1113	11.3345	88.2261
18.2749	11.5864	86.3081
18.4385	11.4605	87.2566
18.6022	11.5108	86.8747
18.7658	11.7879	84.8328
18.9294	12.1783	82.1133
19.093	12.342	81.024
19.2567	12.2035	81.9438
19.4203	12.4554	80.2867
19.5839	12.8836	77.6183
19.7475	13.3495	74.909
19.9112	13.6392	73.3182
20.0748	13.7525	72.7139
20.2384	13.7022	72.9812
20.402	13.677	73.1156
20.5657	13.6392	73.3182
20.7293	13.5888	73.59
20.8929	13.3495	74.909
21.0565	13.3369	74.9798
21.2202	13.5007	74.0705
21.3838	13.5384	73.8638

21.5474	13.6266	73.3859
21.711	13.8029	72.4485
21.8747	13.9162	71.8585
22.0383	14.2059	70.3933
22.2019	14.5082	68.9268
22.3655	14.5963	68.5105
22.5292	14.357	69.6523
22.6928	14.08	71.0229
22.8564	14.08	71.0229
23.02	14.1429	70.7067
23.1837	14.3067	69.8975
23.3473	14.4326	69.2876
23.5109	14.7097	67.9826
23.6745	14.7222	67.9244
23.8382	14.7097	67.9826
24.0018	14.5207	68.867
24.1654	14.4578	69.1669
24.329	14.483	69.0466
24.4927	14.357	69.6523
24.6563	14.5585	68.6883
24.8199	14.5207	68.867
24.9835	14.5837	68.5696
25.1472	14.4578	69.1669
25.3108	14.6341	68.3336
25.4744	14.4578	69.1669
25.638	14.4326	69.2876
25.8017	14.5459	68.7477
25.9653	14.5082	68.9268
26.1289	14.5459	68.7477
26.2925	14.6215	68.3924
26.4562	14.7097	67.9826
26.6198	14.6845	68.0992
26.7834	14.76	67.7505
26.947	14.7726	67.6928
27.1107	14.7097	67.9826
27.2743	14.5207	68.867
27.4379	14.357	69.6523
27.6015	14.2563	70.1445
27.7652	14.1303	70.7697
27.9288	14.1807	70.5183
28.0924	14.0926	70.9594
28.256	13.9288	71.7935
28.4197	13.8785	72.0541
28.5833	13.8281	72.3166
28.7469	13.7903	72.5147
28.9105	13.8407	72.2508
29.0742	13.9792	71.5348
29.2378	14.0422	71.214
29.4014	14.08	71.0229
29.565	14.2059	70.3933
29.7287	14.357	69.6523
29.8923	14.2185	70.3309
30.0559	14.1807	70.5183
30.2196	14.2941	69.9591
30.3832	14.3067	69.8975
30.5468	14.4704	69.1067
30.7104	14.483	69.0466

30.8741	14.5082	68.9268
31.0377	14.5082	68.9268
31.2013	14.483	69.0466
31.3649	14.42	69.3481
31.5286	14.3444	69.7134
31.6922	14.2941	69.9591
31.8558	14.1303	70.7697
32.0194	14.0044	71.4061
32.1831	13.9666	71.5993
32.3467	14.0422	71.214
32.5103	14.1052	70.8961
32.6739	13.9792	71.5348
32.8376	14.0422	71.214
33.0012	14.0044	71.4061
33.1648	13.8407	72.2508
33.3284	13.8533	72.1851
33.4921	13.8281	72.3166
33.6557	13.8533	72.1851
33.8193	13.9162	71.8585
33.9829	13.954	71.6639
34.1466	14.1052	70.8961
34.3102	14.2311	70.2687
34.4738	14.3067	69.8975
34.6374	14.1681	70.581
34.8011	14.1681	70.581
34.9647	14.1429	70.7067
35.1283	14.1807	70.5183
35.2919	14.08	71.0229
35.4556	13.9288	71.7935
35.6192	13.8407	72.2508
35.7828	13.7525	72.7139
35.9464	13.7903	72.5147
36.1101	14.1303	70.7697
36.2737	14.2311	70.2687
36.4373	14.1429	70.7067
36.6009	14.0422	71.214
36.7646	13.9666	71.5993
36.9282	13.6644	73.183
37.0918	13.5132	74.0015
37.2554	13.5007	74.0705
37.4191	13.5384	73.8638
37.5827	13.5762	73.6582
37.7463	13.6014	73.5218
37.9099	13.5007	74.0705
38.0736	13.5132	74.0015
38.2372	13.4251	74.4874
38.4008	13.3495	74.909
38.5644	13.3243	75.0506
38.7281	13.2488	75.4787
38.8917	13.2992	75.1928
39.0553	13.4503	74.3479
39.2189	13.6266	73.3859
39.3826	13.7022	72.9812
39.5462	13.8533	72.1851
39.7098	14.1429	70.7067
39.8734	14.2563	70.1445
40.0371	14.2941	69.9591

40.2007	14.2059	70.3933
40.3643	14.5082	68.9268
40.5279	14.5963	68.5105
40.6916	14.7726	67.6928
40.8552	14.9993	66.6697
41.0188	15.1504	66.0047
41.1824	15.1504	66.0047
41.3461	15.1756	65.8951
41.5097	15.0245	66.558
41.6733	14.8104	67.5201
41.8369	14.7474	67.8084
42.0006	14.9615	66.8381
42.1642	14.7222	67.9244
42.3278	14.5963	68.5105
42.4915	14.76	67.7505
42.6551	14.7474	67.8084
42.8187	14.2563	70.1445
42.9823	14.3444	69.7134
43.146	14.4578	69.1669
43.3096	14.42	69.3481
43.4732	14.483	69.0466
43.6368	14.5082	68.9268
43.8005	14.5963	68.5105
43.9641	14.5837	68.5696
44.1277	14.5585	68.6883
44.2913	14.483	69.0466
44.455	14.2059	70.3933
44.6186	14.0422	71.214
44.7822	13.8533	72.1851
44.9458	13.5132	74.0015
45.1095	13.2866	75.264
45.2731	13.0851	76.4231
45.4367	12.7954	78.1531
45.6003	12.6191	79.245
45.764	12.4176	80.531
45.9276	12.2035	81.9438
46.0912	12.0776	82.7982
46.2548	12.1153	82.54
46.4185	11.9642	83.5826
46.5821	11.7879	84.8328
46.7457	11.5738	86.402
46.9093	11.4982	86.9699
47.073	11.4479	87.3526
47.2366	11.4479	87.3526
47.4002	11.5864	86.3081
47.5638	11.6242	86.0276
47.7275	11.6997	85.472
47.8911	11.7375	85.1969
48.0547	11.7123	85.3801
48.2183	11.7501	85.1056
48.382	11.7501	85.1056
48.5456	11.8257	84.5618
48.7092	11.9516	83.6707
48.8728	12.0524	82.9713
49.0365	12.0901	82.712
49.2001	12.2539	81.6069
49.3637	12.2413	81.6909

49.5273	12.2161	81.8593
49.691	12.1153	82.54
49.8546	12.0776	82.7982
50.0182	12.0398	83.0581
50.1818	12.002	83.3195
50.3455	11.9642	83.5826
50.5091	11.9894	83.407
50.6727	11.9264	83.8474
50.8363	11.8257	84.5618
51	11.8005	84.7423
51.1636	11.662	85.7489
51.3272	11.5864	86.3081
51.4908	11.5864	86.3081
51.6545	11.4605	87.2566
51.8181	11.4479	87.3526
51.9817	11.259	88.8182
52.1453	11.1078	90.0266
52.309	10.9945	90.9547
52.4726	11.07	90.3338
52.6362	10.9441	91.3734
52.7998	10.8308	92.3296
52.9635	10.9567	91.2683
53.1271	10.8811	91.9021
53.2907	10.9567	91.2683
53.4543	10.9945	90.9547
53.618	11.133	89.8229
53.7816	11.2086	89.2174
53.9452	11.3345	88.2261
54.1088	11.3723	87.933
54.2725	11.4982	86.9699
54.4361	11.6116	86.1209
54.5997	11.7123	85.3801
54.7633	11.6368	85.9345
54.927	11.4479	87.3526
55.0906	11.3849	87.8357
55.2542	11.2086	89.2174
55.4179	11.1582	89.6202
55.5815	10.9441	91.3734
55.7451	10.8182	92.4371
55.9087	10.7048	93.4158
56.0724	10.6293	94.0799
56.236	10.5285	94.9802
56.3996	10.4026	96.13
56.5632	10.3774	96.3634
56.7269	10.4404	95.7822
56.8905	10.4404	95.7822
57.0541	10.3648	96.4804
57.2177	10.4026	96.13
57.3814	10.4404	95.7822
57.545	10.4026	96.13
57.7086	10.4152	96.0138
57.8722	10.6041	94.3033
58.0359	10.6041	94.3033
58.1995	10.6545	93.8575
58.3631	10.6545	93.8575
58.5267	10.6167	94.1915
58.6904	10.7552	92.9783

58.854	10.6922	93.5258
59.0176	10.7048	93.4158
59.1812	10.6922	93.5258
59.3449	10.793	92.6528
59.5085	10.8811	91.9021
59.6721	10.8685	92.0086
59.8357	10.7426	93.0873
59.9994	10.7804	92.761
60.163	10.7426	93.0873
60.3266	10.6545	93.8575
60.4902	10.5789	94.5279
60.6539	10.5663	94.6405
60.8175	10.6545	93.8575
60.9811	10.6922	93.5258
61.1447	10.7552	92.9783
61.3084	10.7552	92.9783
61.472	10.8308	92.3296
61.6356	10.7804	92.761
61.7992	10.7048	93.4158
61.9629	10.6545	93.8575
62.1265	10.6167	94.1915
62.2901	10.5663	94.6405
62.4537	10.5663	94.6405
62.6174	10.6041	94.3033
62.781	10.5033	95.2079
62.9446	10.3774	96.3634
63.1082	10.1885	98.1501
63.2719	10.2011	98.0289
63.4355	10.1255	98.7604
63.5991	10.1507	98.5154
63.7627	10.1255	98.7604
63.9264	10.1885	98.1501
64.09	10.2766	97.3081
64.2536	10.2137	97.908
64.4172	10.2892	97.189
64.5809	9.96179	100.384
64.7445	9.9492	100.511
64.9081	9.87364	101.28
65.0717	9.9492	100.511
65.2354	9.91142	100.894
65.399	9.93661	100.638
65.5626	9.96179	100.384
65.7262	9.99957	100.004
65.8899	9.91142	100.894
66.0535	9.83586	101.669
66.2171	9.69732	103.121
66.3807	9.55879	104.616
66.5444	9.40767	106.296
66.708	9.30692	107.447
66.8716	9.19357	108.772
67.0352	9.06763	110.282
67.1989	8.97948	111.365
67.3625	8.9417	111.836
67.5261	8.86613	112.789
67.6898	8.68982	115.077
67.8534	8.56388	116.769
68.017	8.38757	119.224

68.1806	8.19866	121.971
68.3443	8.1105	123.297
68.5079	8.14829	122.725
68.6715	7.87122	127.045
68.8351	7.69491	129.956
68.9988	7.89641	126.64
69.1624	7.909	126.438
69.326	7.60675	131.462
69.4896	7.94679	125.837
69.6533	7.97197	125.439
69.8169	7.78307	128.484
69.9805	8.06013	124.067
70.1441	8.57648	116.598
70.3078	8.57648	116.598
70.4714	8.91651	112.152
70.635	9.16838	109.07
70.7986	9.1432	109.371
70.9623	9.26913	107.885
71.1259	9.40767	106.296
71.2895	9.40767	106.296
71.4531	9.44545	105.871
71.6168	9.64695	103.66
71.7804	9.60917	104.067
71.944	9.83586	101.669
72.1076	9.89882	101.022
72.2713	9.96179	100.384
72.4349	9.81067	101.93
72.5985	9.82326	101.799
72.7621	9.87364	101.28
72.9258	9.9492	100.511
73.0894	9.98698	100.13
73.253	10.1255	98.7604
73.4166	10.1507	98.5154
73.5803	10.3144	96.9516
73.7439	10.4152	96.0138
73.9075	10.2892	97.189
74.0711	10.1255	98.7604
74.2348	10.0625	99.3784
74.3984	9.86104	101.409
74.562	9.77289	102.324
74.7256	9.7477	102.588
74.8893	9.78548	102.192
75.0529	9.83586	101.669
75.2165	9.87364	101.28
75.3801	9.69732	103.121
75.5438	9.58398	104.341
75.7074	9.52101	105.031
75.871	9.52101	105.031
76.0346	9.52101	105.031
76.1983	9.64695	103.66
76.3619	9.73511	102.721
76.5255	9.91142	100.894
76.6891	10.0625	99.3784
76.8528	10.2011	98.0289
77.0164	10.1255	98.7604
77.18	10.2011	98.0289
77.3436	10.3648	96.4804

77.5073	10.453	95.6668
77.6709	10.5663	94.6405
77.8345	10.6545	93.8575
77.9981	10.7048	93.4158
78.1618	10.6293	94.0799
78.3254	10.6293	94.0799
78.489	10.5411	94.8667
78.6526	10.6041	94.3033
78.8163	10.5663	94.6405
78.9799	10.6293	94.0799
79.1435	10.667	93.7467
79.3071	10.7048	93.4158
79.4708	10.6922	93.5258
79.6344	10.73	93.1965
79.798	10.7804	92.761
79.9616	10.8308	92.3296
80.1253	10.9189	91.5841
80.2889	11.07	90.3338
80.4525	11.1078	90.0266
80.6162	11.1078	90.0266
80.7798	11.1708	89.5191
80.9434	11.2464	88.9177
81.107	11.2464	88.9177
81.2707	11.3219	88.3242
81.4343	11.2841	88.6199
81.5979	11.2338	89.0173
81.7615	11.0449	90.5399
81.9252	10.8685	92.0086
82.0888	10.7048	93.4158
82.2524	10.73	93.1965
82.416	10.7552	92.9783
82.5797	10.7048	93.4158
82.7433	10.7048	93.4158
82.9069	10.8182	92.4371
83.0705	10.793	92.6528
83.2342	10.7426	93.0873
83.3978	10.7426	93.0873
83.5614	10.793	92.6528
83.725	10.8308	92.3296
83.8887	10.7804	92.761
84.0523	11.0071	90.8506
84.2159	11.1582	89.6202
84.3795	11.133	89.8229
84.5432	11.0826	90.2312
84.7068	11.1204	89.9246
84.8704	11.0449	90.5399
85.034	10.9945	90.9547
85.1977	10.9567	91.2683
85.3613	10.9819	91.059
85.5249	10.9819	91.059
85.6885	11.0071	90.8506
85.8522	10.7804	92.761
86.0158	10.6545	93.8575
86.1794	10.4655	95.5516
86.343	10.453	95.6668
86.5067	10.2515	97.5472
86.6703	10.1885	98.1501

86.8339	10.1885	98.1501
86.9975	10.1885	98.1501
87.1612	10.1507	98.5154
87.3248	10.1129	98.8834
87.4884	10.1255	98.7604
87.652	10.2011	98.0289
87.8157	10.2137	97.908
87.9793	10.2892	97.189
88.1429	10.2515	97.5472
88.3065	10.1885	98.1501
88.4702	10.1255	98.7604
88.6338	10.1129	98.8834
88.7974	10.0625	99.3784
88.961	9.93661	100.638
89.1247	10.0248	99.753
89.2883	10.0374	99.6278
89.4519	9.9492	100.511
89.6155	9.93661	100.638
89.7792	9.99957	100.004
89.9428	9.82326	101.799
90.1064	9.69732	103.121
90.27	9.70992	102.987
90.4337	9.70992	102.987
90.5973	9.69732	103.121
90.7609	9.64695	103.66
90.9245	9.62176	103.931
91.0882	9.55879	104.616
91.2518	9.48323	105.449
91.4154	9.45804	105.73
91.579	9.36988	106.725
91.7427	9.45804	105.73
91.9063	9.5336	104.892
92.0699	9.49582	105.309
92.2335	9.44545	105.871
92.3972	9.31951	107.302
92.5608	9.20617	108.623
92.7244	9.10541	109.825
92.888	9.02985	110.744
93.0517	8.97948	111.365
93.2153	8.9417	111.836
93.3789	8.86613	112.789
93.5426	8.89132	112.469
93.7062	8.79057	113.758
93.8698	8.74019	114.414
94.0334	8.66463	115.412
94.1971	8.7276	114.579
94.3607	8.70241	114.911
94.5243	8.68982	115.077
94.6879	8.70241	114.911
94.8516	8.77798	113.921
95.0152	8.79057	113.758
95.1788	8.97948	111.365
95.3424	9.01726	110.898
95.5061	9.06763	110.282
95.6697	9.11801	109.673
95.8333	9.19357	108.772
95.9969	9.24395	108.179

96.1606	9.30692	107.447
96.3242	9.24395	108.179
96.4878	9.24395	108.179
96.6514	9.20617	108.623
96.8151	9.23135	108.326
96.9787	9.20617	108.623
97.1423	9.19357	108.772
97.3059	9.16838	109.07
97.4696	9.20617	108.623
97.6332	9.15579	109.221
97.7968	9.23135	108.326
97.9604	9.30692	107.447
98.1241	9.40767	106.296
98.2877	9.48323	105.449
98.4513	9.49582	105.309
98.6149	9.55879	104.616
98.7786	9.52101	105.031
98.9422	9.43285	106.012
99.1058	9.45804	105.73
99.2694	9.5336	104.892
99.4331	9.58398	104.341
99.5967	9.64695	103.66
99.7603	9.77289	102.324
99.9239	9.82326	101.799
100.088	9.87364	101.28
100.251	9.86104	101.409
100.415	9.87364	101.28
100.578	9.87364	101.28
100.742	9.86104	101.409
100.906	9.83586	101.669
101.069	9.83586	101.669
101.233	9.87364	101.28
101.397	10.0374	99.6278
101.56	10.1507	98.5154
101.724	10.2011	98.0289
101.887	10.2011	98.0289
102.051	10.1885	98.1501
102.215	10.0751	99.2542
102.378	10.0374	99.6278
102.542	10.0877	99.1303
102.706	10.1129	98.8834
102.869	10.1129	98.8834
103.033	10.0877	99.1303
103.196	10.0374	99.6278
103.36	10.1507	98.5154
103.524	10.0751	99.2542
103.687	9.98698	100.13
103.851	10.0751	99.2542
104.015	10.0374	99.6278
104.178	10.0374	99.6278
104.342	9.99957	100.004
104.505	10.1255	98.7604
104.669	10.1885	98.1501
104.833	10.1885	98.1501
104.996	10.2137	97.908
105.16	10.1255	98.7604
105.324	10.2011	98.0289

105.487	10.2389	97.6672
105.651	10.2011	98.0289
105.814	10.2011	98.0289
105.978	10.1885	98.1501
106.142	10.1255	98.7604
106.305	10.1129	98.8834
106.469	10.0248	99.753
106.633	9.96179	100.384
106.796	10.0374	99.6278
106.96	9.96179	100.384
107.123	9.98698	100.13
107.287	9.77289	102.324
107.451	9.69732	103.121
107.614	9.62176	103.931
107.778	9.45804	105.73
107.942	9.44545	105.871
108.105	9.35729	106.869
108.269	9.24395	108.179
108.432	9.20617	108.623
108.596	9.23135	108.326
108.76	9.1432	109.371
108.923	9.10541	109.825
109.087	9.19357	108.772
109.251	9.11801	109.673
109.414	9.10541	109.825
109.578	9.16838	109.07
109.741	9.24395	108.179
109.905	9.31951	107.302
110.069	9.43285	106.012
110.232	9.68473	103.255
110.396	9.77289	102.324
110.56	9.9492	100.511
110.723	10.0877	99.1303
110.887	10.2766	97.3081
111.05	10.4404	95.7822
111.214	10.5663	94.6405
111.378	10.667	93.7467
111.541	10.73	93.1965
111.705	10.8685	92.0086
111.869	10.9189	91.5841
112.032	10.9567	91.2683
112.196	11.07	90.3338
112.359	11.1078	90.0266
112.523	11.2338	89.0173
112.687	11.3219	88.3242
112.85	11.259	88.8182
113.014	11.3345	88.2261
113.178	11.3723	87.933
113.341	11.3723	87.933
113.505	11.2464	88.9177
113.668	11.2086	89.2174
113.832	11.2464	88.9177
113.996	11.3849	87.8357
114.159	11.4227	87.5452
114.323	11.3849	87.8357
114.487	11.4227	87.5452
114.65	11.4982	86.9699

114.814	11.5486	86.5905
114.977	11.5864	86.3081
115.141	11.5864	86.3081
115.305	11.5108	86.8747
115.468	11.6368	85.9345
115.632	11.5738	86.402
115.796	11.5864	86.3081
115.959	11.6746	85.6564
116.123	11.7375	85.1969
116.286	11.6746	85.6564
116.45	11.6242	86.0276
116.614	11.5738	86.402
116.777	11.3219	88.3242
116.941	11.1708	89.5191
117.105	11.0323	90.6432
117.268	11.07	90.3338
117.432	11.1204	89.9246
117.595	11.07	90.3338
117.759	11.0071	90.8506
117.923	10.9567	91.2683
118.086	11.0071	90.8506
118.25	10.9819	91.059
118.414	10.9819	91.059
118.577	11.0449	90.5399
118.741	11.1078	90.0266
118.904	11.0323	90.6432
119.068	10.9819	91.059
119.232	10.8182	92.4371
119.395	10.6545	93.8575
119.559	10.5789	94.5279
119.723	10.5285	94.9802
119.886	10.4907	95.3222
120.05	10.4404	95.7822
120.213	10.4152	96.0138
120.377	10.327	96.8334
120.541	10.2137	97.908
120.704	10.1507	98.5154
120.868	10.1507	98.5154
121.032	10.2137	97.908
121.195	10.2137	97.908
121.359	10.3144	96.9516
121.522	10.3144	96.9516
121.686	10.327	96.8334
121.85	10.2515	97.5472
122.013	10.1885	98.1501
122.177	10.0625	99.3784
122.341	9.93661	100.638
122.504	9.89882	101.022
122.668	9.87364	101.28
122.831	9.93661	100.638
122.995	9.96179	100.384
123.159	10.0248	99.753
123.322	10.1507	98.5154
123.486	10.1255	98.7604
123.65	10.1129	98.8834
123.813	10.2011	98.0289
123.977	10.1885	98.1501

124.14	10.1885	98.1501
124.304	10.2892	97.189
124.468	10.327	96.8334
124.631	10.3774	96.3634
124.795	10.5033	95.2079
124.959	10.5411	94.8667
125.122	10.5663	94.6405
125.286	10.5663	94.6405
125.449	10.4907	95.3222
125.613	10.4404	95.7822
125.777	10.3648	96.4804
125.94	10.2766	97.3081
126.104	10.1633	98.3933
126.268	10.1885	98.1501
126.431	10.0625	99.3784
126.595	9.99957	100.004
126.758	9.96179	100.384
126.922	9.93661	100.638
127.086	9.87364	101.28
127.249	9.77289	102.324
127.413	9.81067	101.93
127.577	9.7477	102.588
127.74	9.70992	102.987
127.904	9.77289	102.324
128.067	9.82326	101.799
128.231	9.83586	101.669
128.395	9.81067	101.93
128.558	9.82326	101.799
128.722	9.89882	101.022
128.886	9.96179	100.384
129.049	10.0248	99.753
129.213	10.1633	98.3933
129.376	10.2892	97.189
129.54	10.4152	96.0138
129.704	10.6041	94.3033
129.867	10.6922	93.5258
130.031	10.7426	93.0873
130.195	10.7048	93.4158
130.358	10.7552	92.9783
130.522	10.7804	92.761
130.685	10.8182	92.4371
130.849	10.9441	91.3734
131.013	11.07	90.3338
131.176	11.1204	89.9246
131.34	11.3345	88.2261
131.504	11.4605	87.2566
131.667	11.536	86.685
131.831	11.6746	85.6564
131.995	11.8761	84.2031
132.158	12.0398	83.0581
132.322	12.2539	81.6069
132.485	12.468	80.2056
132.649	12.6191	79.245
132.813	12.7828	78.2301
132.976	12.808	78.0762
133.14	12.745	78.462
133.304	12.745	78.462

133.467	12.7576	78.3845
133.631	12.745	78.462
133.794	12.8458	77.8466
133.958	13.1228	76.203
134.122	13.2488	75.4787
134.285	13.4125	74.5573
134.449	13.4503	74.3479
134.613	13.5132	74.0015
134.776	13.6392	73.3182
134.94	13.6644	73.183
135.103	13.7273	72.8473
135.267	13.8407	72.2508
135.431	13.9162	71.8585
135.594	13.9792	71.5348
135.758	14.08	71.0229
135.922	14.1052	70.8961
136.085	14.1807	70.5183
136.249	14.1807	70.5183
136.412	14.2311	70.2687
136.576	14.2941	69.9591
136.74	14.3948	69.4695
136.903	14.5459	68.7477
137.067	14.6341	68.3336
137.231	14.7474	67.8084
137.394	14.8104	67.5201
137.558	15.0623	66.391
137.721	15.1001	66.2249
137.885	15.1504	66.0047
138.049	15.2134	65.7315
138.212	15.226	65.6771
138.376	15.1756	65.8951
138.54	15.1253	66.1146
138.703	15.0497	66.4466
138.867	14.9363	66.9508
139.03	14.76	67.7505
139.194	14.5585	68.6883
139.358	14.3444	69.7134
139.521	14.2563	70.1445
139.685	14.0548	71.1502
139.849	13.9288	71.7935
140.012	13.8281	72.3166
140.176	13.7147	72.9142
140.339	13.6266	73.3859
140.503	13.5762	73.6582
140.667	13.6014	73.5218
140.83	13.7651	72.6474
140.994	13.9666	71.5993
141.158	14.1052	70.8961
141.321	14.2941	69.9591
141.485	14.42	69.3481
141.648	14.5963	68.5105
141.812	14.5963	68.5105
141.976	14.7474	67.8084
142.139	14.8734	67.2342
142.303	14.9363	66.9508
142.467	14.9615	66.8381
142.63	14.9363	66.9508

142.794	15.0497	66.4466
142.957	15.1378	66.0596
143.121	15.3016	65.3528
143.285	15.4275	64.8193
143.448	15.5912	64.1387
143.612	15.7172	63.6247
143.776	15.8935	62.9189
143.939	15.9438	62.7201
144.103	16.0194	62.4243
144.266	16.1328	61.9857
144.43	16.2335	61.601
144.594	16.3972	60.9859
144.757	16.5232	60.5211
144.921	16.4854	60.6598
145.085	15.6794	63.778
145.248	15.6416	63.9321
145.412	15.5283	64.3987
145.575	15.3016	65.3528
145.739	14.9993	66.6697
145.903	15.5534	64.2945
146.066	15.1253	66.1146
146.23	14.4704	69.1067
146.394	14.1681	70.581
146.557	13.7273	72.8473
146.721	13.4629	74.2784
146.884	13.3369	74.9798
147.048	13.2992	75.1928
147.212	13.2614	75.407
147.375	13.2488	75.4787
147.539	13.2866	75.264
147.703	13.3873	74.6976
147.866	13.3747	74.768
148.03	13.5132	74.0015
148.193	13.6644	73.183
148.357	13.7651	72.6474
148.521	13.7273	72.8473
148.684	13.5762	73.6582
148.848	13.5132	74.0015
149.012	13.5888	73.59
149.175	13.7273	72.8473
149.339	13.9288	71.7935
149.502	14.0548	71.1502
149.666	13.8533	72.1851
149.83	13.4755	74.2089
149.993	13.0851	76.4231
150.157	12.808	78.0762
150.321	12.7954	78.1531
150.484	12.745	78.462
150.648	12.7072	78.6953
150.811	12.7072	78.6953
150.975	12.5309	79.8025
151.139	12.1279	82.4543
151.302	12.0524	82.9713
151.466	12.2413	81.6909
151.63	12.1783	82.1133
151.793	12.1279	82.4543
151.957	12.2413	81.6909

152.12	12.1531	82.2834
152.284	11.9264	83.8474
152.448	11.7501	85.1056
152.611	11.6242	86.0276
152.775	11.4856	87.0652
152.939	11.3849	87.8357
153.102	11.4101	87.6418
153.266	11.3849	87.8357
153.429	11.3345	88.2261
153.593	11.3219	88.3242
153.757	11.4982	86.9699
153.92	11.6997	85.472
154.084	11.662	85.7489
154.248	11.7123	85.3801
154.411	11.536	86.685
154.575	11.3849	87.8357
154.738	11.3219	88.3242
154.902	11.4856	87.0652
155.066	11.5864	86.3081
155.229	11.8635	84.2925
155.393	12.002	83.3195
155.557	12.1783	82.1133
155.72	12.1657	82.1983
155.884	12.1153	82.54
156.047	12.0272	83.145
156.211	12.0524	82.9713
156.375	12.2791	81.4395
156.538	12.2539	81.6069
156.702	12.1279	82.4543
156.866	12.0776	82.7982
157.029	12.0901	82.712
157.193	12.1531	82.2834
157.356	12.2035	81.9438
157.52	12.2539	81.6069
157.684	12.3798	80.7767
157.847	12.468	80.2056
158.011	12.6191	79.245
158.175	12.7198	78.6174
158.338	12.7954	78.1531
158.502	12.8458	77.8466
158.665	13.0473	76.6444
158.829	13.2236	75.6224
158.993	13.3369	74.9798
159.156	13.4503	74.3479
159.32	13.6392	73.3182
159.484	13.7903	72.5147
159.647	13.677	73.1156
159.811	13.6014	73.5218
159.974	13.8029	72.4485
160.138	14.0044	71.4061
160.302	14.2185	70.3309
160.465	14.4326	69.2876
160.629	14.6467	68.2748
160.793	14.8356	67.4055
160.956	14.9363	66.9508
161.12	15.1001	66.2249
161.283	15.2764	65.4605

161.447	15.4653	64.661
161.611	15.6038	64.0869
161.774	15.566	64.2424
161.938	15.7298	63.5738
162.102	15.9187	62.8194
162.265	16.2209	61.6488
162.429	16.4224	60.8924
162.592	16.6491	60.0633
162.756	16.8884	59.2123
162.92	17.0521	58.6438
163.083	17.3921	57.4973
163.247	17.6188	56.7575
163.411	17.8581	55.997
163.574	18.1604	55.065
163.738	18.4752	54.1266
163.901	18.6893	53.5066
164.065	18.916	52.8653
164.229	19.193	52.1022
164.392	19.4197	51.494
164.556	19.7094	50.7372
164.72	20.0242	49.9395
164.883	20.3139	49.2274
165.047	20.6287	48.4761
165.21	20.8428	47.9781
165.374	21.1073	47.377
165.538	21.4222	46.6807
165.701	21.7496	45.9779
165.865	22.14	45.1671
166.029	22.5934	44.2608
166.192	23.1223	43.2483
166.356	23.752	42.1017
166.519	24.8099	40.3065
166.683	25.8552	38.677
166.847	26.8123	37.2963
167.01	27.782	35.9945
167.174	28.9029	34.5986
167.338	29.9859	33.349
167.501	31.1949	32.0565
167.665	32.5803	30.6934
167.828	34.2552	29.1926
167.992	35.9428	27.822
168.156	37.6933	26.5299
168.319	39.5446	25.2879
168.483	41.3204	24.2011
168.647	43.0457	23.2311
168.81	44.8466	22.2982
168.974	46.4838	21.5129
169.137	47.9951	20.8355
169.301	49.33	20.2716
169.465	50.6146	19.7572
169.628	51.7858	19.3103
169.792	52.6674	18.9871
169.956	53.4356	18.7141
170.119	54.1786	18.4575
170.283	54.8209	18.2412
170.446	55.1861	18.1205
170.61	55.6017	17.9851

