LOCKHEED MARTIN

**ENVIRONMENTAL
RESTORATION
PROGRAM**

**Site Investigation Report
for Waste Area Grouping 4
at Oak Ridge National Laboratory**

Volume 2. Appendixes

MANAGED BY
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

UCN-17560 (6-8-95)

ENERGY SYSTEMS

Energy Systems Environmental Restoration Program
ORNL Environmental Restoration Program

**Site Investigation Report
for Waste Area Grouping 4
at Oak Ridge National Laboratory**

Volume 2. Appendixes

Date Issued—August 1995

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Prepared for
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under budget and reporting code EW 20

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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APPENDIX A

RADIOLOGICAL SURVEY DATA
FROM CHEMRAD

**REPORT OF USRADS SURVEY
AT THE
OAK RIDGE NATIONAL LABORATORY
WASTE AREA GROUPING (WAG) 4**

**Submitted to
CDM FEDERAL PROGRAMS CORPORATION
OAK RIDGE, TENNESSEE**

JULY 18, 1994

**WORK PERFORMED UNDER
SUBCONTRACT No. 7908-RS-009-02**

1.0 INTRODUCTION

This report documents the UltraSonic Ranging and Data Systems (USRADS) survey conducted for radiological characterization of approximately 5 acres located at the Oak Ridge National Laboratory (ORNL) Waste Area Grouping (WAG) 4. The survey was conducted by Chemrad Tennessee Corporation under subcontract No. 7908-RS-009-02 to CDM Federal Programs Corporation. The field survey began June 23, 1994 (Chemrad survey team was unable to actually enter field until June 24 awaiting sign-off of CDM plans by MMES) and was terminated on June 29, 1994.

The designated survey area is located on the DOE X-10 facility and South of the main X-10 building complex. The entire north boundary of the site is adjacent to SWSA 4, with the Bath Tubbing Trench Seep Area (BTT) actually being a part of that SWSA (See Figure 1). Approximately one-third of the designated area was actually surveyed. The BTT area slopes moderately eastward toward a small stream in the WAG 4 area. The area is open and had recently been trimmed for the survey. The balance of the designated survey area lies along the small stream within WAG 4 and is densely wooded with heavy underbrush. The area had not been cleared or brushed. Survey reference points for the BTT area were directly tied into the X-10 coordinate system while the balance of the designated survey area were tied into an existing relative metric grid system.

The designated area was surveyed for radiological characterization using near-surface gamma and beta detectors as well as an energy independent dosimeter. This report describes the survey method and presents the survey findings.

2.0 USRADS AND SURVEY INSTRUMENT CONFIGURATION

2.1 DESCRIPTION OF THE USRADS SYSTEM

USRADS was used to automatically correlate survey instrument data with the geographical location of that data during walkover type surveys. The USRADS survey team consisted of a minimum of two Chemrad staff. One person, the "surveyor", performed the actual walk-over wearing an instrumented backpack containing electronic data gathering and positioning equipment (the "Data Pack"). A second person, the "operator", operated a movable base station consisting of a trailer which contained a host microcomputer and a master radio receiver. The Data Pack was the interface between the sensor meters (see Section 2.2), also carried by the surveyor, and the base station.

STUDY AREA FOR ⁹⁰Sr INVESTIGATION

OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure 1.0

USRADS incorporates three technologies: 1) radio frequency (RF) communications is utilized for system timing and data transfer, 2) ultrasonics are used to determine distance by propagation time of the ultrasonic signal, and 3) microcomputers collect data, calculate distances, display data, store data, and reduce data.

USRADS utilizes an ultrasonic signal emitted from the surveyor's Data Pack at one second intervals. At precisely the same instant, an RF transmission is broadcast from the surveyor's Data Pack to the Master Receiver. Since RF transmissions travel at essentially the speed of light, the RF transmission is used to mark the start of the ultrasonic signal. Each Stationary Receiver has an ultrasonic receiver and an RF transmitter. When a Stationary Receiver hears and identifies an ultrasonic signal emitted from the Data Pack, it transmits an RF signal to the Master Receiver. When this RF signal is received by the Master Receiver, it is used as a stop signal for that particular Stationary Receiver, thus establishing the time-of-flight of the ultrasonic signal from the Data Pack to that Stationary Receiver's location. The micro-computer can then determine the distance between the surveyor and that Stationary Receiver's location. Since each Stationary Receiver responds to the ultrasonic signal, these corresponding stop signals are used to calculate distances. Through this method, the surveyor's exact location was established each second throughout each walkover using USRADS.

The USRADS software automatically and instantaneously correlates the data collected with the correct location of the surveyor. The location and corresponding data value is then plotted on a grid map displayed on the host computer.

The data for that one-second time period is also posted at the bottom of the computer screen. The plotted position remains on the computer screen while the data collected is replaced each second to conserve screen space for plotting the track of the surveyor. At any time during the survey, the operator may look at the surveyor's track line to determine if any areas have been missed. The surveyor may return to any missed areas and obtain the necessary coverage.

When proper survey coverage has been accomplished, the operator runs the data reduction routines on the microcomputer. Several different software packages are resident, enabling the operator to review coverage and identify anomalies or other points of interest.

2.2 RADIOLOGICAL CHARACTERIZATION INSTRUMENTATION

Radiological characterization of the survey area was conducted with three instruments.

- 1) A Model 44-2 1 X 1 inch sodium iodide detector probe (NaI scintillation crystal) was coupled to a Ludlum Model 3 count rate meter for near-surface gamma detection data. The probe was suspended from a boom such that it was approximately 15 cm from the surface. The hinged boom permitted the detector to be swung in a path approximately 1.5 meters wide while the surveyor transected the survey area. The instrument output was input to the Data Pack so that the signal was generated simultaneously with the USRADS signal.
- 2) A Ludlum Model 44-9 open window G-M pancake detector mounted approximately 15 cm from the surface was coupled to a Ludlum Model 3 count rate meter for near surface beta detection data. The probe was suspended approximately 15 cm from the surface on the same hinged boom as the Model 44-2 sodium iodide probe (see Item 1 above). The instrument output was input to the Data Pack so that the signal was generated simultaneously with the USRADS signal.
- 3) The low level gamma exposure rate survey instrument was the Bicron MicroRem Model 1056000 Tissue Equivalent Survey Meter used to detect for low-level tissue equivalent (energy independent) dose rate. The Bicron was attached directly to the hinged boom at approximately one meter from the ground surface. The instrument output was input to the Data Pack so that the signal was generated simultaneously with the USRADS signal.

3.0 QUALITY CONTROL

3.1 INSTRUMENTATION CALIBRATION, BACKGROUND AND RESPONSE CHECKS

The radiation instrumentation was calibrated by the manufacturer prior to initiating the surveys under this contract. Calibrations were coordinated by Chemrad and records retained at the Oak Ridge office. Each radiation survey instrument received a daily response check prior to use in the field. All daily response checks were performed at the Chemrad staging site using a cesium-137 source (NaI probe) and Tc-99 source (Pancake). (Each radiation instrument also received a response check at the staging area at the end of

each survey day to verify measurement consistency over the course of the survey day.)

3.2 TRACK MAPS AND CONTOUR PLOTS

During the survey, color coded track maps were generated by the USRADS program. The color track maps show positions of the Stationary Receivers used (plus symbol with adjacent number) and the path taken by the surveyor as a series of small dots. For locations with data beyond the selected threshold values (positive or negative), the surveyor's position is indicated by larger cuneiform symbols (different symbols are used to indicate positive and negative values outside the selected threshold) on the track map.

The color track maps are generated on the computer display in real-time during the conduct of each USRADS walk-over survey. Since the data are automatically stored in the computer, it is immediately available for analysis and review at the conclusion of the survey. The color track maps are valuable tools in identifying general trends and providing verification of findings while the survey is in progress. Copies of the color track maps are included with this report. Concepts such as thorough coverage, generally acceptable rates of increase, clustering of color changes, and verification of suspect findings by adjacent tracks are performed visually by the computer operator during the conduct of the survey. At the conclusion of the survey, data are replayed to verify data integrity.

3.3 THRESHOLD CUTOFF DETERMINATION

The threshold cutoff sets the point at which the location symbol on the track map changes from a small dot to a cuneiform symbol. Thus, the cutoff threshold is useful in identifying locations with elevated measurements. Cutoff thresholds for each instrument were selected based on previous experience, and in the case of the pancake, expressed instructions from CDM Federal field management for a 7,500 cpm threshold. Cutoff thresholds used to generate the color track maps for the survey instruments were as follows.

Near Surface Gamma (Nal)	20,000 cpm
Near Surface Beta (Pancake)	7,500 cpm
Energy Indep. Dose Rate (Bicron)	100 MicroRem/hr

3.4 COLOR CODES AND CONTOURING PARAMETERS

Color codes are set to increasing measurement values as: Black, Green, Blue, Magenta, Yellow, and Red for color track maps and color contour maps. Contouring parameters are as follows.

	Minimum Contour	Contour Interval
Gamma (Nal)	20,000 cpm	100,000 cpm
Beta (Pancake)	7,500 cpm	2,500 cpm
Dose Rate (energy indep.)	100 MicroRem/hr	100 MicroRem/hr

4.0 USRADS SURVEY AND PRESENTATION PROTOCOLS

4.1 SURVEY METHODOLOGY

The surveys were conducted simultaneously in a single walkover of each survey grid. Walkover orientation in the BTT area was N-S while the WAG 4 walkover lacked specific orientation due to under growth restricting movement. (It was agreed upon prior to entering the WAG 4 area that the surveyor could only survey those areas where access was not prohibited by vegetation. This led to a somewhat "random walkthrough" as the surveyor attempted various routes.) The Nal and pancake probes were mounted approximately 15 cm from the ground on a hinged boom which permitted the probes to be swung in a 1.5 meter wide path across the survey transect. The probes were electronically connected to the meters which were rack-mounted to the Datapack. The dose rate meter was mounted approximately 1 meter from the ground and attached directly to the hinged boom. During the radiation survey the grid was traversed at approximately .5 meter per second on parallel transects spaced approximately 2 meters center to center where conditions permitted.

4.3 PROBLEMS ENCOUNTERED DURING SURVEYS

The most significant problems encountered during this survey were related to time constraints and lack of site preparation. Mobilization and setup time is a significant factor in conducting USRADS surveys. Therefore, Chemrad generally operates within a ten hour survey day. For the WAG 4 survey, effective daily survey time was limited to three to six hours due to:

- Maximum work hours were restricted to 7AM to 3PM by client.
- Late starts waiting for RWPs.

- Rain and a required meeting by the Health and Safety Officer on June 27.
- Pancake probe broken during survey and Health and Safety Officer required to leave at site at 2 PM June 28.
- The project was terminated after 1:00 June 29th due to potential lack of time remaining to complete.

Due to time constraints, it was decided (in consultation with the CDM field manager) that when communication interruptions between the Data Pack and the Master Receiver occurred during the survey, the surveyor would continue surveying provided no areas of elevated readings were encountered. If elevated readings (defined as approximately 2,500 CPM for Pancake probe to assure a criteria well below the 7,500 threshold) were encountered the surveyor would remain at that location until communication was restored. The large "void" from approximately 205W to 240W and 180S to 170S was surveyed in this manner during a communication link disruption and no Pancake probe readings exceeding 2,500 CPM were encountered.

USRADS walkover surveys can be impacted by environmental, site and equipment problems. High temperature were experienced throughout the survey but had no apparent impact on survey results.

The BTT terrain is gently rolling and grassy. Thus, its survey was not negatively impacted by site conditions. The balance of the WAG 4 survey area is heavily wooded with dense undergrowth. The heavy undergrowth precluded much of the area from being traversed by the surveyor. It was determined prior to initiating the WAG 4 portion (terminology to differentiate between balance of WAG 4 survey area and the BTT seep area) of the survey that the area could not be brushed due to time constraints and that, therefore, survey would be limited to those areas that could be safely walked by the surveyor. This restricted the survey primarily to narrow paths within the grid for which a survey was conducted. Even with the decision to restrict surveying to accessible areas, progress was slow due to entanglement of the Data Pack masts in vegetation and the need to circumvent many of the denser vegetation areas.

Two instrument-related problems were encountered, were related specifically to the Bicon MicroRem Meter. Bicon data values tend to lag behind the Nal readings. This characteristic is apparently due to the nature of the Bicon detector's reaction time. For areas with only moderate variations, the Bicon readings tended to closely parallel the other instruments' readings. However, for areas with steeply elevated values the Bicon readings peaked 2 to 4 seconds after the Nal readings. The most significant ramification of the Bicon's

slower reaction time would be in small areas of sharply elevated values. Under these conditions, the Bicron data could be mispositioned by 1 to 2 meters (based on approximate survey traverse speed). However, this lag is not considered to be a significant problem for the survey areas due to the nature of the surveys and the distribution of elevated areas. Elevated readings within the BTT survey area were clustered in a single large area from approximately 27,475E to 27,575E and 19,020N to 19100N. For the WAG 4 portion of the survey, elevated reading areas were walked in a concentrated fashion to determine the shape of the elevated reading area rather than in a single passover. Therefore, the surveyor remained at the elevated areas for considerably more than the Bicron lag time.

The second Bicron-related problem was apparent "pegging" of the instrument at 3,070.5 MicroRem/hr in the peak gamma, beta and dose readings area of the BTT (approximately 27,509E X 19,090N). Unlike the digital Ludlum Model 3 for which the transmitted data are not limited by the dial limits, the analog Bicron transmitted data "pegs" with the dial. The surveyors initially believed that the selected Bicron setting (100X) was sufficient but for the highest points within BTT this was not the case and changing settings during a survey introduces considerable confusion in interpretation. The pegged dose readings probably were influenced by the large area of significantly elevated readings.

5.0 SURVEY RESULTS

Elevated readings for the BTT area were clustered in the Southeast corner off the survey area. The highest readings were 70,740 cpm for the Pancake probe, 3,864,960 cpm for the Nal probe and 3,070.5 MicroRem per hour (pegged) for energy independent dose. These highest readings were obtained at 27,505.2E X 19,094.42N. All elevated readings within the BTT were within a contiguous area around this high point. NOTE: the "void" within the high (red) contour lines for the BTT area are a result of contour clipping to process the display data to compensate for processing memory. This was done in response to the dense contour distribution created by the differential between site "background" and maximum readings.

Elevated readings for the WAG 4 portion of the area were more localized into small "seep" areas. The highest Nal readings were found in the eastern portion of the survey areas and were centered around 251W X 152S (in meters from existing relative metric grid system) and reached 1,650,960 cpm for the Nal probe, 15,120 cpm for the pancake probe, and 2,035 MicroRem per hr energy independent dose. A second location near that area that exceeded the 7,500 cpm pancake threshold was located at 252W X 156S (meters) where the highest readings were; 627,720 cpm for Nal, 7,920 cpm for pancake, and 687 MicroRem/hr for energy independent dose (Bicron). The highest pancake

readings were obtained from an area around 255W X 148S (meters) and exceeded 18,000 cpm, with Nal probe readings reaching 1,549,980 cpm and Bicron at 3,062.5 MicroRem/hr. In the Northeast portion of the survey area several areas exceeded the 7,500 cpm pancake threshold. For example, 282W X 148N to 279W X 142S had pancake readings up to 14,640 cpm but with Nal readings reaching barely exceeding 50,000 cpm (and dose correspondingly low at around 80 MicroRem). Pancake probe readings also exceeded 12,500 cpm at 280W X 137S with Nal readings at 84,780 cpm. ASCII files of the data collected during this survey are included with this report and can provide detailed locational positioning of the survey data. Note that in the ASCII files the data is organized as follows: Column 1 = Eastings, Column 2 = Northings, Column 3 = Nal probe, Column 4 = Pancake probe, Column 5 = null set (for additional instrumentation), and Column 6 = Bicron (energy independent dose).

Chattanooga Tennessee Corp.
Oak Ridge, Tennessee

REVISIONS

DATE	DESCRIPTION	DWA	OK	APP

Contours Interval
100/1000 cpm

Color Table (cpm)

0 - 100000
100000 - 200000
200000 - 300000

DRAWN BY: SWS/ALG

CHECKED BY: N. S. Blair

SCALE: 1" = 100'

DATE: 7-7-94

FILE: 8-11-93

FIGURE 2. BATHTUBBING TRENCH SEEP, NaI PROBE

Chemical Tennessee Corp.
Oak Ridge, Tennessee
DRAWING NO. SW5A4B
DATE BY M. S. Blair
SCALE: 1" = 100' BY
DATE 7-7-94 FILE NO. B-103

REVISIONS

DATE	DESCRIPTION	DWN	OK	APP

Contours Interval
2500 cpm

Color Table (cpm)

0 - 2500	1500 - 17500
2500 - 5000	
5000 - 7500	

FIGURE 3. BATHTUBBING TRENCH SEEP, PANCAKE PROBE

Color Table (Rem)	
0 - 100	
101 - 200	
201 - 300	

Contours Interval
100 URem /h

REVISIONS				Central Tennessee Corp. Oak Ridge, Tennessee	
DATE	DESCRIPTION	DATE	BY		
				DRAGG, Y. S. (SASAC)	
				DRAGG, Y. S. (SASAC)	
				SCALE	OK BY
				DATE 7-7-94	FILED 7-7-94

FIGURE 4. BATHUBBING TRENCH SEEP, BICRON MICROREM (ENERGY INDEX) (UORE)

FIGURE 5. WAG4 (PARTIAL). PANCAKE PROBE

Color Table (cpm)	
0 - 100,000	
100,000 - 200,000	
200,000 - 300,000	
300,000 - 400,000	
400,000 - 500,000	
500,000 - 600,000	
600,000 - 700,000	
700,000 - 800,000	
800,000 - 900,000	
900,000 - 1,000,000	

Contour Interval
100,000 cpm

REVISIONS			
DATE	DESCRIPTION	DWN	APP

Chemrod Tennessee Corp.
Cock Ridge, Tennessee

DRAWING NO. WAG4
DATE BY S. 310
DATE 7-7-94
FILE NO. WAG4301

FIGURE 6. WAG4 (PARTIAL). NaI PROBE

FIGURE 7. WAG4 (PARTIAL). BICRON MICROREM (ENERGY INCEP. DOSE).

APPENDIX B

**RADIOLOGICAL SURVEY DATA FROM
ORNL MEASUREMENT APPLICATIONS
AND DEVELOPMENT GROUP**

Internal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

Date: September 14, 1994**To:** S. Laman**C:** File**From:** D. D. Huff, 3504, MS-6317, 4-7726 **Subject:** Record Copy of Notes from SWSA 4 Radiation Survey

Because the area within the fenced area south of the maintained portion of WAG 4 is so heavily vegetated, the use of an ultrasonic ranging and detection system (USRADS) for collecting surface radiation was not feasible for a detailed survey. This was originally recognized in June, and the MAD group was enlisted to survey a portion of the area and build a map image of bathtubbing-trench radiation patterns. The attached report documents their initial survey.

Subsequent evaluation of the USRADS survey for the area that was attempted in the exclusion zone caused an added task for the MAD group. They were commissioned to re-do the area east of the entrance. Although the field work is complete, the results (map) are not available. However, the attached methodology description applies to all the work. Please incorporate this information in the record and distribute copies to the WAG 4 seeps team.

DDH:efk

Attachment

Internal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

Date: July 18, 1994

To: D.D. Huff

c M.E. Murray, R.D. Foley

From: R.L. Coleman. 7503, MS-6382, 4-2925

Subject: SWSA 4 Radiation Surveys and Mapping: 06/30/94 - 07/01/94
Site Code: ONL022

The Measurement Applications and Development Group (MAD) of the Health Sciences Research Division performed a surface radiological survey of a limited portion of the SWSA 4 area at ORNL from June 6 through July 1, 1994. The purpose of this work was to map the radiation levels associated with surface radiological contamination plumes from two separate seep locations on the south side of the SWSA 4 field area. The work was performed at the request of Dale D. Huff of the Environmental Sciences Division in support of SWSA 4 environmental restoration activities.

The seep areas, henceforth denoted as Seep Areas 1 and 2 (SA1 and SA2), are located in the wooded area at the south side of the SWSA 4 area. All mapping was performed relative to the SWSA 4 grid which was already in place. All work, equipment calibrations and field equipment checks were performed in a manner consistent with guidance published in ORNL/TM-8600. All directional descriptors are stated relative to the SWSA-4 reference grid system. All detector readings are given in counts per minute (cpm).

The initial effort consisted of scanning the surface of the ground with Geiger-Mueller (GM) pancake detectors in areas that were accessible and performing a limited scan with a NaI(Tl) detector. The area had average brush undergrowth and therefore the accessibility was slightly limited in some areas. Most of the trees and lower vegetation contained notable levels of radioactive material with the primary radiation from the vegetation being beta. The primary radiation associated with the surface contamination of both SA1 and SA2 was high energy beta, although gamma emitters were present in the soil and were sometimes the major source of detectable radiation in localized spots. It was decided that the primary indicator of surface contamination in both SA1 and SA2 was beta radiation and it was therefore decided to perform the surface contamination mapping with GM pancake detectors. The mapping was performed with pancake detectors in 2 mil plastic bags with ~8 mil plastic tape placed across the detection window for protection. The detectors were kept at near contact with the soil surface during the survey.

Dale Huff
Page 2
July 18, 1994

Seep Area 1 (SA1)

The SA1 area consisted of a single seepage point that extended down gradient towards a small stream south of SWSA 4. The pancake count rate at contact with what seemed to be the origin of SA1 was approximately 40,000 cpm. Two surface count rate boundaries were mapped in relation to this point. The lower count rate cut off point for the first boundary around the seep origin was set at 15,000 cpm and the lower count rate point for the second boundary was set at 5000 cpm. Flags were set at the count rate boundaries and subsequently field mapped relative to SWSA 4 grid marker number W330,S120. A copy of the resulting field map is contained in Attachment 1.

Seep Area 2 (SA2)

The SA2 area consisted of what appeared to be two independent seepage points that merged into a single flow plane that extended down gradient towards a small stream south of SWSA 4. Two count rate boundaries were mapped for this area. Readings around the north west seepage origin ranged from 500 to 3000 cpm. This area showed lower count rates than the southern portions but it was elevated relative to its surroundings and was therefore mapped as part of the seep. This boundary overlapped slightly with a 5000 cpm boundary which extended from the north west seepage origin down gradient. Flags were set at the count rate boundaries for each area and subsequently field mapped relative to SWSA 4 grid marker number W360,S120. A copy of the resulting field map is contained in Attachment 2.

A localized 10,000 cpm area was found at the south western edge of the 5000 cpm boundary. The area was sketched onto the field map for general reference, but no effort was made to accurately delineate its boundaries.

The field maps for both SA1 and SA2 were entered into MapInfo™ superimposed over an existing SWSA 4 layer. A printed copy of three different zoom levels of the MapInfo drawing is given in Attachments 3, 4 and 5.

In addition to mapping the SA1 and SA2 areas, a team of two surveyors spent approximately half a day performing a roaming survey west of the W360,S120 grid point searching for other potential seepage points with pancake detectors. It was noted by the surveyors that the count rate dropped off at a fairly constant rate to a low of about 300 counts per minute approximately 100 ft west of the W360,S120 marker. No seepage areas were found in this area.

If there are any questions regarding the work performed, please feel free to contact me.

Thank you

Robert L Coleman, 02:44 PM 7/19/94, Re: Report

1

MR-Received: by mta CTDVX3; Relayed: Tue, 19 Jul 1994 14:49:43 -0400
Alternate-recipient: prohibited
Disclose-recipients: prohibited
Date: Tue, 19 Jul 1994 14:44:00 -0400 (EDT)
From: Robert L Coleman <COLEMANRL@oax.al.ornl.gov>
Subject: Re: Report
To: ddh@ornl.gov
Posting-date: Tue, 19 Jul 1994 14:48:00 -0400 (EDT)
Importance: normal
Priority: normal
X400-MTS-identifier: [;34944191704991/3079229@OAX]
Al-type: MAIL
Hop-count: 1

Dale,

The field drawings for the SWSA 4 seep areas SA1 and SA2 were mapped as follows:

An initial point on each boundary was located by pacing from the reference grid point marker. The remainder of the boundary was then mapped by pacing to the next flag, determining the direction of traverse from the previous point, and mapping the new point. This process was continued about the perimeter of the boundary until returning to the initial point. The data was hand drawn on ruled sketching paper. All points were located on the map by using an engineer ruler with an interval of 1"=20'.

A few of the traverses were paced by both myself and another team member for QA. As a note, I am usually within about 2 ft on a 50 ft paced measurement.

We did not attempt to gather highly accurate measurements about the boundary. This seemed to be the logical approach given the inherent inaccuracy of the surveyed boundary itself. I would guess that the 5000 cpm boundary was flagged on the order of +/- 5 ft, so trying to map the boundary to much better than this seemed unwarranted. However, if you want us to map the flag points exactly, we can do so by making reasonably precise transit and distance measurements.

Bobby

ATTACHMENTS

No	Description
1	Copy of field drawing of Seep Area 1 (SA1).
2	Copy of field drawing of Seep Area 2 (SA2).
3,4,5	MapInfo™ printouts showing three zoom levels of SWSA 4 area with SA1 and SA2 superimposed.