170.774	55.7654	17.9323
170.937	55.6773	17.9606
171.101	55.438	18.0382
171.265	55.0854	18.1536
171.428	54.6824	18.2874
171.592	54.2164	18.4446
171.755	53.5112	18.6877
171.919	52.8815	18.9102
172.083	52.0503	19.2122
172.246	50.9546	19.6253
172.41	49.7456	20.1023
172.574	48.524	20.6084
172.737	47.2646	21.1575
172.901	46.0934	21.6951
173.064	44.8466	22.2982
173.228	43.6628	22.9028
173.392	42.3908	23.59
173.555	41.2826	24.2233
173.719	40.1995	24.8759
173.883	38.5749	25.9236
174.046	37.0259	27.0081
174.21	35.5524	28.1275
174.373	34.0537	29.3654
174.537	32.3032	30.9567
174.701	30.8675	32.3965
174.864	29.9859	33.349
175.028	29.5703	33.8177
175.192	29.9859	33.349
175.355	30.1748	33.1402
175.519	29.8348	33.5179
175.682	29.3185	34.1082
175.846	28.5628	35.0105
176.01	27.6057	36.2244
176.173	26.5982	37.5965
176.337	25.893	38.6206
176.501	25.3766	39.4064
176.664	25.2129	39.6623
176.828	25.1373	39.7815
176.991	24.4573	40.8877
177.155	23.6764	42.2361
177.319	23.1853	43.1308
177.482	23.1853	43.1308
177.646	23.3112	42.8978
177.81	23.0845	43.319
177.973	22.9334	43.6045
178.137	23.009	43.4613
178.3	22.883	43.7005
178.464	22.3289	44.785
178.628	22.5808	44.2854
178.791	22.8075	43.8453
178.955	23.1853	43.1308
179.119	23.5883	42.3939
179.282	24.2558	41.2273
179.446	24.3313	41.0993
179.609	24.9736	40.0423
179.773	26.3841	37.9016
179.937	26.9382	37.122

180.1	26.0693	38.3593
180.264	25.2129	39.6623
180.428	25.0869	39.8614
180.591	24.9232	40.1232
180.755	24.7217	40.4502
180.918	25.2507	39.6029
181.082	26.0189	38.4336
181.246	26.6864	37.4723
181.409	26.7619	37.3665
181.573	26.4723	37.7754
181.737	26.6738	37.49
181.9	26.7745	37.3489
182.064	27.4042	36.4907
182.227	28.1095	35.5752
182.391	28.248	35.4007
182.555	27.9457	35.7836
182.718	27.9961	35.7192
182.882	28.0717	35.6231
183.046	28.0213	35.6871
183.209	27.9835	35.7353
183.373	28.185	35.4798
183.536	27.9835	35.7353
183.7	27.7191	36.0763
183.864	27.5931	36.2409
184.027	27.8954	35.8482
184.191	27.8954	35.8482
184.355	27.9961	35.7192
184.518	28.0969	35.5912
184.682	28.0213	35.6871
184.845	27.6057	36.2244
185.009	27.102	36.8977
185.173	26.8879	37.1915
185.336	26.6864	37.4723
185.5	26.5226	37.7036
185.664	26.5478	37.6679
185.827	26.7997	37.3138
185.991	26.9508	37.1046
186.154	27.4798	36.3904
186.318	28.2732	35.3692
186.482	28.2354	35.4165
186.645	28.1095	35.5752
186.809	27.7694	36.0108
186.973	27.4294	36.4572
187.136	26.6864	37.4723
187.3	27.1523	36.8293
187.463	27.4294	36.4572
187.627	27.8702	35.8806
187.791	29.0414	34.4336
187.954	30.6282	32.6496
188.118	30.9683	32.2911
188.282	31.2957	31.9533
188.445	32.2402	31.0172
188.609	32.3032	30.9567
188.772	31.6105	31.635
188.936	32.341	30.9205
189.1	33.2981	30.0317
189.263	33.7263	29.6505

189.427	34.6079	28.8952
189.591	35.8924	27.861
189.754	37.2274	26.862
189.918	38.4364	26.017
190.081	39.4061	25.3768
190.245	40.3758	24.7673
190.409	41.3707	24.1717
190.572	42.4538	23.555
190.736	42.8946	23.313
190.9	43.3731	23.0557
191.063	43.8013	22.8304
191.227	43.9399	22.7584
191.39	43.9399	22.7584
191.554	44.4814	22.4813
191.718	44.7081	22.3673
191.881	44.897	22.2732
192.045	44.9726	22.2358
192.209	44.8844	22.2795
192.372	44.6829	22.3799
192.536	44.5947	22.4242
192.699	44.1036	22.6739
192.863	43.4361	23.0223
193.027	42.6301	23.4576
193.19	41.6982	23.9819
193.354	40.464	24.7133
193.518	39.4943	25.3201
193.681	38.6253	25.8898
193.845	37.7689	26.4768
194.008	37.1518	26.9166
194.172	36.8244	27.1559
194.336	36.1569	27.6572
194.499	35.5272	28.1474
194.663	35.099	28.4908
194.827	34.633	28.8742
194.99	34.016	29.398
195.154	33.7137	29.6615
195.318	33.3737	29.9637
195.481	32.9959	30.3068
195.645	33.1344	30.1801
195.808	33.5122	29.8399
195.972	33.8145	29.5732
196.136	34.2678	29.1819
196.299	34.6079	28.8952
196.463	34.5575	28.9373
196.627	34.8849	28.6657
196.79	35.4013	28.2476
196.954	36.308	27.5421
197.117	37.7689	26.4768
197.281	39.8217	25.1119
197.445	41.673	23.9964
197.608	43.5872	22.9425
197.772	45.0985	22.1737
197.936	46.3201	21.5889
198.099	47.7684	20.9343
198.263	49.3804	20.251
198.426	51.0302	19.5962
198.59	52.5918	19.0144

198.754	54.1408	18.4703
198.917	55.4758	18.0259
199.081	56.6848	17.6414
199.245	57.7805	17.3069
199.408	58.662	17.0468
199.572	59.5058	16.8051
199.735	60.2866	16.5874
199.899	60.9163	16.416
200.063	61.3697	16.2947
200.226	61.7097	16.2049
200.39	62.0498	16.1161
200.554	62.3394	16.0412
200.717	62.6039	15.9735
200.881	62.7298	15.9414
201.044	62.8054	15.9222
201.208	62.8809	15.9031
201.372	63.095	15.8491
201.535	63.2462	15.8112
201.699	63.3469	15.7861
201.863	63.4603	15.7579
202.026	63.5106	15.7454
202.19	63.4225	15.7673
202.353	63.5106	15.7454
202.517	63.4603	15.7579
202.681	63.4728	15.7548
202.844	63.5232	15.7423
203.008	63.8129	15.6708
203.172	63.7751	15.6801
203.335	63.7751	15.6801
203.499	63.7499	15.6863
203.662	63.6492	15.7111
203.826	63.3343	15.7892
203.99	63.1454	15.8365
204.153	62.9943	15.8745
204.317	62.7676	15.9318
204.481	62.4528	16.0121
204.644	62.1253	16.0965
204.808	61.6719	16.2148
204.971	61.2437	16.3282
205.135	60.9037	16.4194
205.299	60.4126	16.5529
205.462	59.6569	16.7625
205.626	58.9517	16.963
205.79	58.1205	17.2056
205.953	57.1004	17.513
206.117	55.8158	17.9161
206.28	54.4305	18.3721
206.444	53.083	18.8384
206.608	51.7102	19.3385
206.771	50.4131	19.8361
206.935	49.3552	20.2613
207.099	48.3981	20.662
207.262	47.4787	21.0621
207.426	46.975	21.2879
207.589	46.2571	21.6183
207.753	45.4385	22.0078
207.917	44.6073	22.4178

208.08	44.1414	22.6545
208.244	43.5872	22.9425
208.408	43.3731	23.0557
208.571	43.4235	23.029
208.735	43.285	23.1027
208.898	43.1339	23.1836
209.062	43.2976	23.096
209.226	43.285	23.1027
209.389	43.4109	23.0357
209.553	43.7132	22.8764
209.717	44.1917	22.6287
209.88	44.8088	22.317
210.044	44.9222	22.2607
210.207	45.0481	22.1985
210.371	45.3882	22.0322
210.535	45.6148	21.9227
210.698	45.766	21.8503
210.862	46.0304	21.7248
211.026	46.3831	21.5596
211.189	46.6098	21.4547
211.353	47.1135	21.2253
211.516	46.912	21.3165
211.68	47.0253	21.2651
211.844	46.8238	21.3566
212.007	46.6853	21.42
212.171	46.6098	21.4547
212.335	46.9498	21.2994
212.498	47.1513	21.2083
212.662	47.3654	21.1125
212.825	47.8691	20.8903
212.989	48.0706	20.8027
213.153	48.3981	20.662
213.316	48.8766	20.4597
213.48	49.5819	20.1687
213.644	50.5264	19.7916
213.807	51.3702	19.4665
213.971	51.9117	19.2635
214.134	52.5036	19.0463
214.298	53.4608	18.7053
214.462	54.5061	18.3466
214.625	55.7277	17.9444
214.789	57.2767	17.4591
214.953	58.9895	16.9522
215.116	60.5889	16.5047
215.28	62.0498	16.1161
215.443	63.3973	15.7735
215.607	64.6693	15.4633
215.771	65.6138	15.2407
215.934	66.5331	15.0301
216.098	67.2888	14.8613
216.262	67.8933	14.729
216.425	68.4474	14.6098
216.589	68.9134	14.511
216.752	69.2912	14.4319
216.916	69.732	14.3406
217.08	69.9587	14.2942
217.243	70.1224	14.2608

217.407	70.2861	14.2276
217.571	70.009	14.2839
217.734	69.7446	14.338
217.898	69.4045	14.4083
218.061	69.0015	14.4924
218.225	68.6237	14.5722
218.389	68.0822	14.6881
218.552	67.5155	14.8114
218.716	66.8102	14.9678
218.88	65.7397	15.2115
219.043	64.6315	15.4723
219.207	63.561	15.7329
219.37	62.415	16.0218
219.534	61.206	16.3383
219.698	60.2111	16.6082
219.861	59.3673	16.8443
220.025	58.5739	17.0725
220.189	57.8938	17.273
220.352	57.3145	17.4476
220.516	56.7352	17.6258
220.679	56.181	17.7996
220.843	56.0929	17.8276
221.007	56.2314	17.7837
221.17	56.5337	17.6886
221.334	57.1004	17.513
221.498	57.7679	17.3107
221.661	58.2086	17.1796
221.825	58.6116	17.0615
221.988	58.9895	16.9522
222.152	59.3547	16.8479
222.316	59.7577	16.7343
222.479	61.5082	16.258

~VERSION INFORMATION

VERS .2.0 :CWLS LOG ASCII STANDARD-VERSION 2.0
WRAP .NO :ONE LINE PER DEPTH STEP

~WELL INFORMATION

STRT .FT 219.722 :START DEPTH
STOP .FT 3.24566 :STOP DEPTH
STEP .FT -0.163625 :STEP
NULL . -999.25 :NULL VALUE
COMP . kleinfelder :COMPANY
WELL . :WELL
FLD . :FIELD
LOC . Los Alamos :LOCATION
PROV . N/A :PROVINCE
SRVC . N/A :SERVICE COMPANY
DATE . 12-22-05 :DATE
UWI . N/A :UNIQUE WELL ID

~CURVE INFORMATION

DEPT .FT :DEPTH
GAMM .CPS :Gamma

~PARAMETER INFORMATION

ELEV . :ELEVATION
STE . :STE
DENS . :DENSITY
CASI . :CASING TO1
OPER . :OPERATING RIG TIME
WGT1 . :WGT1
CASI . :CASING SIZE1
CASI . :CASING TO2
WGT2 . :WGT2
CASI . :CASING SIZE2
WELL . laoi3.2a :WELL ID
CASI . :CASING TO3
K.B. . :K.B.
WGT3 . :WGT3
TYPE . :TYPE LOG
CASI . :CASING SIZE3
CASI . :CASING TO4
SALI . :SALINITY
TITL . :TITLE
WGT4 . :WGT4
TOP . :TOP LOGGED INTERVAL
CASI . :CASING SIZE4
WITN . Rick Smith :WITNESSED BY
CASI . :CASING TO5
DRIL . :DRILLING MEAS. FROM
WGT5 . :WGT5
CASI . :CASING SIZE5
CTY . :CTY
WGT6 . :WGT6
CASI . :CASING SIZE6
MAX. . :MAX. REC. TEMP.
D.F. . :D.F.
CASI . :CASING TO6
OTHE . :OTHER SERVICES
BIT1 . 7.5" :BIT1
DEPT . :DEPTH-DRILLER
BIT2 . :BIT2

RUN	.	:	RUN No
RUN1	.	:	RUN1
BIT3	.	:	BIT3
RUN2	.	:	RUN2
PERM	.	:	PERMANENT DATUM
TWP	.	:	TWP
BIT4	.	:	BIT4
LOG	.	:	LOG MEAS. FROM
BIT	.	:	0 BIT FROM1
RUN3	.	:	RUN3
BIT5	.	:	BIT5
CASI	.	:	CASING FROM1
TYPE	.	:	g.w @ 164ft TYPE FLUID IN HOLE
RUN4	.	:	RUN4
FLD	.	:	FLD
BIT6	.	:	BIT6
BIT	.	:	223 BIT TO1
CASI	.	:	CASING FROM2
BIT	.	:	BIT FROM2
CO	.	:	CO
RGE	.	:	RGE
BIT	.	:	BIT TO2
DEPT	.	:	DEPTH-LOGGER
CASI	.	:	CASING FROM3
BIT	.	:	BIT FROM3
RUN5	.	:	RUN5
SEC	.	:	SEC
BIT	.	:	BIT TO3
G.L.	.	:	G.L.
CASI	.	:	CASING FROM4
BIT	.	:	BIT FROM4
RUN6	.	:	RUN6
BIT	.	:	BIT TO4
BTM	.	:	BTM LOGGED INTERVAL
CASI	.	:	CASING FROM5
BIT	.	:	BIT FROM5
STAT	.	:	STATE
BIT	.	:	BIT TO5
LEVE	.	:	LEVEL
CASI	.	:	CASING FROM6
BIT	.	:	BIT FROM6
COUN	.	:	COUNTRY
RECO	.	:	cember hardison RECORDED BY
FILI	.	:	FILING No
BIT	.	:	BIT TO6
~OTHER			
~A			
219.722			95.8281
219.558			84.082
219.395			96.9102
219.231			78.8555
219.067			87.8359
218.904			79.5703
218.74			82.2656
218.577			75.3516
218.413			93.5977
218.249			106.223

218.086	76.5273
217.922	95.2539
217.758	78.1094
217.595	83.6719
217.431	74.8984
217.268	99.875
217.104	81.5117
216.94	108.391
216.777	87.9648
216.613	78.4766
216.449	93.2109
216.286	74.2617
216.122	84.7383
215.959	105.305
215.795	92.2852
215.631	91.2109
215.468	114.586
215.304	97.1133
215.14	97.4688
214.977	111.559
214.813	106.813
214.65	100.148
214.486	99.7344
214.322	99.8008
214.159	84.2813
213.995	113.57
213.831	86.8828
213.668	88.3359
213.504	107.281
213.341	86.043
213.177	80.4141
213.013	107.715
212.85	90.1523
212.686	88.8906
212.522	97.4883
212.359	96.3711
212.195	98.1289
212.032	105.496
211.868	95.5547
211.704	84.4961
211.541	95.0508
211.377	97.5195
211.213	120.168
211.05	87.0078
210.886	71.6133
210.723	87.2734
210.559	94.3477
210.395	90.5703
210.232	92.5625
210.068	81.3086
209.904	71.7305
209.741	101.953
209.577	102.496
209.414	107.824
209.25	97.0234
209.086	86.5898
208.923	93.3867

208.759	78.3359
208.595	97.0977
208.432	79.6094
208.268	91.5977
208.105	86.5117
207.941	90.9727
207.777	97.2539
207.614	95.918
207.45	70.6016
207.286	110.457
207.123	94.9961
206.959	74.7656
206.796	101.059
206.632	88.8828
206.468	98.707
206.305	101.121
206.141	87.7383
205.977	93.1523
205.814	98.3086
205.65	75.5703
205.487	106.59
205.323	86.8008
205.159	89.7422
204.996	80.1797
204.832	94.457
204.668	74.0117
204.505	100.477
204.341	104.266
204.178	96.7383
204.014	88.2305
203.85	109.793
203.687	82.3477
203.523	105.578
203.359	106.008
203.196	89.375
203.032	87.6289
202.869	74.0547
202.705	83.6328
202.541	99.1563
202.378	95.0234
202.214	88.1172
202.05	71.3438
201.887	82.957
201.723	105.684
201.56	78.6758
201.396	95.3008
201.232	105.121
201.069	93.3672
200.905	73.5703
200.741	129.055
200.578	91.582
200.414	117.293
200.251	98.5977
200.087	91.2734
199.923	96.2227
199.76	119.039
199.596	68.0938

199.432	88.5273
199.269	96.6172
199.105	89.8672
198.942	77.7539
198.778	93.1797
198.614	77.4023
198.451	70.8086
198.287	88.5742
198.123	93.1797
197.96	83.1758
197.796	90.6406
197.633	75.7422
197.469	115.527
197.305	102.738
197.142	105.137
196.978	93.9492
196.814	94.3633
196.651	100.668
196.487	103.652
196.324	83.3086
196.16	89.0508
195.996	97.7891
195.833	103.918
195.669	94.0547
195.505	99.4219
195.342	84.2773
195.178	74.582
195.015	100.973
194.851	90.0625
194.687	107.695
194.524	109.02
194.36	84.2852
194.196	81.2578
194.033	98.1133
193.869	93.1289
193.706	80.6172
193.542	98.7852
193.378	90.9922
193.215	90.0703
193.051	96.4141
192.887	83.9141
192.724	96.3906
192.56	97.2461
192.397	95.4688
192.233	108.082
192.069	94.0391
191.906	87.7539
191.742	80.582
191.578	104.824
191.415	103.641
191.251	89.4609
191.088	93.5234
190.924	91.7148
190.76	118.059
190.597	94.0547
190.433	90.4844
190.269	92.9453

190.106	94.0547
189.942	53.9902
189.779	75.5625
189.615	108.266
189.451	101.5
189.288	111.297
189.124	71.7617
188.96	90.2188
188.797	81.6328
188.633	108.41
188.47	91.1445
188.306	99.5547
188.142	64.332
187.979	89.1875
187.815	82.5
187.651	72.0391
187.488	97.7461
187.324	97.3203
187.161	87.6172
186.997	107.383
186.833	99.3594
186.67	81.2344
186.506	89.8516
186.342	101.668
186.179	92.3867
186.015	130.172
185.852	73.7344
185.688	96.4023
185.524	84.1992
185.361	69.6719
185.197	64.4258
185.033	98.6367
184.87	93.3633
184.706	94.5547
184.543	99.7656
184.379	101.395
184.215	87.8906
184.052	83.3516
183.888	111.316
183.724	85.8203
183.561	99.7734
183.397	86.0586
183.234	108.199
183.07	104.875
182.906	86.3516
182.743	71.8359
182.579	103.148
182.415	112.816
182.252	103.422
182.088	96.5039
181.925	102.852
181.761	122.18
181.597	94.1016
181.434	149.5
181.27	124.133
181.106	126.602
180.943	124.621

180.779	127.379
180.616	144.563
180.452	123.074
180.288	103.73
180.125	115.469
179.961	116.625
179.797	107.578
179.634	123.797
179.47	137.18
179.307	131.234
179.143	107.926
178.979	120.32
178.816	128.648
178.652	123.645
178.488	108.941
178.325	131.031
178.161	118.883
177.997	133.664
177.834	82.3281
177.67	126.617
177.507	111.34
177.343	128.055
177.179	130.383
177.016	118.051
176.852	106.527
176.688	125.902
176.525	159.609
176.361	119.777
176.198	106.086
176.034	113.516
175.87	131.867
175.707	104.461
175.543	159.813
175.379	128.484
175.216	120.836
175.052	102.926
174.889	112.91
174.725	93.0508
174.561	110.121
174.398	109.414
174.234	96.9883
174.07	128.781
173.907	131.805
173.743	121.375
173.58	127.891
173.416	110.363
173.252	129.453
173.089	122.258
172.925	108.82
172.761	109.883
172.598	117.945
172.434	121.164
172.271	142.313
172.107	114.965
171.943	159.023
171.78	111.141
171.616	125.426

171.452	119.156
171.289	116.211
171.125	143.953
170.962	116.035
170.798	119.254
170.634	117.941
170.471	133.867
170.307	113.18
170.143	128.063
169.98	132.883
169.816	138.711
169.653	142.031
169.489	153.055
169.325	160.828
169.162	186.461
168.998	173.477
168.834	188.625
168.671	178.625
168.507	161.18
168.344	186.391
168.18	175.945
168.016	193.063
167.853	169.555
167.689	170.523
167.525	159.578
167.362	196.281
167.198	177.016
167.035	190.305
166.871	264.906
166.707	235.063
166.544	229.219
166.38	232.523
166.216	243.375
166.053	223.516
165.889	251.719
165.726	227.406
165.562	262.156
165.398	257
165.235	267.875
165.071	237.164
164.907	265.109
164.744	262.703
164.58	310.563
164.417	232.563
164.253	251.289
164.089	279.016
163.926	268.063
163.762	271.844
163.598	252.008
163.435	301.281
163.271	277.625
163.108	248.516
162.944	256.25
162.78	286.344
162.617	272.875
162.453	233.063
162.289	267.344

162.126	283.344
161.962	254.469
161.799	252.719
161.635	253
161.471	278.844
161.308	291.281
161.144	265.531
160.98	268.063
160.817	279.828
160.653	271.969
160.49	259.141
160.326	275.484
160.162	255
159.999	258.625
159.835	266.719
159.671	235.445
159.508	258.969
159.344	253.828
159.181	254.016
159.017	248.586
158.853	265.391
158.69	230.344
158.526	242.336
158.362	292.094
158.199	202.414
158.035	273.047
157.872	227.039
157.708	248.734
157.544	254.211
157.381	246.664
157.217	262.156
157.053	249.602
156.89	216.844
156.726	230.625
156.563	256.938
156.399	259.266
156.235	242.977
156.072	268.719
155.908	258.109
155.744	215.445
155.581	279.172
155.417	272.672
155.254	257.219
155.09	252.383
154.926	261.859
154.763	275.344
154.599	230.281
154.435	269.063
154.272	237.977
154.108	266.406
153.945	265.984
153.781	239.578
153.617	246.984
153.454	296.516
153.29	279.141
153.126	240.258
152.963	263.625

152.799	256.563
152.636	272.75
152.472	286.531
152.308	291.75
152.145	258.094
151.981	250.484
151.817	231.352
151.654	230.891
151.49	264.016
151.327	242
151.163	239
150.999	211.859
150.836	253.961
150.672	264.953
150.508	239.32
150.345	238.797
150.181	237.5
150.018	275.641
149.854	265.531
149.69	257.047
149.527	217.586
149.363	238.25
149.199	240.25
149.036	231.375
148.872	255.094
148.709	192.703
148.545	246.766
148.381	213.938
148.218	170.883
148.054	244.508
147.89	190.523
147.727	206.016
147.563	237.914
147.4 258	
147.236	222.203
147.072	200.789
146.909	186.938
146.745	205.18
146.581	195.313
146.418	185.641
146.254	176.578
146.091	175.797
145.927	202.219
145.763	145.594
145.6 232.961	
145.436	164.5
145.272	176.297
145.109	158.492
144.945	175.828
144.782	185.242
144.618	237.008
144.454	180.648
144.291	181.711
144.127	198.203
143.963	211.82
143.8 198.586	
143.636	202.164

143.473	211.414
143.309	195.805
143.145	183.273
142.982	172.164
142.818	170.891
142.654	189.938
142.491	190.938
142.327	147.148
142.164	215.641
142	180.391
141.836	202.734
141.673	199.625
141.509	191.578
141.345	207.563
141.182	186.516
141.018	185.117
140.855	200.461
140.691	199.398
140.527	184.547
140.364	214.742
140.2	181.203
140.036	162.461
139.873	172.555
139.709	186.484
139.546	181.234
139.382	215.406
139.218	216.133
139.055	194.453
138.891	183.219
138.727	187.852
138.564	171.625
138.4	169.797
138.237	199.938
138.073	201.813
137.909	162.805
137.746	159.891
137.582	191.633
137.418	194.641
137.255	193.273
137.091	214.5
136.928	198.82
136.764	185.633
136.6	174.602
136.437	166.5
136.273	198.586
136.109	181.695
135.946	228.469
135.782	220.039
135.619	209.859
135.455	183.125
135.291	160.367
135.128	189.031
134.964	204.789
134.8	180.719
134.637	210.992
134.473	205.383
134.31	169.82

134.146	167.227
133.982	192.094
133.819	175.859
133.655	218.039
133.491	179.172
133.328	167.516
133.164	199.625
133.001	199.031
132.837	216.117
132.673	232.773
132.51	174.609
132.346	213.727
132.182	196.039
132.019	168.219
131.855	186.992
131.692	205.828
131.528	155.5
131.364	226.289
131.201	217.219
131.037	195.289
130.873	194.117
130.71	183.047
130.546	201.672
130.383	202.016
130.219	203.828
130.055	169.609
129.892	162.57
129.728	148.797
129.564	184.758
129.401	228.57
129.237	214.273
129.074	185.844
128.91	173.039
128.746	160.25
128.583	239.805
128.419	200.477
128.255	186.344
128.092	194.336
127.928	179.023
127.765	173.766
127.601	185.281
127.437	186.984
127.274	204.539
127.11	181.656
126.946	199.039
126.783	193.344
126.619	201.609
126.456	215.391
126.292	219.023
126.128	183.656
125.965	226.023
125.801	165.563
125.637	185.555
125.474	209.57
125.31	178.516
125.147	171.391
124.983	181.563

124.819	190.773
124.656	180.5
124.492	183.75
124.328	201.359
124.165	173.813
124.001	183.164
123.838	200.305
123.674	214.109
123.51	190.43
123.347	201.891
123.183	224.289
123.019	212.766
122.856	171.445
122.692	198.461
122.529	208.539
122.365	176.641
122.201	183.586
122.038	209.898
121.874	185.898
121.71	204.102
121.547	235.836
121.383	202.789
121.22	187.039
121.056	228.258
120.892	198.203
120.729	224.055
120.565	220.594
120.401	217.313
120.238	225.539
120.074	178.883
119.911	220.531
119.747	228.023
119.583	189.836
119.42	204.422
119.256	172.438
119.092	209.125
118.929	207.805
118.765	209.883
118.602	200.375
118.438	202.82
118.274	202.117
118.111	178.195
117.947	200.07
117.783	204.375
117.62	244.219
117.456	217.07
117.293	216.531
117.129	211.109
116.965	201.867
116.802	193.141
116.638	215.664
116.474	197.102
116.311	194.719
116.147	193.328
115.984	211.516
115.82	243.836
115.656	203.938

115.493	231.844
115.329	221.102
115.165	201.398
115.002	261.109
114.838	200.023
114.675	208.445
114.511	193.969
114.347	232.719
114.184	193.68
114.02	200.867
113.856	220.969
113.693	178.461
113.529	204.164
113.365	216.969
113.202	203.055
113.038	198.148
112.875	221.953
112.711	188.938
112.547	183.992
112.384	203.141
112.22	201.703
112.056	184.93
111.893	222.594
111.729	211.648
111.566	221.18
111.402	227.945
111.238	203.359
111.075	242.148
110.911	197.891
110.747	218.5
110.584	220.469
110.42	214.766
110.257	205.438
110.093	196.75
109.929	230.852
109.766	202.555
109.602	204.25
109.438	214.859
109.275	187.945
109.111	198.219
108.948	203.031
108.784	225.398
108.62	214.656
108.457	197.758
108.293	222.555
108.129	225.773
107.966	201.109
107.802	216.453
107.639	170.953
107.475	198.063
107.311	158.242
107.148	207.469
106.984	215.875
106.82	224
106.657	193.164
106.493	197.008
106.33	230.336

106.166	201.859
106.002	198.82
105.839	203.781
105.675	217.516
105.511	197.57
105.348	213.984
105.184	196.484
105.021	189.289
104.857	192.977
104.693	215.688
104.53	198.375
104.366	214.82
104.202	212.664
104.039	206.195
103.875	197.164
103.712	203.461
103.548	212.352
103.384	193.781
103.221	208.773
103.057	195
102.893	201.109
102.73	204.047
102.566	197.844
102.403	214.938
102.239	233.289
102.075	198.258
101.912	188.938
101.748	201.133
101.584	185.641
101.421	224.438
101.257	204.305
101.094	197.398
100.93	207.719
100.766	165.563
100.603	192.719
100.439	206.609
100.275	213.961
100.112	193.82
99.9482	196.414
99.7846	205.469
99.621	221.328
99.4573	188
99.2937	215.43
99.1301	195.25
98.9665	200.953
98.8028	213.727
98.6392	193.969
98.4756	193.867
98.312	196.594
98.1483	221.672
97.9847	208.945
97.8211	236.539
97.6575	206.5
97.4938	220.906
97.3302	207.641
97.1666	226.773
97.003	192.367

96.8393	231.586
96.6757	198.094
96.5121	250.195
96.3485	213.938
96.1848	194.273
96.0212	197.398
95.8576	230.125
95.694	228.703
95.5303	213.102
95.3667	167.336
95.2031	208.742
95.0395	210.781
94.8758	214.891
94.7122	205.359
94.5486	207.68
94.385	198.766
94.2213	202.828
94.0577	229.945
93.8941	218.961
93.7305	203.469
93.5668	217.313
93.4032	189.953
93.2396	212.664
93.076	200.148
92.9123	217.641
92.7487	192.781
92.5851	213.391
92.4215	196.156
92.2578	189.195
92.0942	189.656
91.9306	177.719
91.767	209.07
91.6033	204.422
91.4397	223.875
91.2761	200.32
91.1125	220.313
90.9488	227.656
90.7852	197.625
90.6216	214.508
90.458	230.758
90.2943	243.18
90.1307	183.508
89.9671	190.992
89.8035	205.125
89.6398	224.773
89.4762	224.578
89.3126	230.266
89.1489	192.023
88.9853	230.109
88.8217	220.711
88.6581	194.859
88.4944	210.211
88.3308	188.031
88.1672	232.563
88.0036	223.898
87.8399	187.609
87.6763	198.117