⑤ = 5K PANCAKE
 ⑬ = 15K PANCAKE
 * = WAG 4 GRID (m)

WAG 4
 SEEPS

RLC, RAM
 6-30-94

SEEP#: SAZ

B-9

SWSA 4 SEEPS

✦ WAG 4 GRID (m)

SURVEYS WITH GAM PAVE
--- 5K BORDER FOR SEEP
(~1K for upper left)

RLL, RANI
7-1-94

N
X
1" = 20'

APPENDIX C

**WAG 4 SITE INVESTIGATION
LOCATION DATA**

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
0186	0186	27549	19019	792.79
1534	1534	27926	19115	787.1
1859	1859	27514	19058	803.64
2747	2747	28030	19050	0
2748	2748	28030	19020	0
2749	2749	27911	19097	0
2752	2752	27891	19067	0
A.C. 02		28999.35	19570.63	795.25
A.C.01 E GATE		29005.92	19572.32	794.68
A.C.03		28992.68	19569.5	795.63
A.C.04		28982.15	19567.08	796.44
A.C.05		28963.49	19562.58	797.82
A.C.06		28943.88	19558.96	798.49
A.C.07		28906.91	19550.14	801.02
A.C.08		28894.23	19549.43	802.57
A.C.09		28746.1	19524.31	806.89
A.C.10		28716.31	19516.39	807.46
A.C.11		28711.12	19513.79	807.37
A.C.12		28704.18	19511.47	807.61
A.C.13		28695.44	19509.57	807.97
A.C.14		28631.64	19486.64	809.93
A.C.15		28260.52	19410.65	808.97
A.C.16		28207.13	19413.71	813.38
A.C.17		28154.46	19416.02	816.06
A.C.18A		28106.01	19417	815.1
A.C.18B		28099.89	19416.72	814.92
A.C.18C		28094.53	19416.63	814.72
A.C.19		28051.44	19418.4	813.69
A.C.20		27999.35	19419.47	812.99
A.C.21		27895.51	19420.43	816.78
A.C.22		27843.3	19420.5	819.51
C-3 CON MON		28452.65	19423.02	814.57
C-4 CON MON		27000.91	19118.96	826.22
DP01	4318	28287.48	19045.18	785.05
DP02	4319	28191.95	19110.99	785.27
DP03	4320	28080.25	19133.92	788.57
DP04	4321	27953.75	19225	797.99
DP05	4322	27400.69	19190.9	806.85
DP06	4323	28295.27	18994.29	783.42
DP07	4324	28272.28	19001.47	781.52
DP08	4325	28160.85	19024.21	780.47
DP09	4326	28074.58	19062.07	783.57

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
DP10	4327	27949.67	19126.72	789.06
DP11	4328	27867.15	19122.73	787.54
DP12	4329	27844.92	19084.92	784.67
DP13	4340	27406.74	19160.55	808.03
DP13R		27406.8	19160.72	808.24
DP14	4339	27404.48	19137.74	808.82
DP14R		27404.46	19137.58	809.09
DP15	4341	27459.37	19165.19	805.21
DP15R		27459.35	19165.36	805.38
DP16	4338	27376.53	19136.91	810.8
DP16R		27376.57	19137.12	811.01
DP17	4342	27870.91	19204.89	796.06
DP17R		27870.93	19205.09	796.3
DP18	4343	27886.27	19206.01	795.57
DP18R		27886.31	19206.27	795.84
DP19	4344	27955.41	19195.07	795.35
DP19R		27955.33	19195.11	795.57
DP20	4345	27966.04	19177.61	793.71
DP20R		27965.97	19177.77	793.91
DP21	4346	27465.25	19118.31	805.19
DP21-A1		27458.37	19119.79	805.65
DP21-A2		27454.74	19127.26	805.99
DP21R		27465.24	19118.12	805.39
DP22	4347	27420.12	19091.83	810.35
DP22R		27419.81	19091.85	810.73
DP23	4348	27452.48	19109	806.41
DP23R		27452.51	19109	806.61
DP24	4354	27976.41	19175.22	793.71
DP24R		27976.36	19175.35	793.96
DP25	4351	27901.61	19220.81	797.01
DP25R		27901.58	19220.66	797.24
DP26	4353	27947.06	19191.47	795.08
DP26R		27946.97	19191.59	795.36
DP27	4352	27944.75	19289.75	802.62
DP27R		27944.75	19289.51	802.87
DP28A	DP28	27882.43	19292.19	804.83
DP28AR		27882.18	19292.15	805.07
DP29	4349	27498.82	19167.42	800.47
DP29R		27498.86	19167.2	800.71
DP30	4350	27478.85	19165.93	803.74
DP30R		27478.72	19165.64	804
DP31	4355	28053.77	19116.27	787.5

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
DP31R		28053.75	19116.44	787.71
DP32	4356	28098.42	19098.74	784.28
DP32R		28098.4	19098.91	784.55
DP33	4358	28149	19093.49	783.29
DP33R		28149.21	19093.53	783.49
DP34	4357	28177.55	19078.28	782.8
DP34R		28177.5	19078.12	783.04
DP35	4359	28197.87	19068.36	783.78
DP35R		28197.91	19068.61	783.99
DP36	4360	28261.26	19027.49	782.5
DP36R		28261.21	19027.72	782.71
DP37	4361	28285.46	19013.08	783.24
DP37R		28285.49	19013.16	783.46
DP38	4362	28302.13	19016.43	784.42
DP38R		28301.93	19016.33	784.65
DP39	4363	28320.66	19027.75	0
DP39R		28320.61	19028.23	0
DP40	4368	27885.46	19246.48	799.37
DP40R		27885.24	19246.47	799.65
DP41	4366	27951.63	19251.35	800.18
DP41R		27951.58	19251.55	800.35
DP42	4365	27987.35	19209.2	797.18
DP42R		27987.32	19209.36	797.38
DP43	4367	27996.76	19177.33	794.86
DP43R		27996.69	19177.49	795.11
DP44	4370	28065.94	19110.14	786.58
DP44R		28065.84	19110.33	786.81
DP45	4369	28063.2	19205.71	797.38
DP45R		28063.17	19206.02	797.65
DP46	4364	27974.69	19209.38	796.91
DP46R		27974.56	19209.71	797.14
DP47	4371	28278.87	19100.15	788.57
DP47R		28279.01	19099.92	788.8
DP48	4374	28296.9	19087.96	788.5
DP48R		28296.82	19088.31	788.76
DP49	4372	27448.56	19133.31	806.54
DP49R		27448.63	19133.01	806.64
DP49R		27448.72	19132.94	806.7
DP50	4373	28061.6	19191.59	796.1
DP50R		28061.44	19192.04	796.31
DP51	4375	28224.31	19189.82	791.74
DP51R		28224.61	19189.77	791.96

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
DP52	4376	28075.25	19209.11	797.17
DP52R		28075.37	19209.08	797.39
DP53	4377	28009.66	19278.67	803.38
DP53R		28009.74	19278.74	803.59
DP54	4378	27341.65	19241.58	807.95
DP54R		27341.94	19241.88	808.14
DP55	4379	28012.52	19168.88	794.29
DP55R		28012.73	19168.72	794.52
Edge Gravel		28017.35	19130.21	790.29
Edge Gravel		28018.24	19141.04	791.48
Edge Gravel		28019.06	19145.37	792
Edge Gravel		28020.14	19139.39	791.29
Edge Gravel		28035.84	19220.05	799.2
Edge Gravel		28037.44	19117.98	788.4
Edge Gravel		28038.53	19239.51	800.84
Edge Gravel		28043.1	19254.39	802.85
Edge Gravel		28043.72	19168.06	794.05
Edge Gravel		28044.75	19131.77	789.72
Edge Gravel		28044.96	19159.3	793.21
Edge Gravel		28047.96	19178.96	794.92
Edge Gravel		28050.33	19295.63	806.15
Edge Gravel		28051.56	19135.9	790.33
Edge Gravel		28052.44	19194.37	796.49
Edge Gravel		28055.63	19144.16	790.99
Edge Gravel		28055.66	19272.58	804.28
Edge Gravel		28056.36	19157.65	792.24
Edge Gravel		28056.8	19278.59	804.96
Edge Gravel		28064.73	19133.43	789.53
Edge Gravel		28065.81	19141.39	790.57
Edge Gravel		28069.56	19303.11	806.12
Edge Gravel		28071.53	19262.6	803.67
Edge Gravel		28077.07	19290.59	805.26
Edge Gravel		28085.11	19283.62	804.77
Edge Gravel		28109.26	19279.7	803.7
Edge Gravel		28109.47	19263.82	802.57
Edge Gravel		28125.95	19263.11	801.87
Edge Gravel		28132.37	19261.87	801.53
Edge Gravel		28136.66	19277.76	802.73
Edge Gravel		28137.36	19263.48	801.38
Edge Gravel		28148.26	19261.68	800.82
Edge Gravel		28166.19	19280.21	802.25
Edge Gravel		28179.83	19264.6	799.86

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
Edge Gravel		28202.14	19286.88	802.22
Edge Gravel		28212.04	19271.04	799.89
Edge Gravel		28238.06	19297.22	802.71
Edge Gravel		28250.15	19286.07	801.17
Edge Gravel		28339.66	19326.13	803.63
Edge Gravel		28343.74	19316.46	803.29
Edge Gravel		28383.73	18976.85	788.88
Edge Gravel		28386.25	18983.99	789.35
Edge Gravel		28394.23	18991.9	789.97
Edge Gravel		28407.64	18990.59	790.1
Edge Gravel		28419.26	18985.68	790.05
Edge Gravel		28420.36	19245.95	802.12
Edge Gravel		28422.04	19259.53	802.81
Edge Gravel		28424.7	18966.06	788.93
Edge Gravel		28425.66	19247.52	802.29
Edge Gravel		28427.58	18989.4	790.49
Edge Gravel		28435.14	19013.43	791.1
Edge Gravel		28438.69	19291.31	804.03
Edge Gravel		28442.11	19279.24	803.48
Edge Gravel		28452.29	19293.96	804.03
Edge Gravel		28452.73	18978.66	790.07
Edge Gravel		28454.2	19339.71	807.07
Edge Gravel		28454.54	19350.45	807.06
Edge Gravel		28455.22	19006.73	791.21
Edge Gravel		28455.71	19310.05	804.82
Edge Gravel		28455.75	18975.02	789.84
Edge Gravel		28462.95	19304.14	804.39
Edge Gravel		28470.96	18953.64	788.87
Edge Gravel		28499.12	19342.88	805.07
Edge Gravel		28500.44	19358.52	806.19
Edge Gravel		28500.59	19346.85	805.33
Edge Gravel		28510.54	19339.07	804.54
Edge Gravel		28510.79	18940.64	789.18
Edge Gravel		28513.15	18959.9	789.39
Edge Gravel		28521.7	19366.27	805.19
Edge Gravel		28537.29	19376.89	805.02
Edge Gravel		28559.67	18928.13	789.46
Edge Gravel		28571.29	18928.58	790
Edge Gravel		28589.92	18946.1	789.55
Edge Gravel		28601.85	19427.9	804.33
Edge Gravel		28608.87	18937.77	789.81
Edge Gravel		28610.95	19420.79	804.25

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
Edge Gravel		28626.76	18917.14	789.45
Edge Gravel		28630.4	19037.88	792.96
Edge Gravel		28630.57	18936.89	789.58
Edge Gravel		28631.35	19054.78	793.08
Edge Gravel		28637.73	19053.54	793.16
Edge Gravel		28641.21	19059.53	793.43
Edge Gravel		28647.71	19448.06	804.58
Edge Gravel		28650.08	19055.94	793.13
Edge Gravel		28650.34	19437	804.01
Edge Gravel		28652.99	18919.92	789.32
Edge Gravel		28653.62	18941.82	790.36
Edge Gravel		28655.33	19063.47	793.1
Edge Gravel		28669.54	18953.91	790.4
Edge Gravel		28675.37	18965.72	790.74
Edge Gravel		28683.12	18940.63	789.5
Edge Gravel		28683.92	19009.29	791.25
Edge Gravel		28688.5	18952.34	790.02
Edge Gravel		28690.36	18998.41	790.92
Edge Gravel		28715.62	18988.23	790.24
Edge Gravel		28721.6	19027.29	789.78
Edge Gravel		28729.77	19012.15	789.65
Edge Gravel		28750.57	19479.14	802.81
Edge Gravel		28752.4	19051.4	789.11
Edge Gravel		28754.57	19467.96	802.37
Edge Gravel		28766.19	19052.33	789.04
Edge Gravel		28768.87	19077.21	789.13
Edge Gravel		28777.99	19097.75	788.96
Edge Gravel		28782.94	19082.04	788.79
Edge Gravel		28793.59	19140.32	790.81
Edge Gravel		28802.15	19135.48	790.18
Edge Gravel		28809.23	19164.53	790.38
Edge Gravel		28811.16	19151.41	789.8
Edge Gravel		28823.97	19163.68	788.95
Edge Gravel		28829.08	19177.84	789.45
Edge Gravel		28852.83	19513.75	799.01
Edge Gravel		28855.02	19501.97	798.14
Edge Gravel		28868.02	19186.74	789.29
Edge Gravel		28869.36	19176.13	789.24
Edge Gravel		28896.44	19194.17	790.52
Edge Gravel		28902.73	19184.27	790.78
Edge Gravel		28925.87	19208.39	790.99
Edge Gravel		28930.47	19197.59	791.07

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
Edge Gravel		28947.2	19226.37	791.07
Edge Gravel		28954.21	19539.53	795.36
Edge Gravel		28957	19218	790.62
Edge Gravel		28957.49	19527.94	795.26
Edge Gravel		28985.3	19273.72	790.33
Edge Gravel		28994.81	19266.87	789.91
Edge Gravel		29018.81	19328.3	790.46
Edge Gravel		29030.81	19324.98	789.95
Edge Gravel		29056.55	19542.03	790.26
Edge Gravel		29063.77	19554.1	790.15
Edge Gravel		29065.44	19537.78	789.83
Edge Gravel		29073.38	19428.83	790.83
Edge Gravel		29074.58	19528.76	789.12
Edge Gravel		29080.27	19522.93	789.01
Edge Gravel		29082.84	19425.6	790.64
Edge Gravel		29087.53	19511.56	788.95
Edge Gravel		29089.74	19557.02	789.09
Edge Gravel		29091.96	19477.55	789.72
Edge Gravel		29094.2	19507.99	789.15
Edge Gravel		29103.64	19559.96	788.48
Edge Gravel		29104.81	19473.11	790.26
Edge Gravel		29110.57	19524.4	789.22
Edge Gravel		29119.96	19485.91	790.29
Edge Gravel		29132.26	19490.82	790.02
Edge Gravel		29135.69	19497.69	790.08
MS1	MS1	28323	18887	0
N-C		27838.4	19006.92	782.34
OLD 6 N-C		27904.72	19112.56	786.59
OLD-3 N-C		28288.13	18992.32	782.75
OLD-3 N/C 297		28288.13	18992.32	782.75
OLD-4 N/C 298		28167.8	19031.85	780.8
OLD-4N-C		28167.8	19031.85	780.8
PA-06		27457.18	19125.47	805.76
PA-07		27458.47	19126.39	805.65
PA-08		27459.77	19127.89	805.49
PA-09		27470.79	19117.83	805
Power Pole		27513.09	19040.07	802.14
Power Pole		27806.7	19152.15	793.06
Power Pole		28087.39	19256.85	803.14
Power Pole		28462.61	19398.71	812.88
Power Pole		28644.38	19008.12	791.74
Power Pole		28703.38	19382.98	800.88

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
Power Pole		28763.05	18965.9	787.2
Power Pole		28850.29	19187.65	789.26
Power Pole		28920.57	19367.49	794.58
Power Pole		29149.63	19351.75	790.19
Power Pole		29241.7	19516.82	787.06
Power Pole7E		27231.32	18934.66	832.44
SCG-3 S-5		28076.96	19018.04	777.81
SCS1 I1		28303.05	18929.04	772.19
SCS1 I2	SCS1	28306.85	18921.21	772.2
SCS1 P-1		28310.71	18937.83	773.98
SCS1 P-2		28307.01	18928.09	773.15
SCS1 P-3		28305.32	18925.34	773.05
SCS1 P-4		28303.46	18924.04	773.58
SCS1 P-5		28299.87	18922.33	773.69
SCS1 P-6		28292.51	18929.26	774.22
SCS1 P-7		28290.48	18934.19	773.71
SCS1 P-8		28287.2	18947.79	774.53
SCS1 S-1		28272.21	18936.1	773.33
SCS1 S-10		28314.86	18918.07	772.8
SCS1 S-11		28315.75	18920.45	772.78
SCS1 S-12		28319.76	18927.39	772.79
SCS1 S-13		28323.94	18931.66	773.08
SCS1 S-14		28327.81	18936.25	774.36
SCS1 S-2		28275.75	18930.63	773.6
SCS1 S-3		28279.3	18929.82	773.86
SCS1 S-4		28286.25	18926.35	773.17
SCS1 S-5		28290.28	18923.37	773.15
SCS1 S-6		28294.53	18920.76	773.19
SCS1 S-7		28304.02	18915.08	772.87
SCS1 S-8		28308.01	18914.64	772.8
SCS1 S-9		28312.58	18916.69	772.8
SCS1 V-1		28311.38	18915.78	772.09
SCS2 I-1		28165.4	18999.45	777.72
SCS2 I-2	SCS2	28164.53	18990	777.54
SCS2 P-10		28155.65	19031.16	780.78
SCS2 P-2		28181.09	19008.51	780.15
SCS2 P-3		28178.73	19001.78	779.62
SCS2 P-4		28175.23	18998.74	778.71
SCS2 P-5		28165.59	18998.34	778.7
SCS2 P-6		28159.74	18999.46	778.95
SCS2 P-7		28155.32	19004.48	779.12
SCS2 P-8		28150.83	19009.24	779.49

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
SCS2 P-9		28149.2	19012.37	779.59
SCS2 S-1		28178.77	19005.48	779.05
SCS2 S-10		28153.98	19008.17	778.6
SCS2 S-11		28150.89	19012.11	779.06
SCS2 S-2		28176.16	19001.16	778.78
SCS2 S-3		28174.24	19000.56	778.77
SCS2 S-4		28168.2	19000.14	778.45
SCS2 S-5		28164.09	19000.68	777.83
SCS2 S-6		28163.29	19000.75	777.98
SCS2 S-7		28160.26	19002.1	778.88
SCS2 S-8		28158.1	19003.83	778.81
SCS2 S-9		28156.1	19006.21	778.43
SCS3 I-1		28078.43	19017.24	777.26
SCS3 I-2	SCS3	28079.06	19011.55	777.19
SCS3 P-1		28089.26	19039.79	780.45
SCS3 P-10		28060.95	19045.53	780.5
SCS3 P-2		28086.93	19025.58	778.83
SCS3 P-3		28084.97	19021.58	778.73
SCS3 P-4		28080.29	19017.02	778.1
SCS3 P-5		28078.41	19016.38	778.25
SCS3 P-6		28076.18	19016.74	778.28
SCS3 P-7		28073.1	19018.64	778.28
SCS3 P-8		28067.34	19028.07	779.14
SCS3 P-9		28062.62	19037.97	779.91
SCS3 S-1		28068.67	19029.49	778.53
SCS3 S-10		28085.42	19025.5	777.86
SCS3 S-2		28072.02	19022.92	778
SCS3 S-3		28073.26	19021.2	777.91
SCS3 S-4		28074.35	19019.07	777.8
SCS3 S-7		28078.98	19017.94	777.53
SCS3 S-8		28082.86	19021.15	777.69
SCS3 S-9		28084.01	19023.01	777.73
SCS3S-6		28077.94	19017.66	777.38
SCS4 I-1		27951.44	19071.35	783.53
SCS4 I-2	SCS4	27960.18	19064.01	783.24
SCS4 P-1		27943.33	19132.23	789.21
SCS4 P-10		27925.85	19085.18	785.58
SCS4 P-2		27925.76	19109.21	787.07
SCS4 P-3		27923.71	19095.1	786.21
SCS4 P-4		27924.17	19093.04	786.19
SCS4 P-5		27931.32	19072.76	785.05
SCS4 P-6		27950.69	19070.14	784.86

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
SCS4 P-7		27952.74	19071.74	784.36
SCS4 P-8		27955.47	19079.89	785.3
SCS4 P9		27954.83	19091.59	786.17
SCS4 S-1		27953.56	19084.75	784.53
SCS4 S-2		27953.81	19080.59	784.57
SCS4 S-3		27952.53	19075.82	784.35
SCS4 S-4		27950.95	19072.07	784.16
SCS4 S-5		27950.17	19071.75	783.88
SCS4 S-6		27944.22	19072.47	784.36
SCS4 S-7		27933.02	19074.75	784.52
SCS4 S-8		27929.42	19081.5	784.93
SCS4 S-9		27926.48	19085.47	785.33
SCS5 I-1		27871.98	19066.33	784.37
SCS5 I-2	SCS5	27876.76	19055.46	784.23
SCS5 P-1		27853.14	19074.63	785.49
SCS5 P-2		27871.31	19065.04	785.73
SCS5 P-3		27873.91	19066.25	785.47
SCS5 P-4		27884.15	19085.24	785.43
SCS5 P-5		27885.88	19098.45	785.92
SCS6 I1		27584.48	19098.69	796.66
SCS6 I2	SCS6	27604.49	19101.48	796.3
SCS6 P-1		27575.41	19106.21	798.47
SCS6 P-2		27584.33	19100.66	798.01
SCS6 P-3		27585.6	19098.79	798.05
SCS6 P-4		27578.51	19088.19	798.78
SP01	SP01	27498.56	19097.97	803.67
SP02	SP02	27886.64	19196.17	794.83
SP03	SP03	27490.11	19074.96	804.12
SP04	SP04	28281.79	18935.26	772.53
SS01002	SS01	28291.42	18948.02	774.6
SS01003	SS01	28294.4	18947.7	774.72
SS01004	SS01	28297.68	18944.79	774.3
SS01005	SS01	28284.93	18937.32	773.27
SS01006	SS01	28290.9	18936.66	772.89
SS01007	SS01	28301.66	18931.81	772.37
SS02008	SS02	28161.02	19023.75	780.34
SS02009	SS02	28163.9	19014.16	779.11
SS02010	SS02	28176.74	19000.99	778.31
SS02011	SS02	28164.59	18995.84	776.51
SS02012	SS02	28157.08	18996.79	777.25
SS02013	SS02	28173.12	18988.95	775.71
SS02014	SS02	28164.25	18985.84	9999.99

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
SS03015	SS03	28081.18	19073.19	783.24
SS03016	SS03	28073.27	19066.3	782.84
SS03017	SS03	28083.08	19057.96	782.14
SS03018	SS03	28076.3	19056.02	781.85
SS03019	SS03	28082.13	19046.28	780.98
SS03020	SS03	28076.9	19034.89	778.45
SS03021	SS03	28066.39	19039.24	779.25
SS03022	SS03	28075.26	19014.55	777.07
SS04023	SS04	27945.45	19122.44	787.81
SS04024	SS04	27952.35	19119.97	787.58
SS04025	SS04	27952.62	19103.8	786.4
SS04026	SS04	27943.04	19100.12	785.75
SS04027	SS04	27932.01	19104.11	786.17
SS04028	SS04	27947.64	19087.88	784.83
SS04029	SS04	27981.79	19075.14	782.81
SS04030	SS04	27960.03	19066.69	782.94
SS04032	SS04	28009.01	19018.64	778.97
SS0431	SS04	27940.23	19049.75	783
SS05033	SS05	27867.24	19084.23	784.51
SS05034	SS05	27847.34	19083.14	784.41
SS05035	SS05	27859.3	19064.99	784.2
SS05036	SS05	27865.47	19039.77	782.99
SS05037	SS05	27849.86	19039.66	783.11
SS05038	SS05	27883.11	19036.64	782.71
SS05039	SS05	27878.61	19064.67	784.17
SS05040	SS05	27867.31	19122.5	787.59
SS05041	SS05	27809.93	19112.04	785.29
SS06046	SS06	27473.16	19086.61	805.18
SS06047	SS06	27475.37	19065.51	804.88
SS06048	SS06	27491.38	19074.76	804.32
SS06049	SS06	27504.12	19096.81	803.33
SS06050	SS06	27521.48	19099.84	802.81
SS06051	SS06	27530.1	19082.79	802.08
SS06052	SS06	27535.08	19071.06	801.31
TP01	TP01	27498.32	19097.14	803.3
TP02	TP02	27489.88	19075.82	804.13
TP03	TP03	27527.4	19074.19	802.12
TP04	TP04	27978.73	19131.77	790.62
TP05	TP05	27978.58	19111.61	787.73
TP06	TP06	27936.33	19094.24	785.13
TP07	TP07	27928.51	19128.22	788.51
TP08	TP08	28050.23	19101.05	785.97

WAG 4 Site Investigation Location Data

PROJECTID	REPORTID	EASTING	NORTHING	ELEVATION
TP09	TP09	28057.94	19078.95	784.14
TP10	TP10	28098.97	19055.86	780.97
TP11	TP11	28078.87	19021.44	777.41
TP12	TP12	28079.13	19007.17	775.85
TRIB01		28160.67	18979.78	774.49
TRIB02		28091.87	18983.56	774.9
TRIB03		28002.96	18993.14	775.79
TRIB04		27921.19	19003.08	776.88
TRIB05		27885.46	19010.79	780.39
TRIB06		27855.96	18991.59	780.3
TRIB07		27823.21	19009.86	781.8
TRIB08		27816.84	18999.73	780.94
TRIB09		27757.71	19019.5	783.15
TRIB10		27697.87	19023.6	783.67
TRIB11		27669.63	19046.02	784.89
TRIB12		27667.81	19036.87	785.77
W190	0190	28047	19208	798.81
W191	0191	28034	19008	778.44
WP01	2567	27459.8	19151.25	0
WP03	2576	27475.98	19125.8	0
WP04	2577	27512.92	19120.42	0
WP05	2578	27482.12	19100.63	0
WP09	2582	27433.13	19089.91	0
WP10	2568	27448.64	19057.41	0
WP11	2569	27433.19	19089.89	0
WP13	2571	27554.78	19063.65	0
WP14	2572	27550.4	19088.2	0

APPENDIX D

**GROUND-PENETRATING RADAR
SURVEY RESULTS**

APPENDIX D, GROUND PENETRATING RADAR SURVEYS OF SWSA 4

William E. Doll
Environmental Sciences Division, ORNL

Introduction

In August 1994, six ground penetrating radar (GPR) lines were run across portions of SWSA 4 (WAG 4) on the Oak Ridge Reservation. These were laid out in two groups: one group near the bathtubbing trenches near the western portion of the WAG, and one group near Drive Point 4, near the center of the WAG. Data were collected with a Sensors and Software PulseEkko IV system using 25 MHz and 50 MHz antennas, at 1-ft spacing. In general, the 50 MHz antennas seem to have a penetration depth of about 10 ft, and the 25 MHz antennas seem to penetrate about 15 ft. Data were collected along one line (C03) in the central group with 100 MHz antennas, but these had at best a penetration of 6–7 ft, and were not used beyond that test.