87.5127	242.773
87.3491	219.383
87.1854	214.602
87.0218	235
86.8582	232.93
86.6946	227.797
86.5309	221.039
86.3673	208.664
86.2037	226.813
86.0401	235.297
85.8764	217.695
85.7128	225.328
85.5492	235.156
85.3856	184.164
85.2219	255.781
85.0583	250.43
84.8947	247.227
84.7311	233.016
84.5674	235.297
84.4038	215.438
84.2402	200.273
84.0766	237.375
83.9129	218.742
83.7493	207.984
83.5857	243.844
83.4221	210.758
83.2584	249.227
83.0948	237.375
82.9312	206.32
82.7676	223.719
82.6039	235.914
82.4403	227.32
82.2767	247.555
82.1131	175.273
81.9494	236.094
81.7858	201.078
81.6222	191.234
81.4586	190.852
81.2949	194.281
81.1313	256.125
80.9677	226.32
80.8041	237.188
80.6404	194.125
80.4768	244.336
80.3132	207.164
80.1496	205.344
79.9859	245.75
79.8223	254.039
79.6587	229.352
79.4951	228.359
79.3314	214.055
79.1678	207.672
79.0042	211.82
78.8406	258.422
78.6769	229.375
78.5133	239.961
78.3497	254.688

78.1861	202.75
78.0224	225.375
77.8588	223.688
77.6952	210.789
77.5316	207.734
77.3679	209.828
77.2043	217.414
77.0407	209.625
76.8771	229.82
76.7134	218.141
76.5498	202.789
76.3862	225.594
76.2225	235.219
76.0589	189.938
75.8953	237.836
75.7317	219.773
75.568	215.859
75.4044	212.43
75.2408	221.93
75.0772	218.117
74.9135	222.578
74.7499	236.43
74.5863	231.086
74.4227	197.547
74.259	205.773
74.0954	222.18
73.9318	226.203
73.7682	211.586
73.6045	228.445
73.4409	196.102
73.2773	222.445
73.1137	234.414
72.95	228.313
72.7864	212.742
72.6228	219.148
72.4592	218.109
72.2955	249.758
72.1319	218.938
71.9683	201.008
71.8047	232.336
71.641	213.75
71.4774	218.68
71.3138	215.203
71.1502	224.703
70.9865	213.93
70.8229	199.273
70.6593	233.43
70.4957	225.461
70.332	205.805
70.1684	205.758
70.0048	213.133
69.8412	268.578
69.6775	178.648
69.5139	206.953
69.3503	235.703
69.1867	254.992
69.023	238.75

68.8594	214.586
68.6958	211.914
68.5322	186.258
68.3685	206.227
68.2049	222.313
68.0413	218.266
67.8777	221.414
67.714	157.344
67.5504	207.086
67.3868	213.586
67.2232	219.406
67.0595	184.289
66.8959	209.734
66.7323	197.969
66.5687	222.859
66.405	232.484
66.2414	219.125
66.0778	210.133
65.9142	241.68
65.7505	223.539
65.5869	194.742
65.4233	253.094
65.2597	258.719
65.096	221
64.9324	210.578
64.7688	183.266
64.6052	222.734
64.4415	223.227
64.2779	214.836
64.1143	244.672
63.9507	215.953
63.787	243.672
63.6234	255.211
63.4598	211.563
63.2961	239.039
63.1325	216.266
62.9689	250.711
62.8053	201.828
62.6416	231.195
62.478	209.672
62.3144	229.273
62.1508	255.563
61.9871	250.461
61.8235	230.086
61.6599	201.5
61.4963	231.781
61.3326	186.289
61.169	225.828
61.0054	239.906
60.8418	220.398
60.6781	236.484
60.5145	191.82
60.3509	210.586
60.1873	193.234
60.0236	180.438
59.86	187.352
59.6964	182.102

59.5328	207.875
59.3691	189.5
59.2055	220.258
59.0419	212.531
58.8783	179.523
58.7146	205.492
58.551	209.281
58.3874	194.609
58.2238	207.203
58.0601	216.766
57.8965	208.188
57.7329	201.906
57.5693	203.914
57.4056	209.313
57.242	193.703
57.0784	193.344
56.9148	217.516
56.7511	205.961
56.5875	163.758
56.4239	210.461
56.2603	160.969
56.0966	189.742
55.933	205.188
55.7694	215.445
55.6058	260.609
55.4421	188.031
55.2785	177.523
55.1149	190.078
54.9513	170.813
54.7876	221.93
54.624	200.797
54.4604	227.047
54.2968	174.516
54.1331	207.344
53.9695	160.258
53.8059	171.594
53.6423	213.508
53.4786	226.359
53.315	184.547
53.1514	185.82
52.9878	174.352
52.8241	223.008
52.6605	216.914
52.4969	182.289
52.3333	165.914
52.1696	185.867
52.006	199.727
51.8424	203.063
51.6788	195.813
51.5151	210.898
51.3515	173.445
51.1879	200.969
51.0242	170.391
50.8606	172.953
50.697	197.664
50.5334	187.484
50.3697	201.555

50.2061	185.195
50.0425	185.063
49.8789	197.867
49.7152	168.703
49.5516	201.391
49.388	219.094
49.2244	200.383
49.0607	192.898
48.8971	173.219
48.7335	181.945
48.5699	175.758
48.4062	197.32
48.2426	192.648
48.079	207.906
47.9154	185.633
47.7517	215.93
47.5881	171.453
47.4245	183.5
47.2609	190.625
47.0972	176.906
46.9336	168.328
46.77	193.055
46.6064	169.648
46.4427	199.188
46.2791	191.813
46.1155	178.406
45.9519	174.797
45.7882	161.367
45.6246	169.93
45.461	168.438
45.2974	167.383
45.1337	178.656
44.9701	156.414
44.8065	192.234
44.6429	194.906
44.4792	141.305
44.3156	129.891
44.152	198.203
43.9884	172.969
43.8247	190.695
43.6611	164.82
43.4975	192.234
43.3339	167.523
43.1702	172.094
43.0066	161.578
42.843	173.039
42.6794	162.328
42.5157	165.484
42.3521	156.352
42.1885	165.641
42.0249	151.313
41.8612	161.227
41.6976	160.008
41.534	154.07
41.3704	168.547
41.2067	192.359
41.0431	147.094

40.8795	182.453
40.7159	195.344
40.5522	171.578
40.3886	186.938
40.225	187.563
40.0614	171.922
39.8977	157.922
39.7341	218.758
39.5705	190.648
39.4069	169.648
39.2432	160.453
39.0796	168.688
38.916	188.023
38.7524	147.469
38.5887	159.414
38.4251	159.844
38.2615	189.844
38.0978	162.539
37.9342	173.953
37.7706	193.625
37.607	183.227
37.4433	168.367
37.2797	160.344
37.1161	181.352
36.9525	174.313
36.7888	188.727
36.6252	174.914
36.4616	202.453
36.298	161.008
36.1343	183.578
35.9707	190.641
35.8071	168.219
35.6435	187.328
35.4798	211.977
35.3162	200.594
35.1526	162.766
34.989	197.313
34.8253	198.867
34.6617	174.773
34.4981	202.695
34.3345	159.055
34.1708	174.461
34.0072	179.492
33.8436	182.758
33.68	183.531
33.5163	194.484
33.3527	190.547
33.1891	189.953
33.0255	178.563
32.8618	182.359
32.6982	184.023
32.5346	180.672
32.371	198.648
32.2073	190.313
32.0437	206.688
31.8801	190.898
31.7165	204.023

31.5528	157.672
31.3892	209.18
31.2256	184.164
31.062	155.594
30.8983	181.836
30.7347	182.383
30.5711	190.758
30.4075	181.336
30.2438	190.438
30.0802	183.344
29.9166	169.352
29.753	193.133
29.5893	197.844
29.4257	203.617
29.2621	204.734
29.0985	190.234
28.9348	208.109
28.7712	193.523
28.6076	181.664
28.444	167.75
28.2803	155.906
28.1167	191.969
27.9531	179.516
27.7895	205.258
27.6258	224.414
27.4622	182.492
27.2986	176.805
27.135	190.781
26.9713	156.063
26.8077	182.477
26.6441	169.758
26.4805	201.531
26.3168	176.18
26.1532	210.719
25.9896	193.805
25.826	176.234
25.6623	194.453
25.4987	223.75
25.3351	201.703
25.1714	142.828
25.0078	173.094
24.8442	157.445
24.6806	177.32
24.5169	204.969
24.3533	186.875
24.1897	219.617
24.0261	177.648
23.8624	212.602
23.6988	192.797
23.5352	182.883
23.3716	191.914
23.2079	230.383
23.0443	181.063
22.8807	161.227
22.7171	209.133
22.5534	156.906
22.3898	152.953

22.2262	207.984
22.0626	196.023
21.8989	180.164
21.7353	187.445
21.5717	173.055
21.4081	153.336
21.2444	216.867
21.0808	169.195
20.9172	147.945
20.7536	186.469
20.5899	177.984
20.4263	187.531
20.2627	165.523
20.0991	187.969
19.9354	168.344
19.7718	160.688
19.6082	182.742
19.4446	154.578
19.2809	149.109
19.1173	154.797
18.9537	154.469
18.7901	185.531
18.6264	131.164
18.4628	199.836
18.2992	179.648
18.1356	163.242
17.9719	179.219
17.8083	165.672
17.6447	167.367
17.4811	148.313
17.3174	195.336
17.1538	160.984
16.9902	173.648
16.8266	176.242
16.6629	140.445
16.4993	178.336
16.3357	159.852
16.1721	198.648
16.0084	178.297
15.8448	169.82
15.6812	175.508
15.5176	154.727
15.3539	158.688
15.1903	187.922
15.0267	169.656
14.8631	159.422
14.6994	173.977
14.5358	154.703
14.3722	154.352
14.2086	159.43
14.0449	142.594
13.8813	174.547
13.7177	144.563
13.5541	163.07
13.3904	138.477
13.2268	161.008
13.0632	155.844

12.8995	171.203
12.7359	138.375
12.5723	148.281
12.4087	151.133
12.245	145.961
12.0814	151.078
11.9178	171.227
11.7542	159.781
11.5905	152.797
11.4269	165.602
11.2633	188.594
11.0997	150.813
10.936	163.117
10.7724	153.57
10.6088	175.445
10.4452	167.875
10.2815	139.672
10.1179	167.742
9.95429	173.117
9.79067	163.5
9.62704	142.828
9.46342	166.109
9.29979	145.07
9.13617	155.234
8.97254	148.992
8.80892	147.266
8.64529	192.445
8.48167	176.25
8.31804	149.227
8.15442	168.344
7.99079	187.68
7.82716	202.172
7.66354	176.406
7.49991	143.203
7.33629	133.445
7.17266	173.547
7.00904	145.836
6.84541	181.141
6.68179	168.813
6.51816	164.063
6.35454	171.133
6.19091	168.938
6.02729	174.766
5.86366	155.93
5.70004	151.211
5.53641	145.094
5.37278	165.164
5.20916	164.422
5.04553	162.227
4.88191	152.594
4.71828	177.781
4.55466	153.063
4.39103	184.602
4.22741	157.016
4.06378	184.516
3.90016	178.625
3.73653	173.148

3.57291	158.258
3.40928	172.555
3.24566	153.133

~VERSION INFORMATION

VERS .2.0 :CWLS LOG ASCII STANDARD-VERSION 2.0
WRAP .NO :ONE LINE PER DEPTH STEP

~WELL INFORMATION

STRT .FT 2.75479 :START DEPTH
STOP .FT 219.886 :STOP DEPTH
STEP .FT 0.163625 :STEP
NULL . -999.25 :NULL VALUE
COMP . kleinfelder :COMPANY
WELL . :WELL
FLD . :FIELD
LOC . Los Alamos :LOCATION
PROV . N/A :PROVINCE
SRVC . N/A :SERVICE COMPANY
DATE . 12-22-05 :DATE
UWI . N/A :UNIQUE WELL ID

~CURVE INFORMATION

DEPT .FT :DEPTH
GAMM .CPS :Gamma

~PARAMETER INFORMATION

ELEV . :ELEVATION
STE . :STE
DENS . :DENSITY
CASI . :CASING TO1
OPER . :OPERATING RIG TIME
WGT1 . :WGT1
CASI . :CASING SIZE1
CASI . :CASING TO2
WGT2 . :WGT2
CASI . :CASING SIZE2
WELL . laoi3.2a :WELL ID
CASI . :CASING TO3
K.B. . :K.B.
WGT3 . :WGT3
TYPE . :TYPE LOG
CASI . :CASING SIZE3
CASI . :CASING TO4
SALI . :SALINITY
TITL . :TITLE
WGT4 . :WGT4
TOP . :TOP LOGGED INTERVAL
CASI . :CASING SIZE4
WITN . Rick Smith :WITNESSED BY
CASI . :CASING TO5
DRIL . :DRILLING MEAS. FROM
WGT5 . :WGT5
CASI . :CASING SIZE5
CTY . :CTY
WGT6 . :WGT6
CASI . :CASING SIZE6
MAX. . :MAX. REC. TEMP.
D.F. . :D.F.
CASI . :CASING TO6
OTHE . :OTHER SERVICES
BIT1 . 7.5" :BIT1
DEPT . :DEPTH-DRILLER
BIT2 . :BIT2

RUN	.		:RUN No
RUN1	.		:RUN1
BIT3	.		:BIT3
RUN2	.		:RUN2
PERM	.		:PERMANENT DATUM
TWP	.		:TWP
BIT4	.		:BIT4
LOG	.		:LOG MEAS. FROM
BIT	.	0	:BIT FROM1
RUN3	.		:RUN3
BIT5	.		:BIT5
CASI	.		:CASING FROM1
TYPE	.	g.w @ 164ft	:TYPE FLUID IN HOLE
RUN4	.		:RUN4
FLD	.		:FLD
BIT6	.		:BIT6
BIT	.	223	:BIT TO1
CASI	.		:CASING FROM2
BIT	.		:BIT FROM2
CO	.		:CO
RGE	.		:RGE
BIT	.		:BIT TO2
DEPT	.		:DEPTH-LOGGER
CASI	.		:CASING FROM3
BIT	.		:BIT FROM3
RUN5	.		:RUN5
SEC	.		:SEC
BIT	.		:BIT TO3
G.L.	.		:G.L.
CASI	.		:CASING FROM4
BIT	.		:BIT FROM4
RUN6	.		:RUN6
BIT	.		:BIT TO4
BTM	.		:BTM LOGGED INTERVAL
CASI	.		:CASING FROM5
BIT	.		:BIT FROM5
STAT	.		:STATE
BIT	.		:BIT TO5
LEVE	.		:LEVEL
CASI	.		:CASING FROM6
BIT	.		:BIT FROM6
COUN	.		:COUNTRY
RECO	.	cember hardison	:RECORDED BY
FILI	.		:FILING No
BIT	.		:BIT TO6
~OTHER			
~A			
2.75479		138.031	
2.91841		139.578	
3.08204		103.035	
3.24566		139.695	
3.40929		112.051	
3.57291		176.273	
3.73654		157.477	
3.90016		184.281	
4.06379		172.883	
4.22741		184.547	

4.39104	153.477
4.55466	154.43
4.71829	154.719
4.88191	180.305
5.04554	147.836
5.20917	142.898
5.37279	129.406
5.53642	181.539
5.70004	165.359
5.86367	169.484
6.02729	190.672
6.19092	170.906
6.35454	135.234
6.51817	156.227
6.68179	127.527
6.84542	171.266
7.00904	150.023
7.17267	180.547
7.33629	142.109
7.49992	164.797
7.66355	159.18
7.82717	177.609
7.9908	158.516
8.15442	144.906
8.31805	158.109
8.48167	173.656
8.6453	143.633
8.80892	156.211
8.97255	122.227
9.13617	174.094
9.2998	180.945
9.46342	170.297
9.62705	144.313
9.79067	174.258
9.9543	194.352
10.1179	173.648
10.2816	141.758
10.4452	183.461
10.6088	154.609
10.7724	148.148
10.9361	180.75
11.0997	132.422
11.2633	146.102
11.4269	131.031
11.5906	154.195
11.7542	153.57
11.9178	171.43
12.0814	158.516
12.2451	160.43
12.4087	158.344
12.5723	163.305
12.7359	183.422
12.8996	168.391
13.0632	150.984
13.2268	135.141
13.3904	135.055
13.5541	159.773

13.7177	166.195
13.8813	126.898
14.0449	166.789
14.2086	143.164
14.3722	170.828
14.5358	154.93
14.6994	141.188
14.8631	142.227
15.0267	135.703
15.1903	159.648
15.3539	175.258
15.5176	131.773
15.6812	197.039
15.8448	147.695
16.0084	124.836
16.1721	173.961
16.3357	147.344
16.4993	141.352
16.6629	169.867
16.8266	195.945
16.9902	196.219
17.1538	167.273
17.3174	140.773
17.4811	172.406
17.6447	149.492
17.8083	174.758
17.9719	170.414
18.1356	174.336
18.2992	145.438
18.4628	180.797
18.6264	156.844
18.7901	196.195
18.9537	150.547
19.1173	161.906
19.2809	201.422
19.4446	159.797
19.6082	190.828
19.7718	148.188
19.9354	146.852
20.0991	147.664
20.2627	138.359
20.4263	150.109
20.5899	186.883
20.7536	165.086
20.9172	134.063
21.0808	155.711
21.2444	179.398
21.4081	164.188
21.5717	165.508
21.7353	169.109
21.8989	166.031
22.0626	198.383
22.2262	169.508
22.3898	192.602
22.5534	205.938
22.7171	168.563
22.8807	204.688

23.0443	221.156
23.208	172.633
23.3716	215.289
23.5352	154.766
23.6988	183.203
23.8625	219.906
24.0261	197.508
24.1897	169.164
24.3533	176.445
24.517	197.922
24.6806	170.094
24.8442	177.414
25.0078	211.445
25.1715	196.773
25.3351	167.719
25.4987	174.563
25.6623	183.633
25.826	158.219
25.9896	195.859
26.1532	141.695
26.3168	187.953
26.4805	190.289
26.6441	227.508
26.8077	168.109
26.9713	173.922
27.135	219.594
27.2986	210.82
27.4622	187.563
27.6258	193.445
27.7895	178.18
27.9531	181.5
28.1167	156.578
28.2803	218.297
28.444	178.117
28.6076	211.148
28.7712	238.594
28.9348	193.742
29.0985	187.219
29.2621	246.93
29.4257	222.531
29.5893	194.047
29.753	185.789
29.9166	199.438
30.0802	188.68
30.2438	172.406
30.4075	145.094
30.5711	180.633
30.7347	196.766
30.8983	205.852
31.062	186.125
31.2256	154.984
31.3892	191.68
31.5528	177.984
31.7165	169.641
31.8801	182.125
32.0437	188.172
32.2073	211.859

32.371	180.383
32.5346	226.516
32.6982	218.453
32.8618	193.508
33.0255	174.883
33.1891	211.719
33.3527	175.164
33.5163	181.281
33.68	167.383
33.8436	195.727
34.0072	203.125
34.1708	194.953
34.3345	188.539
34.4981	211.016
34.6617	178.047
34.8253	167.289
34.989	155.188
35.1526	154.969
35.3162	161.891
35.4799	169.273
35.6435	179.555
35.8071	215.719
35.9707	161.609
36.1344	163.945
36.298	151.336
36.4616	161.039
36.6252	168.023
36.7889	193.422
36.9525	136.938
37.1161	154.648
37.2797	204.828
37.4434	179.188
37.607	165.367
37.7706	176.297
37.9342	215.648
38.0979	198.953
38.2615	191.641
38.4251	191.32
38.5887	194.461
38.7524	124.418
38.916	132.508
39.0796	130.43
39.2432	151.813
39.4069	186.289
39.5705	167.914
39.7341	186.758
39.8977	179.094
40.0614	195.781
40.225	171.781
40.3886	184.383
40.5522	162.852
40.7159	123.098
40.8795	167.758
41.0431	168.625
41.2067	182.203
41.3704	202.977
41.534	155.141

41.6976	185.633
41.8612	195.961
42.0249	178.742
42.1885	157.594
42.3521	178.18
42.5157	152.703
42.6794	205.313
42.843	185.813
43.0066	177.055
43.1702	178.234
43.3339	154.648
43.4975	149.25
43.6611	201.789
43.8247	195
43.9884	170.648
44.152	157.906
44.3156	129.477
44.4792	186.18
44.6429	206.992
44.8065	197.891
44.9701	205.953
45.1337	188.797
45.2974	202.039
45.461	178.594
45.6246	147.055
45.7882	153.445
45.9519	207.445
46.1155	202.07
46.2791	201.781
46.4427	192
46.6064	179.734
46.77	153.797
46.9336	161.547
47.0972	151.219
47.2609	176.945
47.4245	165.539
47.5881	179.336
47.7517	190.93
47.9154	178.805
48.079	198.93
48.2426	217.375
48.4063	170.945
48.5699	179.422
48.7335	184.188
48.8971	229.797
49.0608	193.578
49.2244	188.422
49.388	104.164
49.5516	194.938
49.7153	132.164
49.8789	187.867
50.0425	206.383
50.2061	200.773
50.3698	195.117
50.5334	143.781
50.697	208.867
50.8606	168.211

51.0243	237.367
51.1879	145.859
51.3515	204.539
51.5151	223.867
51.6788	216.297
51.8424	189.086
52.006	180.828
52.1696	209.305
52.3333	177.375
52.4969	179.672
52.6605	185.25
52.8241	206.922
52.9878	210.383
53.1514	168.523
53.315	167.445
53.4786	157.492
53.6423	183.07
53.8059	218.531
53.9695	209.281
54.1331	222.344
54.2968	164.203
54.4604	188.898
54.624	188.75
54.7876	183.32
54.9513	211.336
55.1149	201.609
55.2785	217.695
55.4421	172.633
55.6058	187.172
55.7694	197.656
55.933	181.75
56.0966	183.539
56.2603	222.109
56.4239	193.188
56.5875	245.266
56.7511	165.008
56.9148	203.391
57.0784	185.742
57.242	209.359
57.4056	181.977
57.5693	173.211
57.7329	176.984
57.8965	198.742
58.0601	197.906
58.2238	182.242
58.3874	198.805
58.551	223.117
58.7146	202.719
58.8783	193.344
59.0419	200.398
59.2055	219.141
59.3691	175.18
59.5328	154.586
59.6964	207.234
59.86	197.234
60.0236	191.938
60.1873	164.914

60.3509	207.914
60.5145	210.039
60.6781	191.484
60.8418	213.563
61.0054	203.734
61.169	236.289
61.3327	237.609
61.4963	195.297
61.6599	237.094
61.8235	226
61.9872	252.289
62.1508	221.102
62.3144	221.648
62.478	220.836
62.6417	203.258
62.8053	210.055
62.9689	239.891
63.1325	215.406
63.2962	257.516
63.4598	212.508
63.6234	225.453
63.787	244.711
63.9507	248.047
64.1143	240.18
64.2779	221.219
64.4415	209.953
64.6052	221.172
64.7688	182.477
64.9324	266.469
65.096	160.336
65.2597	259.547
65.4233	247.969
65.5869	237.727
65.7505	221.789
65.9142	252.578
66.0778	201.313
66.2414	240.414
66.405	233.914
66.5687	199.984
66.7323	240.453
66.8959	248.297
67.0595	261.531
67.2232	241.68
67.3868	223.586
67.5504	209.102
67.714	245.297
67.8777	241.555
68.0413	218.141
68.2049	212.781
68.3685	213.781
68.5322	224.906
68.6958	225.305
68.8594	209.805
69.023	197.984
69.1867	253.977
69.3503	249.859
69.5139	250.93

69.6775	204.773
69.8412	255.977
70.0048	200.383
70.1684	201.398
70.332	247.359
70.4957	224.391
70.6593	212.297
70.8229	202.336
70.9865	180.258
71.1502	242.828
71.3138	220.688
71.4774	196.852
71.641	187.211
71.8047	195.938
71.9683	184.695
72.1319	223.297
72.2955	219.664
72.4592	204.828
72.6228	191.82
72.7864	199.438
72.95	223.773
73.1137	204.797
73.2773	217.961
73.4409	197.391
73.6046	203.914
73.7682	191.898
73.9318	236.805
74.0954	226.656
74.2591	229.797
74.4227	199.289
74.5863	207.008
74.7499	176.664
74.9136	198.953
75.0772	247.422
75.2408	218.273
75.4044	204.406
75.5681	182.906
75.7317	232.898
75.8953	209.539
76.0589	244.633
76.2226	199.391
76.3862	215.094
76.5498	202.203
76.7134	224.156
76.8771	212.188
77.0407	209.266
77.2043	204.797
77.3679	235.398
77.5316	240.922
77.6952	222.648
77.8588	266.922
78.0224	240.672
78.1861	188.484
78.3497	225.656
78.5133	164.266
78.6769	226.469
78.8406	216.555

79.0042	203.633
79.1678	233.797
79.3314	236.883
79.4951	238.93
79.6587	215.664
79.8223	261.875
79.9859	178.469
80.1496	233.953
80.3132	238.484
80.4768	223.898
80.6404	225.594
80.8041	242.977
80.9677	201.578
81.1313	251.344
81.2949	245.656
81.4586	226.594
81.6222	188.383
81.7858	178.305
81.9494	221.07
82.1131	223.789
82.2767	195.469
82.4403	225.695
82.6039	234.648
82.7676	199.734
82.9312	201.391
83.0948	225.688
83.2584	183.305
83.4221	248.656
83.5857	226.617
83.7493	200.844
83.9129	235.898
84.0766	252.656
84.2402	258.453
84.4038	234.695
84.5674	208.422
84.7311	224.391
84.8947	228.008
85.0583	234.234
85.2219	273.578
85.3856	212.328
85.5492	229.461
85.7128	239.922
85.8764	225.586
86.0401	219
86.2037	209
86.3673	227.453
86.531	256.547
86.6946	199.578
86.8582	176.531
87.0218	168.797
87.1855	181.984
87.3491	222.453
87.5127	224.398
87.6763	214.609
87.84	234.586
88.0036	220.758
88.1672	205.852

88.3308	282.891
88.4945	206.758
88.6581	217.984
88.8217	232.82
88.9853	209.914
89.149	240.375
89.3126	250.586
89.4762	202.586
89.6398	234.563
89.8035	195.609
89.9671	247.711
90.1307	211.742
90.2943	209.781
90.458	202.719
90.6216	238.688
90.7852	220.258
90.9488	179.672
91.1125	204.992
91.2761	236.664
91.4397	208.969
91.6033	246.422
91.767	209.438
91.9306	153.258
92.0942	197.352
92.2578	222.203
92.4215	224.938
92.5851	237.414
92.7487	194.469
92.9123	198.172
93.076	212.789
93.2396	199.469
93.4032	192.336
93.5668	190.109
93.7305	215.016
93.8941	203.109
94.0577	242.852
94.2213	212.117
94.385	214.781
94.5486	217.492
94.7122	170.875
94.8758	196.227
95.0395	198.492
95.2031	178.438
95.3667	196.797
95.5303	216.531
95.694	156.984
95.8576	210.227
96.0212	195.297
96.1848	215.586
96.3485	279.266
96.5121	207.836
96.6757	233.195
96.8393	191.664
97.003	215.93
97.1666	170.602
97.3302	205.828
97.4938	229.328

97.6575	230.078
97.8211	185.375
97.9847	214.938
98.1483	219.063
98.312	166.422
98.4756	194
98.6392	267.109
98.8028	205.914
98.9665	216.242
99.1301	220.492
99.2937	211.648
99.4574	242.688
99.621	164.641
99.7846	220.469
99.9482	204.813
100.112	200.695
100.275	228.797
100.439	211.266
100.603	155.531
100.766	233.164
100.93	245.852
101.094	179.93
101.257	237.57
101.421	178.117
101.584	189.992
101.748	210.039
101.912	192.43
102.075	246.82
102.239	141.602
102.403	240.234
102.566	185.375
102.73	205.234
102.893	185.977
103.057	235.656
103.221	177.094
103.384	254.844
103.548	207.367
103.712	208.633
103.875	207.563
104.039	201.672
104.202	188.75
104.366	202.516
104.53	212.844
104.693	203.594
104.857	212.031
105.021	212.453
105.184	186.68
105.348	193.211
105.511	184.305
105.675	225.945
105.839	182.32
106.002	206.992
106.166	222.656
106.33	177.367
106.493	256.422
106.657	211.258
106.82	213.195

106.984	227.195
107.148	226.539
107.311	197.445
107.475	226.266
107.639	252.297
107.802	177.172
107.966	223.063
108.129	211.828
108.293	237.414
108.457	183.945
108.62	204.695
108.784	213.352
108.948	245.32
109.111	209.719
109.275	227.898
109.438	242.18
109.602	226.438
109.766	225.148
109.929	213.18
110.093	176.977
110.257	179.125
110.42	176.164
110.584	230
110.747	209.438
110.911	230.266
111.075	226.695
111.238	202.969
111.402	182.188
111.566	204.539
111.729	203.422
111.893	211.727
112.057	190.258
112.22	195.109
112.384	241.398
112.547	198.883
112.711	200.727
112.875	271.703
113.038	219.328
113.202	221.063
113.366	181.836
113.529	173.469
113.693	192.203
113.856	215.227
114.02	195.688
114.184	195.789
114.347	218.836
114.511	221.883
114.675	220.711
114.838	205.047
115.002	253.227
115.165	252.227
115.329	206.945
115.493	211.875
115.656	227.922
115.82	182.641
115.984	217.055
116.147	196.609

116.311	204.344
116.474	185.516
116.638	195.711
116.802	170.82
116.965	219.172
117.129	171.18
117.293	206.719
117.456	203.203
117.62	202.336
117.783	217.617
117.947	185.242
118.111	196.055
118.274	183.266
118.438	170.133
118.602	216.914
118.765	173.555
118.929	187.094
119.092	183.164
119.256	195.758
119.42	207
119.583	187.586
119.747	231.32
119.911	249.617
120.074	198.953
120.238	202.414
120.401	190.359
120.565	176.313
120.729	181.25
120.892	257.266
121.056	242.898
121.22	212.086
121.383	234.43
121.547	212.813
121.71	238.023
121.874	155.336
122.038	214.969
122.201	203.805
122.365	205
122.529	187.992
122.692	225.688
122.856	217.375
123.019	191.602
123.183	195.664
123.347	163.938
123.51	165.023
123.674	196.57
123.838	183.117
124.001	180.938
124.165	191.719
124.328	210.094
124.492	210.563
124.656	220.633
124.819	185.852
124.983	191.914
125.147	240.688
125.31	219.25
125.474	184.695

125.637	174.727
125.801	224.781
125.965	180.125
126.128	210.016
126.292	241.859
126.456	199.336
126.619	220.594
126.783	231.188
126.946	219.961
127.11	190.82
127.274	191.453
127.437	183.125
127.601	184.359
127.765	182.75
127.928	160.18
128.092	192.859
128.255	206.203
128.419	170.484
128.583	203.492
128.746	233.242
128.91	233.328
129.074	177.609
129.237	200.984
129.401	202.797
129.564	161.484
129.728	166.977
129.892	214.117
130.055	198.727
130.219	154.531
130.383	162.539
130.546	180.75
130.71	199.758
130.873	215.484
131.037	266.203
131.201	249.914
131.364	176.719
131.528	225.172
131.692	217.57
131.855	219.016
132.019	184.852
132.182	175.078
132.346	208.375
132.51	193.609
132.673	194
132.837	191.719
133.001	235.836
133.164	194.938
133.328	159.445
133.491	221.555
133.655	177.727
133.819	220.195
133.982	212.188
134.146	198.391
134.31	196.352
134.473	218.992
134.637	185.93
134.8	176.172