The radar lines locations were selected with the intent of crossing one or more trenches in a direction which is approximately perpendicular to their axes. This was determined from magnetic maps and photography that were available before field operations began. Locations of the end points of the GPR lines were surveyed in after acquisition to allow direct comparison of the GPR data with other data sets. Two of the survey flags (at the west end of line W03 and the east end of line W01) were pulled up, presumably by animals, between the time the GPR data were collected and the time when the survey crew acquired their data, so the locations of these two points is approximate.

The GPR method provides cross-sectional images of the subsurface by reflecting radar pulses from natural or man-made objects which have different dielectric properties than overlying or surrounding materials. The cross-sectional images which are included in this report are likely to include reflections from materials within the trenches and weathered bedrock between and beneath the trenches. There is no simple way of distinguishing between the man-made and natural objects, which makes interpretation of these images particularly challenging.

Data Acquisition Process

The data acquisition process consisted on an initial phase in which the transmitting antenna was kept stationary while the receiving antenna was moved away incrementally; data were acquired at 0.5-ft intervals. This process is called a walkaway test, and is used to determine subsurface velocities and to select the optimal separation between antennae for the acquisition phase. If possible, data are acquired over a target at known depth adjacent to the site, such as a culvert, to confirm these measurements. During the acquisition phase, data are acquired by keeping the antennae at constant separation (e.g., 5 ft) and collecting data at 1-ft intervals along a traverse. In this manner, an image is produced of the subsurface beneath the profile line. When the system is functioning optimally, 100 ft of profile data can be acquired in an hour. All data are acquired by following the instrument manufacturer's operating procedures and by following the principles outlined in the instrument manual.

Results from the Western Study Area

The three radar line locations in the western group are shown superimposed on the vertical magnetic gradient map of SWSA 4 in Figs. 1 and 2. Figure 2 is blown up to match the horizontal scale of the GPR lines. All of the radar lines have their 0 point on the left end of the lines mapped in Figs. 1 and 2. Both 25 MHz and 50 MHz data were collected along each of these three lines. In many ways, the 25 MHz data (Figs. 3a–c) provide the clearest correlation with the magnetic gradient data. Figure 3a shows a distinct anomaly extending downward from about 6 ft depth between the 110 and 130 ft markers of Line W01. This correlates nicely with the midpoint of a strong linear negative and positive magnetic gradient anomaly that extends to the northwest of this point. The same magnetic anomaly is observed on GPR line W02 at about 55–70 ft and GPR Line W03 at 40–50 ft.

The same features appear as reflectors on the 50 MHz GPR lines (Figs. 4a–c), but their shape and character are more complicated. Figure 4a, for example, seems to indicate that the source of the reflections is broader than observed in the 25 MHz data. Other strong reflectors in the GPR data from Line 1 that seem to correlate with magnetic anomalies occur at 5–20 ft and 35–70 ft. Along Line 2 (Figs. 3b and 4b), anomalies seem to match the magnetic data at 0–15 ft and 100–110 ft. The 25 MHz image from Line 3 (Fig. 3c) shows a thicker ground wave between 0 and 25 ft (at a depth of 0–5 ft) indicating a lateral change in near surface properties that may correlate with trench fill materials. Both the 25 MHz and 50 MHz images for this line seem to show reflectors at a depth of 5–10 ft along the entire eastern $\frac{2}{3}$ of the line. It is difficult to speculate as to whether these are due to manmade or natural materials, although the magnetic map seems to show anomalies extending at least from 0 to 70 ft along the line.

In general, the radar data from the western lines provides some constraints on trench locations that cannot be obtained from the magnetic data alone. The widths of some of the trenches seem to be constrained by the GPR data, and depths of some of the GPR anomalies could be used as input to modeling programs used to interpret the magnetic data.

Results from the Central Study Area

Data were collected along three closely spaced traverses near the center of WAG 4. Maps showing the location of these lines superimposed on magnetic gradient data are shown in Figs. 5 and 6, and 50 MHz GPR images from those lines are shown at the same horizontal scale in Fig. 7. One of the most obvious anomalies on these lines is a diffractor that is centered at 30 ft on Line C02 and 43 ft on Line C03. The strongest magnetic anomaly on Line C02 is found near this point, but only a weak magnetic anomaly occurs near the GPR anomaly on Line C03. A line connecting these two anomalies is parallel to the trend of the magnetic anomalies in the area. Although a magnetic anomaly seems to occur at the appropriate location on GPR Line C02, there is only a small corresponding anomaly in the GPR data. The largest magnetic gradient anomalies in the central region (besides the large one at 30 ft on Line C02) occur away from the GPR lines.

A high resolution data set was acquired with 50 MHz antennas along Line C03 by compositing data collected from eight antenna separation distances. The procedure used is that which was developed by the petroleum industry for enhancement of seismic data, and is referred to as Common Depth Point (CDP) processing. The image generated by processing these data is shown in Fig. 8. The CDP numbers at the top of the figure begin at 200, and are recorded in 0.5 ft increments. Thus,

40 ft on Fig. 7c corresponds to CDP 280 on Fig. 8. The time scale is the same as in the other figures, with 0.1 ns corresponding to about 8 ft depth. The image in Fig. 8 is clearly superior to the image in Fig. 7c. The diffractor at 40 ft and CDP 280 is reduced to a point with some weak tails in the CDP image (Fig. 8). The region between CDP 203 and the diffraction at CDP 280 has the appearance of a filled depression in the figure, which could be related to the trenches. Even if this interpretation is incorrect, it is clear that the character of the subsurface is different along the first 40 ft than along the rest of the line. The CDP data that were collected along Line C03 were extended about 10 ft east of the flagged end of the line. Thus, this image does extend over a large magnetic gradient anomaly (Fig. 6). This anomaly appears as a pair of features at about 6 and 8 ft depth on the GPR image. Two other CDP GPR anomalies (Fig. 8) which appear to correspond to magnetic gradient anomalies occur at the west end of Line C03 (5 ft depth between CDP 205 and CDP 210) and at CDP 340 at about 10 ft depth. This last anomaly occurs in an area where there are intermediate magnetic anomalies, but does not correspond to a specific peak.

Of the seven trenches shown in Fig. 9, three (TT039, TT040, and TT043) are in excellent agreement with the radar data. The bottom of TT039, as projected by a nearby drive point, is a perfect match with a strong radar reflection at the same depth. Drive points in TT040 penetrated to 8.7 ft and 13.2 ft; GPR data suggest that the bottom of the trench is slightly deeper than the bottom of TT039 along Line C03, at approximately 9.8 ft. It can be inferred from the data that the depth of TT043 along C03 is shallower, at approximately 8 ft. These trenches occur in two distinct, bowl-like depressions that appear between 0.05 ns and 0.10 ns (5 ft to 10 ft) as highlighted in Fig. 9. It appears that each of these "bowls" consists of 2 to 3 trenches. It is noteworthy that these bowls have an echo that occurs about 0.08 ns after the first reflection.

The strongest reflection in the radar data occurred at CDP 284, at depths from 5 to 7 ft. This signal is caused by a localized source, as indicated by the diffraction hyperbolae (tails) that show that it is being detected even when the antennae are as far as 10 ft east and west of its center. Similar reflectors occur at the same time (depth) between CDPs 204 and 217 and between CDPs 395 and 410, but these are weaker, as indicated by the absence of large diffraction hyperbolae there. The reflector between CDPs 204 and 217 matches an area thought to be undisturbed, between trenches TT030 and TT039. The other two are mapped onto the eastern sides of trenches TT041 and TT044. If the reflections from 5 ft to 7 ft can be assumed to represent undisturbed bedrock, then this would imply that the boundaries of TT041 and TT044 should be moved 2 ft and 4 ft, respectively, to the west of their locations shown in Fig. 9. However, it is possible that the reflections are caused by buried waste.

Trench TT042 is problematic. It is located a little east of the east end of the diffraction hyperbola at CDP 283, and no reflector shallower than 10 ft occurs at that location. The first deep reflector occurs at a depth of about 13 ft, and is similar to the reflection between CDP 205 and 405 at the same depth that was interpreted as bedrock. Trench maps show solid-line and dashed-line versions of the location of TT042, some of which show it terminating about 25 ft south of Line C03. If it is not absent along Line C03, its depth is estimated at about 13 ft.

Summary

From our test data at two sites, we can conclude that GPR data are useful in augmenting magnetic gradient data for imaging of trenches in WAG 4. However, GPR is not the perfect imaging tool that some might wish for and the data must be interpreted very carefully. The GPR antennas

which we used have a maximum penetration depth of about 15 ft at this site, and so will be ineffective where thick fill was deposited over the trenches. Lower frequency antennas are not a reasonable option, though it might be possible to improve the penetration slightly by using a more powerful transmitter.

GPR systems can detect trench materials that are nonmagnetic, such as aluminum, stainless steel, and biological materials, as well as magnetic targets. This may be an advantage or disadvantage when compared with magnetic detectors. It means that GPR will be able to detect trenches whether or not they are filled with metallic wastes. However, it also means that GPR is susceptible to reflections from geologic materials, such as weathered rock along trench boundaries, and blocks of fill material (such as cement), as well as the targets. Certain objects will generate diffraction hyperbolae in GPR images, but these usually can be recognized quickly and do not often result in misinterpretations. Because magnetic anomalies are always dipolar (i.e., they always have a positive and negative pole), because they broaden with the depth of the source, and because the observed anomaly is the sum of anomalies from all subsurface magnetic objects, modeling solutions to magnetic data are not unique. Magnetic data from this part of WAG 4 do not correlate well with trench maps. This probably occurs because much of the material in the trenches is not magnetic, though it may have been magnetic when buried (e.g., steel drums may have decayed to nonmagnetic minerals such as magnetic or hematite).

Some anomalies (e.g., the central anomalies on Lines C02 and C03) are enhanced on the GPR data much better than they are on the magnetic data. In other cases, both GPR and magnetic methods detect an anomaly, but the GPR provides more spatial control (e.g., the trench in the Western study area). CDP processing seems to improve the sensitivity of the GPR system, but is more time consuming to acquire and process. Data acquisition for the image shown in Fig. 8 took about three hours in the field and about three days of processing afterwards. The best way of determining the effectiveness of different imaging tools is to acquire data over a site where the locations and nature of the targets are well known, as use that information to select subsequent acquisition tools and parameters.

Figure 1

Figure 2

4/26/43 11/4/43

D-9

Figure 3a

LINE 2 40 111110

D-10

Figure 3b

Figure 3c

57ns ground start
47 ns ground end

LINE 1 SURFING
/ STEP SIZE

Figure 4a

Figure 4b

LINE 3 50MHz

22ms ground station
42 ground wave

D-14

Figure 4c

Figure 5

Figure 6

Figure 7a

Figure 7b

50 MHz
LINE 003

Figure 7c

Figure 8

Approximate trench locations superimposed on radar data. TB=interpreted trench bottom

Uninterpreted radar section for comparison with above

Fig 9. Approximate trench locations superimposed on GPR

WAG 4 Site Characterization

APPENDIX E

DRIVE-POINT INSTALLATION LOGS

WAG4 WELL COMPLETION LOG FOR WELL #1 (D01)

DATE July 18, 1994 CREW N. Farrow J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>4"</u>	<u>X 1</u>	<u>4 "</u>	
<u>1</u>	sub	<u>2 1/4 777"</u>	<u>X 1</u>	<u>2.25 "</u>	
<u>11</u>	rod	<u>60"</u>	<u>X 2</u>	<u>120 "</u>	
<u>1</u>	rod	<u>24"</u>	<u>X 1</u>	<u>24 "</u>	<u>12' 6 1/4"</u>
<u>1</u>	rod	<u>12"</u>	<u>X</u>	<u>"</u>	<u>150.25" (12.5')</u>

Driving information

Point, sub and 5' rod driven to a stick-up distance of 4 " Time begin 1517 Time end 1519
 Additional (5' 2' X) rod driven to a stick-up of 2 " 1541 1546
 Additional (8' 2' X) rod driven to a stick-up of 12 " 1555 1607
 Additional (5' 2' 1') rod driven to a stick-up of " 1608
 Stick-up after pull back 24 " - Stick-up before pull back 12 " = 12 " of pull back. Needs to be 13.25" or more to have the seal to seat in point sub.

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>1"</u>	<u>X 1</u>	<u>1 "</u>	
<u>1</u>	screen	<u>12"</u>	<u>X 1</u>	<u>12 "</u>	
<u>1</u>	seal	<u>0.25"</u>	<u>X 1</u>	<u>0.25 "</u>	
<u>2</u>	riser	<u>60"</u>	<u>X 2</u>	<u>120 "</u>	
<u>1</u>	riser	<u>24"</u>	<u>X 1</u>	<u>24 "</u>	
<u>1</u>	riser	<u>12"</u>	<u>X 1</u>	<u>12 "</u>	<u>171.0" 14' 3"</u>
<u>1</u>	cap	<u>1.75"</u>	<u>X 1</u>	<u>1.75 "</u>	<u>157.0" (13' 3")</u>

Well completion information

Final stick-up distance = 24 " 38.5" above ground surface. 38.5" 380 28-94

14' 13" 3" (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 11' 11"

Was the stick-up after driving altered to produce the final stick-up? ✓ YES NO

What was done? Pulled back 12" instead of 11.5"

Final stick up of well = 38.5" (3' 2.5")

COMMENTS Installed PVC casing 7-19-94

WAG4 WELL COMPLETION LOG **FOR WELL DP 2**

DATE July 19, 1994 **CREW** N. Farrow, C. Lamb, J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	4"	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	2.25" 777	X <u>1</u>	<u>2.25</u> "	
<u>11</u>	rod	60"	X <u>2</u>	<u>120</u> "	
<u>1</u>	rod	24"	X <u>X</u>	<u>24</u> "	138.25" 11' 6.25"
<u>1</u>	rod	12"	X <u>1</u>	<u>12</u> "	<u>162.25</u> " (13' 6.25")

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>4</u> "	<u>1044</u>	<u>1047</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>1</u> "	<u>1100</u>	<u>1101</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>15</u> "	<u>1105</u>	<u>1106</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>14.5</u> "		

* Stick-up after pull back 27 " - Stick-up before pull back 15 " = 12 " of pull back. Needs to be 13.25 " or more to have the seal to seat in point sub.
11.5"

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	1"	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	0.25"	X <u>1</u>	<u>0.25</u> "	
<u>2</u>	riser	60"	X <u>2</u>	<u>120</u> "	
<u>1</u>	riser	24"	X <u>1</u>	<u>24</u> "	
<u>1</u>	riser	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	1.75"	X <u>1</u>	<u>1.75</u> "	<u>159.0</u> " (13' 3")

Well completion information

Final stick-up distance = 26.25 " above ground surface.

159.0 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 128.75 "

Was the stick-up after driving altered to produce the final stick-up? ☒ YES ☐ NO

What was done? _____

COMMENTS

Took off 2' rod & replaced with 1 ft rod.

Note: point stayed on, using PVC casing and dodd-blow hammer extended the point and set casing to a stick up of 26.25"

* Final stick up of drive rods: 27" - 24" = 3" + 12" = 15"

159.0
13' 3"

WAG4 WELL COMPLETION LOG **FOR WELL DP3**

DATE July 19, 1994 **CREW** N. Farrow, C. Lamb, J. LaFosse

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	4"	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25</u> "???"	X <u>1</u>	<u>2.25</u> "	
<u>11</u>	rod	60"	X <u>2</u>	<u>120</u> "	
	rod	24"	X	"	
	rod	12"	X	"	<u>126.25</u> " (<u>10'6 1/2"</u>)

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>1.5</u> "	<u>1410</u>	<u>1411</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>7.5</u> "	<u>1417</u>	<u>1420</u>
Additional (5', 2', 1') rod driven to a stick-up of _____ "		
Additional (5', 2', 1') rod driven to a stick-up of _____ "		
Stick-up after pull back <u>17.5</u> " - Stick-up before pull back <u>7.5</u> " = <u>10</u> " of pull back. Needs to be 13.25" or more to have the seal to seat in point sub.		

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	1"	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	0.25"	X <u>1</u>	<u>0.25</u> "	
<u>2</u>	riser	60"	X <u>2</u>	<u>120</u> "	
	riser	24"	X	"	
	riser	12"	X	"	
<u>1</u>	cap	1.75"	X <u>1</u>	<u>1.75</u> "	<u>135.0</u> " (<u>11'3"</u>)

Well completion information

Final stick-up distance = 20 " above ground surface.

135.0 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 111 "

Was the stick-up after driving altered to produce the final stick-up? _____ YES ☒ NO

What was done? _____

COMMENTS

WAG4 WELL COMPLETION LOG **FOR WELL DP4**

DATE 7-20, 1994 **CREW** J. Farrow J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
1	point	4"	X 1	4 "	
1	sub	2.25 ???"	X 1	2.25 "	
113	rod	60"	X 2	120 "	
11	rod	24"	X 2	48 "	174.25 14'6 1/4"
*	rod	12"	X *	12 "	186.25 (15'6 1/4")

Driving information

Point, sub and 5' rod driven to a stick-up distance of 1.5 "

Additional (5'2', 1') rod driven to a stick-up of 1.5 "

Additional (5'2', 1') rod driven to a stick-up of 4.5 "

Additional (5'2', 1') rod driven to a stick-up of 15.5 "

* Stick-up after pull back 27.75 " - Stick-up before pull back 15.5 " = 12.25 " of pull back. Needs to be 12.25 " or more to have the seal to seat in point sub.

11.5"

Time begin Time end

0854 0901

0907 0908

0912 0913

0919 0920

PVC well stock

quantity	description	length	factor	sub total	total length
1	point	1"	X 1	1 "	
1	screen	12"	X 1	12 "	
1	seal	0.25"	X 1	0.25 "	
11	riser	60"	X 2	120 "	
11	riser	24"	X 2	48 "	
1	riser	12"	X 1	12 "	
1	cap	1.75"	X 1	1.75 "	195.0 "(16'3")

Well completion information

Final stick-up distance = 28.5 " above ground surface.

195.0 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 162.5 "

Was the stick-up after driving altered to produce the final stick-up? ☒ YES ☐ NO

What was done? Removed 1 ft and revised total length accordingly

COMMENTS Removed one ft of casing after pull back

* Final stick up of drive rods: 27.75 " - 12 " = 15.75 " 162.5-94

WAG4 WELL COMPLETION LOG **FOR WELL DPS**

Abandoned

DATE 7-20, 1994 **CREW** N. Farrow, J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>4"</u>	<u>X 1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25 22"</u>	<u>X 1</u>	<u>2.25</u> "	
<u>1</u>	rod	<u>60"</u>	<u>X</u>		
<u>1</u>	rod	<u>24"</u>	<u>X</u>		
<u>1</u>	rod	<u>12"</u>	<u>X</u>		

_____, (____')

Driving information

	<u>Time begin</u>	<u>Time end</u>	<u>Begin / End</u>
Point, sub and 5' rod driven to a stick-up distance of _____"	<u>1126/1135</u>	<u>1129/1136</u>	<u>1135/</u>
Additional (5', 2', 1') rod driven to a stick-up of _____"			
Additional (5', 2', 1') rod driven to a stick-up of _____"			
Additional (5', 2', 1') rod driven to a stick-up of _____"			

Stick-up after pull back _____" - Stick-up before pull back _____" = _____" of pull back. Needs to be 13.25" or more to have the seal to seat in point sub.

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>1"</u>	<u>X</u>		
<u>1</u>	screen	<u>12"</u>	<u>X</u>		
<u>1</u>	seal	<u>0.25"</u>	<u>X</u>		
<u>1</u>	riser	<u>60"</u>	<u>X</u>		
<u>1</u>	riser	<u>24"</u>	<u>X</u>		
<u>1</u>	riser	<u>12"</u>	<u>X</u>		
<u>1</u>	cap	<u>1.75"</u>	<u>X</u>		

_____, (____')

Well completion information

Final stick-up distance = _____" above ground surface.
 _____ (Total apparatus length) - (4") - (stick-up) = (top of screen interval) _____
 Was the stick-up after driving altered to produce the final stick-up? YES NO
 What was done? _____

COMMENTS

Abandoned due to concrete ~ 1 ft Below ground surface; move ~ 4 ft toward BTT Area and try again.

WAG4 WELL COMPLETION LOG **FOR WELL DP5**

DATE 7-20, 1994 **CREW** N. Farrow J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	4"	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25</u> <u>229"</u>	X <u>1</u>	<u>2.25</u> "	
<u>11</u>	rod	60"	X <u>2</u>	<u>120</u> "	
<u>1</u>	rod	24"	X <u>1</u>	<u>24</u> "	
<u>4</u>	rod	12"	X <u>4</u>	<u>48</u> "	<u>174.25"</u> (<u>14'6 1/4"</u>)

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>1.5</u> "	<u>1200</u>	<u>1204</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>2.5</u> "	<u>1210</u>	<u>1213</u>
Additional (5', 2', <u>1</u>) rod driven to a stick-up of <u>13</u> "	<u>1218</u>	<u>1223</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>11.5</u> "		
Stick-up after pull back <u>25.25</u> " - Stick-up before pull back <u>13</u> " = <u>12.25</u> " of pull back. Needs to be <u>13.25</u> " or more to have the seal to seat in point sub.		

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	1"	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	0.25"	X <u>1</u>	<u>0.25</u> "	
<u>111</u>	riser	60"	X <u>3</u>	<u>180</u> "	
<u>1</u>	riser	24"	X <u>1</u>	<u>24</u> "	
<u>1</u>	riser	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	1.75"	X <u>1</u>	<u>1.75</u> "	<u>195.0"</u> (<u>16'3"</u>)

Well completion information

Final stick-up distance = 25.25 " above ground surface.

~~39.5~~ (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 151.5 "

Was the stick-up after driving altered to produce the final stick-up? YES ☒ NO

What was done? _____

COMMENTS

Tight driving All the way down

195
- 39.5
155.5
- 4
151.5

WAG4 WELL COMPLETION LOG FOR WELL DP6

DATE July 22, 1994 CREW N. Farrow C. Lamb

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>4"</u>	<u>X 1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25</u> ^{22 3/4"}	<u>X 1</u>	<u>2.25</u> "	
<u>11</u>	rod	<u>60"</u>	<u>X 2</u>	<u>120</u> "	
<u>1#</u> ^(20' 7-22-94)	rod	<u>24"</u>	<u>X 2</u>	<u>48</u> "	
<u>111</u>	rod	<u>12"</u>	<u>X 3</u>	<u>36</u> "	<u>216.25</u> ^{17' 6 1/4"}

Driving information

Point, sub and 5' rod driven to a stick-up distance of 2 " Time begin 0917 Time end 0918
 Additional (5', 2', 1') rod driven to a stick-up of 2 " 0927 0929
 Additional (5', 2', 1') rod driven to a stick-up of 7 1/4 " 0938 0939
 2 X Additional (5', 2', 1') rod driven to a stick-up of 5 3/8 " 0946 0947
 Stick-up after pull back 31 " - Stick-up before pull back 19 " = 12 " of pull back. Needs to be 13.25" or more to have the seal to seat in point sub.

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>1"</u>	<u>X 1</u>	<u>1</u> "	
<u>1</u>	screen	<u>12"</u>	<u>X 1</u>	<u>12</u> "	
<u>1</u>	seal	<u>0.25"</u>	<u>X 1</u>	<u>0.25</u> "	
<u>111</u>	riser	<u>60"</u>	<u>X 3</u>	<u>180</u> "	
<u>1</u>	riser	<u>24"</u>	<u>X 1</u>	<u>24</u> "	
<u>1</u>	riser	<u>12"</u>	<u>X 1</u>	<u>12</u> "	<u>231</u>
<u>1</u>	cap	<u>1.75"</u>	<u>X 1</u>	<u>1.75</u> "	<u>131</u> "(19' 3")

Well completion information

Final stick-up distance = 44 " above ground surface.

131 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 83 "

Was the stick-up after driving altered to produce the final stick-up? YES ☒ NO

What was done? _____

COMMENTS From 10'-15' drove steady, but tight.

Additional rods

2 ft

stickup
19"

BEGIN
0951

END
0953

234.25 - 21' 6" = TOTAL

WAG4 WELL COMPLETION LOG FOR WELL DP7

DATE July 22, 1994 CREW N. Farrow, C. Lamb

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	4"	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25222"</u>	X <u>1</u>	<u>2.25</u> "	
<u>111</u>	rod	60"	X <u>3</u>	<u>180</u> "	
<u> </u>	rod	24"	X <u> </u>	<u> </u> "	
<u> </u>	rod	12"	X <u> </u>	<u> </u> "	<u>186.25", (15' 6 1/4")</u>

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>2 1/2</u> "	<u>1103</u>	<u>1105</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>3 1/2</u> "	<u>1109</u>	<u>1111</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>22</u> "	<u>1116</u>	<u>1119</u>
Additional (5', 2', 1') rod driven to a stick-up of <u> </u> "		
Stick-up after pull back <u>33 1/2</u> " - Stick-up before pull back <u>22</u> " = <u>11 1/2</u> " of pull back. Needs to be <u>13.25"</u> or more to have the seal to seat in point sub. <u>11.5"</u>		

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	1"	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	0.25"	X <u>1</u>	<u>0.25</u> "	
<u>111</u>	riser	60"	X <u>3</u>	<u>180</u> "	
<u> </u>	riser	24"	X <u> </u>	<u> </u> "	
<u>1</u>	riser	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	1.75"	X <u>1</u>	<u>1.75</u> "	<u>207", (17' 3")</u>

Well completion information

Final stick-up distance = 47 1/2 " above ground surface.

207 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 155.5

Was the stick-up after driving altered to produce the final stick-up? YES ✓ NO

What was done?

COMMENTS Hit water At 3ft Below Ground Surface When inserting
PVC casing

207
- 47.5
159.5
- 4
155.5

WAG4 WELL COMPLETION LOG FOR WELL DPS

DATE July 22, 1994 CREW N. Farrar, C. Lamb

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	4"	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	2.25 <u>22"</u>	X <u>1</u>	<u>2.25</u> "	
<u>11</u>	rod	60"	X <u>2</u>	<u>120</u> "	
<u>18</u>	rod	24"	X <u>1</u>	<u>24</u> "	
<u>1</u>	rod	12"	X <u>1</u>	<u>12</u> "	<u>150.25</u> ", (12' 6 1/4")

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>5 1/2</u> "	<u>1354</u>	<u>1355</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>3 1/2</u> "	<u>1410</u>	<u>1412</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>7 1/2</u> "	<u>1419</u>	<u>1419</u>
Additional (5', 2', 1') rod driven to a stick-up of <u> </u> "		
Stick-up after pull back <u>19.5</u> " - Stick-up before pull back <u>7 1/2</u> " = <u>12</u> " of pull back. Needs to be 13.25" or more to have the seal to seat in point sub.		

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	1"	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	0.25"	X <u>1</u>	<u>0.25</u> "	
<u>11</u>	riser	60"	X <u>2</u>	<u>120</u> "	
<u>1</u>	riser	24"	X <u>1</u>	<u>24</u> "	
<u>1</u>	riser	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	1.75"	X <u>1</u>	<u>1.75</u> "	<u>171</u> ", (14' 3")

Well completion information

Final stick-up distance = 35 " above ground surface.

171 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 132 "

Was the stick-up after driving altered to produce the final stick-up? YES ✓ NO

What was done?

COMMENTS Had to use steel rods to knock drive point out.

171
-35
136
-4
132

WAG4 WELL COMPLETION LOG FOR WELL DP9

DATE July 26, 1994 CREW N. Farrow, J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>4"</u>	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>225.2222</u> (225.2222 ft)	X <u>1</u>	<u>225.22</u> "	
<u>11</u>	rod	<u>60"</u>	X <u>2</u>	<u>120</u> "	
	rod	<u>24"</u>	X		
	rod	<u>12"</u>	X		<u>126.25"</u> (10'6 1/4")

Driving information

Point, sub and 5' rod driven to a stick-up distance of 4 " Time begin 0755 Time end 0756
 Additional (5', 2', 1') rod driven to a stick-up of 12 " 0801 0803
 Additional (5', 2', 1') rod driven to a stick-up of "
 Additional (5', 2', 1') rod driven to a stick-up of "
 Stick-up after pull back 24 " - Stick-up before pull back 12 " = 12 " of pull back. Needs to be 13.25 " or more to have the seal to seat in point sub.
11.5"

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>1"</u>	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	<u>12"</u>	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	<u>0.25"</u>	X <u>1</u>	<u>0.25</u> "	
<u>11</u>	riser	<u>60"</u>	X <u>2</u>	<u>120</u> "	
	riser	<u>24"</u>	X		
<u>1</u>	riser	<u>12"</u>	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	<u>1.75"</u>	X <u>1</u>	<u>1.75</u> "	<u>147</u> " (11'3")

Well completion information

Final stick-up distance = 37.5 " above ground surface.
147 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 105.5"
 Was the stick-up after driving altered to produce the final stick-up? YES ☒ NO
 What was done?

COMMENTS

147
- 37.5

109.5
- 4

105.5

WAG4 WELL COMPLETION LOG FOR WELL DP10

DATE July 29, 1994 CREW N Farrow, J. LaFrost

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>4"</u>	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>225-???"</u>	X <u>1</u>	<u>225</u> "	
<u>11</u>	rod	<u>60"</u>	X <u>2</u>	<u>120</u> "	
	rod	<u>24"</u>	X <u> </u>	<u> </u> "	
	rod	<u>12"</u>	X <u> </u>	<u> </u> "	<u>126.25", (10'6 1/4")</u>

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>3.5"</u>	<u>0752</u>	<u>0753</u>
Additional (5', 2', 1') rod driven to a stick-up of <u>11"</u>	<u>0759</u>	<u>0811</u> ← Continuous Driving at constant rate
Additional (5', 2', 1') rod driven to a stick-up of <u> "</u>	<u> </u>	<u> </u>
Additional (5', 2', 1') rod driven to a stick-up of <u> "</u>	<u> </u>	<u> </u>
Stick-up after pull back <u>23"</u> - Stick-up before pull back <u>11"</u> = <u>12"</u> of pull back. Needs to be <u>13.25"</u> or more to have the seal to seat in point sub. <u>11.5</u>		

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>1"</u>	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	<u>12"</u>	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	<u>0.25"</u>	X <u>1</u>	<u>0.25</u> "	
<u>11</u>	riser	<u>60"</u>	X <u>2</u>	<u>120</u> "	
<u>X</u>	riser	<u>24"</u>	X <u>1</u>	<u>24</u> "	<u>144" (12'0")</u>
<u>1</u>	riser	<u>12"</u>	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	<u>1.75"</u>	X <u>1</u>	<u>1.75</u> "	<u>147", (12'3")</u>

Well completion information

Final stick-up distance = 36 3/4" above ground surface.

147 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 106.25"

Was the stick-up after driving altered to produce the final stick-up? YES ✓ NO

What was done?

COMMENTS Note: had to use rig to pull casing back; the jack would pull it out.

147
- 4
- 36.75

106.25

WAG4 WELL COMPLETION LOG **FOR WELL DP11**

DATE July 29, 1994 **CREW** N. Farrow, J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	4"	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25</u> 2.25	X <u>1</u>	<u>2.25</u> "	
<u>1</u>	rod	60"	X <u>1</u>	<u>60</u> "	
<u>X 1</u>	rod	24"	X <u>1</u>	<u>24</u> "	
<u>X 1</u>	rod	12"	X <u>1</u>	<u>12</u> "	<u>102.25"</u> (<u>8'6 1/4"</u>)

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>3</u> "	<u>0943/6946</u>	<u>0943 1/2 / 0946 1/2</u>
Additional (5' 2 <u>1</u>) rod driven to a stick-up of <u>5 3/4</u> "	<u>0955</u>	<u>0956</u>
Additional (5', 2', 1') rod driven to a stick-up of <u> </u> "		
Additional (5', 2', 1') rod driven to a stick-up of <u> </u> "		
Stick-up after pull back <u>17 3/4</u> " - Stick-up before pull back <u>5 3/4</u> " = <u>12</u> " of pull back. Needs to be <u>13.25</u> " or more to have the seal to seat in point sub.		

11.5

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	1"	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	0.25"	X <u>1</u>	<u>0.25</u> "	
<u>X 1</u>	riser	60"	<u>1.0</u> 1.0 <u>2</u>	<u>60</u> 120	<u>123</u> 123
<u>11</u>	riser	24"	X <u>2</u>	<u>48</u> "	
<u>1</u>	riser	12"	X <u>1</u>	<u>12</u> "	
<u>1</u>	cap	1.75"	X <u>1</u>	<u>1.75</u> "	<u>135</u> " (<u>11'3"</u>)

Well completion information

Final stick-up distance = 29 3/4 " above ground surface.

123 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 88 1/4

Was the stick-up after driving altered to produce the final stick-up? YES ☒ NO

What was done?

COMMENTS

123
4
119
29 3/4
88 1/4

WAG4 WELL COMPLETION LOG FOR WELL DP12

DATE July 29, 1994 CREW N. Farrow, J. LaForest

AQ stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>4"</u>	X <u>1</u>	<u>4</u> "	
<u>1</u>	sub	<u>2.25</u> <u>???"</u>	X <u>1</u>	<u>2.25</u> "	
<u>1</u>	rod	<u>60"</u>	X <u>1</u>	<u>60</u> "	
<u>1</u>	rod	<u>24"</u>	X <u>1</u>	<u>24</u> "	
<u>1</u>	rod	<u>12"</u>	X <u>1</u>	<u>12</u> "	<u>78.25"</u> , (<u>6'6 1/4"</u>)

Driving information

	Time begin	Time end
Point, sub and 5' rod driven to a stick-up distance of <u>8 1/2"</u>	<u>1041</u>	<u>1042</u>
Additional (5', 2', <u>1</u>) rod driven to a stick-up of <u>14 1/2"</u>	<u>1048</u>	<u>1049</u>
Additional (5', 2', 1') rod driven to a stick-up of <u> </u> "	<u> </u>	<u> </u>
Additional (5', 2', 1') rod driven to a stick-up of <u> </u> "	<u> </u>	<u> </u>
Stick-up after pull back <u>26 3/4"</u> - Stick-up before pull back <u>14 1/2"</u> = <u>12.5"</u> of pull back. Needs to be <u>13.25"</u> or more to have the seal to seat in point sub.		

11.5

PVC well stock

quantity	description	length	factor	sub total	total length
<u>1</u>	point	<u>1"</u>	X <u>1</u>	<u>1</u> "	
<u>1</u>	screen	<u>12"</u>	X <u>1</u>	<u>12</u> "	
<u>1</u>	seal	<u>0.25"</u>	X <u>1</u>	<u>0.25</u> "	
<u>1</u>	riser	<u>60"</u>	X <u>1</u>	<u>60</u> "	
<u>1</u>	riser	<u>24"</u>	X <u>1</u>	<u>24</u> "	
<u>11</u>	riser	<u>12"</u>	X <u>2</u>	<u>24</u> "	
<u>1</u>	cap	<u>1.75"</u>	X <u>1</u>	<u>1.75</u> "	<u>99</u> ", (<u>8'3"</u>)

Well completion information

Final stick-up distance = 40 " above ground surface.

99 (Total apparatus length) - (4") - (stick-up) = (top of screen interval) 55"

Was the stick-up after driving altered to produce the final stick-up? YES ✓ NO

What was done?

COMMENTS Location of DP12 in 3" standing water

99
4
95
-40
55

WAG4 WELL LOG FOR COMPLETION OF WELL DP-13DATE 1-25, 1995 CREW N. Farrow, Doug Jones, Jay MitchellReference Stake: * Height above ground surface 2.0 " 2.25 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>111</u> rod	60"	X <u>3</u>	<u>180.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	
				<u>182.40" (15' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>1.5</u> "	<u>1101</u>	<u>1104</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>1.5</u> "	<u>1122</u>	<u>1125</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>51.50</u> "	<u>1130</u>	<u>1134</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>51.50</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>159.44</u> "	= (13' 2")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>65.00</u> "	
*Stick-up before pull back	<u>51.50</u> "	
Total pull back	=	<u>13.50</u> " (must be ≥ 13.5)

Rod length adjustment:

Orig. total rod length	<u>182.40</u> "
Length of section removed	<u>60.00</u> "
Length of section added	<u>12.00</u> "
Final AQ rod length	= <u>134.40</u> "

Verified by: JmDepth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>159.44</u> "
*Final PVC stick-up (w/cap)	<u>29</u> "
Distance from point to TOS	<u>12.5</u> "
Calculated depth to TOS	= <u>117.94</u> "

AQ rod method:

Final AQ rod length	<u>134.40</u> "
*Final rod stick-up after well install.	<u>19.0</u> "
Adjustment to PVC TOS	<u>0.19</u> "
Alternate calculated depth to TOS	= <u>117.21</u> "

Average:

(PVC TOS + AQ TOS)/2	= <u>117.57</u> "
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(Note: Both TOS calculations should be within ± 1 ")Verified by: JmTotal depth to refusal

Final AQ rod length	<u>134.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>17</u> "
Depth to refusal	= <u>131.40</u> "

*Indicates measured value

NOTES: DP-13 Abandon = 2' from Stake #42 West of North 70
* This location, when driving rebar kept hitting
Concrete, Crew moved 20' to the Northwest.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-14DATE 1-25, 1995CREW Norm Farrow, Charles Lamb, Doug Jones, Jay M.t.Reference Stake:* Height above ground surface 2.0 Before 2.0 AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>180.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48</u> "	
<u>1</u> rod	12"	X <u>1</u>	<u>12</u> "	<u>182.40", (15' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>3.25</u> "	<u>0916</u>	<u>0920</u>	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>1.75</u> "	<u>0930</u>	<u>0933</u>	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>9.00</u> "	<u>0939</u>	<u>0946</u>	-
*Additional (5' 2", 1') rod driven to a stick-up of	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>9.00</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12</u> "	
<u>-</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>207.44"</u> = (17' 3")

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>22.50</u> "	
*Stick-up before pull back	<u>9.00</u> "	
Total pull back	=	<u>13.50</u> "

(must be ≥ 13.5)

Verified by: JmRod length adjustment:

Orig. total rod length	<u>182.40</u> "	
Length of section removed	-	<u>0</u> "
Length of section added	+	<u>0</u> "
Final AQ rod length	=	<u>182.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>207.44</u> "
	*Final PVC stick-up (w/cap)	<u>35.50</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>159.44</u> "
AQ rod method:	Final AQ rod length	<u>182.40</u> "
	*Final rod stick-up after well install.	<u>22.50</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>159.71</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>159.57</u> "

(Note: Both TOS calculations should be within ± 1 ")

Verified by: JmTotal depth to refusal

Final AQ rod length	<u>182.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>22.50</u> "
Depth to refusal	= <u>163.90</u> "

*Indicates measured value

- NOTES: 0922 - When driving first section it deflected off something hard
- 0935 - At 7.5 ft went through something hard (concrete) and at 9.0 ft. something like a box.
- 0942 - 11'-12' steady driving but went through. 14' Acted if it was bottom of Trench.
- DP-14 Location is 2' from Stake #43 60° West of Nor

WAG4 WELL LOG FOR COMPLETION OF WELL DP-15DATE 1-25, 1995 CREW N. Farrow, D. Jones, J. Mitchell
1-26Reference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> rod	24"	X <u>1</u>	<u>24.00</u> "	
<u>11</u> rod	12"	X <u>2</u>	<u>24.00</u> "	<u>170.40</u> " (14' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>1.0</u> "	<u>1424</u>	<u>1424</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>.75</u> "	<u>1440</u>	<u>1445</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>1.0</u> "	<u>1450</u>	<u>1451</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>9.25</u> "	<u>1455</u>	<u>1457</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>9.25</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>195.44</u> " = (16' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>23.00</u> "
*Stick-up before pull back	<u>9.25</u> "
Total pull back	<u>13.75</u> "

(must be ≥ 13.5 ")Verified by: gm

Rod length adjustment:

Orig. total rod length	<u>170.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>-</u> "
Final AQ rod length	<u>170.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>195.44</u> "
	*Final PVC stick-up (w/cap)	<u>32</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>150.94</u> "
AQ rod method:	Final AQ rod length	<u>170.40</u> "
	*Final rod stick-up after well install.	<u>23</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>147.21</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>149.075</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: gmTotal depth to refusal

Final AQ rod length	<u>170.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>23</u> "
Depth to refusal	<u>151.40</u> "

*Indicates measured value

NOTES: Crew had to pull PVC casing and run a rod down to push Drive Point on down into hole to try to get PVC at the correct Height.

Red length's = 82.50", 78.00", 39.0", = 16' 6.25", Drove Rod down to 14" above AQ casing, started with 23.75" above casing

Note: Thick Black Liquid was present on the Water Column

$16.625 = 199.50" - 23.75$ StickUp = $175.75" - 23" = 152.75$ Below Ground for the Depth of Solid Rod, As Compared to 151' 4" depth of Refusal from log sheet. The 3.5" difference between AQ + PVC method for T.O.S. Calculation, Can not resolve problem without pulling casing + PVC.

Well Location is 10' West of North 70° , Angle Left
from Stake #40

$\alpha \vee \beta$ α β $\vdash$ $\perp$ $\vdash$ D.S. D.C.T. it is

WAG4 WELL LOG FOR COMPLETION OF WELL DP-16DATE 1-24, 1995 CREW N. Farrow, Charlie Lamb, Doug Jones, Jay MitchReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>111</u> rod	60"	X <u>3</u>	<u>180.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	
				<u>182.40</u> " (15' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>3.0</u> "	<u>1329</u>	<u>1332</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>2.25</u> "	<u>1335</u>	<u>1338</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>50.75</u> "	<u>1343</u>	<u>1359</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>50.75</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>171.44</u> "	= (14' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>64.25</u> "	
*Stick-up before pull back	<u>50.75</u> "	
Total pull back	=	<u>13.50</u> "

(must be ≥ 13.5)

Verified by: gm

Rod length adjustment:

Orig. total rod length	<u>182.40</u> "
Length of section removed	<u>60.00</u> "
Length of section added	<u>24.00</u> "
Final AQ rod length	= <u>146.40</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>171.44</u> "
*Final PVC stick-up (w/cap)	<u>41.0</u> "
Distance from point to TOS	<u>12.5</u> "
Calculated depth to TOS	= <u>117.94</u> "

AQ rod method:

Final AQ rod length	<u>146.40</u> "
*Final rod stick-up after well install.	<u>28</u> "
Adjustment to PVC TOS	<u>0.19</u> "
Alternate calculated depth to TOS	= <u>118.21</u> "

Average:

(PVC TOS + AQ TOS)/2	= <u>118.08</u> "
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(Note: Both TOS calculations should be within ± 1 ")

Verified by: gmTotal depth to refusal

Final AQ rod length	<u>146.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>28</u> "
Depth to refusal	= <u>122.40</u> "

*Indicates measured value

NOTES: 1343 - 1349 = 52.25" Stick-up of
1348 - 1349 = 52.00" Stick-up of
1349 - 1352 = 51.50" Stick-up of
1356 - 1359 = 50.75" Stick-up of

DP-16 Location is 17' from stake #44 90° West

WAG4 WELL LOG FOR COMPLETION OF WELL DP-16 AbandonDATE 1-24, 1995 CREW Norm Farrow, Charlie Lamb, Jay MitchellReference Stake: * Height above ground surface 2.0 " - "
 Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>60</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>-</u> ", (<u>-</u>)

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>5.0</u> "	<u>1116</u>	<u>1117</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>33.4</u> "	<u>1124</u>	<u>1143</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>-</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>-</u> riser	60"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>-</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>-</u> ", = (<u>-</u>)

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>-</u> "
*Stick-up before pull back	<u>-</u> "
Total pull back	= <u>-</u> "

(must be ≥ 13.5)Verified by: -

Rod length adjustment:

Orig. total rod length	<u>-</u> "
Length of section removed	- <u>-</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>-</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>-</u> "
*Final PVC stick-up (w/cap)	- <u>-</u> "
Distance from point to TOS	- <u>12.5</u> "
Calculated depth to TOS	= <u>-</u> "

AQ rod method:

Final AQ rod length	<u>-</u> "
*Final rod stick-up after well install.	- <u>-</u> "
Adjustment to PVC TOS	- <u>0.19</u> "
Alternate calculated depth to TOS	= <u>-</u> "

Average:

(PVC TOS + AQ TOS)/2	= <u>-</u> "
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(Note: Both TOS calculations should be within ± 1 ")Verified by: -Total depth to refusal

Final AQ rod length	<u>-</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>-</u> "
Depth to refusal	= <u>-</u> "

*Indicates measured value

NOTES:

*1 When Driving the ^{2nd} ~~1st~~ gm 1-24.95 5 ft Section (After point, sub, 5ft) the drive point hit Compact Material at a stick up of $36\frac{3}{8}"$. Team still continues to drive, drive progress at approximately $\frac{1}{2}$ inch for every 2 minutes of drive Time.

DP-16 Abandon Location = 2' from stake #44 = 90° West of A

WAG4 WELL LOG FOR COMPLETION OF WELL DP-17DATE 1-26, 1995 CREW Norm Farrew, Doug Jones, Jay MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>170.40"</u> (14' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>2.25</u> "	<u>1353</u>	<u>1355</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>2.25</u> "	<u>1358</u>	<u>1400</u>	<u>-</u>
+2' *Additional (5' 2", 1') rod driven to a stick-up of	<u>16.00</u> "	<u>1403</u>	<u>1405</u>	<u>1406</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>16.00</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	

Total length of PVC material = 195.44" = (16' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>30.50</u> "
*Stick-up before pull back	<u>16.00</u> "
Total pull back	= <u>14.50</u> "

(must be ≥ 13.5)Verified by: *Jm*

Rod length adjustment:

Orig. total rod length	<u>170.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>+</u> "
Final AQ rod length	= <u>170.40</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>195.44</u> "
*Final PVC stick-up (w/cap)	<u>42.375</u> "
Distance from point to TOS	<u>12.5</u> "
Calculated depth to TOS	= <u>140.565</u> "

AQ rod method:

Final AQ rod length	<u>170.40</u> "
*Final rod stick-up after well install.	<u>30.375</u> "
Adjustment to PVC TOS	<u>0.19</u> "

Average:

Alternate calculated depth to TOS	= <u>139.835</u> "
(PVC TOS + AQ TOS)/2	= <u>139.2</u> "

(Note: Both TOS calculations should be within ± 1 ")Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>170.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>30.375</u> "
Depth to refusal	= <u>140.025</u> "

*Indicates measured value

NOTES:

1416 - Begin pullback 29.5" Final 30.5" pullback
was done before setting screen.

DP-17 Location is 14'50" from stake #30 0° North

WAG4 WELL LOG FOR COMPLETION OF WELL DP-18DATE 1-27, 1995 CREW N. Farrow, D. Jones, J. Mitchell, C. LambReference Stake: * Height above ground surface 2.0 " 2.25 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u> "	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> "	<u>182.40" (15' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>3.0</u> "	<u>09.25</u>	<u>09.27</u>	-
*Additional (5' 2', 1') rod driven to a stick-up of	<u>2.25</u> "	<u>08.27</u>	<u>08.31</u>	-
*Additional (5' 2', 1') rod driven to a stick-up of	<u>18.0</u> "	<u>08.36</u>	<u>08.39</u>	-
*Additional (5' 2', 1') rod driven to a stick-up of	-	-	-	-
*Additional (5' 2', 1') rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>18.0</u> "	-	-	-

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>1/1</u> riser	60"	X <u>3</u>	<u>180.00</u> "	
- riser	24"	X -	-	
- riser	12"	X -	-	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>195.44" = (16.29')</u>

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>31.50</u> "
*Stick-up before pull back	- <u>18.00</u> "
Total pull back	= <u>13.50</u> "

(must be ≥ 13.5)Verified by: *J*

Rod length adjustment:

Orig. total rod length	<u>182.40</u> "
Length of section removed	- <u>12.00</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>170.40</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>195.44</u> "
*Final PVC stick-up (w/cap)	- <u>3.5</u> "
Distance from point to TOS	- <u>12.5</u> "
Calculated depth to TOS	= <u>147.50</u> "

AQ rod method:

Final AQ rod length	<u>170.40</u> "
*Final rod stick-up after well install.	- <u>19.375</u> "
Adjustment to PVC TOS	- <u>0.19</u> "
Alternate calculated depth to TOS	= <u>150.825</u> "

Average:

(PVC TOS + AQ TOS)/2	= <u>149.165</u> "
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(Note: Both TOS calculations should be within ± 1 ")Verified by: *J m*Total depth to refusal

Final AQ rod length	<u>170.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>19.375</u> "
Depth to refusal	= <u>155.025</u> "

*Indicates measured value

- NOTES: 0846 - When Setting PVC Casing there appears to be a 1' of Sediment. PVC will not go all the way down before pullback. 53" of PVC Stick, at beginning, before driving it down.
- 0855 - Begin Pulling PVC Casing, to drive rods down thru AQ Casing, well is not setting right.
- 0918 - Begin Pulling casing, and installing rods = 16' 6.25" 48" from Top of rods hit some obstruction and pushed through it.
- 0935 - There is a discrepancy of 3.0" with PVC + AQ, this is Second time this happened when Crew pushed with rods.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-19DATE 1-27, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u> "	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> "	<u>182.40</u> " (15' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of <u>1.5</u> "	<u>0942</u>	<u>0944</u>	-	-
*Additional (5' 2', 1') rod driven to a stick-up of <u>2.25</u> "	<u>0947</u>	<u>0950</u>	-	-
+ 2' *Additional (5' 2', 1') rod driven to a stick-up of <u>45.125</u> "	<u>0954</u>	<u>0957</u>	-	-
*Additional (5' 2', 1') rod driven to a stick-up of <u>-</u> "	-	-	-	-
*Additional (5' 2', 1') rod driven to a stick-up of <u>-</u> "	-	-	-	-
*Stick-up before pull-back = <u>45.125</u> "				

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>171.44</u> "	= (14' 2")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>58.625</u>	
*Stick-up before pull back	-	<u>45.125</u>
Total pull back	=	<u>13.50</u> "

(must be ≥ 13.5)

Verified by: *gm*

Rod length adjustment:

Orig. total rod length	<u>182.40</u> "
Length of section removed	- <u>48.00</u> "
Length of section added	+ <u>12.00</u> "
Final AQ rod length	= <u>146.40</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>171.44</u> "
*Final PVC stick-up (w/cap)	- <u>34.75</u> "
Distance from point to TOS	- <u>12.5</u> "
Calculated depth to TOS	= <u>124.19</u> "

AQ rod method:

Final AQ rod length	<u>146.40</u> "
*Final rod stick-up after well install.	- <u>22.75</u> "
Adjustment to PVC TOS	- <u>0.19</u> "
Alternate calculated depth to TOS	= <u>123.46</u> "

Average:

(PVC TOS + AQ TOS)/2	= <u>123.825</u> "
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(Note: Both TOS calculations should be within ± 1 ")

Verified by: *gm*Total depth to refusal

Final AQ rod length	<u>146.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>22.75</u> "
Depth to refusal	= <u>147.65</u> "

*Indicates measured value

NOTES: DP-19 Location is 18'0" from stake #25 10° West of N.

WAG4 WELL LOG FOR COMPLETION OF WELL

DP 20

2P 17

gm 1-27-95

DATE 1-27, 1995CREW N. Farrow, C. Lamb, D. Jones, J.M. HillReference Stake:* Height above ground surface 2.0 " 1.25 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>128.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>122.40</u> " (10' 2')

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>1.0</u> "	<u>1037</u>	<u>1038</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>30.50</u> "	<u>1040</u>	<u>1042</u>	<u>1044</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>30.50</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>128.00</u> "	
<u>X</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	

Total length of PVC material = 147.44 " = (12' 2.8')AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>44.00</u> "
*Stick-up before pull back	<u>30.50</u> "
Total pull back	= <u>13.50</u> "

(must be ≥ 13.5)Verified by: gmRod length adjustment:

Orig. total rod length	<u>122.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>+</u> "
Final AQ rod length	= <u>122.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> "
	*Final PVC stick-up (w/cap)	<u>56.25</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>78.69</u> "
AQ rod method:	Final AQ rod length	<u>122.40</u> "
	*Final rod stick-up after well install.	<u>44</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>78.21</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>78.45</u> "

(Note: Both TOS calculations should be within ± 1 ")Verified by: gmTotal depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>44</u> "
Depth to refusal	= <u>82.40</u> "

*Indicates measured value

NOTES:

1042 - At 7' hit something hard, Solid, Took off driving head, replace with Pulling Head, so hammer will not shake, so much.