134.964	175.352
135.128	247.734
135.291	192.844
135.455	206.82
135.619	211.125
135.782	184.93
135.946	177.914
136.109	207.438
136.273	191.891
136.437	249.078
136.6	212.711
136.764	235.883
136.928	185.242
137.091	195.648
137.255	161.758
137.418	196.094
137.582	196.664
137.746	201.57
137.909	239.648
138.073	207.641
138.237	178.148
138.4	212.375
138.564	205.578
138.727	185.164
138.891	167.57
139.055	179.086
139.218	193.484
139.382	168.836
139.546	195.5
139.709	199.781
139.873	176.531
140.036	205.656
140.2	196.297
140.364	190.313
140.527	172.453
140.691	201.672
140.855	195.336
141.018	206.773
141.182	193.727
141.345	178.289
141.509	170.328
141.673	200.984
141.836	219.383
142	174.625
142.164	191.391
142.327	168.094
142.491	195.727
142.654	170.195
142.818	230.172
142.982	180.164
143.145	160.313
143.309	199.711
143.473	220.477
143.636	229.398
143.8	245.859
143.963	208.563
144.127	180.555

144.291	209.828
144.454	210.523
144.618	225.484
144.782	192.781
144.945	150.891
145.109	176.078
145.272	194.664
145.436	160.164
145.6	204.945
145.763	143.797
145.927	174.969
146.091	195.656
146.254	202.813
146.418	205.859
146.581	208.117
146.745	184.797
146.909	221.328
147.072	190.664
147.236	232.914
147.4	222.602
147.563	242.461
147.727	232.617
147.89	222.398
148.054	229.773
148.218	245.477
148.381	209.977
148.545	208.953
148.709	253.156
148.872	211.125
149.036	230.891
149.199	225.563
149.363	209.859
149.527	168.836
149.69	191.367
149.854	220.063
150.018	213.953
150.181	256.016
150.345	262.109
150.508	249.727
150.672	255.109
150.836	227.758
150.999	260.281
151.163	259.766
151.327	246.148
151.49	235.219
151.654	245
151.817	230.406
151.981	203.086
152.145	270.813
152.308	285.375
152.472	232.25
152.636	301.359
152.799	273.906
152.963	277.719
153.126	192.617
153.29	269.703
153.454	240.875

153.617	196.148
153.781	276.281
153.945	319.469
154.108	254.305
154.272	221.32
154.435	268.594
154.599	227.453
154.763	235.156
154.926	237.836
155.09	243.375
155.254	250.953
155.417	235.063
155.581	251.773
155.744	251.617
155.908	288.375
156.072	285.313
156.235	286.313
156.399	298.438
156.563	258.156
156.726	216.063
156.89	220.219
157.053	258.375
157.217	221.273
157.381	262.938
157.544	224.523
157.708	245.141
157.872	266.891
158.035	244.281
158.199	247.789
158.362	256.609
158.526	250.531
158.69	229.609
158.853	272.641
159.017	282.969
159.181	317.016
159.344	285.594
159.508	313.891
159.671	264.75
159.835	251.289
159.999	246.32
160.162	262.672
160.326	211.281
160.49	218.711
160.653	276.266
160.817	248.219
160.98	284.359
161.144	271.734
161.308	293.047
161.471	284.969
161.635	249.961
161.799	246.852
161.962	264.469
162.126	255.781
162.289	223.086
162.453	223.023
162.617	267.063
162.78	262.453

162.944	302.266
163.108	257.688
163.271	247.102
163.435	232.523
163.598	260.125
163.762	349.328
163.926	248.734
164.089	266.328
164.253	290.547
164.417	270.625
164.58	239.313
164.744	224.813
164.907	272.547
165.071	256.609
165.235	250.5
165.398	302.344
165.562	254.063
165.726	240.203
165.889	214.398
166.053	283.953
166.216	267.641
166.38	253.289
166.544	234.461
166.707	195.867
166.871	209.023
167.035	196.883
167.198	252.523
167.362	207.414
167.525	175.727
167.689	186.133
167.853	190.914
168.016	208.297
168.18	209.719
168.344	184.969
168.507	194.305
168.671	168.781
168.834	201.055
168.998	161.102
169.162	181.391
169.325	177.953
169.489	180.656
169.653	162.617
169.816	157.859
169.98	127.551
170.143	125.633
170.307	122.348
170.471	108.355
170.634	128.516
170.798	105.82
170.962	113.348
171.125	138.938
171.289	135.492
171.452	146.047
171.616	116.977
171.78	130.469
171.943	142.992
172.107	112.938

172.271	115.82
172.434	147.469
172.598	144.953
172.761	110.887
172.925	112.48
173.089	122.621
173.252	112.563
173.416	123.516
173.58	109.512
173.743	143.453
173.907	113.609
174.07	131.977
174.234	102.008
174.398	110.598
174.561	130.766
174.725	127.379
174.889	111.227
175.052	110.34
175.216	98.6836
175.38	131.039
175.543	117.281
175.707	107.508
175.87	98.5703
176.034	110.484
176.198	90.4258
176.361	106.871
176.525	96.7656
176.689	137.047
176.852	99.6953
177.016	125.781
177.179	136.242
177.343	118.559
177.507	122.191
177.67	104.031
177.834	144.625
177.998	98.125
178.161	123.984
178.325	88.918
178.488	109.301
178.652	135.156
178.816	110.059
178.979	116.145
179.143	156.008
179.307	123.66
179.47	124.215
179.634	100.254
179.797	118.793
179.961	93.8008
180.125	114.676
180.288	135.102
180.452	126.68
180.616	115.938
180.779	144
180.943	88.4648
181.106	115.828
181.27	118.801
181.434	121.414

181.597	90.918
181.761	104.75
181.925	85.0664
182.088	91.5547
182.252	130.492
182.415	133.227
182.579	94.2852
182.743	102.582
182.906	108.34
183.07	82.1133
183.234	84.7813
183.397	95.1406
183.561	86.6953
183.724	107.363
183.888	113.965
184.052	87.668
184.215	80.3086
184.379	68.8867
184.543	87.6367
184.706	111.598
184.87	63.9941
185.033	80.0859
185.197	113.582
185.361	107.91
185.524	78.5352
185.688	73.1836
185.852	84.4922
186.015	90.7695
186.179	89.0742
186.342	82.7461
186.506	99.5391
186.67	114.984
186.833	71.7578
186.997	108.484
187.161	109.938
187.324	101.641
187.488	97.5469
187.651	99.5977
187.815	67.8633
187.979	113.789
188.142	68.0938
188.306	90.2188
188.47	102.07
188.633	65.7461
188.797	82.7227
188.96	91.8828
189.124	92.6406
189.288	94.957
189.451	91.4766
189.615	91.5
189.779	63.4492
189.942	91.0859
190.106	98.9805
190.269	84.2656
190.433	67.0703
190.597	101.75
190.76	79.4922

190.924	49.2363
191.088	78.7852
191.251	57.2617
191.415	76.5078
191.578	105.184
191.742	111.781
191.906	77.0195
192.069	103.094
192.233	98.4102
192.397	98.1133
192.56	103.852
192.724	86.1484
192.887	76.8672
193.051	96.2305
193.215	104.941
193.378	81.8203
193.542	83.875
193.706	96.8828
193.869	82.8594
194.033	85.9688
194.196	86.9492
194.36	98.5273
194.524	93.7422
194.687	103.297
194.851	131.141
195.015	61.1484
195.178	101.121
195.342	91.3008
195.505	111.148
195.669	77.7734
195.833	60.4473
195.996	120.668
196.16	63.6836
196.324	116.508
196.487	81.7617
196.651	119.648
196.814	86.1367
196.978	98.875
197.142	86.1797
197.305	119.129
197.469	68.7656
197.633	78.8672
197.796	98.9336
197.96	70.2617
198.123	76.3047
198.287	80.9688
198.451	66.6094
198.614	100.07
198.778	106.82
198.942	78.4531
199.105	101.992
199.269	62.1523
199.432	79.9414
199.596	77.9023
199.76	78.3047
199.923	94.543
200.087	124.438

200.251	96.5313
200.414	71.6406
200.578	69.8047
200.741	79.2734
200.905	122.609
201.069	80.4453
201.232	116.805
201.396	92.9453
201.56	96.207
201.723	88.5508
201.887	102.945
202.05	90.0781
202.214	101.438
202.378	87.8203
202.541	83.8086
202.705	101.828
202.869	66.918
203.032	94.5273
203.196	63.4648
203.359	71.1289
203.523	110.289
203.687	61.2031
203.85	68.9531
204.014	102.836
204.178	93.6367
204.341	95.7383
204.505	101.113
204.668	75.6055
204.832	99.3477
204.996	91.0625
205.159	74.4883
205.323	98.6875
205.487	78.0117
205.65	90.1406
205.814	106.043
205.977	85.7188
206.141	93.8984
206.305	82.2344
206.468	78.0508
206.632	113.633
206.796	76.8203
206.959	118.191
207.123	83.1602
207.286	80.4063
207.45	82.9297
207.614	73.7773
207.777	83.6641
207.941	96.5547
208.105	76.7422
208.268	73.6406
208.432	83.3945
208.595	82.9375
208.759	71.6523
208.923	76.9102
209.086	89.9219
209.25	90.5234
209.414	62.834

209.577	87.5781
209.741	78.4609
209.904	102.113
210.068	68.8594
210.232	65.8242
210.395	71.8867
210.559	81.0234
210.723	88.5195
210.886	98.1094
211.05	82.918
211.213	81.4375
211.377	77.3867
211.541	94.9727
211.704	97.5156
211.868	110.324
212.032	96.7773
212.195	105.203
212.359	103.762
212.522	98.0742
212.686	82.5039
212.85	110.875
213.013	101.719
213.177	121.68
213.341	82.9453
213.504	65.4727
213.668	89.3164
213.831	116.516
213.995	124.992
214.159	95.3008
214.322	124.148
214.486	100.266
214.65	107.977
214.813	115.883
214.977	113.531
215.14	83.4336
215.304	98.3477
215.468	101.188
215.631	80.9297
215.795	117.379
215.959	93.2734
216.122	101.902
216.286	85.1953
216.449	96.0625
216.613	101.629
216.777	64.9648
216.94	95.168
217.104	98.3359
217.268	102.043
217.431	115.711
217.595	109.391
217.758	103.801
217.922	83.6641
218.086	92.2852
218.249	70.1602
218.413	91.9961
218.577	93.8281
218.74	66.5391

218.904	97.7617
219.067	96.0898
219.231	101.836
219.395	95.0547
219.558	107.629
219.722	97.1797
219.886	94.6992

Appendix C

Lithologic Log

Geologic Unit	Lithologic Description <i>Please see the End Notes for the sources of these descriptions.</i>	Interval (ft)	Elevation (amsl)
Quaternary Alluvium (Qal)	Sandy silt/clay, dusky brown (5YR 2/2), moderately to well sorted, non-indurated. Composed of: 75% silt/clay; 20% sand, mixed composition including intermediate composition volcanics (inter. comp. volcanics) and felsic crystals, subangular to subrounded; 5% gravel, inter. comp. volcanics, up to 20 mm, subangular to subrounded. Damp. Organic fragments. <ul style="list-style-type: none"> • 1.0-3.9, No recovery. 	0.0-3.9	6624.3-6620.4
	Gravelly silty/clayey sand, moderate yellowish brown (10YR 5/4), poorly sorted, non-indurated. Composed of: 60-70% sand, mixed composition including tuff fragments, inter. comp. volcanics, felsic crystals, angular to subrounded; 15-20% gravel, tuff, inter. comp. volcanics, up to 20 mm, subangular; 15-20% silt/clay. Damp. <ul style="list-style-type: none"> • 6.4-6.7, Alluvium, as above, increase in gravel size (up to 50 mm) and abundance. • 6.7-13.8, No recovery. 	3.9-13.8	6620.4-6610.5
	Gravel, moderate yellowish brown (10YR 5/4), well sorted, non-indurated. Composed of: 80-90% gravel, predominantly inter. comp volcanics, common tuff fragments, up to 70 mm, angular; 10-20% sand, predominantly felsic crystals, subangular to subrounded. Damp. <ul style="list-style-type: none"> • 15.0-15.7, No recovery. 	13.8-15.7	6610.5-6608.6
	Sand, dark yellowish brown (10YR 4/2), well sorted, non-indurated. Composed of: 95% sand, predominantly felsic crystals, minor tuff, minor inter. comp. volcanics, subrounded; 5% silt/clay; trace gravel and a boulder as noted below. Wet. <ul style="list-style-type: none"> • 18.2-20.0, Alluvium, boulder, coring not attempted. • 22.8-23.8, Alluvium, as above, increase in sand size and gravel abundance. 	15.7-23.8	6608.6-6600.5
	Gravelly silty/clayey sand, moderate yellowish brown (10YR 5/4), poorly sorted, non-indurated. Composed of: 60-70% sand, mixed composition including felsic crystals, tuff fragments, and inter. comp. volcanics, angular to subrounded; 15-20% gravel, mixed composition including tuff fragments and inter. comp. volcanics, up to 10 mm, angular to subrounded; 15-20% silt/clay. Wet. <ul style="list-style-type: none"> • 25.0-26.8, No recovery. 	23.8-26.8	6600.5-6597.5

Geologic Unit	Lithologic Description <i>Please see the End Notes for the sources of these descriptions.</i>	Interval (ft)	Elevation (amsl)
Otowi Member of the Bandelier Tuff (Qbo)	<p>Tuff -Transitional Interval with overlying alluvium, moderate yellowish brown (10YR 5/4) to very pale orange (10YR 8/2), non-welded. Composed of: fine ash matrix; 10-25% felsic crystals (clear, <2 mm, predominantly broken/angular fragments with trace crystal faces); trace to 5% vitric pumice (brownish orange, up to 10 mm, subrounded); 5-10% lithics (dark gray, generally <5 mm, up to 15 mm, angular). Wet to damp to dry across interval as noted. Based on appearance of core, additional water from overlying formation may have entered into sample interval during drilling. Localized clay alteration of pumice.</p> <p>Note: The top of the Qbo is estimated at 26.8 ft bgs. From 26.8 to 34.3 ft bgs, recovered core appears as a transitional interval with the overlying alluvium. The high moisture content of the alluvium resulted in disturbed core and possible intermixing of zones during drilling. Additionally, Otowi Member tuff with secondary alteration resembled reworked tuff in the alluvium.</p> <ul style="list-style-type: none"> • 26.8 to 27.5 ft, Tuff, Transitional Interval, moderate yellowish brown (10YR 5/4); trace subrounded lithics noted at beginning of interval; trace vitric pumice apparent at 27.5 ft bgs. Wet to damp. • 27.5 to 27.7 ft, Tuff, Transitional Interval, as above, color change to very pale orange (10YR 8/2); lithics up to 10mm, angular. Wet to damp. • 31.2 to 34.3 ft, Tuff, Transitional Interval, as above, yellowish gray (5Y 8/1). Damp to dry. 	26.8- 34.3	6597.5-6590.0
	<p>Tuff, very pale orange (10YR 8/2), poorly welded, trace intact core. Composed of: fine ash matrix; 10-25% felsic phenocrysts, clear, 1mm, broken, subhedral to euhedral; 10-15% lithics, inter. comp. volcanics, brownish gray to medium gray, 3 to 5 mm, generally <3 mm, angular; 2-5% pumice, vitric, very light gray to yellowish orange, up to 3 mm, rounded, predominantly altered. Dry. Clay alteration of pumice and staining of tuff decrease with depth.</p> <ul style="list-style-type: none"> • 34.5-35.0 ft, No recovery. • 45.0-50.0 ft, Tuff, as above, increase in lithics (15-20%) and size (5-10 mm). 	34.3-50.0	6590.0-6574.3
	<p>Tuff, pale yellowish brown (10YR 6/2), poorly welded. Composed of: fine ash matrix; 10-25% felsic phenocrysts, clear; 10-15% lithics, inter. comp. volcanics, 1 mm, angular; 2-5% pumice, vitric, yellow, locally altered. Dry. Alteration/staining as noted.</p> <ul style="list-style-type: none"> • 50.0-60.0 ft, Tuff, as above, clay alteration of pumice and staining of tuff decrease with depth. • 66.7-70.0 ft, No recovery. 	50.0-70.0	6574.3-6554.3

Geologic Unit	Lithologic Description <i>Please see the End Notes for the sources of these descriptions.</i>	Interval (ft)	Elevation (amsl)
Otowi Member of the Bandelier Tuff (Qbo)	Tuff, very pale orange (10YR 8/2), poorly welded. Composed of: fine ash matrix; 10-25% felsic phenocrysts, clear; 10-20% lithics, inter. comp. volcanics, 1 mm, angular; 2-15% pumice, vitric, white to very light gray to yellow, up to 10 mm, commonly altered. Dry. Alteration as noted. <ul style="list-style-type: none"> • 70.0-80.0 ft, Tuff, as above, clay alteration of pumice. • 95.0-120.0 ft, Tuff, as above, increase in felsic phenocryst abundance to 40-60%. • 120.0-135.0 ft, Tuff, as above, decrease in felsic phenocrysts abundance 20-35%; clay alteration of pumice. 	70.0-135.0	6554.3-6489.3
	Tuff, very pale orange (10YR 8/2), poorly welded. Composed of: fine ash matrix; 40-60% felsic phenocrysts, clear up to 1 mm, subhedral to broken; 10-20% lithics, inter. comp. volcanics, gray to brownish gray, 1 mm, angular; 2-5% pumice, vitric, white to very light gray to yellow, up to 10 mm, rounded, commonly altered. Wet.	135.0-147.0	6489.3-6477.3
Guaje Pumice Bed of the Otowi Member of the Bandelier Tuff (Qbog)	Pumice Bed, very light gray (N8), non to poorly welded. Composed of: pumice matrix, vitric, white to very light gray, up to 10 mm, round to subrounded, trace light brown to yellow staining/alteration and manganese/iron (Mn/Fe) specks, trace to common felsic phenocrysts; 2-10% lithics, inter. comp. volcanics, dark gray, up to 4 mm, angular; trace felsic crystals, clear, up to 1 mm. Wet. <p>Note: The top of the Qbog is 147.0 ft bgs based on geophysical log from LAOI-3.2a.</p> <ul style="list-style-type: none"> • 147.2-150.0 ft, No recovery. • 152.0-155.0 ft, Pumice Bed, increase in lithic abundance to 5-10%. • 155.0-165.0 ft, Pumice Bed, as above, increase in pumice clay alteration. 	147.0-170.0	6477.3-6454.3
Puye Formation (Tpf)	Well sorted conglomerate, medium dark gray (N4) to pale brownish red (10R 5/4), moderately to well sorted, non-indurated. Composed of: 95% gravel, inter. comp. volcanics, generally 15-20 mm, angular to subangular; 5% sand, predominantly inter. comp. volcanics (dark gray to medium brown), common felsic crystals (clear), subangular; trace silt/clay, light brown. Wet. <p>Note: The top of the Tpf is 170.0 ft bgs based on geophysical log from LAOI-3.2a.</p>	170.0-185.0	6454.3-6439.3
	Conglomerate, dark yellowish brown (10YR 4/2) to grayish brown (5YR 3/2), moderately sorted, non-indurated. Composed of: 50-70% gravel, predominantly inter. comp. volcanics (dark gray to brownish red), generally 10-15 mm, up to 30 mm, angular to subangular; 30-50% sand, predominantly inter. comp. volcanics (dark gray to reddish brown), trace felsic crystals (clear), trace mafic crystals (very dark brown to black, platy, biotite noted), subangular to subrounded. Wet. Grain-size coarsening downward.	185.0-200.0	6439.3-6424.3

Intermediate Wells LAOI-3.2 and LAOI-3.2a Completion Report

Geologic Unit	Lithologic Description <i>Please see the End Notes for the sources of these descriptions.</i>	Interval (ft)	Elevation (amsl)
Puye Formation (Tpf)	Gravelly silty/clayey sandstone, moderate brown (5YR 4/4) to grayish brown (5YR 3/2) to moderate yellowish brown (10YR 5/4), moderately sorted, poorly to moderately indurated. Composed of: 75-90% sand, predominantly inter. comp. volcanics (dark gray to reddish brown), minor felsic crystals, trace mafic crystals (black, platy to square), subangular to subrounded; 5-10% silt/clay. Wet to damp as noted. <ul style="list-style-type: none"> • 200.0 to 207.4 ft, Gravelly silty/clayey sandstone, as above, wet. • 204.5 to 207.4 ft, No recovery, dacite cobble lodged in core barrel. • 207.4 to 221.8 ft, Gravelly silty/clayey sandstone, as above, damp. • 216.8 to 216.9 Gravelly silty/clayey sandstone, as above, dacite cobbles, gray to pale brown, felsic phenocrysts (white to yellow, up to 4 mm), mafic phenocrysts (black, up to 1 mm, platy). • 216.9 to 221.8 ft, No recovery. 	200.0- 221.8	6424.3- 6402.5
	Sandy siltstone/claystone, moderate brown (5YR 4/4) to moderate yellowish brown (10YR 5/4), well sorted, moderately to poorly indurated. Composed of: 85-90% silt/clay; 10-15% sand, predominantly inter. comp. volcanics, trace felsic crystals, subrounded; 5-10% gravel, inter. comp. volcanics, up to 10 mm, subangular to subrounded. Damp. Clay has waxy texture.	221.8- 227.5	6402.5- 6396.8
	Gravelly silty/clayey sandstone, moderate brown (5YR 4/4), moderately sorted, moderately to well indurated. Composed of: 70-80% sand, predominantly inter. comp. volcanics (dark gray), trace felsic crystals (clear to white), trace mafic crystals (black), subrounded; 15-30% silt/clay; 0-5% gravel, inter. comp. volcanics, dark gray, up to 10 mm, subrounded. Damp to dry (core often recovered with water in the core barrel; however core is damp to dry). Gradational with overlying siltstone/claystone. <ul style="list-style-type: none"> • 233.1 to 238.1 ft, No recovery. 	227.5- 240.7	6396.8- 6383.6
	Sandy siltstone/claystone, moderate brown (5YR 4/4) to moderately yellowish brown (10YR 5/4), well sorted, moderately to well indurated. Composed of: 70-80% silt/clay; 20-30% sand, predominantly inter. comp. volcanics (gray to reddish brown), trace felsic crystals (clear), subrounded; trace gravels, inter. comp. volcanics, up to 7 mm, subangular to subrounded. Damp to dry (core often recovered with water in the core barrel; however, core is damp to dry). Gradational with overlying sandstone.	240.7- 266.5	6383.6- 6357.8
Cerros del Rio Basalt (Tb4)	Basalt, black (N1), vesicular. Composed of: aphanitic groundmass; 2% olivine phenocrysts, pale yellow to pale greenish yellow, up to 0.5 mm, subhedral, platy. Damp. Sharp contact with overlying siltstone/claystone. Note: The top of the Tb4 is 266.5 ft bgs based on driller's observations and core.	266.5- 266.9	6357.8- 6357.4
LAOI-3.2a TD = 266.9 FT BGS			

Geologic Unit	Lithologic Description <i>Please see the End Notes for the sources of these descriptions.</i>	Interval (ft)	Elevation (amsl)
References			
<p>Dutro, J. T., Dietrich, R. V., and Foose, R. M., 1989, American Geological Institute. Data Sheets, 3rd Edition. Geological Society of America, 1995, Rock-Color Chart, 8th Printing.</p> <p>Tucker, M.E., 1991, Sedimentary Petrology, An Introduction to the Origin of Sedimentary Rocks, Blackwell Science Limited.</p>			
Classification System			
<p>Field geologists used principles identified in the AGI Data Sheets (Dutro, J. T, et al., 1989) to describe lithology. Specifically, AGI Data Sheets 32.1, 32.2 as well as 29.1 (the modified Wentworth scale for grain-size classification) were used for sedimentary units. The AGI approach was augmented by the classification system presented in Sedimentary Petrology, An Introduction to the Origin of Sedimentary Rocks (Tucker, 1991).</p>			
Groundwater Occurences			
<p>Please refer to sections 6.2 and 10.4.2 of the report for a description of groundwater occurrences.</p>			
Analytical Samples			
<p>Please refer to sections 4.1 and 10.2.1 of the report for a description of analytical samples collected.</p>			
Lithologic descriptions for the following intervals were obtained at these wells:			
0-165 ft bgs: LAOI-3.2			
165-200 ft bgs: LAOI-3.2a			
200-229.2 ft bgs: LAOI-3.2a(plugged)			
229.2-266.9 ft bgs: LAOI-3.2a			

Appendix D

Groundwater Analytical Results

1.0 SAMPLING AND ANALYSIS OF GROUNDWATER AT LAOI-3.2 AND LAOI-3.2a

Shallow alluvial and perched intermediate groundwater was encountered at LAOI-3.2, LAOI-3.2a(plugged) and LAOI-3.2a. At LAOI-3.2, two screening groundwater samples were collected during drilling, one from the shallow zone and one from the intermediate zone; two final samples were collected from the completed well near the end of development. One screening sample was collected from the intermediate zone in LAOI-3.2a(plugged) and one final sample was collected from the developed well at LAOI-3.2a.

The groundwater samples were analyzed for anions, including perchlorate, cations and metals. During well development, water samples were also submitted for total organic carbon (TOC) analyses.

1.1 Analytical Techniques

Groundwater samples were filtered prior to analyses for metals, trace elements, and major cations and anions. Aliquots of the samples were filtered through 0.45-micrometer membranes. Samples were acidified with analytical grade nitric acid to a pH of 2.0 or less for metal and major cation analyses. Total carbonate alkalinity was measured at Los Alamos National Laboratory's Earth and Environmental Sciences Group 6 (EES-6) using standard titration techniques. Samples collected for TOC analyses were not filtered.

Groundwater samples were analyzed by EES-6 using techniques specified in the US Environmental Protection Agency SW-846 manual. Ion chromatography (IC) was the analytical method for bromide, chloride, fluoride, nitrate, nitrite, oxalate, perchlorate, phosphate, and sulfate. The instrument detection limits (IDLs) for perchlorate analyses were 0.001 and 0.002 parts per million (ppm) for the groundwater samples.

Inductively coupled (argon) plasma optical emission spectroscopy (ICPOES) was used for calcium, iron, magnesium, potassium, silica, and sodium. Aluminum, antimony, arsenic, barium, beryllium, cadmium, cesium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, nickel, rubidium, selenium, silver, thallium, thorium, tin, vanadium, uranium, and zinc were analyzed by inductively coupled (argon) plasma mass spectrometry (ICPMS). The precision limits (analytical error) for major ions and trace elements were generally less than $\pm 10\%$ using ICPOES and ICPMS.

1.2 Analytical Results

Analytical results for groundwater samples collected at LAOI-3.2 are provided in Table 1.2-1. Table 1.2-2 contains the analytical results for the samples collected from both LAOI-3.2a(plugged) and LAOI-3.2a.

Perchlorate was tentatively detected in the perched intermediate zone screening sample from LAOI-3.2 at 0.0074 ppm, but was not detected in the other samples from LAOI-3.2. Perchlorate was detected in the screening sample from LAOI-3.2a(plugged) and in the sample collected after well development from LAOI-3.2a at 0.0046 and 0.0006 ppm, respectively.

Nitrate (as nitrogen) was detected at 1.25 and 1.37 ppm in both of the groundwater samples collected near the end of well development from LAOI-3.2. This analyte was also detected at 3.46 and 3.11 ppm in the LAOI-3.2a(plugged) and LAOI-3.2a samples, respectively.

The concentration of TOC in a sample collected from LAOI-3.2 near the end of development was 0.52 ppm. At LAOI-3.2a, TOC was measured at 0.92 ppm and was not detected (<0.1 ppm) in two samples collected near the end of development.

Table 1.2-1. Hydrochemistry of Groundwater Samples Collected from Perched Alluvial and Intermediate Groundwater at LAOI-3.2 (filtered samples)

WELL	LAOI-3.2	LAOI-3.2	LAOI-3.2	LAOI-3.2
SAMPLE ID	GWL2-04-53835	GWL2-04-53836	EU05070G32L01	EU05070G32L02
SAMPLE TYPE	During drilling	During drilling	After development	After development
DEPTH (ft bgs)	~14	~140	158.8	152.3
WATER-BEARING UNIT	Perched alluvial	Perched intermediate	Perched intermediate	Perched intermediate
GEOLOGIC UNIT	Quaternary alluvium	Otowi Member/Guaje	Guaje Pumice Bed	Guaje Pumice Bed
DATE	2/4/05	2/15/05	2/23/05	2/23/05
Charge Balance (%)	-1.05	-1.75	-2.82	-2.48
pH (Lab)	6.85	7.32	7.05	7.05
Ag (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
Al (ppm)	0.014	5.52	0.0048	0.0059
Alkalinity (ppm CaCO ₃ /L)	64.8	175	76.7	73.9
As (ppm)	0.0008	0.0006	0.0003	0.0003
B (ppm)	0.036	0.041	0.011	0.010
Ba (ppm)	0.10	0.097	0.015	0.014
Be (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
Br (ppm)	0.43	0.11	0.04	0.04
Ca (ppm)	37.7	37.9	13.0	13.2
Cd (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
Cl (ppm)	165	43.0	5.48	5.92
ClO ₄ (ppm)	U [0.002]	0.0074	U [0.001]	U [0.001]
Co (ppm)	U [0.001]	0.0015	U [0.001]	U [0.001]
CO ₃ (ppm)	0	0	0	0
Cr – Total (ppm)	0.0035	0.0073	U [0.001]	U [0.001]
Cs (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
Cu (ppm)	0.0031	0.0051	0.0012	0.0022
F (ppm)	0.48	0.32	0.09	0.08
Fe (ppm)	U [0.01]	5.44	U [0.01]	U [0.01]
HCO ₃ (ppm)	79.1	213	93.6	90.2
Hg (ppm)	U [0.00005]	U [0.00005]	U [0.00005]	U [0.00005]
K (ppm)	9.25	17.5	5.41	5.60
Li (ppm)	0.059	0.020	0.0045	0.0046
Mg (ppm)	9.99	11.7	3.57	3.82
Mn (ppm)	0.077	1.09	0.18	0.12
Mo (ppm)	0.23	0.14	0.0010	0.0007
Na (ppm)	71.7	45.7	16.1	14.1
Ni (ppm)	0.0011	0.0040	U [0.001]	U [0.001]
NO ₂ (as N) (ppm)	U [0.002]	1.16	U [0.002]	U [0.002]
NO ₃ (as N) (ppm)	U [0.002]	4.8	1.25	1.37
C ₂ O ₄ (ppm)(oxalate)	U [0.01]	U [0.01]	U [0.01]	U [0.01]
Pb (ppm)	U [0.0002]	U [0.0002]	U [0.0002]	U [0.0002]
PO ₄ (ppm)	0.05	U [0.001]	U [0.001]	0.02
Rb (ppm)	0.016	0.088	0.024	0.026
Sb (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
Se (ppm)	0.0012	U [0.001]	U [0.001]	U [0.001]
SiO ₂ (ppm)	41.7	113	72.1	72.9
SO ₄ (ppm)	11.3	13.7	5.17	3.65
Sn (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
Sr (ppm)	0.25	0.22	0.074	0.069
Th (ppm)	U [0.001]	0.004	U [0.001]	U [0.001]

Ti (ppm)	U [0.001]	0.032	U [0.001]	U [0.001]
Tl (ppm)	U [0.001]	U [0.001]	U [0.001]	U [0.001]
U (ppm)	0.0004	0.0086	0.0013	0.0011
V (ppm)	0.002	0.002	0.001	0.001
Zn (ppm)	0.001	0.017	0.005	0.006
TDS (calculated)	427.1	534.2	220.4	215.8

Notes: U = Undetected at the IDL shown in brackets. Bicarbonate (HCO₃) concentrations were calculated from measured total carbonate alkalinity. Silica was calculated from concentration of silicon.