DP-20 Location is 7'50" from #23 Stake 25' East of north.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-21.41 AbandonDATE 2-6, 1995 CREW N. Farver, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " - "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>-</u> "(<u>-</u>)

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>1353</u>	<u>1355</u>	<u>-</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>-</u> riser	60"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>-</u> " = (<u>-</u>)

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>-</u> "
*Stick-up before pull back	<u>-</u> "
Total pull back	= <u>-</u> "

(must be ≥ 13.5)

Verified by:

Rod length adjustment:

Orig. total rod length	<u>-</u> "
Length of section removed	- <u>-</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>-</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>-</u> "
	*Final PVC stick-up (w/cap)	- <u>-</u> "
	Distance from point to TOS	= <u>12.5</u> "
	Calculated depth to TOS	= <u>-</u> "
AQ rod method:	Final AQ rod length	<u>-</u> "
	*Final rod stick-up after well install.	- <u>-</u> "
	Adjustment to PVC TOS	- <u>0.19</u> "
	Alternate calculated depth to TOS	= <u>-</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>-</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by:

Total depth to refusal

Final AQ rod length	<u>-</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>-</u> "
Depth to refusal	= <u>-</u> "

*Indicates measured value

NOTES: _____

WAG4 WELL LOG FOR COMPLETION OF WELL DP-2/A2DATE 2-6, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " - "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>-</u> "(<u>-</u>)

Driving information

		Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>15.75</u> "	<u>1500</u>	<u>1501</u>	<u>-</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>-</u> riser	60"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material = <u>-</u> " = (<u>-</u>)				

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>-</u> "
*Stick-up before pull back	<u>-</u> "
Total pull back	= <u>-</u> "

(must be >= 13.5")

Verified by:

Rod length adjustment:

Orig. total rod length	<u>-</u> "
Length of section removed	- <u>-</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>-</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>-</u> "
	*Final PVC stick-up (w/cap)	- <u>-</u> "
	Distance from point to TOS	- <u>12.5</u> "
	Calculated depth to TOS	= <u>-</u> "
AQ rod method:	Final AQ rod length	<u>-</u> "
	*Final rod stick-up after well install.	- <u>-</u> "
	Adjustment to PVC TOS	- <u>0.19</u> "
	Alternate calculated depth to TOS	= <u>-</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>-</u> "
(Note: Both TOS calculations should be within +/- 1")		

Verified by:

Total depth to refusal

Final AQ rod length	<u>-</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>-</u> "
Depth to refusal	= <u>-</u> "

*Indicates measured value

NOTES: _____

WAG4 WELL LOG FOR COMPLETION OF WELL DP-21.1DATE 2-16, 1995 CREW N. Farrow, J. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 15 " 1.5 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>62.40" (5' 2")</u>

Driving information

Point, sub and 5' rod driven to a stick-up of	Start	End	Start	End
<u>23.0</u> "	<u>13.24</u>	<u>13.27</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back = <u>23.0</u> "				

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> " (point, screen & seal)
<u>-</u> riser	60"	X <u>-</u>	<u>-</u> "
<u>///</u> riser	24"	X <u>3</u>	<u>72.00</u> "
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "

Total length of PVC material = 87.44 " = (7' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>36.5</u> "
*Stick-up before pull back	<u>23.0</u> "
Total pull back	<u>13.5</u> "

(must be ≥ 13.5)Verified by: *jm*

Rod length adjustment:

Orig. total rod length	<u>62.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>+</u> "
Final AQ rod length	<u>62.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>87.44</u> "
	*Final PVC stick-up (w/cap)	<u>49.0</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>25.74</u> "
AQ rod method:	Final AQ rod length	<u>62.40</u> "
	*Final rod stick-up after well install.	<u>36.5</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>25.71</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>25.825</u> "

(Note: Both TOS calculations should be within ± 1 ")

Verified by: *jm*Total depth to refusal

Final AQ rod length	<u>62.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>36.5</u> "
Depth to refusal	<u>29.9</u> "

*Indicates measured value

NOTES:

DP-21.1 Location is $154''$ ($12'10''$) 150° West of North
From Well # 2576

DP-21 A1 - Location is $188''$ ($15'8''$) 140° West of North
From Well # 2576

DP-21 A2 - Location is $256''$ ($21'4''$) 120° West of North
From Well # 2576

DP-21 A3 - Location is 140° West of North $221''$ ($18'5''$)
From Well # 2576

WAG4 WELL LOG FOR COMPLETION OF WELL DP-22DATE 2-6, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 3.5 * 30 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> *	
<u>111</u> rod	60"	X <u>3</u>	<u>180.00</u> *	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> *	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> *	<u>182.40" (15' 2")</u>

Driving information

Point, sub and 5' rod driven to a stick-up of	<u>3.5</u> *	Start	End	Start	End
*Additional (5' 2", 1') rod driven to a stick-up of	<u>6.25</u> *	<u>0957</u>	<u>0958</u>	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>42.50</u> *	<u>1015</u>	<u>1016</u>	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> *	<u>1023</u>	<u>1024</u>	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> *	-	-	-	-
*Stick-up before pull-back =	<u>42.50</u> *	-	-	-	-

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> *	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u> *	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> *	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> *	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> *	

Total length of PVC material = 207.44 * = (17' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>56.50</u>	2-6-95 Jm
*Stick-up before pull back	<u>42.50</u>	
Total pull back	= <u>14.0</u> *	(must be >= 13.5")

Verified by: JmRod length adjustment:

Orig. total rod length	<u>182.40</u> *
Length of section removed	- <u>-</u> *
Length of section added	+ <u>-</u> *
Final AQ rod length	= <u>182.40</u> *

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>207.44</u> *
	*Final PVC stick-up (w/cap)	- <u>69.0</u> *
	Distance from point to TOS	- <u>12.5</u> *
	Calculated depth to TOS	= <u>125.94</u> *
AQ rod method:	Final AQ rod length	<u>182.40</u> *
	*Final rod stick-up after well install.	- <u>55.75</u> *
	Adjustment to PVC TOS	- <u>0.19</u> *
	Alternate calculated depth to TOS	= <u>126.46</u> *
Average:	(PVC TOS + AQ TOS)/2	= <u>126.20</u> *

(Note: Both TOS calculations should be within +/- 1")

Verified by: JmTotal depth to refusal

Final AQ rod length	<u>182.40</u> *
Drive point tip	+ <u>4.0</u> *
*AQ rod stick-up	- <u>55.75</u> *
Depth to refusal	= <u>130.65</u> *

*Indicates measured value

NOTES:

DP-22 Location is 156" (13') 105° West of North
from Well # 2582

Norm thinks Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-23DATE 2-6, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 1.5 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u> "	
<u>21</u> rod	12"	X <u>1</u>	<u>12.00</u> "	<u>182.40</u> " (152)

2-6-95 Jm

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>5.375</u> "	<u>12.50</u>	<u>12.58</u>	-
*Additional (5'2", 1') rod driven to a stick-up of	<u>4.75</u> "	<u>12.49</u>	<u>12.50</u>	-
*Additional (5'2", 1') rod driven to a stick-up of	<u>31.0</u> "	<u>12.55</u>	<u>12.58</u>	-
*Additional (5'2", 1') rod driven to a stick-up of	-	-	-	-
*Additional (5'2", 1') rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>31.0</u> "	-	-	-

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	

Total length of PVC material = 171.44 " = (14' 3")AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>44.50</u> "	
*Stick-up before pull back	-	<u>31.0</u> "
Total pull back	=	<u>13.50</u> "

(must be ≥ 13.5)

Verified by: Jm

Rod length adjustment:

Orig. total rod length	<u>182.40</u> "
Length of section removed	- <u>36.00</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>146.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>171.44</u> "
	*Final PVC stick-up (w/cap)	- <u>20.75</u> "
	Distance from point to TOS	- <u>12.5</u> "
	Calculated depth to TOS	= <u>138.19</u> "
AQ rod method:	Final AQ rod length	<u>146.40</u> "
	*Final rod stick-up after well install.	- <u>8.25</u> "
	Adjustment to PVC TOS	- <u>0.19</u> "
	Alternate calculated depth to TOS	= <u>137.96</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>138.075</u> "

(Note: Both TOS calculations should be within ± 1)

Verified by: Jm

Total depth to refusal

Final AQ rod length	<u>146.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>8.25</u> "
Depth to refusal	= <u>142.15</u> "

2-6-95 Jm

*Indicates measured value

NOTES:

DP-23 Location is 329" (27'5") 20° East of North
from Well # 2582

Norm thinks well is in Trench

1236 - When driving AQ rod hit something first foot
and deflected off.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-24DATE 2-13, 1995 CREW N. Farrow, C Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40"</u>	<u>X 1</u>	<u>2.40</u> "	
<u>11</u> rod	<u>60"</u>	<u>X 2</u>	<u>120.00</u> "	
<u>11</u> rod	<u>24"</u>	<u>X 2</u>	<u>48.00</u> "	
<u>-</u> rod	<u>12"</u>	<u>X -</u>	<u>-</u> "	<u>170.40" (14' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>5.75</u> "	<u>0949</u>	<u>0950</u>	<u>-</u>
*Additional (5' 2, 1') rod driven to a stick-up of	<u>6.25</u> "	<u>0955</u>	<u>0956</u>	<u>-</u>
+2' *Additional (5' 2, 1') rod driven to a stick-up of	<u>39.375</u> "	<u>0958</u>	<u>1004</u>	<u>-</u>
*Additional (5' 2, 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2, 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>39.375</u> "	<u>-</u>	<u>-</u>	<u>-</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	<u>13.25"</u>	<u>X 1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	<u>60"</u>	<u>X 2</u>	<u>120.00</u> "	
<u>1</u> riser	<u>24"</u>	<u>X 1</u>	<u>24.00</u> "	
<u>1</u> riser	<u>12"</u>	<u>X 1</u>	<u>12.00</u> "	
<u>1</u> cap	<u>2.19"</u>	<u>X 1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>171.44" = (14' 3")</u>

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>53.00"</u>	
*Stick-up before pull back	<u>39.375</u> "	
Total pull back	<u>13.625</u> "	(must be $\geq 13.5"$)

Rod length adjustment:

Orig. total rod length	<u>170.40"</u>
Length of section removed	<u>24.00"</u>
Length of section added	<u>+</u>
Final AQ rod length	<u>146.40"</u>

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>171.44"</u>
	*Final PVC stick-up (w/cap)	<u>41.750"</u>
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>117.19"</u>
AQ rod method:	Final AQ rod length	<u>146.40"</u>
	*Final rod stick-up after well install.	<u>28.750"</u>
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>117.46"</u>
Average:	(PVC TOS + AQ TOS)/2	<u>117.325"</u>
(Note: Both TOS calculations should be within $\pm 1"$)		

Total depth to refusal

Final AQ rod length	<u>170.40"</u>
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>28.750"</u>
Depth to refusal	<u>145.65"</u>

*Indicates measured value

Verified by: *Jm*Verified by: *Jm*

NOTES:

DP-24 Location = 114" (9'6") 0° West of North from Stake #20

Vorman Farrow believes ^{will go 20-25} ~~level~~ is in Trench.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-25DATE 2-9, 1995 CREW W. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> *	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> *	
<u>111</u> rod	24"	X <u>3</u>	<u>72.00</u> *	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> *	<u>146.40</u> * (12' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>3.5</u> *	<u>1407</u>	<u>1408</u>	-
*Additional (5' 2", 1") rod driven to a stick-up of	<u>8.0</u> *	<u>1412</u>	<u>1413</u>	-
+2' +2' *Additional (5' 2", 1") rod driven to a stick-up of	<u>35.0</u> *	<u>1417</u>	<u>1421</u>	-
*Additional (5' 2", 1") rod driven to a stick-up of	-	-	-	-
*Additional (5' 2", 1") rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>35.0</u> *	-	-	-

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> * (point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>120.00</u> *
- riser	24"	X -	-
- riser	12"	X -	-
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> *

Total length of PVC material = 135.44 * = (11' 3")

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>48.75</u> *
*Stick-up before pull back	- <u>35.0</u> *
Total pull back	= <u>13.75</u> *

(must be ≥ 13.5)Verified by: *Jm*Rod length adjustment:

Orig. total rod length	<u>146.40</u> *
Length of section removed	- <u>36.00</u> *
Length of section added	+ <u>-</u> *
Final AQ rod length	= <u>110.40</u> *

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>135.44</u> *
	*Final PVC stick-up (w/cap)	- <u>25.50</u> *
	Distance from point to TOS	- <u>12.5</u> *
	Calculated depth to TOS	= <u>97.44</u> *
AQ rod method:	Final AQ rod length	<u>110.40</u> *
	*Final rod stick-up after well install.	- <u>12.75</u> *
	Adjustment to PVC TOS	- <u>0.19</u> *
	Alternate calculated depth to TOS	= <u>97.46</u> *
Average:	(PVC TOS + AQ TOS)/2	= <u>97.45</u> *

(Note: Both TOS calculations should be within ± 1 ")

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>110.40</u> *
Drive point tip	+ <u>4.0</u> *
*AQ rod stick-up	- <u>12.75</u> *
Depth to refusal	= <u>101.65</u> *

*Indicates measured value

NOTES: *Norman Farrow believes were in Trench*
DP-25 Location - 930" 77' 6" 180° West of North Fr
Stake # 27

WAG4 WELL LOG FOR COMPLETION OF WELL DP-26DATE 2-13, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	
				<u>122.40</u> " (10' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>3.0</u> "	<u>0905</u>	<u>0906</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>2.0</u> "	<u>0909</u>	<u>0915</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>2.0</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
				Total length of PVC material = <u>147.44</u> " = (12' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>16.5</u> "
*Stick-up before pull back	<u>2.0</u> "
Total pull back	= <u>14.5</u> "

(must be ≥ 13.5)Verified by: Jm

Rod length adjustment:

Orig. total rod length	<u>122.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>+</u> "
Final AQ rod length	= <u>122.40</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>147.44</u> "
*Final PVC stick-up (w/cap)	<u>29.0</u> "
Distance from point to TOS	<u>12.5</u> "
Calculated depth to TOS	= <u>105.94</u> "

AQ rod method:

Final AQ rod length	<u>122.40</u> "
*Final rod stick-up after well install.	<u>16.25</u> "
Adjustment to PVC TOS	<u>0.19</u> "

Average:

Alternate calculated depth to TOS	= <u>105.96</u> "
(PVC TOS + AQ TOS)/2	= <u>105.95</u> "
(Note: Both TOS calculations should be within ± 1 ")	

Verified by: JmTotal depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>16.25</u> "
Depth to refusal	= <u>110.15</u> "

*Indicates measured value

NOTES:

DP-26 Location = 153" (12'9") 35° West of North
 from Stake #25

Norman Farrow believes ^{Well from 2-15-93} ~~Ground~~ is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP.27DATE 2-9, 1995 CREW N. Farrow, P. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>132.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>132.40</u> " (10' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>9.0</u> "	<u>145.2</u>	<u>145.3</u>	<u>145.2</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>6.75</u> "	<u>145.9</u>	<u>145.9</u>	<u>151.8</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>6.75</u> "			

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> " (point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>132.00</u> "
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "
Total length of PVC material = <u>147.44</u> " = (147.44)			

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>21.00</u> "
*Stick-up before pull back	<u>6.75</u> "
Total pull back	<u>14.25</u> " (must be ≥ 13.5 ")

Verified by: *Jm*Rod length adjustment:

Orig. total rod length	<u>132.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>-</u> "
Final AQ rod length	<u>132.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> "
	*Final PVC stick-up (w/cap)	<u>33.75</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>101.19</u> "
AQ rod method:	Final AQ rod length	<u>132.40</u> "
	*Final rod stick-up after well install.	<u>21.00</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>101.21</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>101.2</u> "
	(Note: Both TOS calculations should be within ± 1 ")	

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>132.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>21.00</u> "
Depth to refusal	<u>165.40</u> "

*Indicates measured value

NOTES:

Norman Farrow does not know if in Trench
DP-27 Location 60" S' 0" 180° 20' West of North
from Stake #27

WAG4 WELL LOG FOR COMPLETION OF WELL DP-28ADATE 2-9, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " — "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>—</u>	<u>—</u> "	
<u>—</u> rod	24"	X <u>—</u>	<u>—</u> "	
<u>—</u> rod	12"	X <u>—</u>	<u>—</u> "	<u>—</u> " (<u>—</u>)

Driving information

		Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>7.5</u> "	<u>1318</u>	<u>1320</u>	<u>—</u>	<u>—</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>49.5</u> "	<u>1324</u>	<u>1329</u>	<u>1330</u>	<u>1333</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Stick-up before pull-back =	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>—</u> riser	60"	X <u>—</u>	<u>—</u> "	
<u>—</u> riser	24"	X <u>—</u>	<u>—</u> "	
<u>—</u> riser	12"	X <u>—</u>	<u>—</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material = <u>—</u> " = (<u>—</u>)				

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>—</u> "
*Stick-up before pull back	<u>—</u> "
Total pull back	= <u>—</u> "

(must be ≥ 13.5)Verified by: —

Rod length adjustment:

Orig. total rod length	<u>—</u> "
Length of section removed	- <u>—</u> "
Length of section added	+ <u>—</u> "
Final AQ rod length	= <u>—</u> "

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC	<u>—</u> "
*Final PVC stick-up (w/cap)	- <u>—</u> "
Distance from point to TOS	= <u>12.5</u> "
Calculated depth to TOS	= <u>—</u> "

AQ rod method:

Final AQ rod length	<u>—</u> "
*Final rod stick-up after well install.	- <u>—</u> "
Adjustment to PVC TOS	- <u>0.19</u> "
Alternate calculated depth to TOS	= <u>—</u> "

Average:

(PVC TOS + AQ TOS)/2	= <u>—</u> "
(Note: Both TOS calculations should be within +/- 1")	

Verified by: —Total depth to refusal

Final AQ rod length	<u>—</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>—</u> "
Depth to refusal	= <u>—</u> "

*Indicates measured value

NOTES:

*Norman Farrow believes we are not in Trench
Hit something at 6 feet.*

*DP-28A Location: 748" 62' 4" 110° West of North
from Stake # 29*

WAG4 WELL LOG FOR COMPLETION OF WELL DP-29DATE 2-8, 1995 CREW N. Farrow, C. Lamb, P. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> *	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> *	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u>	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u>	<u>122.40</u> * (10' 2")

Driving information

		Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>7.0</u> *	<u>1409</u>	<u>1410</u>	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>35.0</u> *	<u>1416</u>	<u>1423</u>	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u>	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u>	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u>	-	-	-	-
*Stick-up before pull-back =	<u>35.0</u> *	-	-	-	-

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> *	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> *	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u>	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> *	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> *	
Total length of PVC material =			<u>147.44</u> *	= (12' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>48.5</u> *
*Stick-up before pull back	<u>35.0</u> *
Total pull back	= <u>13.5</u> *

(must be ≥ 13.5)Verified by: *Jm*

Rod length adjustment:

Orig. total rod length	<u>122.40</u> *
Length of section removed	<u>-</u>
Length of section added	<u>+</u>
Final AQ rod length	= <u>122.40</u> *

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> *
	*Final PVC stick-up (w/cap)	<u>61.00</u> *
	Distance from point to TOS	<u>12.5</u> *
	Calculated depth to TOS	= <u>73.94</u> *
AQ rod method:	Final AQ rod length	<u>122.40</u> *
	*Final rod stick-up after well install.	<u>48.5</u> *
	Adjustment to PVC TOS	<u>0.19</u> *
	Alternate calculated depth to TOS	= <u>73.71</u> *
Average:	(PVC TOS + AQ TOS)/2	= <u>73.825</u> *
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>122.40</u> *
Drive point tip	<u>4.0</u> *
*AQ rod stick-up	<u>48.5</u> *
Depth to refusal	= <u>77.90</u> *

*Indicates measured value

NOTES:

DP-29 Location 424" (35'4") 35° East of North
 from Stake #40

Location is believed to be in Trench.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-30DATE 2-8, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> "	
<u>17N 1</u> rod	24"	X <u>6</u>	<u>144.00</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>206.40</u> " (17' 2")

Driving information

		Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>10.5</u> "	<u>1529</u>	<u>1529</u>	<u>-</u>	<u>-</u>
+2' +2' *Additional (5' 2) 1' rod driven to a stick-up of	<u>3.0</u> "	<u>1535</u>	<u>1539</u>	<u>1544</u>	<u>1546</u>
+2' +2' *Additional (5' 2) 1' rod driven to a stick-up of	<u>50.25</u> "	<u>1552</u>	<u>1554</u>	<u>1555</u>	<u>1557</u>
*Additional (5' 2, 1) rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2, 1) rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>50.25</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> " (point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "
<u>11</u> riser	24"	X <u>2</u>	<u>48.00</u> "
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "

Total length of PVC material = 183.44 " = (15' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>64.25</u> "
*Stick-up before pull back	<u>50.25</u> "
Total pull back	= <u>14.00</u> "

(must be ≥ 13.5)Verified by: *jm*

Rod length adjustment:

Orig. total rod length	<u>206.40</u> "
Length of section removed	- <u>48.00</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>158.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>183.44</u> "
	*Final PVC stick-up (w/cap)	- <u>28.95</u> "
	Distance from point to TOS	- <u>12.5</u> "
	Calculated depth to TOS	= <u>142.19</u> "
AQ rod method:	Final AQ rod length	<u>158.40</u> "
	*Final rod stick-up after well install.	- <u>16.25</u> "
	Adjustment to PVC TOS	- <u>0.19</u> "
	Alternate calculated depth to TOS	= <u>141.96</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>142.075</u> "

(Note: Both TOS calculations should be within ± 1 ")

Verified by: *jm*Total depth to refusal

Final AQ rod length	<u>158.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>16.25</u> "
Depth to refusal	= <u>146.15</u> "

*Indicates measured value

NOTES: DP-30 Location 197" (16'5") 23° East of North from Stake #40
 Crew did ^{on 2-8-75} not penetrate Trench at this location

WAG4 WELL LOG FOR COMPLETION OF WELL DP-31DATE 2-13, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>170.40</u> " (14' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>5.750</u> "	<u>1056</u>	<u>1058</u>	<u>-</u>
+2' *Additional (5' 2" 1') rod driven to a stick-up of	<u>4.0</u> "	<u>1102</u>	<u>1104</u>	<u>-</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>50.50</u> "	<u>1107</u>	<u>1114</u>	<u>-</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>50.50</u> "	<u>-</u>	<u>-</u>	<u>-</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>147.44</u> " = (12' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>64.00</u> "
*Stick-up before pull back	<u>50.50</u> "
Total pull back	= <u>13.5</u> "

(must be ≥ 13.5)Verified by: *Jm*

Rod length adjustment:

Orig. total rod length	<u>170.40</u> "
Length of section removed	<u>48.00</u> "
Length of section added	<u>-</u> "
Final AQ rod length	= <u>122.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> "
	*Final PVC stick-up (w/cap)	<u>28.5</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>106.44</u> "
AQ rod method:	Final AQ rod length	<u>122.40</u> "
	*Final rod stick-up after well install.	<u>15.75</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>106.46</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>106.45</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>15.750</u> "
Depth to refusal	= <u>140.65</u> "

*Indicates measured value

NOTES:

DP-31 Location = 324" (27') 90° West of North from Stake #15

Norman Farrow believes ^{well on} ~~well~~ 2.13.75 was in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-32DATE 2-13, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u> "	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> "	<u>182.40</u> " (15' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>5.50</u> "	<u>1320</u>	<u>1321</u>	-
*Additional (5' 2, 1') rod driven to a stick-up of	<u>22.250</u> "	<u>1327</u>	<u>1328</u>	-
*Additional (5' 2, 1') rod driven to a stick-up of	<u>42.875</u> "	<u>1333</u>	<u>1340</u>	-
*Additional (5' 2, 1') rod driven to a stick-up of	-	-	-	-
*Additional (5' 2, 1') rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>42.875</u> "	-	-	-

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>171.44</u> "	= (14' 3")

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>56.375</u>	
*Stick-up before pull back	-	<u>42.875</u>
Total pull back	=	<u>13.5</u> "

(must be ≥ 13.5)

Verified by: Rod length adjustment:

Orig. total rod length	<u>182.40</u> "
Length of section removed	- <u>36.00</u> "
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>146.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>171.44</u> "
	*Final PVC stick-up (w/cap)	- <u>34.250</u> "
	Distance from point to TOS	- <u>12.5</u> "
	Calculated depth to TOS	= <u>124.69</u> "
AQ rod method:	Final AQ rod length	<u>146.40</u> "
	*Final rod stick-up after well install.	- <u>20.250</u> "
	Adjustment to PVC TOS	- <u>0.19</u> "
	Alternate calculated depth to TOS	= <u>125.96</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>125.325</u> "

(Note: Both TOS calculations should be within ± 1 ")

Verified by: Total depth to refusal

Final AQ rod length	<u>146.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>20.25</u> "
Depth to refusal	= <u>130.15</u> "

*Indicates measured value

NOTES: DP-32 Location = 96" (8') 10° West of North from
Stake #15

Norman Farrow believes ^{well 9-2-13-75} ~~rod~~ was in Trench.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-33DATE 2-13, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>—</u> rod	24"	X <u>—</u>	<u>—</u> "	
<u>—</u> rod	12"	X <u>—</u>	<u>—</u> "	<u>122.40</u> " (10' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of <u>2.5</u> "	<u>1503</u>	<u>1504</u>	<u>—</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>61.5</u> "	<u>1508</u>	<u>1509</u>	<u>—</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Stick-up before pull-back = <u>61.5</u> "				

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>1</u> riser	60"	X <u>1</u>	<u>60.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>111.44</u> "	= (9' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>—</u> "	
*Stick-up before pull back	<u>61.5</u> "	
Total pull back	=	<u>—</u> " (must be ≥ 13.5)

Verified by: _____

Rod length adjustment:

Orig. total rod length	<u>122.40</u> "
Length of section removed	<u>60.0</u> "
Length of section added	<u>24.0</u> "
Final AQ rod length	= <u>86.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>111.44</u> "
	*Final PVC stick-up (w/cap)	<u>38.5</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>60.44</u> "
AQ rod method:	Final AQ rod length	<u>86.40</u> "
	*Final rod stick-up after well install.	<u>25.125</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>61.085</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>60.7625</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: JmTotal depth to refusal

Final AQ rod length	<u>86.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	<u>25.125</u> "
Depth to refusal	= <u>65.275</u> "

*Indicates measured value

NOTES: DP-33 Location 396" (33') 100° West of North
Stake #11

Norm. Farrow believes ~~Crew~~ Well 9-2-18-95 was in Trench
When driving First 5' Section hit something that
had a void drive point fell in, Set Well
Did not pull back for Well Screen

WAG4 WELL LOG FOR COMPLETION OF WELL DP-33 ContinuedDATE 2-22, 1995 CREW N. Farrow, J. LaForest, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40"</u>	<u>X 1</u>	<u>2.40</u>	
<u>11</u> rod	<u>60"</u>	<u>X 2</u>	<u>120.00</u>	
<u>-</u> rod	<u>24"</u>	<u>X -</u>	<u>-</u>	
<u>-</u> rod	<u>12"</u>	<u>X -</u>	<u>-</u>	
				<u>122.40" (10' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of <u>2.5</u>	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of <u>61.5</u>	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u>	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u>	-	-	-	-
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u>	-	-	-	-
*Stick-up before pull-back = <u>61.5</u>	-	-	-	-

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	<u>13.25"</u>	<u>X 1</u>	<u>13.25</u>	(point, screen & seal)
<u>1</u> riser	<u>60"</u>	<u>X 1</u>	<u>60.00</u>	
<u>1</u> riser	<u>24"</u>	<u>X 1</u>	<u>24.00</u>	
<u>1</u> riser	<u>12"</u>	<u>X 1</u>	<u>12.00</u>	
<u>1</u> cap	<u>2.19"</u>	<u>X 1</u>	<u>2.19</u>	
Total length of PVC material = <u>111.44"</u>				= (9' 3")

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>38.75</u>
*Stick-up before pull back	<u>25.125</u>
Total pull back	<u>13.75</u> (must be ≥ 13.5)

Rod length adjustment:

Orig. total rod length	<u>122.40"</u>
Length of section removed	<u>60.0</u>
Length of section added	<u>24.0</u>
Final AQ rod length	<u>86.40"</u>

Verified by: Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>111.44"</u>
	*Final PVC stick-up (w/cap)	<u>51.25</u>
	Distance from point to TOS	<u>12.5</u>
	Calculated depth to TOS	<u>47.69"</u>
AQ rod method:	Final AQ rod length	<u>86.40"</u>
	*Final rod stick-up after well install.	<u>38.75</u>
	Adjustment to PVC TOS	<u>0.19</u>
	Alternate calculated depth to TOS	<u>47.46"</u>
Average:	(PVC TOS + AQ TOS)/2	<u>47.575"</u>
(Note: Both TOS calculations should be within $\pm 1"$)		

Verified by: Total depth to refusal

Final AQ rod length	<u>86.40"</u>
Drive point tip	<u>4.0</u>
*AQ rod stick-up	<u>38.75</u>
Depth to refusal	<u>51.15"</u>

*Indicates measured value

NOTES: DP-33 Location 396" (33') 100° West of North from Stake
 This work will be continued from 2-B-95, crew
 will pull back AQ Rod from 25.125 to 38.625 38.1
 9m 2-22-95

WAG4 WELL LOG FOR COMPLETION OF WELL DP-34DATE 2-13, 1995 CREW N. Farwell, C Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 20" 2.0"
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40"</u>	<u>X 1</u>	<u>2.40</u>	
<u>11</u> rod	<u>60"</u>	<u>X 2</u>	<u>120.00</u>	
<u>11</u> rod	<u>24"</u>	<u>X 2</u>	<u>48.00</u>	
<u>-</u> rod	<u>12"</u>	<u>X -</u>	<u>-</u>	<u>170.40" (14' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>9.0</u>	<u>1412</u>	<u>1413</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>8.0</u>	<u>1418</u>	<u>1419</u>	<u>-</u>
+2' *Additional (5' 2", 1') rod driven to a stick-up of	<u>8.0</u>	<u>1422</u>	<u>1423</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>8.0</u>			

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	<u>13.25"</u>	<u>X 1</u>	<u>13.25</u> (point, screen & seal)
<u>11</u> riser	<u>60"</u>	<u>X 2</u>	<u>120.00</u>
<u>-</u> riser	<u>24"</u>	<u>X -</u>	<u>-</u>
<u>1</u> riser	<u>12"</u>	<u>X -</u>	<u>12.00</u>
<u>1</u> cap	<u>2.19"</u>	<u>X 1</u>	<u>2.19</u>
Total length of PVC material = <u>147.44"</u> = <u>(12' 3")</u>			

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>21.5</u>	
*Stick-up before pull back	<u>8.0</u>	
Total pull back	<u>= 13.5</u>	<u>(must be >= 13.5")</u>

Rod length adjustment:

Orig. total rod length	<u>170.40"</u>
Length of section removed	<u>- 48.00"</u>
Length of section added	<u>+ -</u>
Final AQ rod length	<u>= 122.40"</u>

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44"</u>
	*Final PVC stick-up (w/cap)	<u>- 34.25"</u>
	Distance from point to TOS	<u>- 12.5</u>
	Calculated depth to TOS	<u>= 100.69"</u>
AQ rod method:	Final AQ rod length	<u>122.40"</u>
	*Final rod stick-up after well install.	<u>- 21.50"</u>
	Adjustment to PVC TOS	<u>- 0.19</u>
	Alternate calculated depth to TOS	<u>= 100.71"</u>
Average:	(PVC TOS + AQ TOS)/2	<u>= 100.70"</u>
(Note: Both TOS calculations should be within +/- 1")		

Total depth to refusal

Final AQ rod length	<u>122.40"</u>
Drive point tip	<u>+ 4.0</u>
*AQ rod stick-up	<u>- 21.50"</u>
Depth to refusal	<u>= 104.90"</u>

*Indicates measured value

Verified by: *Jm*Verified by: *Jm*

NOTES:

Location DP-34 87" (7'3") 5° East of South from
Stake #11

N. Farrow believes ^{Well 2-13-93}
~~Great~~ was in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-35DATE 2-14, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>122.40</u> " (10' 2")

Driving information

Point, sub and 5' rod driven to a stick-up of	Start	End	Start	End
*Additional (5' 2', 1') rod driven to a stick-up of	<u>5.5</u> "	<u>10.53</u>	<u>10.55</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>29.0</u> "	<u>10.58</u>	<u>11.16</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>29.0</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>147.44</u> "	= (12' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>42.625</u> "	
*Stick-up before pull back	<u>29.0</u> "	
Total pull back	=	<u>13.625</u> " (must be ≥ 13.5)

Verified by: *jm*

Rod length adjustment:

Orig. total rod length	<u>122.40</u> "	
Length of section removed	<u>-</u> "	
Length of section added	<u>+</u> "	
Final AQ rod length	=	<u>122.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> "
	*Final PVC stick-up (w/cap)	<u>55.25</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>79.69</u> "
AQ rod method:	Final AQ rod length	<u>122.40</u> "
	*Final rod stick-up after well install.	<u>42.50</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>79.71</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>79.70</u> "
	(Note: Both TOS calculations should be within ± 1 ")	

Verified by: *jm*Total depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>42.50</u> "
Depth to refusal	= <u>83.90</u> "

*Indicates measured value

NOTES: DP-35 Location 180.00" (15') 180° West of North from
Stake #9

N. Farrow believes Well is not in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-36DATE 2-14, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> "	
<u>111</u> rod	24"	X <u>3</u>	<u>72.00</u> "	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> "	<u>146.40</u> " (12' 2")

Driving information

		Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>4.0</u> "	<u>1149</u>	<u>1151</u>	—	—
+2 *Additional (5' <u>2</u> 1') rod driven to a stick-up of	<u>3.750</u> "	<u>1156</u>	<u>1158</u>	—	—
*Additional (5' <u>2</u> 1') rod driven to a stick-up of	<u>18.0</u> "	<u>1159</u>	<u>1159</u>	—	—
*Additional (5' <u>2</u> 1') rod driven to a stick-up of	<u>4.5</u> "	<u>1203</u>	<u>1205</u>	—	—
*Additional (5' <u>2</u> 1') rod driven to a stick-up of	<u>—</u> "	—	—	—	—
*Stick-up before pull-back =	<u>4.5</u> "	—	—	—	—

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> riser	24"	X <u>2</u>	<u>48.00</u> "	
<u>—</u> riser	12"	X <u>—</u>	<u>—</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	

Total length of PVC material = 183.44 " = (15' 3")

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>18.0</u> "	
*Stick-up before pull back	<u>4.5</u> "	
Total pull back	= <u>13.5</u> "	(must be >= 13.5")

Rod length adjustment:

Orig. total rod length	<u>146.40</u> "	
Length of section removed	<u>12.00</u> "	
Length of section added	<u>24.00</u> "	
Final AQ rod length	= <u>158.40</u> "	

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>183.44</u> "
	*Final PVC stick-up (w/cap)	<u>42.625</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>128.315</u> "
AQ rod method:	Final AQ rod length	<u>158.40</u> "
	*Final rod stick-up after well install.	<u>30.0</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>128.21</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>128.27</u> "
	(Note: Both TOS calculations should be within +/- 1")	

Total depth to refusal

Final AQ rod length	<u>158.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>30.0</u> "
Depth to refusal	= <u>132.40</u> "

*Indicates measured value

Verified by: *Jm*Verified by: *Jm*

NOTES: DP-36 Location 396.00" (33') 77° West of North from
Stake #3

N. Farrow believes well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-37DATE 2-14, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40"</u>	<u>X 1</u>	<u>2.40</u> "	
<u>11</u> rod	<u>60"</u>	<u>X 2</u>	<u>120.00</u> "	
<u>111</u> rod	<u>24"</u>	<u>X 5</u>	<u>120.00</u> "	
<u>-</u> rod	<u>12"</u>	<u>X -</u>	<u>-</u>	
				<u>242.40" (20' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>7.0</u> "	<u>1240</u>	<u>1241</u>	<u>-</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>6.0</u> "	<u>1245</u>	<u>1248</u>	<u>-</u>
+2' +2' *Additional (5' 2" 1') rod driven to a stick-up of	<u>28.750</u> "	<u>1251</u>	<u>1254</u>	<u>-</u>
+2' *Additional (5' 2" 1') rod driven to a stick-up of	<u>12.00</u> "	<u>1257</u>	<u>1259</u>	<u>-</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>12.00</u> "			

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	<u>13.25"</u>	<u>X 1</u>	<u>13.25</u> " (point, screen & seal)
<u>111</u> riser	<u>60"</u>	<u>X 3</u>	<u>180.00</u> "
<u>1</u> riser	<u>24"</u>	<u>X 1</u>	<u>24.00</u> "
<u>-</u> riser	<u>12"</u>	<u>X -</u>	<u>-</u>
<u>1</u> cap	<u>2.19"</u>	<u>X 1</u>	<u>2.19</u> "
			Total length of PVC material = <u>219.44</u> " = <u>(18' 3")</u>

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>25.750</u> "
*Stick-up before pull back	<u>-</u> <u>12.00</u> "
Total pull back	<u>=</u> <u>13.750</u> "

(must be ≥ 13.5)Verified by: *Jm*

Rod length adjustment:

Orig. total rod length	<u>242.40</u> "
Length of section removed	<u>-</u> <u>48.00</u> "
Length of section added	<u>+</u> <u>-</u> "
Final AQ rod length	<u>=</u> <u>194.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>219.44</u> "
	*Final PVC stick-up (w/cap)	<u>-</u> <u>38.50</u> "
	Distance from point to TOS	<u>-</u> <u>12.5</u> "
	Calculated depth to TOS	<u>=</u> <u>168.44</u> "
AQ rod method:	Final AQ rod length	<u>194.40</u> "
	*Final rod stick-up after well install.	<u>-</u> <u>25.50</u> "
	Adjustment to PVC TOS	<u>-</u> <u>0.19</u> "
	Alternate calculated depth to TOS	<u>=</u> <u>163.71</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>=</u> <u>166.58</u> "
	(Note: Both TOS calculations should be within ± 1 ")	

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>194.40</u> "
Drive point tip	<u>+</u> <u>4.0</u> "
*AQ rod stick-up	<u>-</u> <u>25.50</u> "
Depth to refusal	<u>=</u> <u>173.40</u> "

*Indicates measured value

NOTES: DP-37 Location 108.00" (9') 27° West of North from
Stake #3

N. Farrow believes Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-38DATE 2-14, 1995 CREW N. Farwell, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 1.75 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>1</u> rod	24"	X <u>1</u>	<u>24.00</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>146.40</u> " (12' 2")

Driving information

Point, sub and 5' rod driven to a stick-up of	Start	End	Start	End
<u>6.5</u> "	<u>1331</u>	<u>1333</u>	-	-
*Additional (5' 2', 1') rod driven to a stick-up of	<u>7.0</u> "	<u>1338</u>	<u>1340</u>	-
*Additional (5' 2', 1') rod driven to a stick-up of	<u>3.0</u> "	<u>1342</u>	<u>1347</u>	-
*Additional (5' 2', 1') rod driven to a stick-up of	-	-	-	-
*Additional (5' 2', 1') rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>3.0</u> "	-	-	-

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> " (point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "

Total length of PVC material = 171.44 " = (14' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>16.5</u> "
*Stick-up before pull back	<u>3.0</u> "
Total pull back	= <u>13.5</u> "

(must be ≥ 13.5)Verified by: *Jm*

Rod length adjustment:

Orig. total rod length	<u>146.40</u> "
Length of section removed	-
Length of section added	+ <u>-</u> "
Final AQ rod length	= <u>146.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>171.44</u> "
	*Final PVC stick-up (w/cap)	- <u>29.25</u> "
	Distance from point to TOS	- <u>12.5</u> "
	Calculated depth to TOS	= <u>129.69</u> "
AQ rod method:	Final AQ rod length	<u>146.40</u> "
	*Final rod stick-up after well install.	- <u>16.50</u> "
	Adjustment to PVC TOS	- <u>0.19</u> "
	Alternate calculated depth to TOS	= <u>129.71</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>129.70</u> "

(Note: Both TOS calculations should be within ± 1 ")

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>146.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	- <u>16.50</u> "
Depth to refusal	= <u>133.90</u> "

*Indicates measured value

NOTES: DP-38 Location 252.00" (21') 26° East of North from
Stake #3

N. Farrow believes Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-39DATE 2-20, 1995 CREW N. Farrow, J. LaForest, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>11</u> rod	24"	X <u>5</u>	<u>120.00</u> "	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> "	<u>254.40" (21' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>12.75</u> "	<u>1040</u>	<u>1042</u>	<u>1043</u>
*Additional (5' 2' 1") rod driven to a stick-up of	<u>10.0</u> "	<u>1051</u>	<u>1051</u>	<u>1052</u>
+2' +2' *Additional (5' 2' 1") rod driven to a stick-up of	<u>34.5</u> "	<u>1103</u>	<u>1104</u>	<u>1105</u>
+2' *Additional (5' 2' 1") rod driven to a stick-up of	<u>75.0</u> "	<u>1109</u>	<u>1116</u>	<u>1117</u>
*Additional (5' 2' 1") rod driven to a stick-up of	<u>75.0</u> "	<u>1116</u>	<u>1116</u>	<u>1117</u>
*Stick-up before pull-back =	<u>75.0</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u> "	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>219.44" = (18' 3")</u>

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>88.75</u> "
*Stick-up before pull back	<u>75.0</u> "
Total pull back	<u>13.75</u> "

(must be ≥ 13.5)Verified by: *Jr*

Rod length adjustment:

Orig. total rod length	<u>254.40</u> "
Length of section removed	<u>60.0</u> "
Length of section added	<u>13.75</u> "
Final AQ rod length	<u>194.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>219.44</u> "
	*Final PVC stick-up (w/cap)	<u>41.5</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>165.44</u> "
AQ rod method:	Final AQ rod length	<u>194.40</u> "
	*Final rod stick-up after well install.	<u>28.75</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>165.46</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>165.45</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: *Jr*Total depth to refusal

Final AQ rod length	<u>194.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>28.75</u> "
Depth to refusal	<u>169.65</u> "

*Indicates measured value

NOTES:

DP-39 Location 292" (24'4") 35° West of North
 From Stake #1
 Norman Farrow believes well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-40DATE 2.21, 1995 CREW N. Farrow, T. Thomas, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>111</u> rod	24"	X <u>3</u>	<u>72.00</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	
				<u>194.40</u> " (16' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>6.0</u> "	<u>14.28</u>	<u>14.30</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>6.0</u> "	<u>14.35</u>	<u>14.38</u>	<u>-</u>
+2' 12" *Additional (5' 2", 1') rod driven to a stick-up of	<u>32.25</u> "	<u>144.2</u>	<u>144.8</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>32.25</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> riser	12"	X <u>-</u>	<u>-</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
				Total length of PVC material = <u>195.44</u> " = (16' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>46.0</u> "	
*Stick-up before pull back	<u>32.25</u> "	
Total pull back	<u>13.75</u> "	(must be ≥ 13.5)

Verified by:

Rod length adjustment:

Orig. total rod length	<u>194.40</u> "	
Length of section removed	<u>24.00</u> "	
Length of section added	<u>170.40</u> "	9-2-21-95
Final AQ rod length	<u>170.40</u> "	

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>195.44</u> "
	*Final PVC stick-up (w/cap)	<u>34.0</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>148.94</u> "
AQ rod method:	Final AQ rod length	<u>170.40</u> "
	*Final rod stick-up after well install.	<u>21.75</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>148.46</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>148.70</u> "
	(Note: Both TOS calculations should be within ± 1 ")	

Verified by: Total depth to refusal

Final AQ rod length	<u>170.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>21.75</u> "
Depth to refusal	<u>152.65</u> "

*Indicates measured value

NOTES:

DP-40 Location $462''$ ($38' 6''$) 33° East of North from Stake #33

Norman Farrow believes well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-41DATE 2-21, 1995 CREW N. Farrow, J. LaForest, D. Jones, J. Mitchell
9-2-21-95Reference Stake: * Height above ground surface 2.0 " 31.15 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40</u> "	<u>X 1</u>	<u>2.40</u> "	
<u>11</u> rod	<u>60</u> "	<u>X 2</u>	<u>120.00</u> "	
<u>11</u> rod	<u>24</u> "	<u>X 5</u>	<u>120.00</u> "	
<u>-</u> rod	<u>12</u> "	<u>X -</u>	<u>-</u> "	<u>242.40</u> " (20' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>7.0</u> "	<u>0954</u>	<u>0955</u>	<u>-</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>6.75</u> "	<u>1002</u>	<u>1004</u>	<u>-</u>
+2' +2' *Additional (5' 2" 1') rod driven to a stick-up of	<u>29.75</u> "	<u>1007</u>	<u>1008</u>	<u>-</u>
+2' *Additional (5' 2" 1') rod driven to a stick-up of	<u>57.50</u> "	<u>1012</u>	<u>1017</u>	<u>1019</u>
*Additional (5' 2" 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>57.50</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	<u>13.25</u> "	<u>X 1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	<u>60</u> "	<u>X 3</u>	<u>180.00</u> "	
<u>1</u> riser	<u>24</u> "	<u>X 1</u>	<u>24.00</u> "	
<u>-</u> riser	<u>12</u> "	<u>X -</u>	<u>-</u> "	
<u>1</u> cap	<u>2.19</u> "	<u>X 1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>219.44</u> " = (18' 3")

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>71.625</u> "	
*Stick-up before pull back	<u>57.50</u> "	
Total pull back	<u>14.125</u> "	(must be >= 13.5")

Verified by: *Jm*Rod length adjustment:

Orig. total rod length	<u>242.40</u> "
Length of section removed	<u>48.00</u> "
Length of section added	<u>-</u> "
Final AQ rod length	<u>194.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>219.44</u> "
	*Final PVC stick-up (w/cap)	<u>35.0</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>171.94</u> "
AQ rod method:	Final AQ rod length	<u>194.40</u> "
	*Final rod stick-up after well install.	<u>23.5</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>170.71</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>171.325</u> "
(Note: Both TOS calculations should be within +/- 1")		

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>194.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>23.5</u> "
Depth to refusal	<u>174.90</u> "

*Indicates measured value

NOTES:

DP-41 Location 102" (8' 6") 18° West of North
 from Stake #26

Norman Farrow believes well is in Trench.

WAG4 WELL LOG FOR COMPLETION OF WELL DP-42

DATE 2-20, 1995 CREW M. Farrow, J. LaForest, D. Jones, J. Mitchell

Reference Stake:

Height above ground surface 2.0' Before 2.0' After

AO stock

quantity/description	length	factor	sub total	total rod length
1 sub	2.40'	X 1	2.40'	
1 rod	60'	X 2	120.00'	
1 rod	24'	X 1	24'	
1 rod	12'	X 1	12'	
				122.40' (10' 2')

Driving information

Point, sub and 5' rod driven to a stick-up of	6.5'	1533	1534	End
Additional (5' 2, 1') rod driven to a stick-up of	53.5'	1539	1544	End
Additional (5' 2, 1') rod driven to a stick-up of				
Additional (5' 2, 1') rod driven to a stick-up of				
Additional (5' 2, 1') rod driven to a stick-up of				
Stick-up before pull-back =	53.5'			

PVC well stock

quantity/description	length	factor	sub total	(point, screen & seal)
1 pt. sc. & se.	13.25'	X 1	13.25'	
1 nser	60'	X 1	60.00'	
1 nser	24'	X 1	24.00'	
1 nser	12'	X 1	12.00'	
1 cap	2.19'	X 1	2.19'	
				Total length of PVC material = 111.44' = (9' 3")

AO rod adjustment (to set PVC assembly)

Pull back:

Stick-up after pull back
Stick-up before pull back
Total pull back
Rod length adjustment:

67.0'	-	53.5'	=	13.5'
122.40'	-	60.00'	=	62.40'
24.00'	+	24.00'	=	24.00'
86.40'	=			

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC

Final PVC stick-up (w/cap)

Distance from point to TOS

Calculated depth to TOS

AO rod method:

Final AO rod length

Final rod stick-up after well install.

Adjustment to PVC TOS

Alternate calculated depth to TOS

(PVC TOS + AO TOS)/2

Average:

(Note: Both TOS calculations should be within +/- 1")

111.44'	-	43.25'	=	12.5'
55.69'	-	86.40'	=	31.0'
0.19'	-	31.0'	=	55.21'
55.45'	=			

Total depth to refusal

Final AO rod length

Drive point tip

AO rod stick-up

Depth to refusal

86.40'	+	4.0'	=	31.0'
59.40'	=			

Indicates measured value

Verified by:

Verified by:

NOTES:

DP-42 Location 546" (45'6") 10° West of North
 from Stake #20

Norman Farrow believes well is not in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-43DATE 2-21, 1995 CREW N. Farrow, J. LaForrest, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u> "	
<u>111</u> rod	24"	X <u>3</u>	<u>72.00</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>134.40</u> " (11' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of <u>8.0</u> "	<u>1101</u>	<u>1103</u>	<u>-</u>	<u>-</u>
+2', +2' *Additional (5' 2") 1' rod driven to a stick-up of <u>28.5</u> "	<u>1122</u>	<u>1125</u>	<u>1126</u>	<u>1127</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back = <u>28.5</u> "				

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> " (point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "

Total length of PVC material = 147.44 " = (12' 3")AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>42.25</u> "
*Stick-up before pull back	<u>28.5</u> "
Total pull back	<u>13.75</u> "

(must be ≥ 13.5 ")Verified by: Jn

Rod length adjustment:

Orig. total rod length	<u>134.40</u> "
Length of section removed	<u>24.00</u> "
Length of section added	<u>12.00</u> "
Final AQ rod length	<u>122.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> "
	*Final PVC stick-up (w/cap)	<u>42.0</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>92.94</u> "
AQ rod method:	Final AQ rod length	<u>122.40</u> "
	*Final rod stick-up after well install.	<u>30.50</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>91.71</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>92.325</u> "

(Note: Both TOS calculations should be within ± 1 ")Verified by: JnTotal depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>30.50</u> "
Depth to refusal	<u>95.90</u> "

*Indicates measured value

NOTES: DP-43 Location 702" (58'6") 125° East of North
from Stake # 22
Norman Farrow believes well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP44DATE 3-13, 1995 CREW Jim L Forest, No. in Farrow, Charlie Lamb, Doug JonesReference Stake: * Height above ground surface $\frac{2.00}{\text{Before}} = \frac{1.625}{\text{After}}$ AQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.4</u>	
<u>11</u> rod	60"	X <u>2</u>	<u>120</u>	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u>	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u>	
				<u>122.4" (10-2)</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>5.00</u>	<u>1453</u>	<u>1454</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>9.50</u>	<u>1459</u>	<u>1505</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5'2", 1') rod driven to a stick-up of	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>9.50</u>			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u>	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120</u>	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u>	
<u>1</u> riser	12"	X <u>1</u>	<u>12</u>	
<u>-</u> cap	2.19"	X <u>1</u>	<u>2.19</u>	
				Total length of PVC material = <u>147.44" = (12-29)</u>

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>23.0</u>
*Stick-up before pull back	<u>9.5</u>
Total pull back	<u>13.5</u>

(must be ≥ 13.5)Verified by: SnRod length adjustment:

Orig. total rod length	<u>122.4</u>
Length of section removed	<u>-0-</u>
Length of section added	<u>-0-</u>
Final AQ rod length	<u>122.4</u>

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u>
	*Final PVC stick-up (w/cap)	<u>35.5</u>
	Distance from point to TOS	<u>12.5</u>
	Calculated depth to TOS	<u>99.44</u>
AQ rod method:	Final AQ rod length	<u>122.4</u>
	*Final rod stick-up after well install.	<u>22.5</u>
	Adjustment to PVC TOS	<u>0.19</u>
	Alternate calculated depth to TOS	<u>99.71</u>
Average:	(PVC TOS + AQ TOS)/2	<u>99.575</u>

(Note: Both TOS calculations should be within $\pm 1'$)

Verified by: SnTotal depth to refusal

Final AQ rod length	<u>122.4</u>
Drive point tip	<u>4.0</u>
*AQ rod stick-up	<u>22.5</u>
Depth to refusal	<u>103.9</u>