Table 1.2-2. Hydrochemistry of Groundwater Samples Collected from Perched Intermediate Groundwater at LAOI-3.2a(plugged) and LAOI-3.2a (filtered samples)

WELL	LAOI-3.2a(plugged)	LAOI-3.2a
SAMPLE ID	EU0507GI32A01	EU0507GI32A02
SAMPLE TYPE	During drilling	After development
DEPTH (ft bgs)	170	183.8
WATER-BEARING UNIT	Perched intermediate	Perched intermediate
GEOLOGIC UNIT	Puye Formation	Puye Formation
DATE	12/14/05	2/2/06
Charge Balance (%)	-2.51	-6.65
pH (Lab)	7.37	6.63
Ag (ppm)	U [0.001]	U [0.001]
Al (ppm)	0.0099	0.0013
Alkalinity (ppm CaCO ₃ /L)	63.4	66.1
As (ppm)	0.0003	0.0003
B (ppm)	0.092	0.048
Ba (ppm)	0.35	0.020
Be (ppm)	U [0.001]	U [0.001]
Br (ppm)	0.13	0.11
Ca (ppm)	18.7	19.0
Cd (ppm)	U [0.001]	U [0.001]
Cl (ppm)	27.4	28.1
ClO ₄ (ppm)	0.0046	0.0006
Co (ppm)	U [0.001]	U [0.001]
CO ₃ (ppm)	0	0
Cr – Total (ppm)	0.0010	0.0011
Cr (VI) (ppm)	Not measured	0.0004
Cs (ppm)	U [0.001]	U [0.001]
Cu (ppm)	0.0019	U [0.001]
F (ppm)	0.10	0.09
Fe (ppm)	0.03	0.07
HCO ₃ (ppm)	77.4	80.6
Hg (ppm)	U [0.00005]	U [0.00005]
K (ppm)	7.24	8.38
Li (ppm)	0.0070	0.0048
Mg (ppm)	5.90	4.68
Mn (ppm)	0.092	0.0081
Mo (ppm)	0.0048	U [0.001]
Na (ppm)	17.4	15.9
Ni (ppm)	0.0029	U [0.001]
NO ₂ (as N) (ppm)	U [0.002]	U [0.002]
NO ₃ (as N) (ppm)	3.46	3.11
C ₂ O ₄ (ppm)(oxalate)	0.02	U [0.01]
Pb (ppm)	U [0.0002]	U [0.0002]
PO ₄ (ppm)	U [0.01]	U [0.01]
Rb (ppm)	0.023	0.036
Sb (ppm)	U [0.001]	U [0.001]

Se (ppm)	U [0.001]	U [0.001]
SiO ₂ (ppm)	65.5	64.7
SO ₄ (ppm)	9.30	10.6
Sn (ppm)	U [0.001]	U [0.001]
Sr (ppm)	0.077	0.12
Th (ppm)	U [0.001]	U [0.001]
Ti (ppm)	U [0.002]	U [0.002]
Tl (ppm)	U [0.001]	U [0.001]
U (ppm)	0.0011	0.0010
V (ppm)	U [0.001]	0.002
Zn (ppm)	0.084	0.16
TDS (calculated)	245.1	246.4

Notes: U = Undetected at the IDL shown in brackets. Bicarbonate (HCO₃) concentrations were calculated from measured total carbonate alkalinity. Silica was calculated from concentration of silicon.

Appendix E

Aquifer Testing Reports

TABLE OF CONTENTS

1.0 LAOI-3.2a PUMPING TEST ANALYSIS..... E1-1

INTRODUCTION..... E1-1

 Water Withdrawal Effects on Water Levels..... E1-2

BACKGROUND DATA..... E1-2

IMPORTANCE OF EARLY DATA..... E1-3

TIME-DRAWDOWN METHODS E1-5

RECOVERY METHODS E1-6

SPECIFIC CAPACITY METHOD..... E1-6

LAOI-3.2a DATA ANALYSIS..... E1-8

 Lateral Extent of Perched Zone..... E1-8

 Background Data..... E1-9

 Trial Testing E1-10

 24-Hour Constant-Rate Pumping Test E1-11

 Specific Capacity Data..... E1-12

SUMMARY E1-13

REFERENCES E1-13

2.0 LAOI-3.2 PUMPING TEST ANALYSIS E2-1

INTRODUCTION..... E2-1

BACKGROUND DATA..... E2-1

CASING STORAGE..... E2-3

TIME-DRAWDOWN METHODS E2-3

RECOVERY METHODS E2-4

SPECIFIC CAPACITY METHOD..... E2-5

LAOI-3.2 DATA ANALYSIS E2-6

 Background Data..... E2-6

 Test 1 E2-7

 Test 2..... E2-8

 Specific Capacity Data..... E2-9

SUMMARY E2-10

REFERENCES E2-11

1.0 LAOI-3.2a PUMPING TEST ANALYSIS

INTRODUCTION

This section describes the analysis of constant-rate test pumping conducted in February 2006 on LAOI-3.2a located in Los Alamos Canyon, adjacent to well LAOI-3.2. The primary objective of the analysis was to determine the hydraulic properties of the perched zone in which LAOI-3.2a is completed. LAOI-3.2a is a 3-inch (in.) diameter well and thus the inflatable packer system used in the Regional (R)-well testing program could not be used. Therefore, the data collected from LAOI-3.2a showed casing storage effects.

LAOI-3.2a is completed within the Puye Formation, just beneath the Guaje Pumice Bed. It is completed with 10 feet (ft) of well screen set from 181.4 to 191 ft below ground surface (bgs). At the time of testing, the static water level was 178.01 ft bgs, just 3 ft above the top of the screen. The filter pack rises to 176.7 ft bgs and, thus, the water level fell within the filter packed interval. Nearby well LAOI-3.2 is shallower, screened from 153.3 ft to 162.8 ft. Its static water level was higher as well at 134 ft bgs. The 44-ft water level difference between the two screen zones implied tight intervening sediments and likely little hydraulic connection between the two.

Testing consisted of brief trial pumping on February 7, followed by a 24-hour (hr) constant-rate pumping test that was begun on February 9. Two trial tests were conducted. Trial 1 was conducted at a discharge rate of 5.0 gallons per minute (gpm) for 40 minutes (min.) from 12:00 noon until 12:40 pm and was followed by 110 min. of recovery until 2:30 pm.

Following trial 1 recovery, trial 2 was conducted for 120 min. from 2:30 pm until 4:30 pm at a discharge rate of 4.0 gpm. Following shutdown, recovery was monitored for 39.5 hours (hrs) until 8:00 am on February 9.

At 8:00 am on February 9, the 24-hr pumping test was begun at a rate of 4.0 gpm. After a few hours of pumping, the discharge rate exhibited subtle, though erratic fluctuations suggestive of insufficient head over the pump bowls to maintain consistent pump operation. The pump submergence prior to pumping was less than 10 ft and, thus, it seemed possible that the water level might have been pulled too close to the intake. Also, there was concern that the water level might be pulled below the transducer which was submerged only a little more than 6 ft below the static water level. Therefore, at 1:50 pm, after 350 min. of operation, the discharge rate was reduced to 2.6 gpm. Subsequently, additional more conservative calculations were performed to estimate possible worst-case pumping levels and the decision was made to cut the flow rate further. At 5:20 pm, 210 min. after the initial rate reduction, the discharge rate was reduced further to 1.3 gpm. It was held at that rate for the remaining 880 min. of the test until shutdown at 8:00 am on February 10. Thus, the 24-hr pumping test was conducted at three discharge rates – Q_1 , Q_2 and Q_3 , equal to 4.0, 2.6 and 1.3 gpm, respectively – for periods p_1 , p_2 and p_3 , having values of 350, 210 and 880 min., respectively.

Following shutdown, recovery/background measurements were recorded for 9038 min. (more than 6 days) until 2:38 pm on February 16.

Throughout the testing and recovery period, water levels were collected from nearby well LAOI-3.2 and analyzed to discern whether or not there was a hydraulic connection between the two wells.

Water Withdrawal Effects on Water Levels

On February 1 and 2, final well development was completed on LAOI-3.2a by pumping a total of 3155 gallons (gal.) of water from the well. Prior to pump development (on February 1), the static water level was 175.6 ft bgs. Five days after pump development (on February 7), water levels remained 2.41 ft lower than the starting level, at 178.01 ft bgs. This suggested permanent dewatering of a laterally limited zone around the well. To see if this effect would be repeated, the 6-day extended recovery data set was recorded from the well following test pumping. As discussed later, pumping 3797 gal. of water from the well during hydraulic testing caused an apparently permanent water level reduction of 1.03 ft.

BACKGROUND DATA

The background water level data collected in conjunction with running the pumping tests allow the analyst to see what water level fluctuations occur naturally in the aquifer and help distinguish between water level changes caused by conducting the pumping test and changes associated with other causes.

Background water level fluctuations have several causes, among them barometric pressure changes, operation of other wells in the aquifer, earth tides and long-term trends related to weather patterns. The background data hydrographs from the LAOI-3.2a tests, as well as that from adjacent well LAOI-3.2, were compared to barometric pressure data from the area to determine if a correlation existed.

Previous pumping tests have demonstrated a barometric efficiency for most wells of between 90 and 100 %. Barometric efficiency is defined as the ratio of water level change divided by barometric pressure change, expressed as a percentage. In the initial pumping tests conducted as part of this project, down hole pressure was monitored using a *vented* transducer. This equipment measures the *difference* between the total pressure applied to the transducer and the barometric pressure, this difference being the true height of water above the transducer.

Subsequent pumping tests, including LAOI-3.2a, have utilized *non-vented* transducers. These devices simply record the total pressure on the transducer, that is, the sum of the water height plus the barometric pressure. This results in an attenuated “apparent” hydrograph in a barometrically efficient well. Take as an example a 90 % barometrically efficient well. When monitored using a vented transducer, an increase in barometric pressure of 1 unit causes a decrease in recorded down-hole pressure of 0.9 units, because the water level is forced downward 0.9 units by the barometric pressure change. However, using a non-vented transducer, the total measured pressure increases by 0.1 units (the combination of the barometric

pressure increase and the water level decrease). Thus, the resulting apparent hydrograph changes by a factor of 100 minus the barometric efficiency, and in the same direction as the barometric pressure change, rather than in the opposite direction.

Barometric pressure data were obtained from the Los Alamos National Laboratory TA-54 tower site from the Environmental Division-Meteorology and Air Quality (ENV-MAQ). The TA-54 measurement location is at an elevation of 6548 ft above mean sea level (amsl), whereas the wellhead elevation is approximately 6624 ft amsl. The static water level in the 3-in. casing in LAOI-3.2a was about 178 ft bgs, making the water table elevation approximately 6442 ft amsl. Therefore, the measured barometric pressure data from TA-54 had to be adjusted to reflect the pressure at the elevation of the water table within LAOI-3.2a.

The following formula was used to adjust the measured barometric pressure data:

$$P_{WT} = P_{TA54} \exp \left[- \frac{g}{3.281R} \left(\frac{E_{LAOI} - E_{TA54}}{T_{TA54}} + \frac{E_{WT} - E_{LAOI}}{T_{WELL}} \right) \right] \quad (1)$$

where,

P_{WT} = barometric pressure at the water table inside LAOI-3.2a

P_{TA54} = barometric pressure measured at TA-54

g = acceleration of gravity, in meters per seconds squared (9.80665 m/sec²)

R = gas constant, in J/Kg/degree Kelvin (287.04 J/Kg/degree Kelvin)

E_{LAOI} = land surface elevation at LAOI-3.2a, in feet (6624 ft)

E_{TA54} = elevation of barometric pressure measuring point at TA-54, in feet (6548 ft)

E_{WT} = elevation of the water level in LAOI-3.2a, in feet (approximately 6442 ft)

T_{TA54} = air temperature near TA-54, in degrees Kelvin (assigned a value of 32.5 degrees Fahrenheit, or 273.4 degrees Kelvin)

T_{WELL} = air temperature inside LAOI-3.2a, in degrees Kelvin (assigned a value of 59 degrees Fahrenheit, or 288.2 degrees Kelvin)

This formula is an adaptation of an equation provided by ENV-MAQ. It can be derived from the ideal gas law and standard physics principles. An inherent assumption in the derivation of the equation is that the air temperature between TA-54 and the well is temporally and spatially constant, and that the temperature of the air column in the well is similarly constant. Similar calculations were made for LAOI-3.2.

The corrected barometric pressure data reflecting pressure conditions at the water table were compared to the water level hydrograph to discern the correlation between the two.

IMPORTANCE OF EARLY DATA

When pumping or recovery first begins, the vertical extent of the cone of depression is limited to approximately the well screen length, the filter pack length or, the aquifer thickness in relatively thin permeable strata. For many pumping tests on the plateau, the early pumping period is the

only time that the effective height of the cone of depression is known with certainty. Thus, the early data often offer the best opportunity to obtain hydraulic conductivity information, because conductivity would equal the earliest-time transmissivity divided by the well screen length.

Unfortunately, in many of the pumping tests, casing storage effects dominate the early-time data, hindering the effort to determine the transmissivity of the screened interval. The duration of casing storage effects can be estimated using the following equation (Schafer, 1978).

$$t_c = \frac{0.6(D^2 - d^2)}{\frac{Q}{s}} \tag{2}$$

where,

- t_c = duration of casing storage effect, in minutes
- D = inside diameter of well casing, in inches
- d = outside diameter of column pipe, in inches
- Q = discharge rate, in gpm
- s = drawdown observed in pumped well at time t_c , in feet

Drainage and refilling of the filter pack also can cause a storage effect. This was applicable to the LAOI-3.2a pumping tests because the water level fell within the filter pack. The above formula can be modified to account for the combined effects of casing and filter pack storage as follows:

$$t_c = \frac{0.6[(D^2 - d^2) + S_y(D_w^2 - d_o^2)]}{\frac{Q}{s}} \tag{3}$$

where,

- S_y = short-term specific yield of filter pack material (typically 20 %)
- D_w = diameter of borehole, in inches
- d_o = outside diameter of well casing, in inches

In some instances, it may be possible to eliminate casing storage effects by setting an inflatable packer above the tested screen interval prior to conducting the test. Therefore, this option has been implemented for the R-well testing program. However, because of the small (3-in.) diameter of the well casing in LAOI-3.2a, it was not possible to install the inflatable packer assembly to eliminate casing storage effects. Even if a smaller diameter packer had been made available for this purpose, it would only have eliminated casing storage effects, but could not have prevented drainage and refilling of the filter pack during the tests.

TIME-DRAWDOWN METHODS

Time-drawdown data can be analyzed using a variety of methods. Among them is the Cooper-Jacob method (1946), a simplification of the Theis equation (1935) that is mathematically equivalent to the Theis equation for pumped well data. The Cooper-Jacob equation describes drawdown around a pumping well as follows:

(4)

$$s = \frac{264Q}{T} \log \frac{0.3Tt}{r^2 S}$$

where,

- s = drawdown, in feet
- Q = discharge rate, in gpm
- T = transmissivity, in gallons per day per foot (gpd/ft)
- t = pumping time, in days
- r = distance from center of pumpage, in feet
- S = storage coefficient (dimensionless)

The Cooper-Jacob equation is a simplified approximation of the Theis equation and is valid whenever the u value is less than about 0.05, where u is defined as follows:

(5)

$$u = \frac{1.87r^2 S}{Tt}$$

For small radius values (e.g., corresponding to borehole radii), u is less than 0.05 at very early pumping times and, therefore, is less than 0.05 for most or all measured drawdown values. Thus, for the pumped well, the Cooper-Jacob equation usually can be considered a valid approximation of the Theis equation.

According to the Cooper-Jacob method, the time-drawdown data are plotted on a semilog graph, with time plotted on the logarithmic scale. Then a straight line of best fit is constructed through the data points and transmissivity is calculated using:

(6)

$$T = \frac{264Q}{\Delta s}$$

where,

- T = transmissivity, in gpd/ft
- Q = discharge rate, in gpm
- Δs = change in head over one log cycle of the graph, in feet

RECOVERY METHODS

Recovery data were analyzed using the Theis Recovery Method. This is a semi-log analysis method similar to the Cooper-Jacob procedure.

In this method, residual drawdown is plotted on a semi-log graph versus the ratio t/t' , where t is the time since pumping began and t' is the time since pumping stopped. A straight line of best fit is constructed through the data points and T is calculated from the slope of the line as follows:

$$T = \frac{264Q}{\Delta s} \tag{7}$$

The recovery data are particularly useful compared to time-drawdown data. Because the pump is not running, spurious data responses associated with dynamic discharge rate fluctuations are eliminated. The result is that the data set is generally “smoother” and easier to analyze.

Because the 24-hr pumping test was conducted at variable pumping rates, the subsequent recovery data were corrected mathematically to account for the variable rates. This was accomplished by adjusting the value of t/t' prior to plotting the graph. Then the data were analyzed using the final rate of the test. The following equation was derived for adjusting the t/t' values:

$$(t/t')_{adj} = \exp\left(\frac{Q_1}{Q_3} \ln \frac{p_1 + p_2 + p_3 + t'}{t'} + \frac{Q_2 - Q_1}{Q_3} \ln \frac{p_2 + p_3 + t'}{t'} + \frac{Q_3 - Q_2}{Q_3} \ln \frac{p_3 + t'}{t'}\right) \tag{8}$$

where,

- $(t/t')_{adj}$ = the adjusted value of t/t' needed to account for variable discharge
- Q_1, Q_2, Q_3 = the three discharge rates (4.0, 2.6 and 1.3 gpm)
- p_1, p_2, p_3 = the three pumping periods (350, 210 and 880 min.)
- t' = time since pumping stopped

SPECIFIC CAPACITY METHOD

The specific capacity of the pumped well can be used to obtain a lower-bound value of hydraulic conductivity. The hydraulic conductivity is computed using formulas that are based on the assumption that the pumped well is 100 % efficient. The resulting hydraulic conductivity is the value required to sustain the observed specific capacity. If the actual well is less than 100 % efficient, it follows that the actual hydraulic conductivity would have to be greater than calculated to compensate for well inefficiency. Thus, because the efficiency is unknown, the

computed hydraulic conductivity value represents a lower bound. The actual conductivity is known to be greater than or equal to the computed value.

For fully penetrating wells, the Cooper-Jacob equation can be iterated to solve for the lower-bound hydraulic conductivity. However, this approach does not account for partial penetration effects. In this case the saturated zone was taken to run from the water level at 178 ft to the bottom of the well screen at 191 ft, making the saturated thickness 13 ft. Thus, the 10-foot (ft) well screen partially penetrated the saturated zone. To account for this well and formation geometry, it was necessary to use a computation algorithm that includes the effects of partial penetration. One such approach was introduced by Brons & Marting (1961) and augmented by Bradbury & Rothchild (1985).

Brons and Marting introduced a dimensionless drawdown correction factor, s_p , approximated by Bradbury and Rothschild as follows:

$$s_p = \frac{1 - \frac{L}{b}}{\frac{L}{b}} \left[\ln \frac{b}{r_w} - 2.948 + 7.363 \frac{L}{b} - 11.447 \left(\frac{L}{b} \right)^2 + 4.675 \left(\frac{L}{b} \right)^3 \right] \quad (9)$$

In this equation, L is the well screen length, in feet. Incorporating the dimensionless drawdown parameter, the conductivity is obtained by iterating the following formula:

$$K = \frac{264Q}{sb} \left(\log \frac{0.3Tt}{r_w^2 S} + \frac{2s_p}{\ln 10} \right) \quad (10)$$

To apply this formula, a storage coefficient value must be assigned. Storage coefficient values for confined conditions can be expected to range from about 10^{-5} to 10^{-3} , depending on aquifer thickness, while for unconfined conditions they typically range from about 0.01 to 0.25 (Driscoll 1986). Because the water level fell within the Puye formation, the assumption was made that the zone was unconfined. However, without knowing the vertical distribution of hydraulic conductivity, it can't be known for certain that unconfined conditions prevailed at the site. The calculation result is not particularly sensitive to the choice of storage coefficient value, so a rough estimate of the storage coefficient is generally adequate to support the calculations. A value of 0.1 was used in the calculations for LAOI-3.2a.

The analysis also requires assigning a value for the saturated aquifer thickness, b . In LAOI-3.2a, calculations were based on an assumed aquifer thickness of 13 ft – the distance from the water level to the bottom of the screen.

Computing the lower-bound estimate of hydraulic conductivity can provide a useful frame of reference for evaluating the other pumping test calculations.

LAOI-3.2a DATA ANALYSIS

This section presents the data obtained from the LAOI-3.2a pumping test and the results of the analytical interpretations. Analyses were applied to pre- and post-development water levels, recovery data following trial 1, pumping and recovery data from trial 2, the 24-hr constant-rate pumping data, and the subsequent recovery data. There also is a discussion of the background data recorded before and after the constant-rate pumping test in the pumped well and nearby well LAOI-3.2.

Lateral Extent of Perched Zone

As stated above, extended pumping LAOI-3.2a seemed to cause an apparent “permanent” lowering of the water level, in that even after several days of recovery the original static water level was not restored. Well development pumping on February 1 and 2 removed 3155 gal. of water, or about 422 cubic feet (ft³). After 5 days of recovery, on February 7 the new static water level was 178.01 ft, 2.41 ft lower than the February 1 measurement of 175.60 ft. During test pumping, the volume of water pumped was 3797 gal., or 508 cubic ft. After 6 days of recovery, the new water level was an additional 1.03 ft lower at 179.04 ft bgs.

This information was used to estimate a possible range for the size of the perched zone affected by pumping. If the perched area is visualized as a square of length dimension, L , the following equation can be derived to estimate this dimension:

$$L = \sqrt{\frac{V}{sS}} \quad (11)$$

where,

- L = length dimension along one side of square area, in feet
- V = volume pumped, in ft³
- s = decline in water level, in feet
- S = storage coefficient

Note that this equation is based on the assumption that the perched zone head declined by a magnitude, s , everywhere. For really extensive perched zones, this assumption will be violated and the equation will underestimate the size of the perched area.

If unconfined conditions exist at the site, a reasonable range of short term storage coefficient values is on the order of 10^{-1} to 10^{-2} . Initially, these values were used to estimate the size of the perched zone. For the pumped volume and the water level decline observed during well development, the equation showed that L ranged from just 42 to 132 ft. Repeating the

calculations for the test pumping period yielded a range for L of 64 to 202 ft. It is clear that the test pumping caused less lowering of the water table than did the original well development. It is possible that this was because the storage coefficient of the particular sediments drained during testing was greater than that of the sediments drained during well development. Regardless of the exact storage coefficient value, the calculations showed that if unconfined conditions exist, the perched zone is very small.

Unfortunately, there was no way to determine with certainty whether the perched zone was confined or unconfined from the available data. For example, if the top several feet of saturated sediments were tight and could not drain, confined conditions rather than unconfined would apply. The size of the perched zone was recalculated for confined conditions for a range of storage coefficients of 10^{-3} to 10^{-4} – a 100-fold reduction compared to the unconfined assumption. This caused a 10-fold increase in the linear dimension of the perched zone – 420 to 1320 ft for the development phase and 640 to 2020 ft for the pumping phase.

Background Data

Water level data were plotted along with barometric pressure data for both LAOI-3.2a and nearby well LAOI-3.2. Figure 1 shows the apparent water level hydrograph for LAOI-3.2a and the barometric pressure data recorded before, during and after the constant-rate pumping test. Apparent on the hydrograph is that water levels continued to show recovery from the testing throughout the monitoring period.

The data on Figure 1 showed little or no apparent pressure change in response to changes in barometric pressure. This signified a nearly 100 % barometric efficiency and meant that the actual water level in the well moved in lockstep with barometric pressure. When barometric pressure increased, the water level declined an equal amount and when barometric pressure decreased, the water rose, so that the total measured pressure remained unchanged, except for the effect of ongoing recovery.

Note that for the last day or so of recovery, the water level in the well appeared to stabilize, even though the level was still more than a foot below the original static water level. As discussed in the previous section, this was strong evidence of a laterally limited perched zone.

Figure 2 shows a comparison of the hydrograph for nearby well LAOI-3.2 and the barometric pressure signal. The shapes of the curves are similar but show changes in opposite directions. That is, when the barometric pressure increased, the measured water level declined. This is because the water levels were recorded using a vented transducer and the well has a very high barometric efficiency. Although the shapes of the curves are similar, the hydrograph shows a steady rise in relation to the barometric pressure curve – at a relatively modest rate early on and at a somewhat greater rate later.

The hydrograph data were corrected for this background trend and plotted on Figure 3. The background trend that provided the best correlation included an assumed background water level rise of 0.033 ft per day for the first four days, and 0.095 ft per day thereafter. The resulting

match to the barometric pressure curve is nearly perfect and implies essentially a 100 % barometrically efficient well.

Previous testing has shown that most wells in the area have high barometric efficiencies. However, exceptions to this have included wells closer to the Rio Grande and shallow wells. These are the shallowest wells that have shown such high barometric efficiencies. It suggests that the overlying Otowi Member tuff unit effectively isolates the underlying zones from atmospheric pressure influences.

Of significance is that the data from LAOI-3.2 indicated no response to pumping LAOI-3.2a.

Trial Testing

Following pump installation, the well was pumped briefly (trial testing) to evaluate well capacity, fill the drop pipe in preparation for subsequent testing, and generate some useful data. Trial 1 was conducted on February 7 at a discharge rate of 5.0 gpm for 40 min. from 12:00 noon until 12:40 pm and was followed by 110 min. of recovery until 2:30 pm.

Trial 2 was conducted at a rate of 4.0 gpm for 120 min. from 2:30 pm until 4:30 pm. Following shutdown, recovery was monitored for 39.5 hrs until 8:00 am on February 9.

Trial 1

Figure 4 shows recovery from the trial 1 pumping event. The early data on the graph showed casing and filter pack storage effects with a computed storage duration of 3.5 min., while the balance of the data yielded a calculated transmissivity of 1640 gpd/ft. If the saturated height from the static water level to the bottom of the well screen is arbitrarily used as the saturated thickness (13 ft), the computed hydraulic conductivity averages 126 gallons per day per square foot (gpd/ft²), or 16.9 ft per day. If the conductivity is non-uniform as is likely, it is possible that most of the water is obtained from a fraction of the total thickness, which would make the conductivity of the thinner contributing zone proportionately greater.

Trial 2

Figure 5 shows time-drawdown data from the trial 2 test. The early data showed a casing and filter pack storage duration of 3.0 min. The subsequent data yielded a transmissivity of 1450 gpd/ft and an average hydraulic conductivity of 112 gpd/ft², or 14.9 ft per day.

After about 15 min., the drawdown curve steepened significantly, suggesting negative boundary conditions. This was expected because of the severe lateral limits to the perched zone discussed earlier.

Figure 6 shows the recovery following trial 2 pump shutoff. Multiple slopes are evident on the graph. Casing and filter pack storage calculations predicted an effect of 6.2 min. duration. Following the casing and filter pack storage affected data, the slope of the curve suggested a transmissivity of 910 gpd/ft and an average hydraulic conductivity of 70 gpd/ft², or

9.4 ft per day. This was less than that obtained from previous analyses. The recovery curve then flattened substantially, yielding a transmissivity of 1660 gpd/ft and a hydraulic conductivity of 128 gpd/ft², or 17.1 ft per day. This was in better agreement with previous estimates.

There was no apparent explanation for the pronounced bimodal distribution of the recovery data following trial 2 – an effect showing up only subtly on other plots. It is possible that it may be related to storage effects that were not accounted for by the standard equation. For example, a large void near the piezometric surface caused during drilling, such as a washout, could have resulted in an increased storage effect. The construction history of LAOI-3.2a was somewhat unusual in that the well was originally completed to a greater depth where it would not yield water, and then was moved upward to its final location. It is possible that the borehole could have been over excavated during these procedures or perhaps even during the original drilling. A second possibility is that the sediments near the top of the well screen could be highly stratified with alternating tight and permeable zones. The contrast in conductivity with depth could cause variable slopes on the recovery graph as the rising water level passed through zones of differing permeability. These explanations are conjectural and there is no way of knowing with certainty what caused the unusual trial 2 recovery response.

24-Hour Constant-Rate Pumping Test

The 24-hr pumping test was started at 8:00 am on February 9 and continued until 8:00 am on February 10. The discharge rate started out at 4.0 gpm for 350 min., then was reduced to 2.6 gpm for 210 min. and finally was reduced again to 1.3 gpm for the remaining 880 min. of the test. As stated earlier, the rate reductions were made to minimize the chances of dewatering the pressure transducer during the test. Following shutdown, recovery/background measurements were recorded for 9038 min. until 2:38 pm on February 16.

Time-Drawdown Analysis

Figure 7 shows the drawdown measured in LAOI-3.2a. The calculated casing and filter pack storage time was 4.4 min. The first slope immediately following this time yielded a transmissivity of 1510 gpd/ft and an average hydraulic conductivity of 116 gpd/ft², or 15.5 ft per day.

However, the shape of the drawdown curve was not consistent with the computed storage time parameter in which the curve should transition from steep to flat at the calculated storage time. If a greater borehole size contributed to a longer storage time, it is possible that the alternate interpretation shown on Figure 6 might apply. This corresponds to a casing and filter pack storage time of about 25 min., several times greater than the calculated value. This steeper line of fit for this interpretation yielded a transmissivity of 690 gpd/ft and an average hydraulic conductivity of 53 gpd/ft², or 7.1 ft per day.

The steep portion of the curve at late time shows the boundary effect corresponding to the lateral limits of the perched zone discussed previously.

The two discharge rate reductions are evident on the time-drawdown graph. Note that just prior to the first reduction, the drawdown had reached nearly 4.5 ft, placing the pumping level within 2 ft of the pressure transducer. The steep slope of the curve at that point, compounded by the fact that the slope was continuing to increase, showed that the transducer likely would have been dewatered had the rate remained at 4.0 gpm. In fact, the data suggest that the second rate reduction may have been essential also to keep the water level above the transducer.

Recovery Analysis

Figure 8 shows the recovery data recorded following the 24-hr test. The transmissivity computed from the line of fit on the graph was 880 gpd/ft. Note that the saturated zone had been dewatered by more than 3 ft by the pumping test and remained dewatered during the first few hours of recovery when the data could be used to determine formation properties. Therefore, the hydraulic conductivity calculations were made based on an assumed saturated thickness of 10 ft – 3 ft less than what was used in other calculations – to provide a more representative value than would have been obtained assuming full remaining saturation.

The late recovery data clearly show a profound boundary effect as evidenced by the very steep late time slope on Figure 8. The data were re-plotted on Figure 9 as feet of recovery versus recovery time to provide a more illuminating view of the boundary-affected data. Graphed in this manner it is apparent that the rate of recovery began to decrease toward the end of the monitoring period as water levels appeared to level off at a new static water level. This unusual response reinforced the idea of severe lateral limits to the saturated perched zone.

Specific Capacity Data

Specific capacity data were used along with well geometry to estimate lower-bound conductivity values for the LAOI-3.2a perched zone. In addition to specific capacity, other input values used in the calculations included the well screen length of 10 ft, a saturated zone thickness of either 10 or 13 ft, a storage coefficient of 0.05, and a borehole radius of 0.51 ft.

During trial 2 LAOI-3.2a produced 4.0 gpm with a drawdown of 2.63 ft after 120 min. of pumping, for a specific capacity of 1.52 gallons per minute per foot of drawdown (gpm/ft). Application of the Brons and Marting method yielded a lower-bound transmissivity estimate of 1390 gpd/ft and a hydraulic conductivity of 107 gpd/ft², or 14.3 ft per day.

During recovery following the 24-hr test, water levels recovered 0.92 ft in 120 min. The recovery time was limited to this value to minimize the effect of the negative boundary on the calculations. Also, in this analysis the saturated thickness was approximated as 10 ft rather than the original value of 13 ft because of the significant reduction in saturated thickness that occurred as a result of 24 hrs of pumping. The resulting lower-bound transmissivity estimate was 1130 gpd/ft corresponding to a hydraulic conductivity of 113 gpd/ft², or 15.1 ft per day.

The conventional pumping test analysis revealed differing results with one set of three hydraulic conductivity values averaging 9.4 ft per day and another set of four averaging 16.1 ft per day.

The overall average was 13.2 ft per day. The specific capacity derived values were slightly greater, but were reasonably consistent with those obtained from conventional analysis.

SUMMARY

The following information summarizes the results of the pumping and recovery tests on LAOI-3.2a:

1. The barometric efficiencies of LAOI-3.2a and LAOI-3.2 are essentially 100 %.
2. The static water level measured in LAOI-3.2a was 44 ft lower than that in LAOI-3.2, suggesting minimal hydraulic connection between the two zones.
3. Development pumping of 3155 gal. of water from LAOI-3.2a over a 2-day period caused an observed decline of 2.41 ft in the static water level measured 5 days following cessation of pumping, compared to that measured prior to pump development. Similarly, test pumping which removed 3797 gal. of water over a 3-day period resulted in a water level decline of 1.03 ft after 6 days of recovery. These results suggested severe lateral limits to the saturated perched zone.
4. Hydraulic conductivity values obtained using conventional analysis techniques were somewhat inconsistent, with three analyses yielding an average conductivity of 9.4 ft per day and four other analyses producing an average of 16.1 ft per day. The overall average was 13.2 ft per day.
5. Specific capacity data yielded lower-bound hydraulic conductivity estimates of 14.3 and 15.1 ft per day, reasonably consistent with, though slightly greater than, the conventionally derived values.
6. Drawdown and recovery data showed a strong indication of negative boundary effects, consistent with the apparent permanent dewatering that resulted from pumping LAOI-3.2a.

REFERENCES

Bradbury, Kenneth R. and Rothschild, Edward R., 1985. A Computerized Technique For Estimating the Hydraulic Conductivity of Aquifers From Specific Capacity Data. *Ground Water*. V. 23, no. 2, pp. 240-246.

Brons, F. and Marting, V. E., 1961. The Effect of Restricted Fluid Entry on Well Productivity. *J. Petrol. Technol.* V. 13, no. 2, pp. 172-174.

Cooper, H. H., Jr. and Jacob, C. E., 1946. A Generalized Graphic Method for Evaluating Formation Constants and Summarizing Well Field History, *Transactions. Am. Geophys. Union*, v. 27, No. 4, pp. 526-534.

Driscoll, F. G., 1986. *Groundwater and Wells*, U.S. Filter/Johnson Screens, St. Paul, MN.

Schafer, David C., 1978. Casing Storage Can Affect Pumping Test Data, Johnson Drillers' Journal, Jan/Feb, Johnson Division, UOP Inc., St. Paul, Minnesota.

Theis, C. V., 1935. The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, Transactions. Am. Geophys. Union, v. 16, pp. 519-524.

Figure 1. Comparison of LAOI-3.2a Apparent Hydrograph and Adjusted TA-54 Barometric Pressure

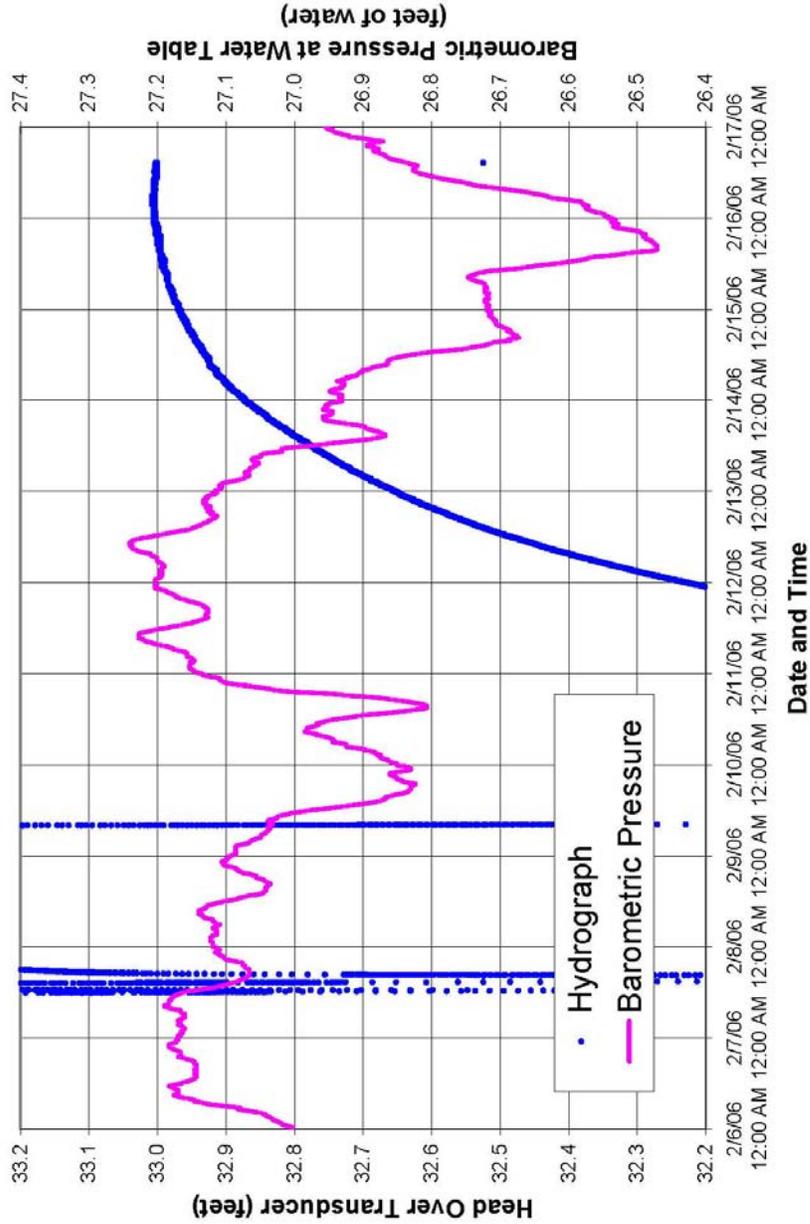


Figure 2. Comparison of LAOI-3.2 Apparent Hydrograph and Adjusted TA-54 Barometric Pressure

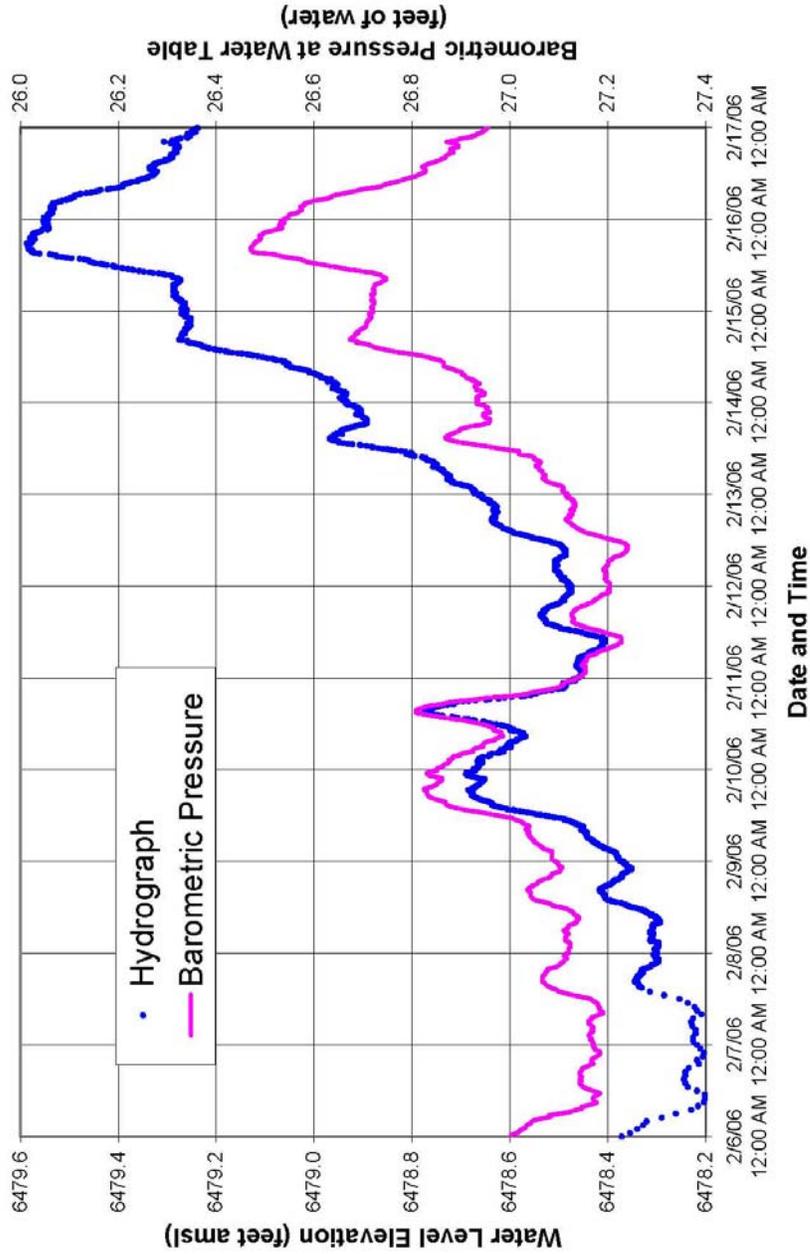


Figure 3. LAOI-3.2 Water Level Change Corrected For 100 Percent Barometric Efficiency and Water Level Rises of 0.033 and 0.095 Feet Per Day

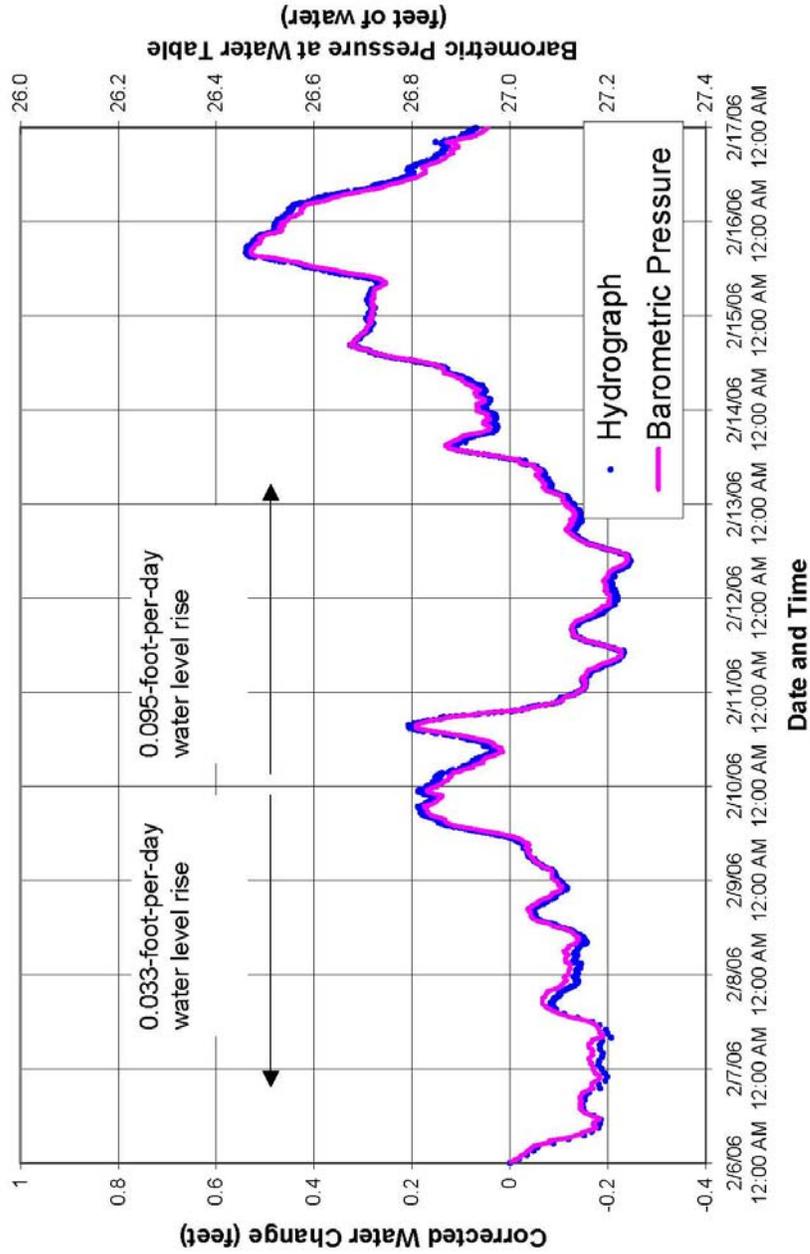


Figure 4. Well LAOI-3.2a Trial 1 Residual Drawdown

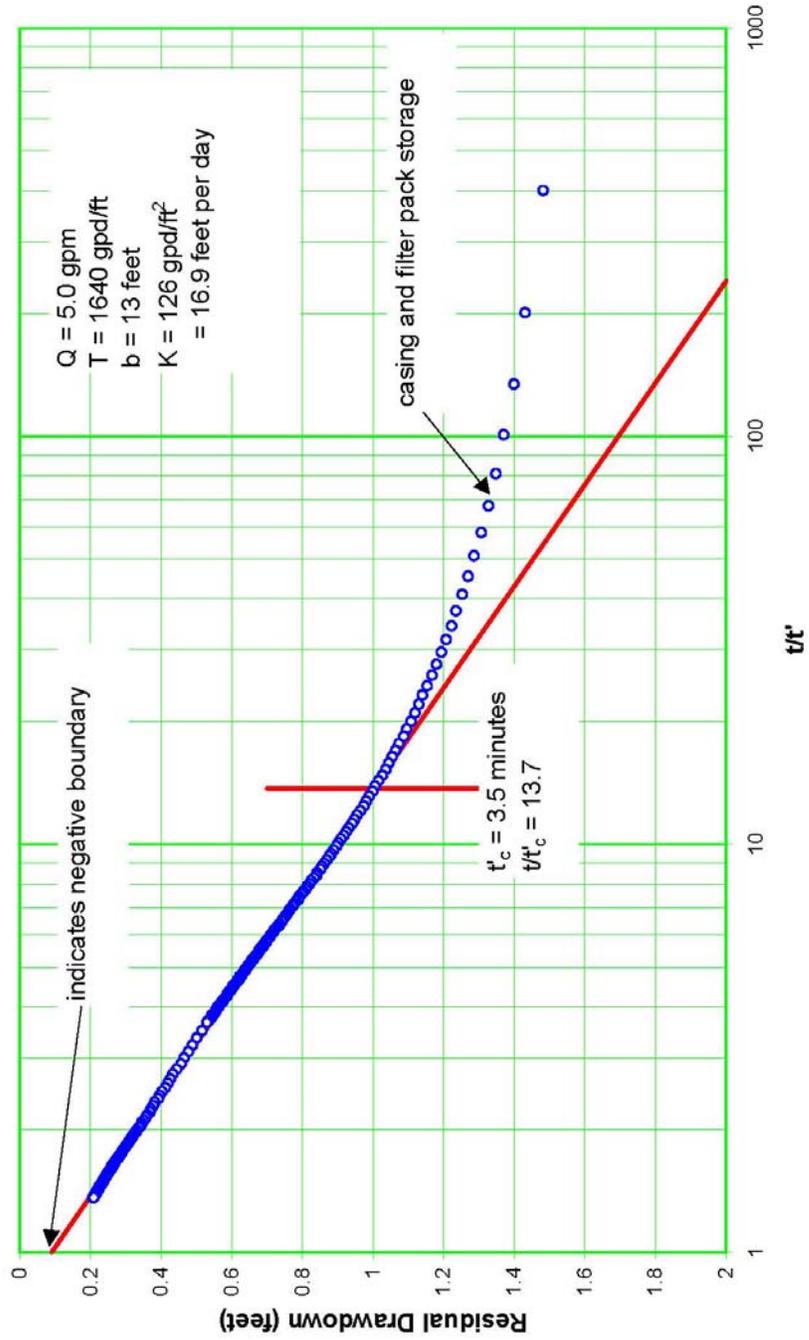


Figure 5. Well LAOI-3.2a Trial 2 Drawdown

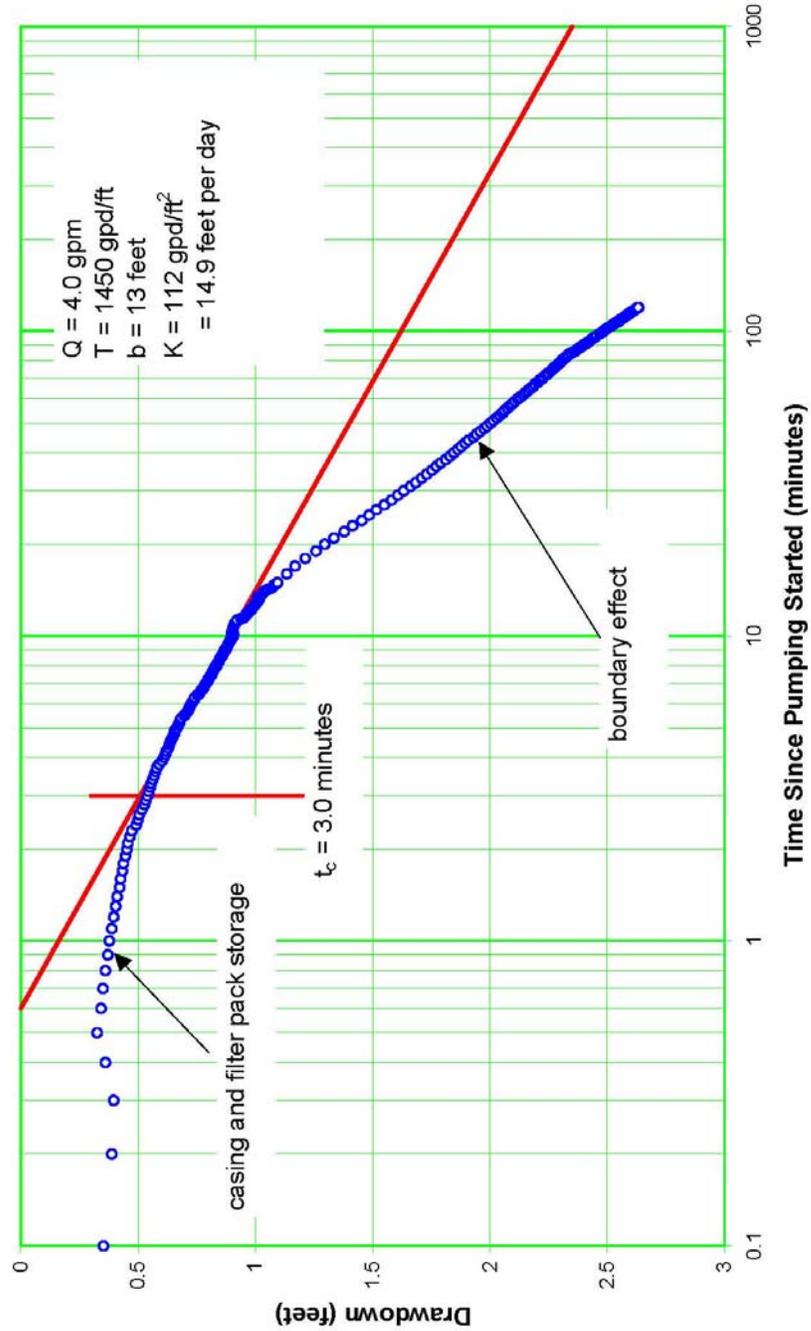


Figure 6. Well LAOI-3.2a Trial 2 Residual Drawdown

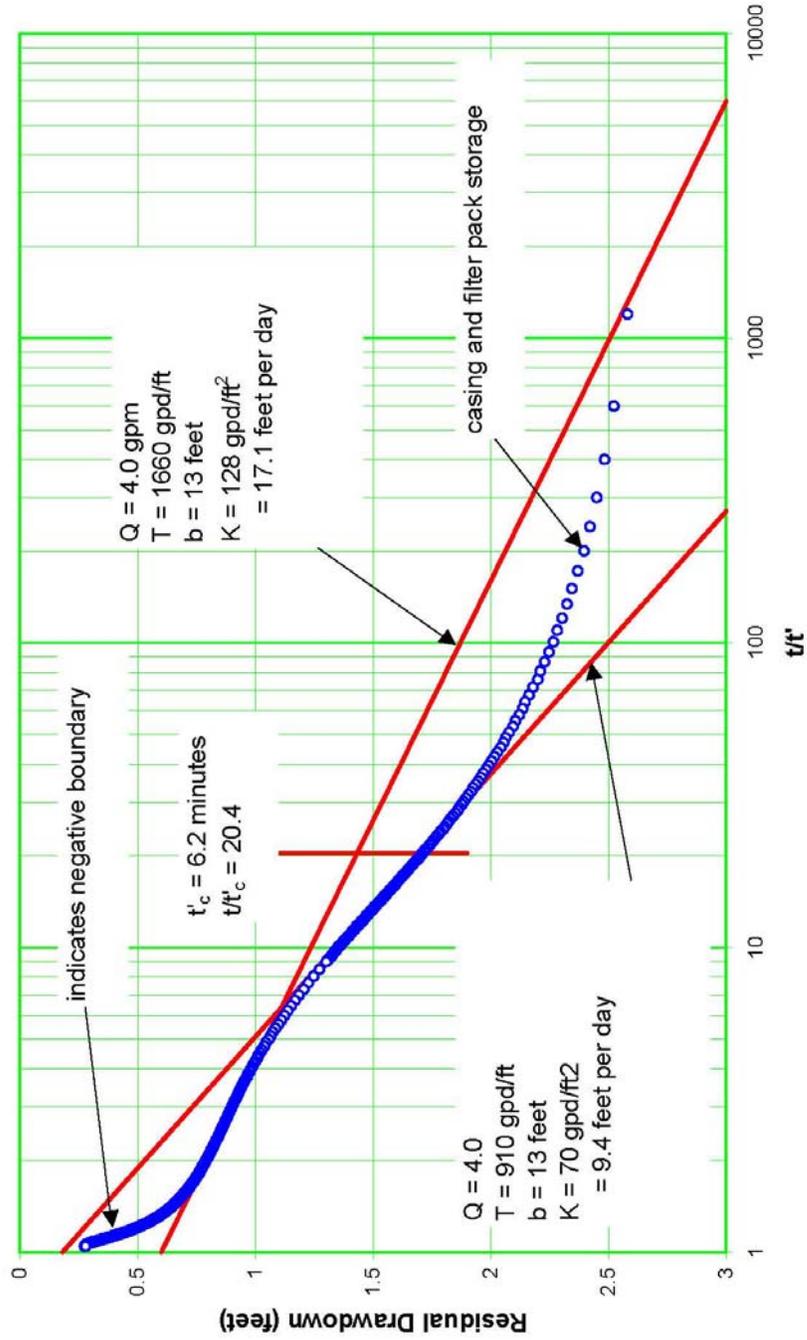


Figure 7. Well LAOI-3.2a Drawdown

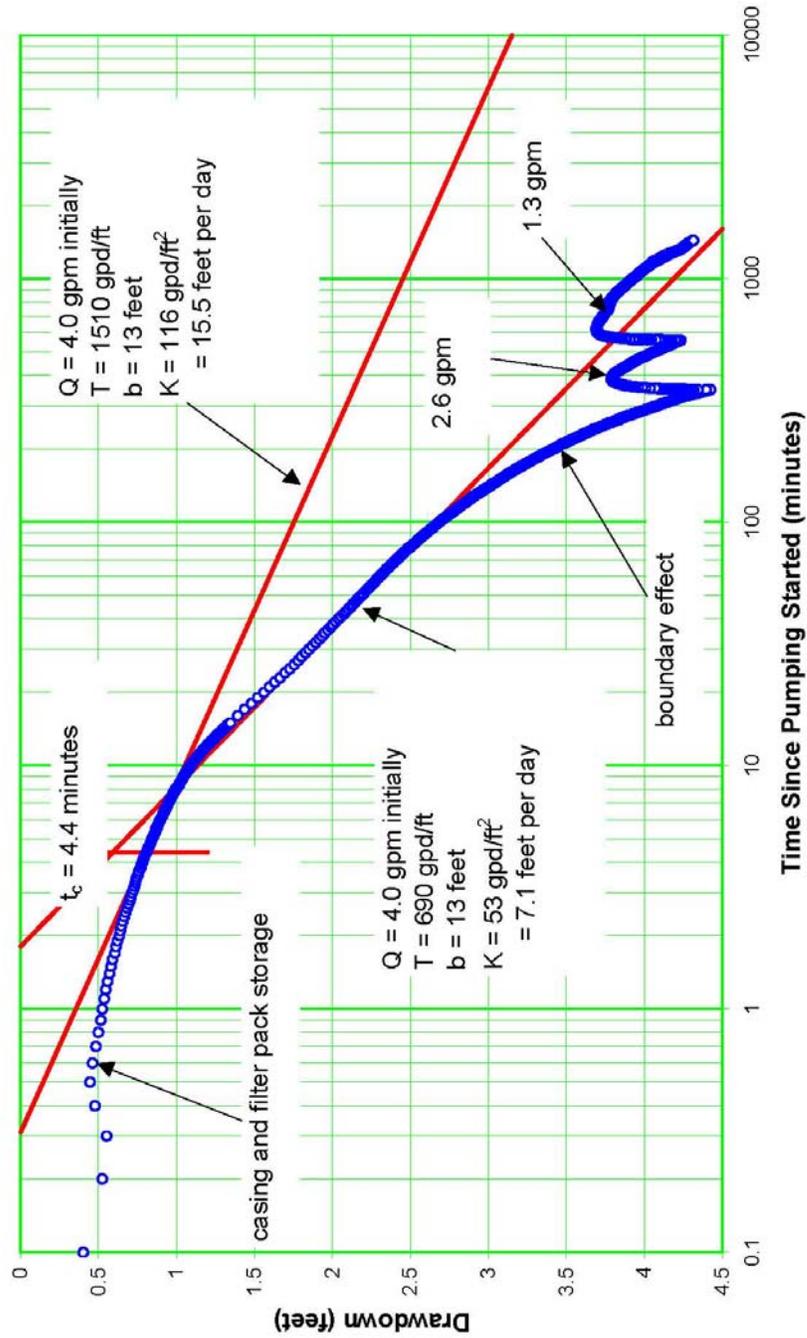


Figure 8. Well LAOI-3.2a Residual Drawdown

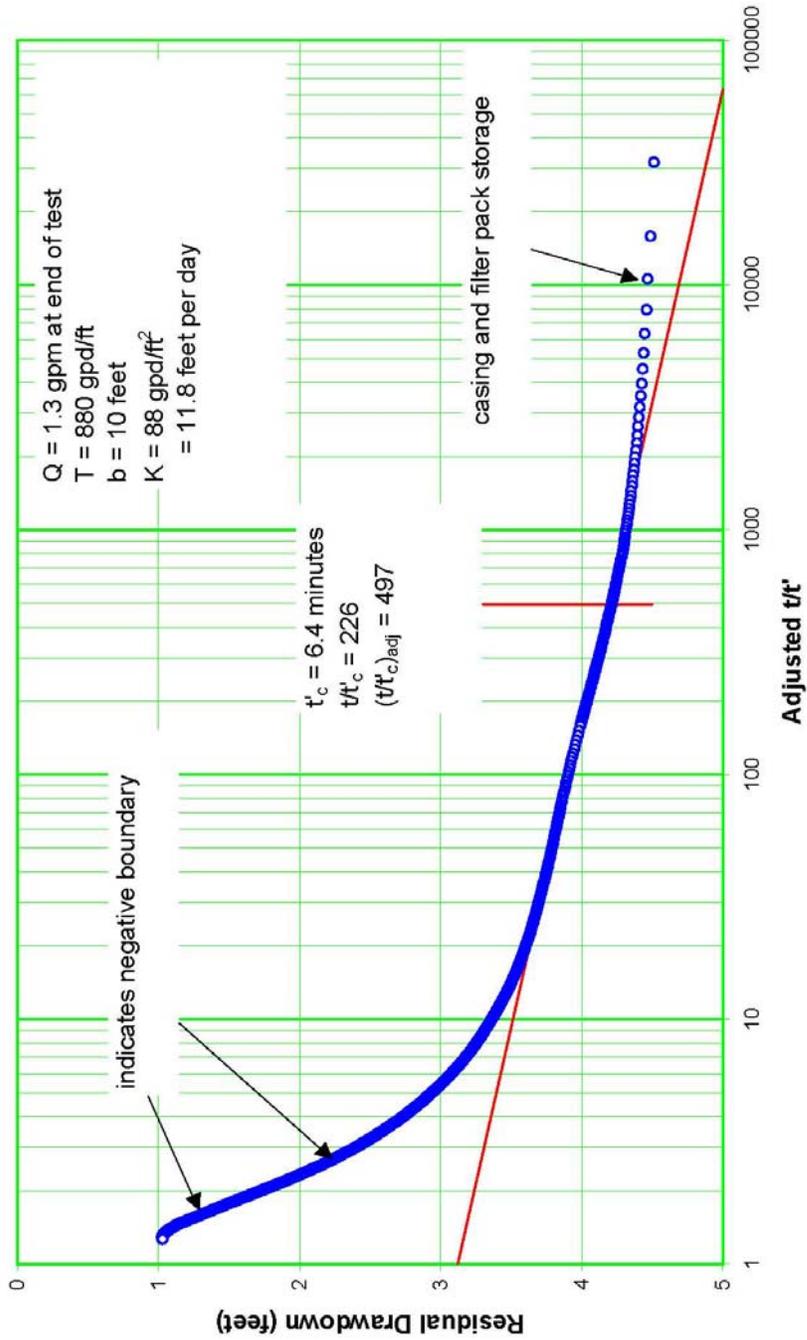
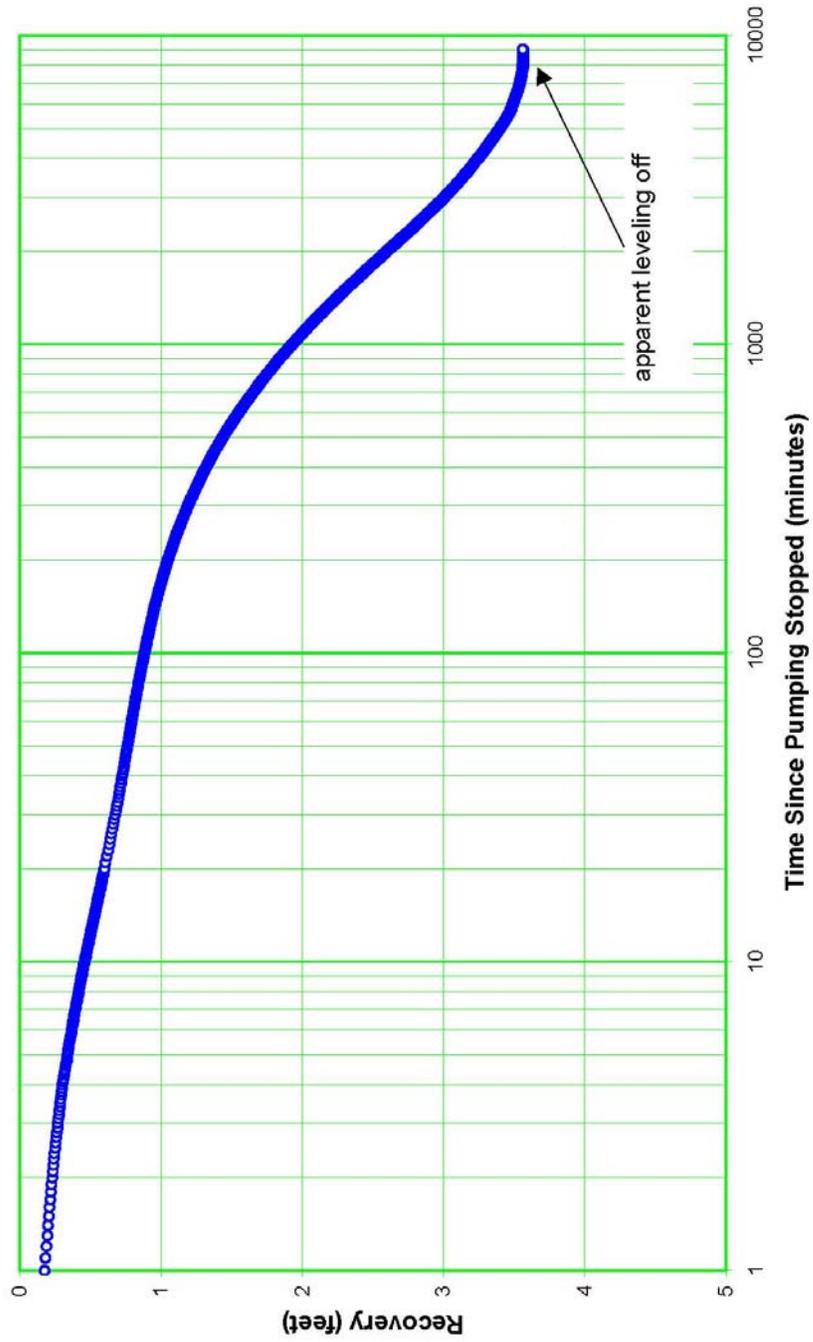


Figure 9. Well LAOI-3.2a Recovery



2.0 LAOI-3.2 PUMPING TEST ANALYSIS

INTRODUCTION

This section describes the analysis of constant-rate pumping tests conducted in August 2005 on Well LAOI-3.2 in Los Alamos Canyon. The primary objective of the analysis was to determine the hydraulic properties of the sediments screened in LAOI-3.2.