*Indicates measured value

NOTES: DP-44 Location 600.00" (50') 148° East of North
from Stake #17

Norman Farrow believes well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-45DATE 2-22, 1995 CREW N. Farrow, J. LaForest, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> rod	24"	X <u>-</u>	<u>-</u> "	
<u>-</u> rod	12"	X <u>-</u>	<u>-</u> "	<u>122.40</u> " (10' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>7.5</u> "	<u>1407</u>	<u>1408</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>45.0</u> "	<u>1412</u>	<u>1415</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back =	<u>45.0</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>-</u> riser	24"	X <u>-</u>	<u>-</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =				<u>147.44</u> " = (12' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:	
*Stick-up after pull back	<u>58.625</u> "
*Stick-up before pull back	<u>45.0</u> "
Total pull back	= <u>13.625</u> " (must be ≥ 13.5)
Rod length adjustment:	
Orig. total rod length	<u>122.40</u> "
Length of section removed	<u>-</u> "
Length of section added	<u>-</u> "
Final AQ rod length	= <u>122.40</u> "

Verified by: JmDepth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u> "
	*Final PVC stick-up (w/cap)	<u>70.375</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>64.565</u> "
AQ rod method:	Final AQ rod length	<u>122.40</u> "
	*Final rod stick-up after well install.	<u>58.375</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>63.835</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>64.20</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: JmTotal depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	<u>58.375</u> "
Depth to refusal	= <u>68.025</u> "

*Indicates measured value

NOTES: DP-45 Location = 576" (48') 15° West of North
from Stake #17

Norman Farrow believes Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-42-46
Jm. 2-20-95DATE 2-20, 1995CREW N. Farrow, J. LaForest, D. Jones, J. Mitchell

Reference Stake:

* Height above ground surface 2.0 " 2.0 "
Before After

AQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u> "	
<u>—</u> rod	24"	X <u>—</u>	<u>—</u> "	
<u>—</u> rod	12"	X <u>—</u>	<u>—</u> "	<u>122.40</u> " (10' 2 1/2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>8.75</u> "	<u>1423</u>	<u>1424</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>42.50</u> "	<u>1433</u>	<u>1439</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>—</u> "	<u>—</u>	<u>—</u>	<u>—</u>
*Stick-up before pull-back =	<u>42.50</u> "			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> "	
<u>—</u> riser	24"	X <u>—</u>	<u>—</u> "	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
Total length of PVC material =			<u>147.44</u> "	= <u>(147.44)</u> 12' 3" Jm. 2-20-95

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>56.0</u> "	
*Stick-up before pull back	<u>42.50</u> "	
Total pull back	= <u>13.5</u> "	(must be ≥ 13.5)

Verified by: Jm

Rod length adjustment:

Orig. total rod length	<u>122.40</u> "
Length of section removed	<u>—</u> "
Length of section added	<u>—</u> "
Final AQ rod length	= <u>122.40</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>149.44</u> "
	*Final PVC stick-up (w/cap)	<u>67.75</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	= <u>67.19</u> "
AQ rod method:	Final AQ rod length	<u>122.40</u> "
	*Final rod stick-up after well install.	<u>55.75</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	= <u>66.46</u> "
Average:	(PVC TOS + AQ TOS)/2	= <u>66.825</u> "
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: Jm

Total depth to refusal

Final AQ rod length	<u>122.40</u> "
Drive point tip	+ <u>4.0</u> "
*AQ rod stick-up	<u>55.75</u> "
Depth to refusal	= <u>70.65</u> "

*Indicates measured value

NOTES: DP-46 Location - 522" (43' 6") 28° West of North
from Stake #20

Norman Farrow believes Well is not in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP47DATE 3-13, 1995 CREW J. A. Lefort, Norm Fierman, Charles Lamb, Doug JonesReference Stake: * Height above ground surface $\frac{2.00}{\text{Before}}$ $\frac{2.00}{\text{After}}$ AQ stock

quantity/description	length	factor	sub total	total rod length
1 sub	2.40"	X 1	2.40	
11 rod	60"	X 2	120	
744 rod	24"	X 5	120	
1 rod	12"	X 1	12	
				242.4 (20.2)

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	1600	1602		
*Additional (5'2", 1') rod driven to a stick-up of	1604	1607		
*Additional (5'2", 1') rod driven to a stick-up of	1609	1611		
*Additional (5'2", 1') rod driven to a stick-up of	1613	1614	1615	1616
*Additional (5'2", 1') rod driven to a stick-up of				
*Stick-up before pull-back =	60.375			

PVC well stock

quantity/description	length	factor	sub total	
1 pt. sc. & se.	13.25"	X 1	13.25	(point, screen & seal)
11 riser	60"	X 3	180	
1 riser	24"	X 1	24	
1 riser	12"	X 1	12	
1 cap	2.19"	X 1	2.19	
				Total length of PVC material = 219.44 = (18.29)

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	74
*Stick-up before pull back	60.375
Total pull back	13.625

(must be ≥ 13.5)Verified by SA

Rod length adjustment:

Orig. total rod length	242.4
Length of section removed	48
Length of section added	-0-
Final AQ rod length	194.4

Depth to top of PVC well screen (TOS)

PVC:

Total length of PVC

219.44

*Final PVC stick-up (w/cap)

- 38.625

Distance from point to TOS

- 12.5

Calculated depth to TOS

= 168.29

AQ rod method:

Final AQ rod length

194.4

*Final rod stick-up after well install.

- 26.25

Adjustment to PVC TOS

- 0.19

Alternate calculated depth to TOS

= 167.96

Average:

(PVC TOS + AQ TOS)/2

= 168.13

(Note: Both TOS calculations should be within $\pm 1'$)Verified by: SATotal depth to refusal

Final AQ rod length

194.4

Drive point tip

+ 4.0

*AQ rod stick-up

- 26.25

Depth to refusal

= 172.15

*Indicates measured value

NOTES: DP47 drove like it was in a Trench
 Distance & Direction = 228" (19') 100° West of North
 from Stake #6

WAG4 WELL LOG FOR COMPLETION OF WELL DP-48DATE 3-14, 1995 CREW N. Farrow, Tim LeForest, Doug Jones, Jay M.Reference Stake: * Height above ground surface 2.0 * 2.0 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u>	242.40 240 (20' 2")
<u>11</u> rod	60"	X <u>2</u>	<u>120.00</u>	
<u>11</u> rod	24"	X <u>5</u>	<u>120.00</u>	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u>	

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>11.125</u>	<u>0955</u>	<u>0957</u>	<u>—</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>7.78</u>	<u>1004</u>	<u>1006</u>	<u>—</u>
+2' +2' *Additional (5' 2', 1') rod driven to a stick-up of	<u>20.75</u>	<u>1012</u>	<u>1014</u>	<u>—</u>
+2' *Additional (5' 2', 1') rod driven to a stick-up of	<u>51.0</u>	<u>1018</u>	<u>1022</u>	<u>—</u>
*Additional (5' 2', 1') rod driven to a stick-up of	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
*Stick-up before pull-back =	<u>51.0</u>	<u>—</u>	<u>—</u>	<u>—</u>

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u>	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180.00</u>	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u>	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u>	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u>	

Total length of PVC material = 219.44 * = (18' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>64.5</u>
*Stick-up before pull back	<u>51.0</u>
Total pull back	<u>13.5</u>

(must be ≥ 13.5)Verified by: *Jm*

Rod length adjustment:

Orig. total rod length	<u>242.40</u>
Length of section removed	<u>78.0</u>
Length of section added	<u>—</u>
Final AQ rod length	<u>194.40</u>

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>219.44</u>
	*Final PVC stick-up (w/cap)	<u>29.25</u>
	Distance from point to TOS	<u>12.5</u>
	Calculated depth to TOS	<u>177.69</u>
AQ rod method:	Final AQ rod length	<u>194.40</u>
	*Final rod stick-up after well install.	<u>16.5</u>
	Adjustment to PVC TOS	<u>0.19</u>
	Alternate calculated depth to TOS	<u>177.71</u>
Average:	(PVC TOS + AQ TOS)/2	<u>177.70</u>

(Note: Both TOS calculations should be within ± 1 ")

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>194.40</u>
Drive point tip	<u>4.0</u>
*AQ rod stick-up	<u>16.5</u>
Depth to refusal	<u>181.90</u>

*Indicates measured value

NOTES: DP-48 - Location is 70" (5'10") 30° East of South
 From Stake #6
 Norman Farrow believes well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP49

DATE 3-13, 1995 CREW Jay Lefew + Mark Feltz + Dave Jones + Charles Lamb

Reference Stake: * Height above ground surface $\frac{2.00}{\text{Before}}$ $\frac{2.00}{\text{After}}$

AQ stock

quantity/description	length	factor	sub total	total rod length
1 sub	2.40"	X 1	2.40	
1 rod	60"	X 1	60	
1 rod rod	24"	X 6	144	
1 rod	12"	X 1	12	
				206.4 = (17.2)

Driving information

	Point, sub and 5' rod driven to a stick-up of	8.50	1051	1053	-	-
+2 +2	*Additional (5' 2", 1") rod driven to a stick-up of	24.25	1054	1055	-	-
+2	*Additional (5' 2", 1") rod driven to a stick-up of	24.0	1057	1100	-	-
	*Additional (5' 2", 1") rod driven to a stick-up of	43.50	1103	1107	-	-
	*Additional (5' 2", 1") rod driven to a stick-up of	-	-	-	-	-
	*Stick-up before pull-back =	43.50	-	-	-	-

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> (point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120</u>
<u>111</u> riser	24"	X <u>3</u>	<u>72</u>
<u>-</u> riser	12"	X <u>-</u>	<u>-</u>
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u>
Total length of PVC material =			<u>207.44</u> = (1729)

AQ rod adjustment (to set PVC assembly)

Pull back:			
*Stick-up after pull back		<u>57.0</u>	-
*Stick-up before pull back	-	<u>43.50</u>	-
Total pull back	=	<u>13.50</u>	(must be ≥ 13.5)
Rod length adjustment:			
Orig. total rod length		<u>206.4</u>	-
Length of section removed	-	<u>24</u>	-
Length of section added	+	<u>-0-</u>	-
Final AQ rod length	=	<u>182.4</u>	-

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	-	<u>207.49</u>
	*Final PVC stick-up (w/cap)	-	<u>45.0</u>
	Distance from point to TOS	-	<u>12.5</u>
	Calculated depth to TOS	=	<u>149.99</u>
AQ rod method:	Final AQ rod length	-	<u>152.4</u>
	*Final rod stick-up after well install.	-	<u>32.75</u>
	Adjustment to PVC TOS	-	<u>0.19</u>
	Alternate calculated depth to TOS	=	<u>149.46</u>
Average:	(PVC TOS + AQ TOS)/2	=	<u>149.7</u>
	(Note: Both TOS calculations should be within +/- 1")		

Total depth to refusal

Final AQ rod length		182.4
Drive point tip	+	4.0
*AQ rod stick-up	-	32.35
Depth to refusal	=	153.65

*Indicates measured value

NOTES: DP-49 Location $227''$ ($18'11''$) 35° East of South
from Stake #41

Norman Farrow believes Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP50DATE 3-13, 1995 CREW Jim LaForest, Norm Ferrell, Doug Jones, Charles GaltReference Stake: * Height above ground surface 2.00 " 2.00 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> "	
<u>11</u> rod	60"	X <u>2</u>	<u>120</u> "	
<u>11</u> rod	24"	X <u>3</u>	<u>72</u> "	
<u>—</u> rod	12"	X <u>—</u>	<u>—</u> "	
				<u>194.4</u> " (16.2)

Driving information

Point, sub and 5' rod driven to a stick-up of	4.0 "	Start	End	Start	End
*Additional (5' 2", 1') rod driven to a stick-up of	<u>3.0</u> "	<u>1402</u>	<u>1405</u>	—	—
+2 +2 *Additional (5' 2", 1') rod driven to a stick-up of	<u>27.25</u> "	<u>1408</u>	<u>1410</u>	—	—
*Additional (5' 2", 1') rod driven to a stick-up of	<u>—</u> "	<u>1413</u>	<u>1419</u>	—	—
*Additional (5' 2", 1') rod driven to a stick-up of	<u>—</u> "	—	—	—	—
*Stick-up before pull-back =	<u>27.25</u> "	—	—	—	—

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> "	(point, screen & seal)
<u>111</u> riser	60"	X <u>3</u>	<u>180</u> "	
<u>—</u> riser	24"	X <u>—</u>	<u>—</u> "	
<u>—</u> riser	12"	X <u>—</u>	<u>—</u> "	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> "	
			<u>195.44</u> "	(16.29)

Total length of PVC material = 195.44 " = (16.29)AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>40.75</u> "
*Stick-up before pull back	<u>27.25</u> "
Total pull back	<u>13.5</u> "

(must be ≥ 13.5)Verified by: SmRod length adjustment:

Orig. total rod length	<u>194.4</u> "
Length of section removed	<u>24.0</u> "
Length of section added	<u>0.0</u> "
Final AQ rod length	<u>170.4</u> "

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>195.44</u> "
	*Final PVC stick-up (w/cap)	<u>27.25</u> "
	Distance from point to TOS	<u>12.5</u> "
	Calculated depth to TOS	<u>153.69</u> "
AQ rod method:	Final AQ rod length	<u>170.4</u> "
	*Final rod stick-up after well install.	<u>16.5</u> "
	Adjustment to PVC TOS	<u>0.19</u> "
	Alternate calculated depth to TOS	<u>153.71</u> "
Average:	(PVC TOS + AQ TOS)/2	<u>153.70</u> "

(Note: Both TOS calculations should be within ± 1 ")Verified by: SmTotal depth to refusal

Final AQ rod length	<u>170.4</u> "
Drive point tip	<u>4.0</u> "
*AQ rod stick-up	<u>16.5</u> "
Depth to refusal	<u>157.9</u> "

*Indicates measured value

NOTES:

DP.50 Location 388" (32'4") 25° West of North
from Stake #17

Norman Farrow believes Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-51DATE 3-21, 1995 CREW H. Farrow, C. Lamb, P. Abston, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40"</u>	<u>X 1</u>	<u>2.40</u>	
<u>11</u> rod	<u>60"</u>	<u>X 2</u>	<u>120.00</u>	
<u>-</u> rod	<u>24"</u>	<u>X -</u>	<u>-</u>	
<u>-</u> rod	<u>12"</u>	<u>X -</u>	<u>-</u>	
				<u>122.40" (10' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of <u>5.0</u>	<u>0940</u>	<u>0941</u>	<u>0942</u>	<u>0943</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>25.375</u>	<u>0948</u>	<u>100951</u>	<u>0958</u>	<u>1007</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Stick-up before pull-back = <u>25.375</u>				

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	<u>13.25"</u>	<u>X 1</u>	<u>13.25</u>	(point, screen & seal)
<u>11</u> riser	<u>60"</u>	<u>X 2</u>	<u>120.00</u>	
<u>-</u> riser	<u>24"</u>	<u>X -</u>	<u>-</u>	
<u>1</u> riser	<u>12"</u>	<u>X 1</u>	<u>12.00</u>	
<u>1</u> cap	<u>2.19"</u>	<u>X 1</u>	<u>2.19</u>	
				Total length of PVC material = <u>147.44" = (12' 3")</u>

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>39.0"</u>	
*Stick-up before pull back	<u>25.375</u>	
Total pull back	<u>13.625</u>	(must be $\geq 13.5"$)

Rod length adjustment:

Orig. total rod length	<u>122.40"</u>	
Length of section removed	<u>-</u>	
Length of section added	<u>+</u>	
Final AQ rod length	<u>122.40"</u>	

Verified by: jmDepth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>147.44</u>
	*Final PVC stick-up (w/cap)	<u>51</u>
	Distance from point to TOS	<u>12.5</u>
	Calculated depth to TOS	<u>83.94</u>
AQ rod method:	Final AQ rod length	<u>122.40</u>
	*Final rod stick-up after well install.	<u>39</u>
	Adjustment to PVC TOS	<u>0.19</u>
	Alternate calculated depth to TOS	<u>83.21</u>
Average:	(PVC TOS + AQ TOS)/2	<u>83.575</u>
	(Note: Both TOS calculations should be within $\pm 1"$)	

Verified by: jmTotal depth to refusal

Final AQ rod length	<u>122.40"</u>
Drive point tip	<u>4.0</u>
*AQ rod stick-up	<u>39</u>
Depth to refusal	<u>87.40"</u>

*Indicates measured value

NOTES: DP-51 Location is 60" (5') 115° East of North
from stake #10

Norman Farrow believes well is not in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-52DATE 3-21, 1995 CREW N. Farrow, C. Lamb, P. Abster, J. MitchellReference Stake: * Height above ground surface 2.0 " 2.0 "
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	<u>2.40"</u>	<u>X 1</u>	<u>2.40</u>	
<u>11</u> rod	<u>60"</u>	<u>X 2</u>	<u>120.00</u>	
<u>-</u> rod	<u>24"</u>	<u>X -</u>	<u>-</u>	
<u>-</u> rod	<u>12"</u>	<u>X -</u>	<u>-</u>	<u>122.40" (10' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of <u>8.0</u> "	<u>1040</u>	<u>1041</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>60.375</u> "	<u>1045</u>	<u>1047</u>	<u>1050</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
*Additional (5' 2", 1') rod driven to a stick-up of <u>-</u> "	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

*Stick-up before pull-back = 60.375 "PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	<u>13.25"</u>	<u>X 1</u>	<u>13.25</u>	(point, screen & seal)
<u>1</u> riser	<u>60"</u>	<u>X 1</u>	<u>60.00</u>	
<u>-</u> riser	<u>24"</u>	<u>X -</u>	<u>-</u>	
<u>1</u> riser	<u>12"</u>	<u>X 1</u>	<u>12.00</u>	
<u>1</u> cap	<u>2.19"</u>	<u>X 1</u>	<u>2.19</u>	

Total length of PVC material = 87.44 " = (7' 3")

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	<u>73.875</u>	
*Stick-up before pull back	<u>60.375</u>	
Total pull back	<u>13.50</u>	(must be ≥ 13.5)

Verified by: Jm

Rod length adjustment:

Orig. total rod length	<u>122.40</u>
Length of section removed	<u>60.00</u>
Length of section added	<u>-</u>
Final AQ rod length	<u>62.40</u>

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>87.44</u>
	*Final PVC stick-up (w/cap)	<u>26.50</u>
	Distance from point to TOS	<u>12.5</u>
	Calculated depth to TOS	<u>48.44</u>
AQ rod method:	Final AQ rod length	<u>62.40</u>
	*Final rod stick-up after well install.	<u>13.875</u>
	Adjustment to PVC TOS	<u>0.19</u>
	Alternate calculated depth to TOS	<u>48.335</u>
Average:	(PVC TOS + AQ TOS)/2	<u>48.3875</u>

(Note: Both TOS calculations should be within $\pm 1'$)

Verified by: JmTotal depth to refusal

Final AQ rod length	<u>62.40</u>
Drive point tip	<u>4.0</u>
*AQ rod stick-up	<u>13.875</u>
Depth to refusal	<u>52.525</u>

*Indicates measured value

NOTES: DP-52 Location is 288" (24') 150° East of North
From Stake # 16

Norman Farrow believes Well is in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-53DATE 3-21, 1995 CREW N. Farrow, C. Lamb, P. Abston, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u>	
<u>1</u> rod	60"	X <u>1</u>	<u>60.00</u>	
<u>11</u> rod	24"	X <u>2</u>	<u>48.00</u>	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u>	
				<u>110.40" (9' 2")</u>

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>2.0</u>	<u>1127</u>	<u>1129</u>	<u>1131</u>
+2' *Additional (5' 2", 1') rod driven to a stick-up of	<u>29.25</u>	<u>1131</u>	<u>1145</u>	<u>1147</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>1</u>	<u>1147</u>	<u>1149</u>	<u>1151</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>1</u>	<u>1151</u>	<u>1153</u>	<u>1155</u>
*Additional (5' 2", 1') rod driven to a stick-up of	<u>1</u>	<u>1155</u>	<u>1157</u>	<u>1159</u>
*Stick-up before pull-back =	<u>29.25</u>			

PVC well stock

quantity/description	length	factor	sub total	
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u>	(point, screen & seal)
<u>1</u> riser	60"	X <u>1</u>	<u>60.00</u>	
<u>1</u> riser	24"	X <u>1</u>	<u>24.00</u>	
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u>	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u>	
			<u>111.44</u>	<u>(9' 3")</u>

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>44.0</u>
*Stick-up before pull back	<u>29.25</u>
Total pull back	<u>14.75</u>

(must be >= 13.5")Verified by: *Jm*Rod length adjustment:

Orig. total rod length	<u>110.40</u>
Length of section removed	<u>24.00</u>
Length of section added	<u>1</u>
Final AQ rod length	<u>86.40</u>

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>111.44</u>
	*Final PVC stick-up (w/cap)	<u>32.50</u>
	Distance from point to TOS	<u>12.5</u>
	Calculated depth to TOS	<u>66.44</u>
AQ rod method:	Final AQ rod length	<u>86.40</u>
	*Final rod stick-up after well install.	<u>20.00</u>
	Adjustment to PVC TOS	<u>0.19</u>
	Alternate calculated depth to TOS	<u>66.21</u>
Average:	(PVC TOS + AQ TOS)/2	<u>66.325</u>

(Note: Both TOS calculations should be within +/- 1")

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>86.40</u>
Drive point tip	<u>4.0</u>
*AQ rod stick-up	<u>20.0</u>
Depth to refusal	<u>70.40</u>

*Indicates measured value

NOTES: DP-53 Location is 432" (36') 5° West of North
from stake # 19

Norman Farrow believes well is not in Trench

WAG4 WELL LOG FOR COMPLETION OF WELL DP-54DATE 3-21, 1995 CREW N. Farrow, C. Lamb, D. Jones, J. MitchellReference Stake: * Height above ground surface 2.0 * 2.0 *
Before AfterAQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u> *	
<u>1</u> rod	60"	X <u>1</u>	<u>60.0</u> *	
<u>11</u> rod	24"	X <u>5</u>	<u>120.00</u> *	
<u>1</u> rod	12"	X <u>1</u>	<u>12.00</u> *	<u>182.40</u> * (15' 2")

Driving information

	Start	End	Start	End
Point, sub and 5' rod driven to a stick-up of	<u>16.0</u> *	<u>1434</u>	<u>1437</u>	-
*Additional (5' 2") rod driven to a stick-up of	<u>25.75</u> *	<u>1452</u>	<u>1453</u>	-
*Additional (5' 2") rod driven to a stick-up of	<u>35.0</u> *	<u>1456</u>	<u>1503</u>	-
*Additional (5' 2", 1") rod driven to a stick-up of	-	-	-	-
*Additional (5' 2", 1") rod driven to a stick-up of	-	-	-	-
*Stick-up before pull-back =	<u>35.0</u> *	-	-	-

PVC well stock

quantity/description	length	factor	sub total
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u> * (point, screen & seal)
<u>11</u> riser	60"	X <u>2</u>	<u>120.00</u> *
<u>11</u> riser	24"	X <u>2</u>	<u>48.0</u> *
<u>1</u> riser	12"	X <u>1</u>	<u>12.00</u> *
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u> *
Total length of PVC material = <u>183.44</u> * = (15' 3")			

AQ rod adjustment (to set PVC assembly)Pull back:

*Stick-up after pull back	<u>48.75</u> *
*Stick-up before pull back	<u>35.0</u> *
Total pull back	= <u>13.75</u> *

(must be ≥ 13.5)Verified by: *Jm*Rod length adjustment:

Orig. total rod length	<u>182.40</u> *
Length of section removed	- <u>24.0</u> *
Length of section added	+ <u>0.0</u> *
Final AQ rod length	= <u>158.40</u> *

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	<u>183.44</u> *
	*Final PVC stick-up (w/cap)	- <u>37.375</u> *
	Distance from point to TOS	- <u>12.5</u> *
	Calculated depth to TOS	= <u>133.565</u> *
AQ rod method:	Final AQ rod length	<u>158.40</u> *
	*Final rod stick-up after well install.	- <u>24.5</u> *
	Adjustment to PVC TOS	- <u>0.19</u> *
	Alternate calculated depth to TOS	= <u>134.09</u> *
Average:	(PVC TOS + AQ TOS)/2	= <u>133.8275</u> *
(Note: Both TOS calculations should be within ± 1 ")		

Verified by: *Jm*Total depth to refusal

Final AQ rod length	<u>158.40</u> *
Drive point tip	+ <u>4.0</u> *
*AQ rod stick-up	- <u>24.5</u> *
Depth to refusal	= <u>137.90</u> *

*Indicates measured value

NOTES:

DP-54 Location is 108" (9') 140° East of North from Stake #35

Norman Farrow believes well is in Trench.