LAOI-3.2 is a 2-inch (in.) diameter well completed with a single screen, 9.5-foot (ft) long, in the Guaje Pumice Bed, between the depths of 153.3 and 162.8 ft. The piezometric surface lies above the top of the well screen at approximately 138 ft. During drilling, it was not possible to determine if the tuff above the screened zone was permeable or tight, or if the zone was confined or unconfined. However, wet core was encountered near the elevation corresponding to the well's static water level, suggesting the possibility of unconfined conditions.

After an initial false start, which was aborted, two pumping tests were conducted on LAOI-3.2. Test 1 pumping began at 6:30 pm on August 2. Except for a momentary shutdown, it lasted 120 minutes (min.) until 8:30 pm at an average discharge rate of 3.6 gpm. The test was terminated at that time because an equipment malfunction made it impossible to download data during pumping. Following shutdown, recovery data were recorded for nearly 63 hours (hrs) until 11:08 am on August 5.

Test 2 began at 11:30 am on August 5 and lasted 240 min. until 3:30 pm, after which recovery was monitored for nearly 71 hrs until 2:08 pm on August 8. The discharge rate for test 2 averaged about 3.5 gpm.

It was expected that the extended recovery from the tests also would serve as background data.

Most of the pumping tests on the Plateau have been conducted using an inflatable packer to eliminate casing storage effects and using non-vented pressure transducers to minimize barometric pressure effects in the data set. Because LAOI-3.2 is a 2-in. well, it was not possible to employ the inflatable packer. Also, for the convenience of accessing transducer data during the test via a cable, the existing vented transducer available on site was used for the test. Because the well was relatively shallow, it was suspected that the water level response to barometric pressure changes might be moderate, neutralizing the advantage of using a non-vented transducer and making use of the vented transducer acceptable. However, this proved not to be the case, as the well was essentially 100 % barometrically efficient. Thus, in hindsight, a non-vented transducer would have been preferred for these tests.

BACKGROUND DATA

The background water level data collected in conjunction with running the pumping tests allow the analyst to see what water level fluctuations occur naturally in the aquifer and help distinguish

between water level changes caused by conducting the pumping test and changes associated with other causes.

Background water level fluctuations have several causes, among them barometric pressure changes, operation of other wells in the aquifer, earth tides and long-term trends related to weather patterns. The background data hydrographs from the LAOI-3.2 tests were compared to barometric pressure data from the area to determine if a correlation existed.

Previous pumping tests have demonstrated a barometric efficiency for most wells on the Plateau of between 90 and 100 %. Barometric efficiency is defined as the ratio of water level change divided by barometric pressure change, expressed as a percentage. Because of the use of the vented transducer, a high barometric efficiency would require significant data adjustments to remove the barometric effects from the data set prior to analysis.

Barometric pressure data were obtained from the Los Alamos National Laboratory TA-54 tower site from the Environmental Division-Meteorology and Air Quality (ENV-MAQ). The TA-54 measurement location is at an elevation of 6548 ft above mean sea level (amsl), whereas the wellhead elevation was 6622 ft amsl. Furthermore, the static water level in LAOI-3.2 was about 138 ft below ground surface (bgs), making the water table elevation approximately 6482 ft amsl. Therefore, the measured barometric pressure data from TA-54 had to be adjusted to reflect the pressure at the elevation of the water table within LAOI-3.2.

The following formula was used to adjust the measured barometric pressure data:

$$P_{WT} = P_{TA54} \exp \left[- \frac{g}{3.281R} \left(\frac{E_{LAOI32} - E_{TA54}}{T_{TA54}} + \frac{E_{WT} - E_{LAOI32}}{T_{WELL}} \right) \right] \tag{1}$$

where,

- P_{WT} = barometric pressure at the water table inside LAOI-3.2
- P_{TA54} = barometric pressure measured at TA-54
- g = acceleration of gravity, in meters per seconds squared (9.80665 m/sec²)
- R = gas constant, in J/Kg/degree Kelvin (287.04 J/Kg/degree Kelvin)
- E_{LAOI32} = land surface elevation at LAOI-3.2, in feet (6622 ft)
- E_{TA54} = elevation of barometric pressure measuring point at TA-54, in feet (6548 ft)
- E_{WT} = elevation of the water level in LAOI-3.2, in feet (6482 ft)
- T_{TA54} = air temperature near TA-54, in degrees Kelvin (assigned a value of 69.5 degrees Fahrenheit, or 294.0 degrees Kelvin)
- T_{WELL} = air temperature inside LAOI-3.2, in degrees Kelvin (assigned a value of 60 degrees Fahrenheit, or 288.7 degrees Kelvin)

This formula is an adaptation of an equation provided by ENV-MAQ. It can be derived from the ideal gas law and standard physics principles. An inherent assumption in the derivation of the equation is that the air temperature between TA-54 and the well is temporally and spatially constant, and that the temperature of the air column in the well is similarly constant.

The corrected barometric pressure data reflecting pressure conditions at the water table were compared to the water level hydrograph to discern the correlation between the two.

CASING STORAGE

In most pumping tests, when a packer is not used to prevent drainage and refilling of the well casing, casing storage effects dominate the early-time data, rendering these early data unusable in the analysis. Therefore, it is necessary to screen out the data affected by casing storage prior to analysis. The duration of casing storage effects can be estimated using the following equation (Schafer 1978).

$$t_c = \frac{0.6(D^2 - d^2)}{\frac{Q}{s}} \quad (2)$$

where,

- t_c = duration of casing storage effect, in minutes
- D = inside diameter of well casing, in inches
- d = outside diameter of column pipe, in inches
- Q = discharge rate, in gallons per minute (gpm)
- s = drawdown observed in pumped well at time t_c , in feet

This equation was used to quantify the duration of the invalid portion of the time-drawdown and recovery graphs obtained from LAOI-3.2.

TIME-DRAWDOWN METHODS

Time-drawdown data can be analyzed using a variety of methods. Among them is the Cooper-Jacob method (1946), a simplification of the Theis equation (1935) that is mathematically equivalent to the Theis equation for pumped well data. The Cooper-Jacob equation describes drawdown around a pumping well as follows:

$$s = \frac{264Q}{T} \log \frac{0.3Tt}{r^2S} \quad (3)$$

where,

- s = drawdown, in feet
- Q = discharge rate, in gpm
- T = transmissivity, in gallons per day per foot (gpd/ft)
- t = pumping time, in days
- r = distance from center of pumpage, in feet
- S = storage coefficient (dimensionless)

The Cooper-Jacob equation is a simplified approximation of the Theis equation and is valid whenever the u value is less than about 0.05, where u is defined as follows:

$$u = \frac{1.87r^2S}{Tt} \quad (4)$$

For small radius values (e.g., corresponding to borehole radii), u is less than 0.05 at very early pumping times and, therefore, is less than 0.05 for all measured drawdown values. Thus, for the pumped well, the Cooper-Jacob equation can be considered a valid approximation of the Theis equation.

According to the Cooper-Jacob method of analysis, the time-drawdown data are plotted on a semilog graph, with time plotted on the logarithmic scale. Then a straight line of best fit is constructed through the data points and transmissivity is calculated using:

$$T = \frac{264Q}{\Delta s} \quad (5)$$

where,

T = transmissivity, in gpd/ft

Q = discharge rate, in gpm

Δs = change in head over one log cycle of the graph, in feet

RECOVERY METHODS

Recovery data are generally analyzed by a semi-log analysis method similar to the Cooper-Jacob procedure.

In this method, residual drawdown is plotted on a semi-log graph versus the ratio t/t' , where t is the time since pumping began and t' is the time since pumping stopped. A straight line of best fit is constructed through the data points and T is calculated from the slope of the line as follows:

$$T = \frac{264Q}{\Delta s} \quad (6)$$

The recovery data are particularly useful compared to time-drawdown data. Because the pump is not running, spurious data responses associated with dynamic discharge rate fluctuations are eliminated. The result is that the data set is generally “smoother” and easier to analyze.

SPECIFIC CAPACITY METHOD

The specific capacity of the pumped well can be used to obtain a lower-bound value of hydraulic conductivity. The hydraulic conductivity is computed using formulas that are based on the assumption that the pumped well is 100 % efficient. The resulting hydraulic conductivity is the value required to sustain the observed specific capacity. If the actual well is less than 100 % efficient, it follows that the actual hydraulic conductivity would have to be greater than calculated to compensate for well inefficiency. Thus, because the efficiency is unknown, the computed hydraulic conductivity value represents a lower bound. The actual conductivity is known to be greater than or equal to the computed value.

For fully penetrating wells, the Cooper-Jacob equation can be solved for the lower-bound hydraulic conductivity. The equation is rewritten, solving for T , as follows:

$$T = 264 \frac{Q}{s} \log \frac{0.3Tt}{r^2 S} \quad (7)$$

Note that T appears on both sides of the equation and, thus, an iterative procedure is used to arrive at a solution.

The Cooper-Jacob equation (assuming full penetration) ignores the contribution to well yield from permeable sediments above and below the screened interval. To account for this contribution for cases where the well screen only partially penetrates the permeable sediments, it is necessary to use a computation algorithm that includes the effects of partial penetration. One such approach was introduced by Brons & Marting (1961) and augmented by Bradbury & Rothchild (1985).

Brons and Marting introduced a dimensionless drawdown correction factor, s_p , approximated by Bradbury and Rothschild as follows:

$$s_p = \frac{1 - \frac{L}{b}}{\frac{L}{b}} \left[\ln \frac{b}{r_w} - 2.948 + 7.363 \frac{L}{b} - 11.447 \left(\frac{L}{b} \right)^2 + 4.675 \left(\frac{L}{b} \right)^3 \right] \quad (8)$$

In this equation, L is the well screen length, in feet. Incorporating the dimensionless drawdown parameter, the conductivity is obtained by iterating the following formula:

$$K = \frac{264Q}{sb} \left(\log \frac{0.3Tt}{r_w^2 S} + \frac{2s_p}{\ln 10} \right) \quad (9)$$

To apply either the Cooper-Jacob method or the Brons and Marting method, a storage coefficient value must be assigned. Storage coefficient values for unconfined aquifers typically range from a few percent to 20 % or more, with the majority of the values falling between approximately 5 and 15 %. Thus, in the absence of site-specific storage coefficient data, a value of 0.1 is deemed to be a reasonable choice for performing the calculations for unconfined conditions. When confined conditions are encountered, the storage coefficient can be expected to range from about 10^{-5} to 10^{-3} , depending on aquifer thickness (the thicker the aquifer, the greater the storage coefficient). Typically, a value of 5×10^{-4} may be assigned for most calculation purposes. The calculation result is not particularly sensitive to the choice of storage coefficient value, so a rough estimate of the storage coefficient is adequate to support the calculations. Because wet core was observed at the depth of the piezometric surface at LAOI-3.2, unconfined conditions were assumed initially and a storage coefficient value of 0.1 was applied. However, it was also considered that the saturated sediments above the well screen might have been tight, making the aquifer response perhaps less unconfined and more leaky confined. Therefore, a range of storage coefficient values was used in the calculations presented below.

The analysis also requires assigning a value for the saturated aquifer thickness, b . Two scenarios were considered, one in which the aquifer thickness was assigned the distance from the static water level to the bottom of the well screen (assumed unconfined conditions), and one in which the aquifer thickness was set equal to the well screen length (assumed confined or leaky confined conditions).

LAOI-3.2 DATA ANALYSIS

This section presents the data obtained from the LAOI-3.2 pump testing and the results of the analytical interpretations. Analyses were applied to time-drawdown and recovery data for both tests 1 and 2. There also is a discussion of the background data recorded after each of the constant-rate pumping tests.

Background Data

Figure 1 shows a comparison of the water level recovery data recorded following tests 1 and 2 and the barometric pressure corrected to conditions at the elevation of the water level inside LAOI-3.2. A cursory examination of the graph showed that the water level data included a strong barometric signal, with the magnitude of the water level fluctuations essentially equal to that of the barometric pressure changes. This was a somewhat surprising result because of the shallow depth of the perched zone. It suggested that changes in barometric pressure are not readily transmitted through the vadose zone in the Otowi Member of the Bandelier Tuff.

Another, less obvious, feature of the plots was that the barometric pressure curve minima and maxima preceded those on the hydrograph by about an hour (hr). The hour offset could be eliminated by adding one hr to the reported times for the barometric pressure readings, leading to a suspicion that the reported times might have been in Mountain Standard Time rather than Mountain Daylight Time. A check with ENV-MAQ confirmed that that was indeed the case,

i.e., all barometric pressure files obtained from ENV-MAQ report Mountain Standard Time regardless of the season.

Prior to analysis, the extended recovery/background water level data were corrected for the effects of barometric pressure changes using the following formula:

$$W_c = W - E(\Delta B) \tag{10}$$

where,

- W_c = corrected depth to water, in feet
- W = measured depth to water, in feet
- E = barometric efficiency
- ΔB = change in barometric pressure, in feet of water

Before correcting the hydrographs, the reported times for the barometric pressure data were increased by 1 hr to eliminate the time offset caused by the different reporting standards. In performing the corrections, the barometric efficiency was adjusted until the obvious barometric pressure peaks and valleys were minimized and the corrected curves were as smooth as possible.

Figure 2 shows a comparison of the actual and corrected hydrographs. Best results were obtained for a barometric efficiency of 100 %. This meant that a change in the magnitude of the barometric pressure caused an equal change in the water level in the well.

Prior to analysis, the recovery data were corrected for barometric pressure effects to remove the perturbations caused by changes in barometric pressure. Time-drawdown data, on the other hand, were not corrected because the barometric pressure changed very little over the short duration of the pumping episodes.

Test 1

Test 1 was started at 6:30 pm on August 2 and continued at 3.6 gpm for 120 min. until 8:30 pm. Following shutdown, recovery data were recorded until 11:08 am on August 5.

Time-Drawdown Analysis

Figure 3 shows the time-drawdown data for the 2-hr pumping test. A brief shutdown about 12 min. into the test can be discerned from the graph. A casing storage calculation showed an estimated casing storage duration of about 1.4 min., consistent with the early data points on the graph that fell above the straight line of best fit.

The transmissivity calculated from the straight line of best fit was 810 gpd/ft. As described below, evidence suggested that the screened interval included the most permeable sediments and, thus, this transmissivity was considered primarily representative of the 9.5-ft thick screened interval. The resulting hydraulic conductivity was 85 gallons per day per square foot (gpd/ft²), or 11.4 ft per day.

The late time-drawdown data exhibited a steeper slope, consistent with negative boundary conditions, thus suggesting that the pumped zone is of quite limited areal extent.

Recovery Analysis

Figure 4 shows recovery data from test 1. It is apparent from the initial buildup of head above the static level that water at the surface drained or siphoned back down the well after pump shutoff, unfortunately corrupting the early recovery data.

Figure 5 shows an expanded-scale view of the late recovery data. At very late time, the influence of the diurnally varying barometric pressure on the data is evident on the plot.

Figures 6 and 7 show similar plots of the complete recovery data set and the late recovery data, with corrections incorporated to account for the barometric influence. The analysis on Figure 7 revealed a transmissivity of 1060 gpd/ft corresponding to a hydraulic conductivity of 112 gpd/ft², or 14.9 ft per day.

The steep trace described by the very late data confirmed the presence of a negative boundary, i.e., the lateral limit of the permeable perched interval.

Test 2

Test 2 was started at 11:30 pm on August 5 and continued at 3.5 gpm for 240 min. until 3:30 pm. Following shutdown, recovery data were recorded until 2:08 pm on August 8.

Time-Drawdown Analysis

Figure 8 shows the time-drawdown data for the 4-hr pumping test. As before, a casing storage calculation showed an estimated casing storage duration of about 1.4 min., consistent with the early data points on the graph that fell above the straight line of best fit.

The transmissivity calculated from the straight line of best fit was 770 gpd/ft. The resulting hydraulic conductivity was 81 gpd/ft², or 10.8 ft per day.

As with test 1, the late time-drawdown data exhibited a steeper slope, consistent with negative boundary conditions, again suggesting that the pumped zone is of severely limited areal extent.

Recovery Analysis

Figure 9 shows recovery data from test 2 that have been corrected for barometric effects. The early data showed a slight rise and decline of water levels – similar to the test 1 recovery, but more subdued. It seems reasonable that this response may have been caused by gravity drainage of water standing in the drop tube (whereas the larger test 1 response surely was supported by backflow of water from the surface). Analysis of the recovery data revealed a transmissivity of 920 gpd/ft corresponding to a hydraulic conductivity of 97 gpd/ft², or 12.9 ft per day.

The steep trace described by the very late data confirmed the presence of a negative boundary, or lateral limit of the permeable saturated zone.

Averaging all of the hydraulic conductivity values from the two pumping tests yielded a value of 12.5 ft per day.

Specific Capacity Data

During test 1, LAOI-3.2 produced 3.6 gpm with 3.17 ft of drawdown after 11.25 min. of pumping, making the specific capacity 1.14 gallons per minute per foot (gpm/ft). The early-time data were used to avoid the effects of the momentary shutdown and the negative boundary that altered the later data. During test 2, LAOI-3.2 produced 3.5 gpm with 3.81 ft of drawdown after 39.7 min. of pumping, making the specific capacity 0.92 gpm/ft after that amount of pumping time. This information was used along with well and formation geometry data to establish a lower-bound value for hydraulic conductivity. Other input values used in the calculations included a well screen length of 9.5 ft, an assumed storage coefficient of 0.1, and a borehole radius of 0.34 ft.

Initially, the saturated thickness, b , was set equal to 25 ft, the distance from the static water level to the bottom of the well screen. Using this input, the computed lower-bound transmissivity values were 1465 gpd/ft and 1690 gpd/ft for tests 1 and 2, respectively. On their face, these results could not be valid because the lower-bound transmissivity values substantially *exceeded* the conventionally derived values.

This suggested that the assumption of 25 ft of permeable tuff was incorrect. Indeed, the lithologic log described the screened interval formation as coarser than the overlying ash flow. Therefore, calculations were repeated for an assumed permeable thickness equal to the well screen length of 9.5 ft.

Postulating relatively tighter materials above the screened interval does not necessarily preclude unconfined conditions. It is still likely that these overlying materials could drain and contribute to storage, although perhaps not as effectively as would more permeable sediments. For the subsequent lower-bound transmissivity calculations, a range of storage coefficient values was used, ranging from 0.01 to 0.1.

Lower-bound transmissivity and hydraulic conductivity values were computed for tests 1 and 2 for the assumption of a saturated permeable zone thickness of 9.5 ft and for the stated range of storage coefficient values. The results are plotted on Figure 10. As indicated on the graph, the lower-bound hydraulic conductivity values ranged from about 9 ft per day (for $S = 0.1$) to more than 13 ft per day (for $S = 0.01$). For smaller storage coefficient values, the computed lower-bound hydraulic conductivity values would have been even greater, thus clearly exceeding the average value of 12.5 ft per day obtained from conventional analysis. Therefore, it appeared that a smaller storage coefficient value was likely not applicable.

Overall, the hydraulic conductivity values obtained from the conventional pumping test analyses and the lower-bound values shown on Figure 10 were consistent and in good agreement. All calculations were based on a saturated permeable zone thickness of 9.5 ft.

Note that if a greater saturated permeable zone thickness is assumed, two things happen – 1) the hydraulic conductivity calculated from conventional analysis gets smaller, and 2) the lower-bound transmissivity computed from specific capacity gets larger – resulting in lower-bound values exceeding conventional values. This provides strong evidence that the sediments above the screened interval are likely not highly permeable.

This can be illustrated by computing transmissivity and hydraulic conductivity for different assumed saturated thickness values. For illustration purposes, calculations were performed based on the test 2 specific capacity, and assuming a storage coefficient value of 0.03 and the average conventionally calculated transmissivity analysis of 890 gpd/ft.

Figure 11 shows the projected lower-bound transmissivity values compared to the value obtained from conventional analysis, as a function of assumed permeable zone thickness. It is apparent that for assumed thickness values greater than about 12 ft, impossible results are obtained in which the lower-bound transmissivity value exceeds the actual value.

Figure 12 shows similar calculations comparing hydraulic conductivity values. Again, the contradictory result of lower-bound values exceeding actual values seems to rule out the possibility of a large permeable zone thickness.

SUMMARY

The following information summarizes the results of the pumping and recovery tests on LAOI-3.2:

1. The LAOI-3.2 pumping tests investigated the hydraulic properties of a perched saturated zone within the Guaje Pumice Bed at the base of the Otowi Member of the Bandelier Tuff.
2. Water level changes in LAOI-3.2 were nearly identical to barometric pressure changes, implying essentially a 100 % barometrically efficient saturated perched zone. Use of a vented pressure transducer to record water levels required that barometric pressure corrections be made to the pumping test data.
3. Casing storage effects were present, though short-lived.
4. Lack of a check valve in the drop tubing string allowed backflow of pumped water after pump shutoff, corrupting the early recovery data.
5. Comparison of computed transmissivity and hydraulic conductivity to lower-bound values supported the idea that most of the transmissivity of the saturated zone occurred within the screened interval. This idea seemed consistent with the lithologic log showing finer sediments above the screen.

6. Testing showed transmissivities ranging from 770 to 1060 gpd/ft, averaging 890 gpd/ft and hydraulic conductivity values ranging from 10.8 ft per day to 14.9 ft per day, averaging 12.5 ft per day.
7. Using a permeable saturated zone thickness of 9.5 ft, calculated lower-bound hydraulic conductivity values ranged from about 9 to 14 ft per day.
8. All of the observed data showed strong boundary effects, suggesting that the pumped zone was severely limited in areal extent.

REFERENCES

Bradbury, Kenneth R. and Rothschild, Edward R., 1985. A Computerized Technique For Estimating the Hydraulic Conductivity of Aquifers From Specific Capacity Data. *Ground Water*. V. 23, no. 2, pp. 240-246.

Brons, F. and Marting, V. E., 1961. The Effect of Restricted Fluid Entry on Well Productivity. *J. Petrol. Technol.* V. 13, no. 2, pp. 172-174.

Cooper, H. H., Jr. and Jacob, C. E., 1946. A Generalized Graphic Method for Evaluating Formation Constants and Summarizing Well Field History, *Transactions. Am. Geophys. Union*, v. 27, No. 4, pp. 526-534.

Schafer, David C., 1978. Casing Storage Can Affect Pumping Test Data, *Johnson Drillers' Journal*, Jan/Feb, Johnson Division, UOP Inc., St. Paul, Minnesota.

Theis, C. V., 1935. The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, *Transactions. Am. Geophys. Union*, v. 16, pp. 519-524.

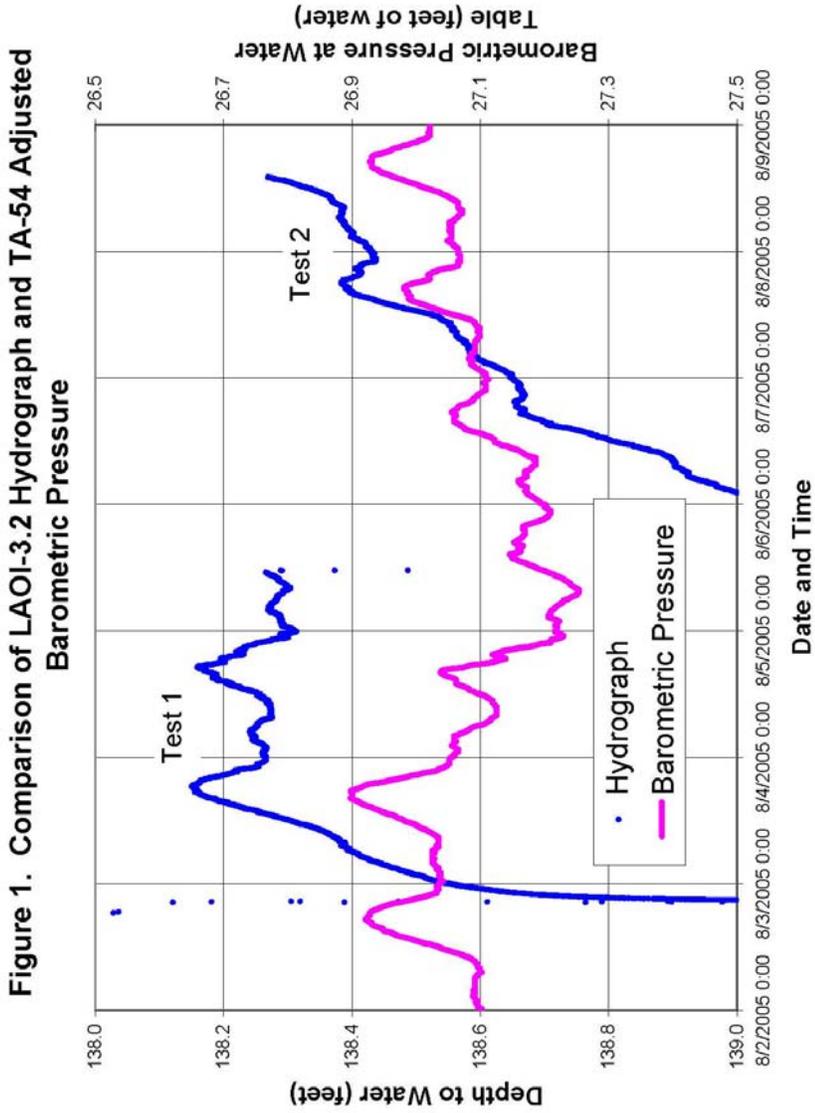


Figure 2. Comparison of LAOI-3.2 Actual and Adjusted Hydrographs
With Time Offset Removed

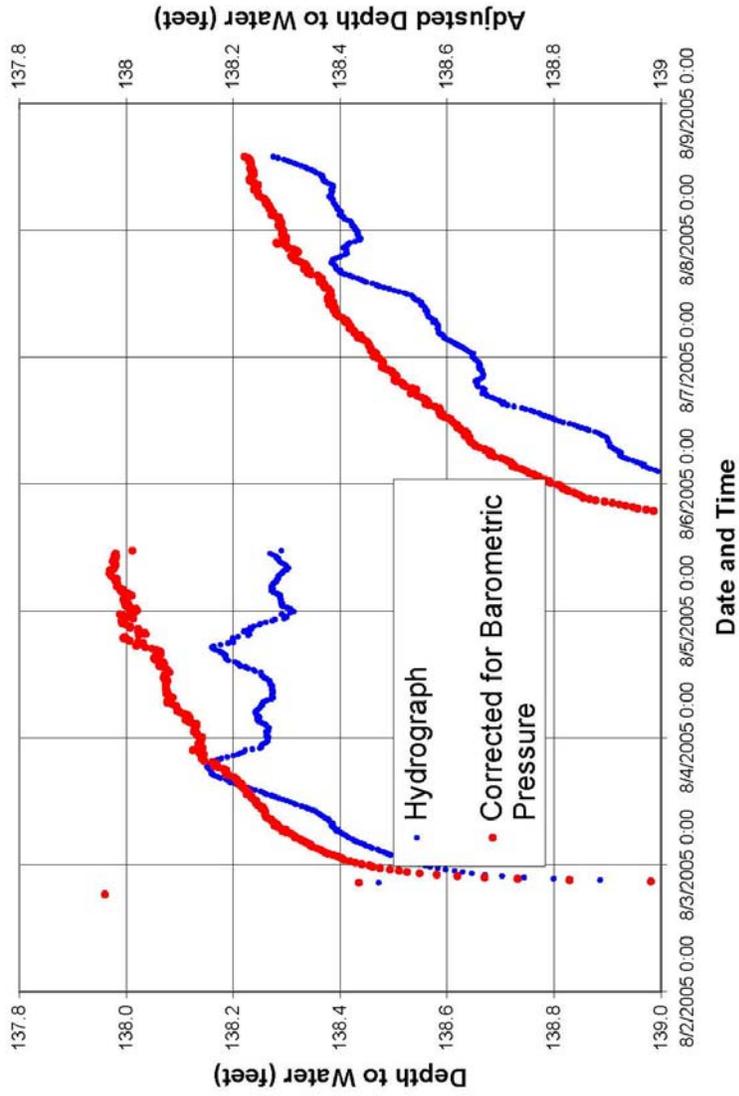


Figure 3. Well LAOI-3.2 Test 1 Drawdown

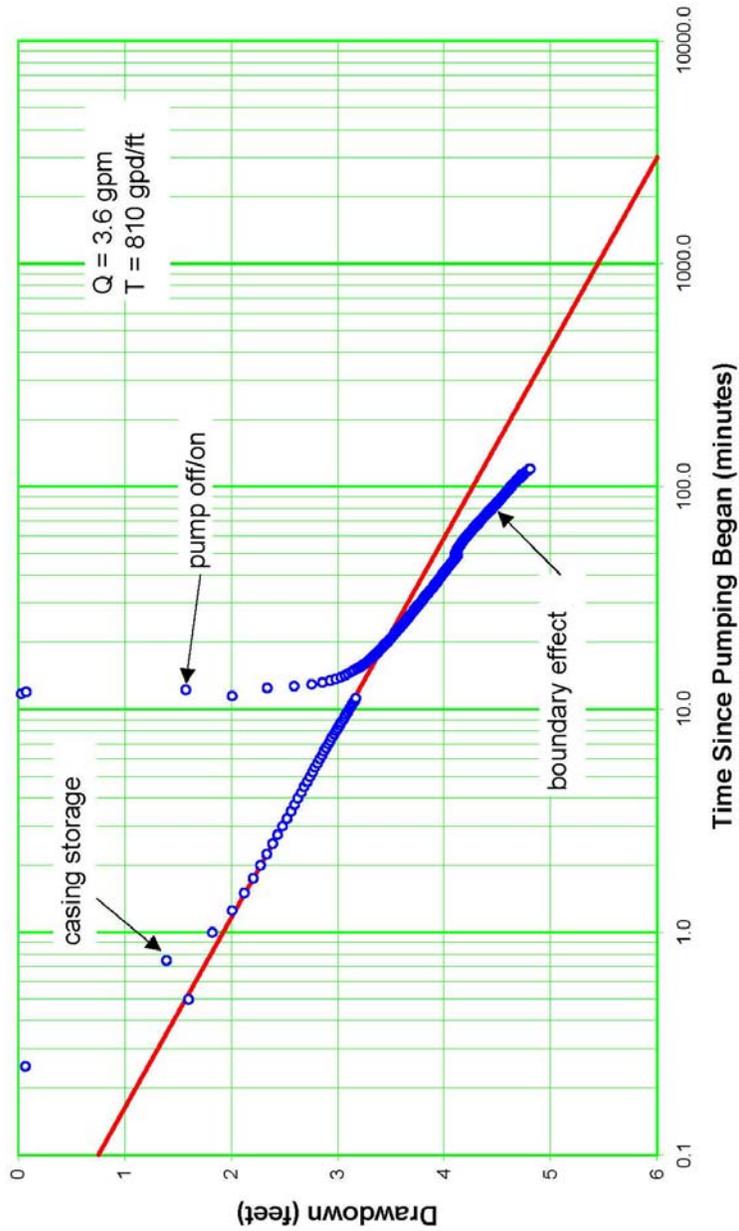


Figure 4. Well LAOI-3.2 Test 1 Recovery

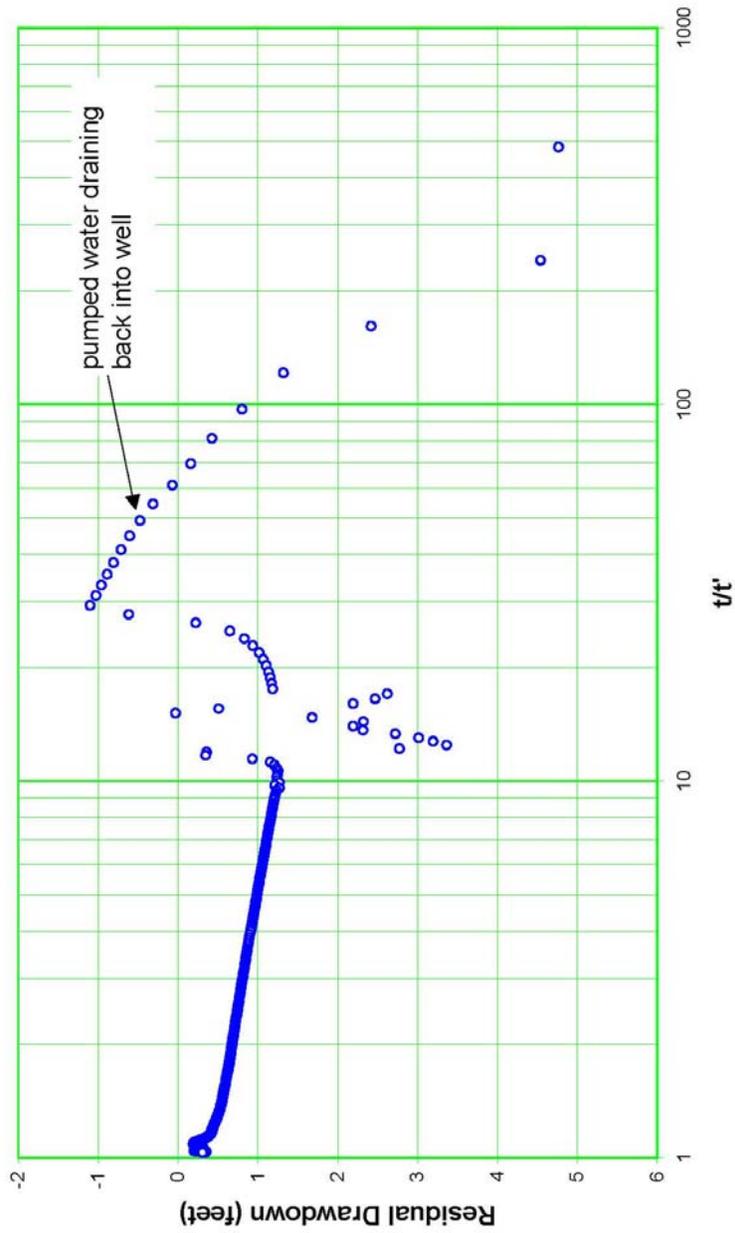


Figure 5. Well LAOI-3.2 Test 1 Recovery - Expanded Scale

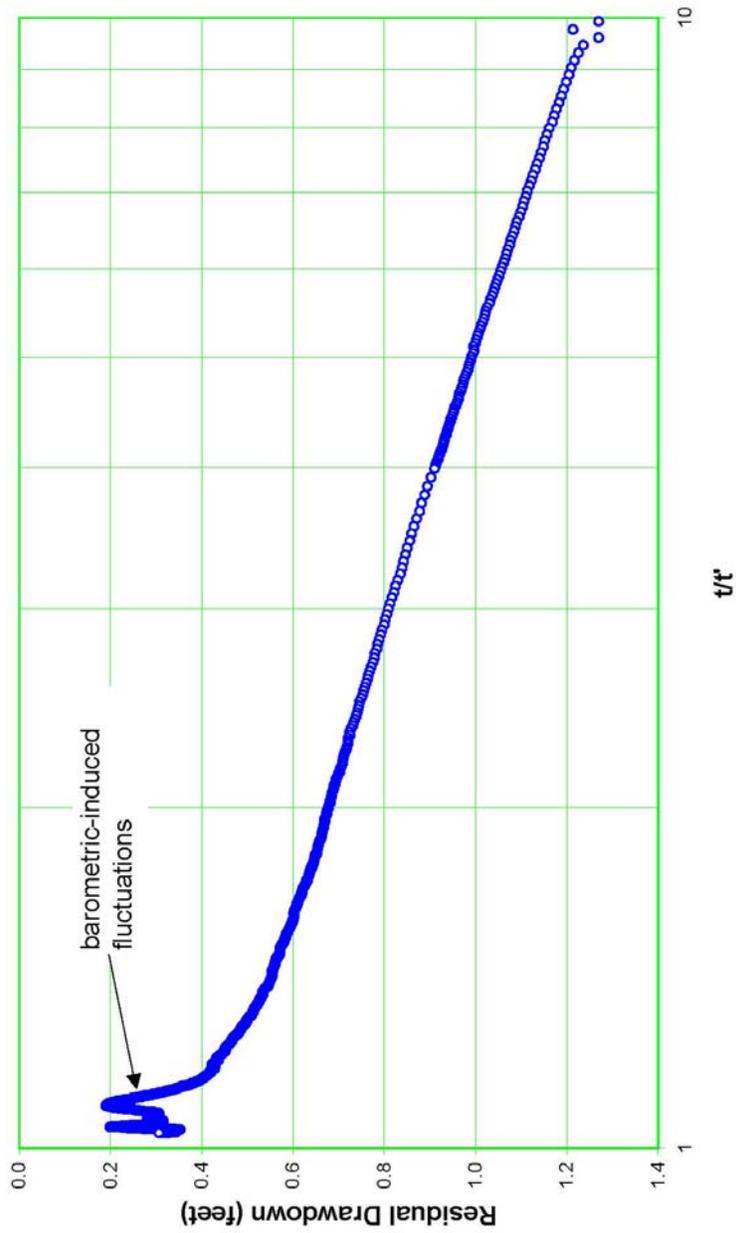


Figure 6. Well LAOI-3.2 Test 1 Corrected Recovery

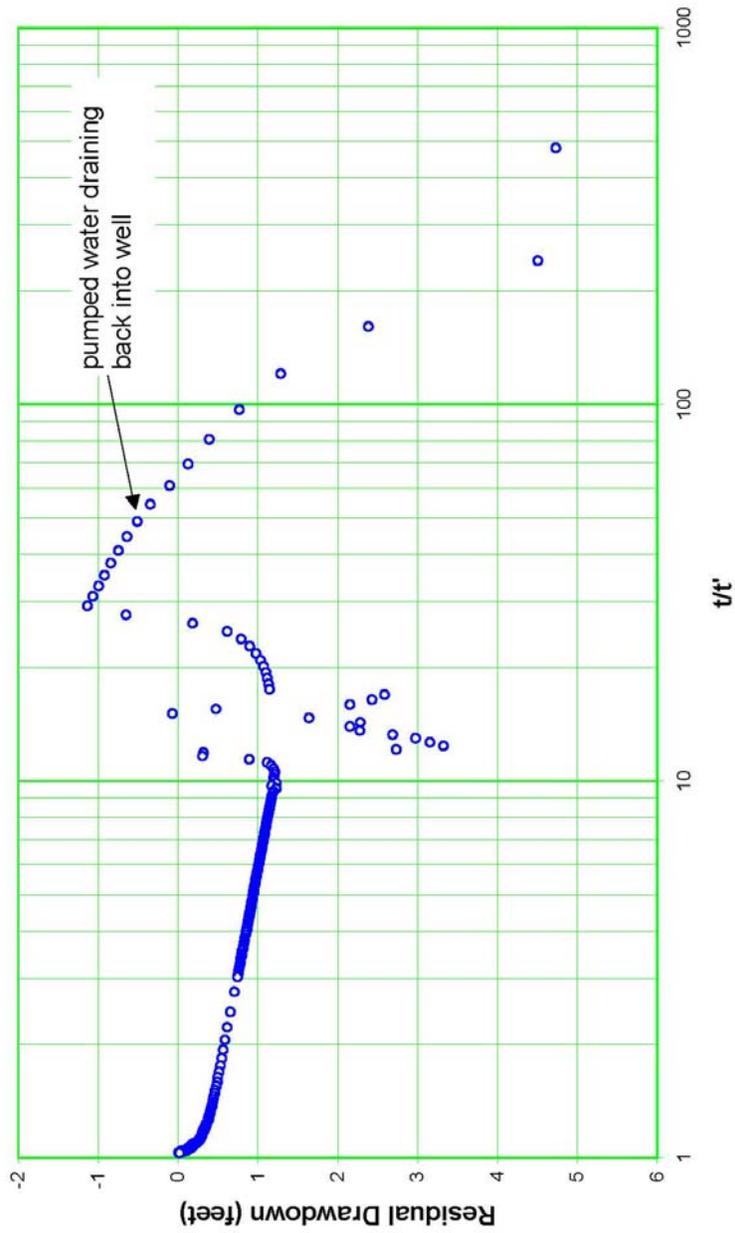


Figure 7. Well LAOI-3.2 Test 1 Corrected Recovery - Expanded Scale

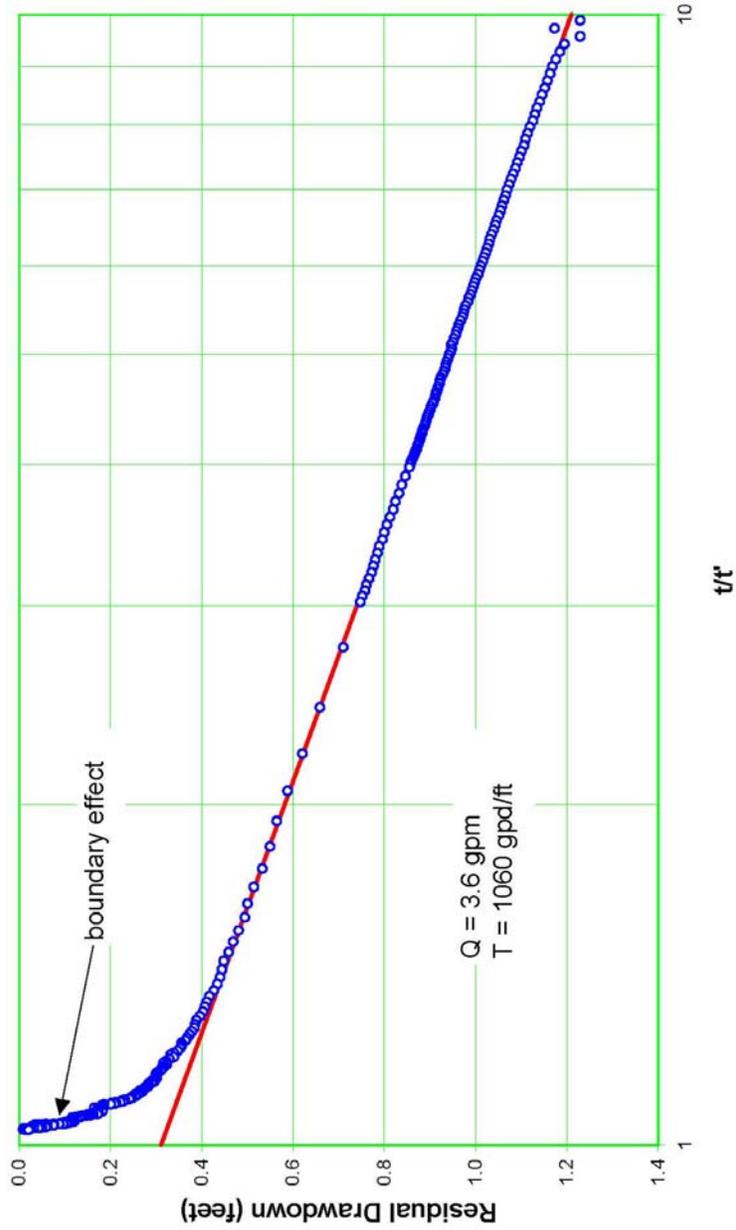


Figure 8. Well LAOI-3.2 Test 2 Drawdown

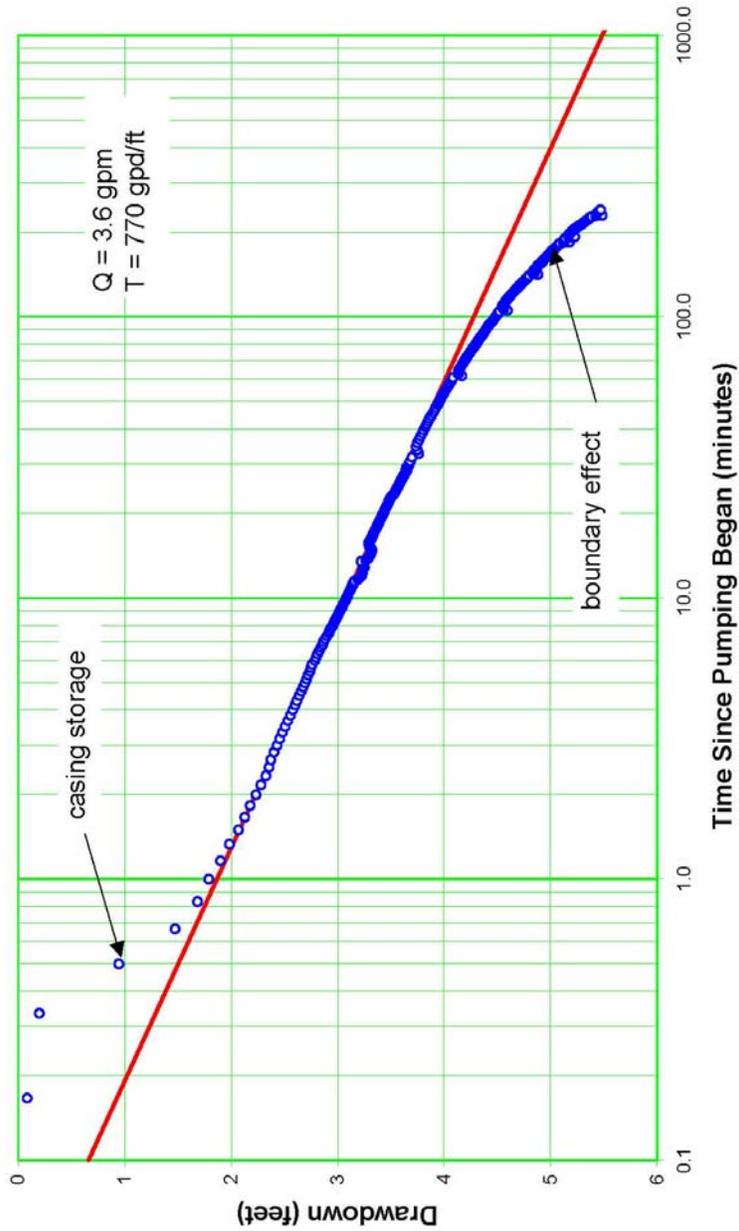
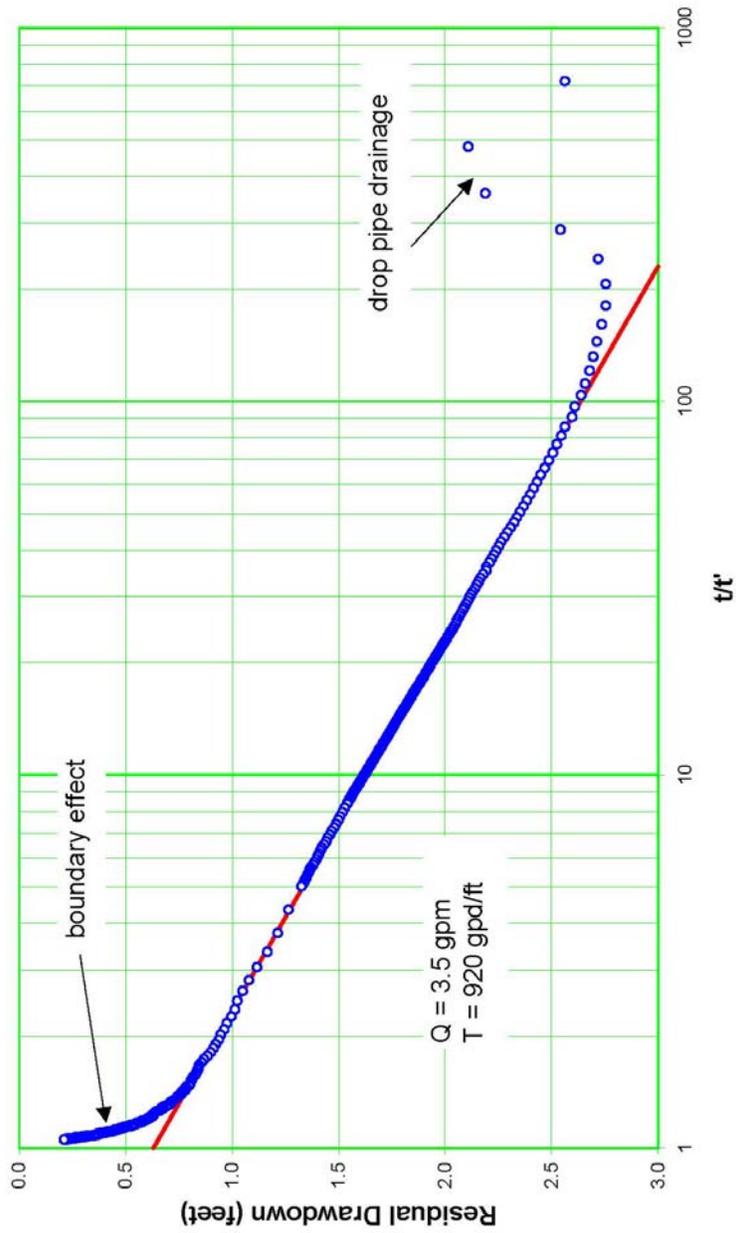


Figure 9. Well LAOI-3.2 Test 2 Corrected Recovery



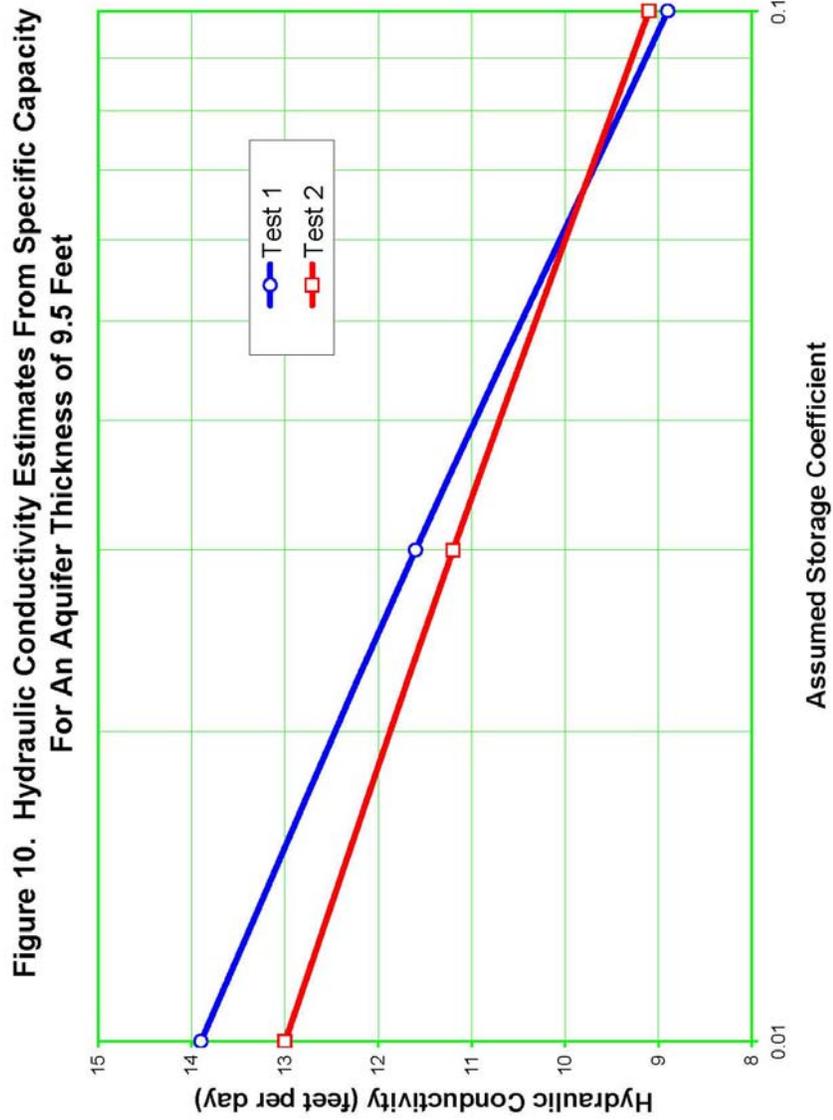
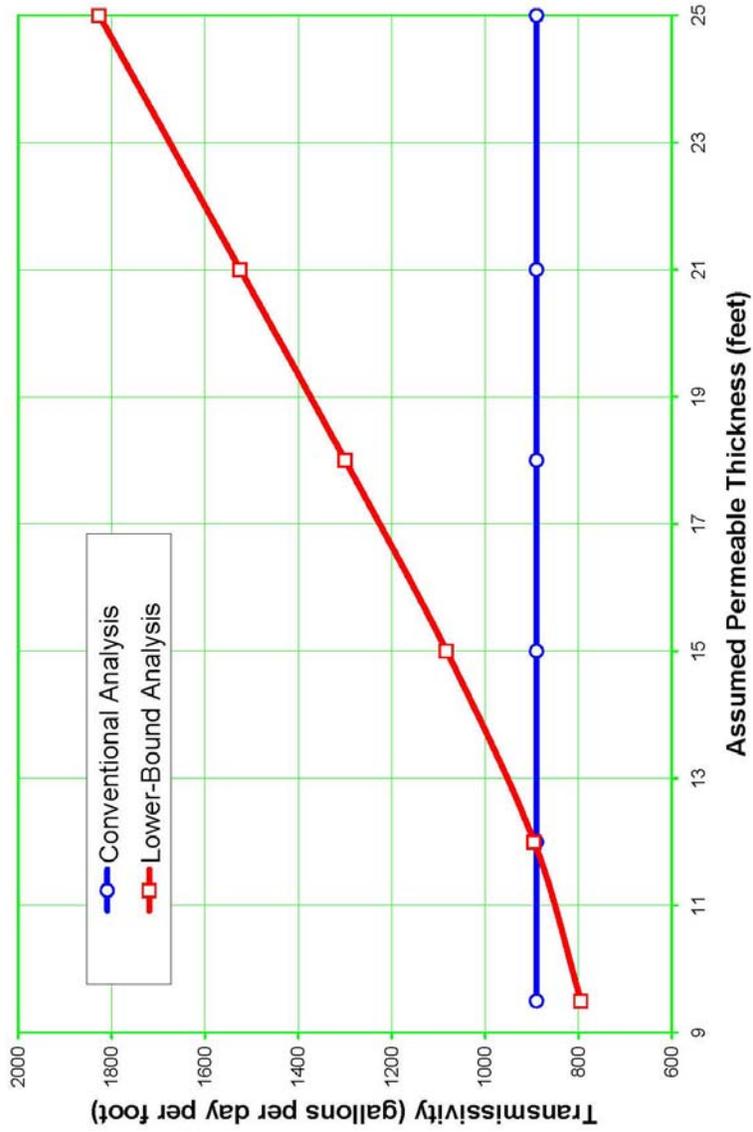
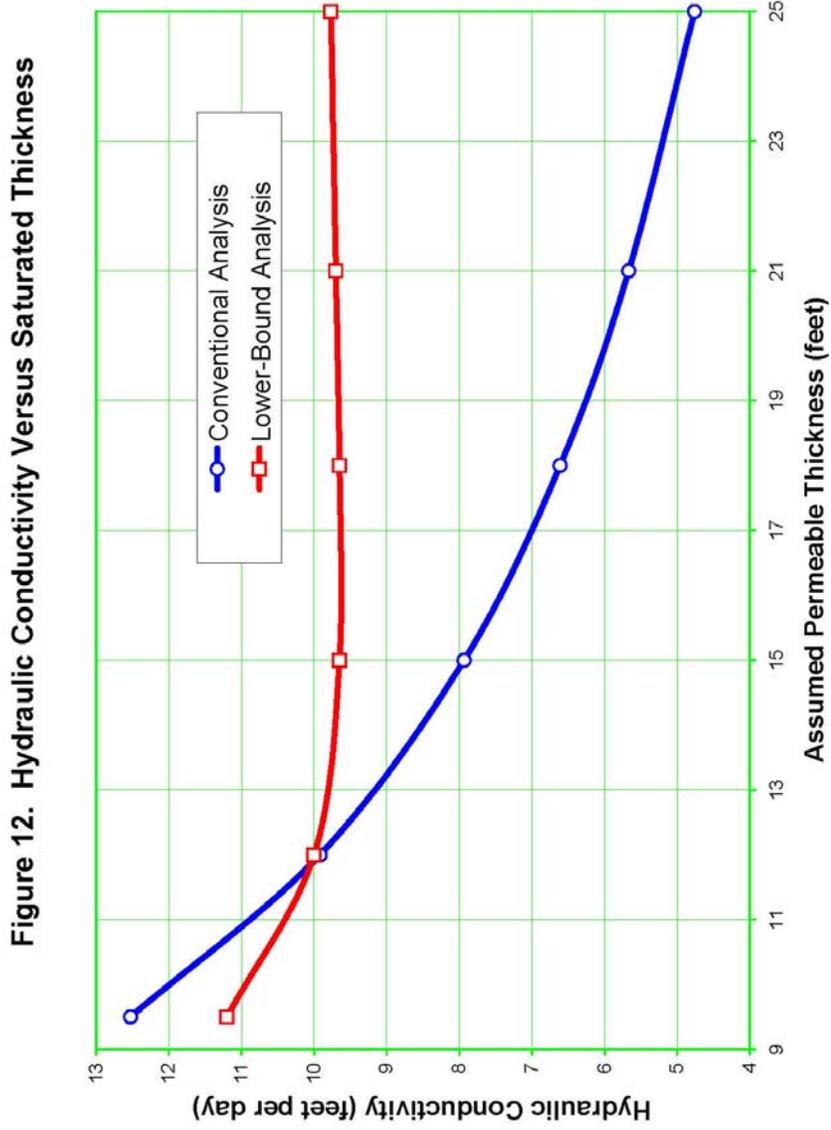


Figure 11. Transmissivity Versus Saturated Thickness





Appendix F

Deviations from Planned Activities

**Table F-1
Deviations From Planned Activities LAOI-3.2**

Activity	Drilling Work Plan for LAOI-3.2 (Kleinfielder 2004a)	LAOI-3.2 Actual Work
Borehole Depth	Borehole target depth was 300 feet (ft) below ground surface (bgs).	Borehole drilling was halted at 165 ft bgs to install a perched intermediate groundwater monitoring well.
Centralizers	Centralizers were called for to stabilize the well casing.	Centralizers could not be used at LAOI-3.2 because of the narrower borehole diameter.

**Table F-2
Deviations From Planned Activities LAOI-3.2a**

Activity	Drilling Work Plan for LAOI-3.2a (Kleinfielder 2005a)	LAOI-3.2a Actual Work
Borehole Depth	Borehole target depth was 300 feet (ft) below ground surface (bgs).	Borehole drilling was halted at 266.9 ft bgs to install a perched intermediate groundwater monitoring well.
Coring Interval	Drilling plan called for coring to begin at 150 ft bgs, just below the top of the Guaje Pumice Bed (147 ft bgs).	When drilling started, LANL scientists approved core collection beginning at 170 ft bgs, the top of Puye Formation and the approximate TD of LAOI-3.2. However, cores samples were collected from 200 to 234.3 in LAOI-3.2a(plugged), and from 229.2 to 266.9 at LAOI-3.2a. Core was not collected in either hole between 170 and 200 ft bgs in the Upper Puye Formation.
Core Samples	The drilling plan called for samples to be collected for geochemical analysis at 50 ft intervals beginning at 150 ft bgs and continuing to TD.	Samples were not collected in either LAOI-3.2a(plugged) or LAOI-3.2a at 150 ft bgs, but were collected from 202.4 to 204.5 ft bgs in LAOI-3.2a(plugged) and from 251.9 to 253.9 ft bgs in LAOI-3.2a. Note that a sample was collected for geochemical analysis from 143.3 to 144.8 ft bgs in LAOI-3.2 in 2005.