WAG4 WELL LOG FOR COMPLETION OF WELL D155DATE 3-23, 1995 CREW N. Farrow, J. L. Forest, P. Abston, J. MitchellReference Stake: * Height above ground surface $\frac{2.00}{\text{Before}}$ $\frac{2.00}{\text{After}}$ AQ stock

quantity/description	length	factor	sub total	total rod length
<u>1</u> sub	2.40"	X <u>1</u>	<u>2.40</u>	
<u>11</u> rod	60"	X <u>2</u>	<u>120</u>	
<u>1</u> rod	24"	X <u>1</u>	<u>24</u>	
<u>1</u> rod	12"	X <u>5</u>	<u>60</u>	206.4 - (17.2)

Driving information

Point, sub and 5' rod driven to a stick-up of	5.50	Start	End	Start	End
*Additional (5' 2", 1") rod driven to a stick-up of	22.0	1054	1055		
*Additional (5' 2", 1") rod driven to a stick-up of	57.0	1101	1103		
*Additional (5' 2", 1") rod driven to a stick-up of		1108	1112		
*Additional (5' 2", 1") rod driven to a stick-up of					
*Stick-up before pull-back =	57.0				

PVC well stock

quantity/description	length	factor	sub total	(point, screen & seal)
<u>1</u> pt. sc. & se.	13.25"	X <u>1</u>	<u>13.25</u>	
<u>11</u> riser	60"	X <u>2</u>	<u>120</u>	
<u>1</u> riser	24"	X <u>1</u>	<u>24</u>	
<u>1</u> riser	12"	X <u>1</u>	<u>12</u>	
<u>1</u> cap	2.19"	X <u>1</u>	<u>2.19</u>	

Total length of PVC material = 171.44 = (14.29)

AQ rod adjustment (to set PVC assembly)

Pull back:

*Stick-up after pull back	72.5
*Stick-up before pull back	57.0
Total pull back	= 13.5

(must be ≥ 13.5)Verified by: SM

Rod length adjustment:

Orig. total rod length	206.4
Length of section removed	- 60
Length of section added	+ 0
Final AQ rod length	= 146.4

Depth to top of PVC well screen (TOS)

PVC:	Total length of PVC	171.44
	*Final PVC stick-up (w/cap)	- 23.0
	Distance from point to TOS	- 12.5
	Calculated depth to TOS	= 135.94
AQ rod method:	Final AQ rod length	146.4
	*Final rod stick-up after well install.	- 10.75
	Adjustment to PVC TOS	- 0.19
	Alternate calculated depth to TOS	= 135.46
Average:	(PVC TOS + AQ TOS)/2	= 135.70

(Note: Both TOS calculations should be within $\pm 1'$)

Verified by: SMTotal depth to refusal

Final AQ rod length	146.4
Drive point tip	+ 4.0
*AQ rod stick-up	- 10.75
Depth to refusal	= 139.65

NOTES:

N. Farion Says Drive Point is "IN TRENCH"

Direction from Stake 20 = 55° EAST OF NORTH

DISTANCE FROM STAKE 20 = 39 ft (PACE COUNT)

APPENDIX F

**DAILY DRIVE-POINT-INSTALLATION
FIELD PLAN AND DAILY NOTES**

FIELD PLAN II FOR SHALLOW DRIVE POINT WELLS IN WAG 4 JANUARY 1995

INTRODUCTION

The installation of shallow monitoring wells in and near trenches within WAG 4 will be completed using current drive point procedures. The wells will be driven to refusal (a maximum estimated depth of 20 feet) in soils that contain clay, silt, sand, and gravel.

This document provides the following information:

- a statement of the basic drive point plan
- a statement of system set up and operation
- basis for decisions
- sequential procedure for field operation
- list of equipment and supporting units
- alphabetical/location listing of equipment and supplies

BASIC DRIVE POINT PLAN

PLAN: Drive the basic system to refusal.

The basic drive point plan will use either of the two hammer types - a vibrator or an impact/ram hammer. Both hammers, supported by a portable tripod, are air operated and remotely controlled. The first hammer, used for driving only, operates at an impact frequency of 1700 blows/min. and weighs about 136 lbs. The second hammer operates at a frequency of about 300 blows/min. weighs about 85 lbs. and will drive and extract rods.

REMOTE OPERATION: Hammers and winches can be operated remotely. Over-the-hole work requires setting up, adding rods and pull-back operations. After the set up, operators will move away (at least 15' per H & S guidelines) from the installation site and remotely control work from that point. After each driving operation, the SSHO will verify that the site is safe and the workers will return to the site to service the equipment.

SYSTEMS SET UP AND OPERATION

Drive Point Sequence

The drive point couples to the drive point sub with a temporary tether to keep the point in place when driving through a void. This sub couples to the pin end of the first rod. The drive head adapter couples to the other end of the rod. Joints will be tightened securely with pipe wrenches. The hammer will be fitted with the driver guide, raised to sufficient height so the rod assembly inserts in the driver guide. The winch line remains coupled to the hammer during the driving process.

Hammer Sequence

The air operated hammer couples to the compressor in the following order: hammer to 25' hose and control valve, hose and control valve to regulator/oiler, regulator/oiler to hose, hose to moisture trap, moisture trap to compressor. All quick couplings will be secured with safety pins.

BASIS FOR DECISIONS

If the hammer begins immediately to penetrate, then the operator should drive the rod so that the top is a foot above the ground. Raise the hammer with the winch. Uncouple the drive head and add another section of rod and continue driving.

If immediate progress is not made, watch the system for any sign of stress or gradual progress. If either system stress or insufficient progress is observed, the decision to abandon this location will be made and the drive point system moved to another location.

SEQUENTIAL PROCEDURE FOR FIELD OPERATION**MOBILIZATION**

Equipment is mobilized in four units as follows: the trailer-mounted compressor, a tripod trailer with most of the field supplies and equipment, a decon trailer, and the support vehicle 9892. The minimum crew will consist of four persons: the SSHO, the data recorder, and two installers.

SITE PREPARATION

The installers will do the following: position a customized 4' X 4' X 3/4" plywood board over the well location, set up the tripod, anchor it securely to the ground (Cribbing may be necessary in very uneven terrain.), adjust the tripod to the vertical position, make battery connections between the winch and battery, connect the winch controls to the tripod relays, couple the air line to the hammer (as previously described in **Hammer Sequence**), check the hammer for proper mode, and set a reference pin (1/2" rebar 18" long) in the ground near the well site. (Other cribbing boards may be used to keep tools & personnel out of the contaminated soil.)

All log sheet measurements will reference this pin. This pin will be nearly flush with the plywood and will remain at the site as a permanent reference.

MEASUREMENTS AND LOG SHEET ENTRIES

Record the well number, date, & crew information.

The reference stake measure - from the top of the stake to the ground surface - must be recorded. If conditions do not permit this to be made accurately with the plywood in place; it must be recorded when the site is vacated.

DRIVING

After site preparation, the driving operation will begin at the compressor. Close the air valve at the compressor. Start the compressor, following the instructions on the compressor. While it comes to operating temperature, make sure that the oiler is full, check all connections for safety

pins and make sure that all valves are closed. When operating temperature is achieved, open the valve on the compressor that delivers air to the hose assembly. Check that the hammer is in correct operating mode, then open the control valve. Drive to refusal or to within about a foot of the rod top (it is necessary to get a pipe wrench on this section). If another section of rod is to be added, raise the hammer with the winch. Uncouple the drive head from the rod and add a section of rod. Couple the drive head to the new section of rod, tightening all joints with wrenches. Lower the hammer and begin driving. This sequence will be repeated until refusal. At refusal, raise the hammer, remove the drive head adapter from the rod and the rod guide from the hammer.

MEASUREMENTS AND LOG SHEET ENTRIES

Record in the "AQ stock" column on the log sheet the quantity of each driven rod next to its corresponding length.

Record the time the hammer is run to drive that section of rod. (The hammer may be started and stopped several times during a driving operation.) The time needed is the total time run per section.

Record the amount of stick-up at the end of each driving cycle - especially the final stick-up. Make the calculations pertinent to this section.

WELL INSTALLATION

(To complete the well, generally two more feet of well material is needed than the AQ rod used.) Assemble the well material in the following manner: couple the point to the screen, insert the seal on the pin end of the screen, couple the first section of riser, and add riser sections as needed. Tighten all joints securely and insert the assembly into the AQ rod. Loosely couple the last section and use it to push the well material to the bottom of the rods. This last section will be removed so that the pulling sub can be coupled to the rods.

MEASUREMENTS AND LOG SHEET ENTRIES

Record in the "PVC well stock" column on the log sheet the quantity of each piece of well material used next to its corresponding length.

PULL-BACK OPERATIONS

The pulling sub is in two parts: one is coupled to the rods, the other is coupled to the hammer. These two parts will be connected and the pin set to connect them. Change the hammer control to reverse. Take necessary measurements and calculate pull-back distance. Since this is pull-back, an operator will be at the well site to measure and control the amount of pull-back. Activate the hammer until the desired measure is obtained. After pull back, it may be desirable to alter the top section of AQ rod.

MEASUREMENTS AND LOG SHEET ENTRIES

Measure the final pull-back distance and record.

Explain and record alterations to AQ rod length.

FINISHING THE WELL

Drive the pin out of the pulling sub and separate the two parts. Raise the hammer and remove

the two parts of the pulling sub from the rod and hammer. Insert an appropriate length of well material into the AQ rods and screw it on to the existing material in the rods. Push the well material to the bottom, screw on the well cap and use the plastic hammer to "set" the well. Verify that the stick-up distance is appropriate. If so, make and record the necessary measurements. Tape, seal, and label the well.

If the distance is not appropriate, the most probable reason is that the point did not properly expend. Therefore, it is necessary to remove the well material and manually expend the point. Remove the well material, checking it for contamination. Measure and mark the ram rods for the appropriate distance if the point had expended. Insert the ram rods into the AQ rods and drive them to the expected distance. This will expend the point. Remove the ram rods, checking for contamination. Rinse these rods with the garden sprayer before putting them back in the trailer. Reinstall the well material and push it to the bottom and complete the well as described above.

MEASUREMENTS AND LOG SHEET ENTRIES

Record the final well material stick-up above the reference point - this includes the cap.

Confirm all log sheet entries before leaving the site.

Measure the stick-up of the reference pin after the plywood is removed and confirm previous measure or record if not recorded earlier.

Make final calculations and verify entries.

LIST OF EQUIPMENT AND SUPPORTING UNITS

SAFETY EQUIPMENT

hard hat	gloves	side shields
radios	KIN 294 radio	first aid kit
garden sprayer		
respirators (as needed)		

TRIPOD & ACCESSORIES

tripod	electric winch	winch controls
twin lead extension	battery hook up	12 volt battery
wheel covers	3/4" plywood	anchor pins
tripod pad crank	cribbing	

HAMMER & ACCESSORIES

RH-75 hammer	regulator/oiler	special hose
driving sub	pulling sub	2, U-pin
hammer lubricant		

COMPRESSOR & ACCESSORIES

compressor	wheel chocks	moisture trap
air tool box	hoses	safety pins

AQ RODS AND ACCESSORIES

5' rods
drive points

2' rods
ram rods

1' rods

PVC WELL MATERIALS

5' riser
1' screen
seal

2' riser
point

1' riser
cap

TOOLS

ball pein hammer
large channel locks
tape measure
reversing wrench

2-24" pipe wrenches
lady slipper
rod level

drift pin punch
alan wrench
plastic hammer

MISCELLANEOUS

reference pins
paper wipes
hammer cover
magic marker
magnetic tool holder

extra drive point screws
rags
winch cover
carrying case
calculator

paper clips
trailer cover
2" plastic tape
plastic bin
clip board

ALPHABETICAL/LOCATION LISTING OF EQUIPMENT AND SUPPLIES

ITEM	LOCATION	ITEM	LOCATION
air tool box		plywood, 3/4"	T/P TRAILER
COMPRESSOR		point, well	TOOL BOX
alan wrench	TOOL BOX	pulling sub	CARRY CASE
TRAY		radio, KIN 294	personal
anchor pins	T/P TRAILER	rags	TOOL BOX
ball peen hammer	TOOL BOX	ram rods	T/P TRAILER
battery hook up	T/P TRAILER	reference pins	T/P TRAILER
battery, 12 volt	T/P TRAILER	regulator/oiler	T/P TRAILER
cap	TOOL BOX	RH-75 hammer	TRIPOD
TRAY		riser, 5'	T/P TRAILER
carrying case	T/P TRAILER	riser, 2'	T/P TRAILER
clipboard	TRUCK	riser, 1'	T/P TRAILER
compressor		rod level	CARRY CASE
COMPRESSOR		rods, 5'	T/P TRAILER
cribbing	T/P TRAILER	rods, 2'	T/P TRAILER
drift pin punch	TOOL BOX	rods, 1'	T/P TRAILER
drive points	TOOL BOX	safety pins	CARRY CASE
driving sub	CARRY CASE	screen, 1'	TOOL BOX
electric winch	TRIPOD	seal	TOOL BOX
extra drive point screws	TOOL BOX	side shields	personal
TRAY		tape measure	CARRY CASE
first aid kit	TRUCK	trailer cover	TOOL BOX
garden sprayer	T/P TRAILER	tripod	T/P TRAILER
gloves	TOOL BOX	tripod pad crank	CARRY CASE
hammer cover	TOOL BOX	twin lead extension	T/P TRAILER
hammer lubricant	TOOL BOX	U-pin	CARRY CASE
hard hat radios	TRUCK	U-pin, extra	TOOL BOX
hoses	T/P TRAILER	TRAY	
hose, special	T/P TRAILER	wheel chocks	T/P TRAILER
lady slipper	TOOL BOX	wheel covers	TOOL BOX
large channel locks	TOOL BOX	winch controls	T/P TRAILER
magic marker	CARRY CASE	winch cover	TOOL BOX
magnetic tool holder	T/P TRAILER	wrench, reversing	TOOL BOX
moisture trap			
COMPRESSOR			
paper clips	TOOL BOX		
TRAY			
paper wipes	TOOL BOX		
pipe wrenches, 24"	TOOL BOX		
plastic bin	T/P TRAILER		
plastic hammer	TOOL BOX		
plastic tape, 2"	CARRY CASE		

Locations are isolated to:

COMPRESSOR	is the compressor trailer.
CARRY CASE	is a brown plastic Rubber Maid tote tray.
TRIPOD	is the tripod structure.
T/P TRAILER	is the tripod trailer.
TOOL BOX	is the tread plate box on the tripod trailer.
TOOL BOX TRAY	is either of two trays in the TOOL BOX.
TRUCK	is vehicle 9892.

DAILY NOTES ON WAG 4 DRIVE POINT INSTALLATION

DP-16 Jan. 24, 1995, Tuesday. **WEATHER:** Bright sunshine today but breezy & cold. **DOSEMETER READING:** 11am; 12 pm. **CREW:** Doug Jones, SSHO, Jim LaForrest, log sheet and records, Charles Lamb, & Norman Farrow as installers. **EVENTS (recorded at 1700 hrs. from memory):** First day of field work started today; on sit at 0800 hrs. Set up on DP-16 (near stake #44) for first drive. This was the exact site picked by Dale. We drove to ~7' and hit something hard. Several persistent 2 minute drives gained less than 2". We abandoned the site. Log sheet should show "DP-16 ABANDONED". We moved about 15-20' toward Lagoon Rd. and along the trench axis as defined by the stakes. We called this on DP-16 and drove to 10' as if we were in backfill material. The rate was so steady at 10' we added another 5' rod. Drove it about 6" and it stopped. We gained ~ 2" as defined at the previous site. We set the well in this one, although I did not think that we were in the bottom of a trench. We finished off the well & moved the tripod to the next location (DP-14) and set it up and leveled & covered it. I talked to Dan Marsh on the radio before 1500 hrs. and notified him of the availability of one well for sampling tonight. We left the site about 1500 hrs.

DP-14, 13 & 15 Jan. 25, 1995, Wednesday. **WEATHER:** Same as Tuesday bit warmer. **DOSEMETER READING:** 12 am; 14 pm. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** Started at DP-14 next to stake #43. This one was in an obvious depression. This well went very smoothly. As I remember, we used 2- 5' rods, 2-2' rods & 1-1' rod. We drove to a final stick up of about 6"-9" and finished the well.

Move do DP-13 next to stake # 42 and set up for the next drive point. In setting the anchors we struck refusal about 14" and moved about 15'-20' toward Lagoon Rd. Drove the first 10 feet easily and added another 5' and refused at about 11'. We had water when we set the well.

Moved to DP-15, about 8' toward Lagoon Rd. from stake #40, and drove the first 9' easily, the last 1' was slow. I added a 1' rod and drove it easily (at about the same rate as the first 9'). I added another 2' & 1-1' rod and drove them to a stick up of a few inches. I installed 16' of PVC and had about 2' of stick up as expected. After pull back we still had about 2' of stick up, indicating that the point did not expend. Driving on the plastic did not expend the point. We left the well at this point since it would mean decon etc.

DP-15 continued on Jan 26, EVENTS (recorded at 1130 hrs. from recorder & memory): removed the board and other materials from the well site and pulled the PVC casing. I measured the ram rods to get a total rod length and connected them together and set them down to the bottom. In so doing it felt soft. Not as metal striking metal. Ball park figures: 14' of AQ, 16' of ram rod with about 2' of stick-up above the AQ rod. We marked 13.5" and drove to that point. At about 13" it seemed to get hard.

After 2 or 3 more blows it began to move again. I think that I drove off the point and bypassed it. The log shows the actual figures. I pulled the rods and checked for rad reading - nothing. I reinstalled the PVC and with an impact on the top the well material would have continued to go down. We took the final measurements and calculated a 3.6" discrepancy between the TOS using the PVC & AQ method. We were not able to resolve the difference. We loaded supplies and pulled out about 1030 hrs. but could not get into the Met Tower gate. Broke for lunch @ 1115 hrs. to reconvene @ 12:30

DP-17 Jan. 26, 1995, Thursday. **WEATHER:** Bright sunshine today, cold in am, much warmer in pm. **DOSEMETER READING:** 14 am; 14 pm. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1600 hrs. from recorder & memory):** Moved to next site - east of the met tower & west of the center diversion ditch. Found no flag or markers other than the stakes. Stake #30 was the only one of the two stakes that we could read the number on. Set up next to the deer fence and about 8' - 10' from the stake (which was inside the fence). Called Dale to get a DP#. Ellen said that Dale said to continue in sequence starting with DP-17. This site was in an obvious depression. Drove two 5' rods and two 2' rods. At about 11' driving slowed down for about 2" - 4" then picked back up. At 12' it slowed again then picked up again. At near 13' the rate again slowed and continued to decrease to about 13' acting as if we were in the bottom of the trench. I pulled back about 14.5" instead of 13.5" then set 16' PVC.

We moved the equipment to the next site and set up to be ready to drive tomorrow.

DP-18 Jan. 27, 1995, Thursday. **WEATHER:** Over cast and cold but pleasant. **DOSEMETER READING:** 14 am; 16 pm. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charlie as installers. **EVENTS (recorded at 1500 hrs. from tape recorder & memory):** Drove two 5' rods, two 2' rods and a 1' rod. At ~ 13' the rate changed abruptly, almost stopped. Rate again picked up after pounding a few minutes then slowed as if we were in the bottom of a trench. Installation of 16' of PVC left about 30" of stick-up, (should have been about 12"). Attempts to drive the PVC only gained about 6"-8", indicating that the point may have been expended early in the driving process and probably the tube was filled with 12"-18" of soil. The PVC was removed from the AQ rods and the ram rods were inserted (nominally 16.5' of rods). They encountered soft material also but rested on something. Rough calculations said that the end of the ram rod was ~ 12"-18" from the bottom of the AQ rod. I picked up the ram rods and dropped them and they went easily beyond the bottom of the AQ rods. I do not remember driving the ram rods. When we pulled them they not have caked mud on the bottom as one would have expected if driving took place. At some point we removed a 1' AQ rod, therefore we had 14' of AQ rod. Inserting 16' of PVC material and settling it by pressure we had roughly a foot of PVC stick-up above the AQ rod. Final stick-up on AQ was 19.25", and 35' on the PVC. Jay's calculations for TOS showed about 3" to 3-1/2" difference as on the previous one (DP-15) where we manually expended the point. We remeasured the stick up on the reference pin, the AQ rod and neither have changed in the process of expending the

point.

By process of elimination, we determined that the stake on the east end of the cedar tree had to be #29. In this sequence of 31 to 25, 29 was the only one that was not visible from the burial ground.

DP-19 Jan. 27, 1995, Thursday. **WEATHER:** Over cast and cold but pleasant. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charlie as installers. **EVENTS (recorded at 1530 hrs. from memory):** Dale wanted to move DP-19 about 18' up slope from stake #24. I moved about 4'-5' east off the center line of the trench because the topography looked more "trenchy". Drove two 5' rods (the last 8" - 9" were much slower, i.e. between 9' & 10'). Added a 1' rod & two 2' rods for the next drive. The 10' to 11' interval drove at a reasonable rate then slowed abruptly. After 3" to 4" of very slow penetration we stopped. We removed the two 2' AQ rods and added a 1' AQ rod to finish the well with 12' of AQ rods. Installation of 14' of PVC ended with about a foot of PVC above the AQ rod.

DP-20 Jan. 27, 1995, Thursday. **WEATHER:** **DOSEMETER READING:** **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charlie as installers. **EVENTS (recorded at 1600 hrs. from tape recorder & memory):** Adjacent to stake #23 - no trench-looking depressions. Drove 5' of AQ rod and added another 5' rod. At about 6' and slowed rapidly; the hammer began to rebound. We replaced the slip coupling with the pin coupling at about 7' and drove for several minutes with minimal, if any, progress. With 10' of AQ rod we inserted 6' of PVC and pushed it to the bottom with another 5' section (then removed the last 5' section). After pull back we added the 5' section + a 1' section of PVC.

Jan. 30, 1995, Monday. No drive points today (snow). Planned to use this week to repair/modify the tripod and prepare for the trailer. Trailer arrived on Wed. Feb. 1. Charles & I spent Thursday outfitting it. I continued on Friday (11.5) & Saturday (8). We're ready to start on Monday in the bath-tubbing trench area.

DP-22 Feb. 6, 1995, Monday **WEATHER:** Clear and very cold, lots of sunshine, mild wind. **DOSEMETER READING:** 19 to 19. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Charles Lamb & Norman Farrow as installers. **EVENTS (recorded at 1130 hrs. from memory and tape recorder.** DP-21, 22, & 23 were inside the BTT area. DP-22 was the upper most well. The site was off the line between wells 2574 and 2582, about 5' toward Lagoon Road. There was an obvious depression. To minimize movement of hoses, wires and equipment within the BTT area, we drive DP-22 first. When driving the first rod, it deflected about 3' or 4' deep. In retracting the hammer, the rods were bound in the drive coupling and pulled the rods back about 3" or 4" before I noticed it. The point was assumed to have expended. to confirm this, I took a new 5' section of AQ rod and a point & sub and inserted a well screen (1') & 5' riser and marked the well material at the top of the AQ rod. I then

inserted the well material into the driven well. If this mark stopped at the top of the AQ rod, the assumption would be that the point was still in place. The mark went deeper, indicating that the point had expended as suspected. We carefully screwed and pushed the rod down toward the point and were successful in mating the two. This rod was set to 3.5". We added another 5' AQ rod and aligned the tripod with the rods and drove it. Went through two obvious voids of about 12" each. Remeasuring with the PVC we determined that the point was in place. Drove the second 5' rod to 6.25". Added another 5' rod and drove about 18" to 20" as in a trench then it slowed as if it was in the bottom.

DP-23 Feb. 6, 1995, Monday **WEATHER:** Clear and very cold, lots of sunshine, mild wind. **DOSEMETER READING:** 19 to 19. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Charles Lamb & Norman Farrow as installers. **EVENTS (recorded at 1630 hrs. from memory and tape recorder.** DP-21, 22, & 23 were inside the BTT area. DP-23 was the middle well. It was in an obvious depression. Struck something very near the surface and deflected off. After we reached the bottom of the first section, we realigned the tripod with the steel. 5-3/8" stick-up. The second 5' piece drove as in a trench with fast and slow zones. Hit something hard at 8'; drove through on to a stick-up of about 5". Added two 2' and one 1' rod and drove to about 12' when it appeared to go into the bottom of the trench. Drove about 6" to 8" and called it good. Added a screen, two 5', at 2' and a 1'. Removed a 2' & 1' AQ rod. After pull back we had the following measures: PVC = 20.75" Steel = 8.25".

DP-21.1 Feb. 6, 1995, Monday **WEATHER:** Clear and very cold, lots of sunshine, mild wind. **DOSEMETER READING:** 19 to 19. **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Charles Lamb & Norman Farrow as installers. **EVENTS (recorded at 1645 hrs. from memory and tape recorder.** DP-21, 22, & 23 were inside the BTT area. DP-21 was the lower well. A well defined trench-like feature, very near the visible seep. We made several attempts hitting a very hard object at about 3' to 4'. The first attempt was finished as a well even though it was shallow. Installed 7' of PVC for the finished well. Three other attempts refused at 3'. We decided to come back tomorrow with a fixed point and drive until we get through the 3' zone, then pull back and go back in with the AQ rods to set the well.

Feb. 7, 1995, Thursday. **H&S NO-WORK DAY:** Doug decided at 8:00 that the "slip-hazard index" was too high. That we would not work until later (~ 11:00). Work is canceled today due to wet conditions, per Doug Jones @ 11:15. **WEATHER:** Cold (~32 to 35 degrees) and snowy, very little accumulation, no sun.

DP-29 Feb. 8, 1995, Wednesday **WEATHER:** Very cold & breezy, residual snow, sun. **DOSEMETER READING:** 19 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Charles Lamb & Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from tape recording and memory):** Section meeting @ 9 am. Work did not begin at 10:30. Field change notice was not in effect so we scanned the equipment out of the "rad zone" and set it up on the trailer and moved to DP-29 site.

Site located about 25' east of stake #40. Drove 5' of rod, did not drive as if in a trench or trench cap. Added another 5' rod and drove to about 7'. Still no indication of trench; in fact the rate from beginning to end was a steady slowing down. We finished it as a well anyway.

DP-30 Feb. 8, 1995, Wednesday **WEATHER:** Very cold & breezy, residual snow, sun. **DOSEMETER READING:** 19 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Charles Lamb & Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from tape recording and memory):** After installing DP-30, Charles found a depression near the break in slope; I found an old corrugated well #2688. This was the type that was put in a trench. I picked a site about 12' to 15' east of stake #40. Talked to Dale on the phone about what we had done and were planning. He said call it DP-30. This one did not drive as a trench either except for the way it stopped. I'm assuming that we drove in backfill material all the way with no voids. We drove 5' of AQ, followed by 6' of twos, then 6' more of twos. With the trailer we gained a lot of freeboard which permitted us to drive longer sequences of rods. When we drove the 5' rod, we had a point, 5', 2', & 1' on. Jay's records probably showed only a 5' rod and we measured relative to the 5' rod. We removed the 1' rod and added 2 more 2' rods with a 1' rod on top for the next drive and drove it to about 22". Measuring relative to the top 2' rod. We then added a 5' rod (not to be counted) and drove the third 2' rod to a stickup of 3", i.e., almost 11' of rod in the ground. We removed the 5' & 1' rod and added 3 more 2' rods and drove them to a stickup of about 50". That was what I called the "bottom of the trench". We had 17' of AQ rod, added 15' of well material and removed two 2' AQ rods to finish the well.

DP-28A Feb. 9, 1995, Thursday. **WEATHER:** Very cold, sun with clouds moving in. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** Went with Dale @ 8:00 to flag the new sites; took about 1.5 hrs. Moved from DP-30 to DP-28 and set up. Could not get the compressor to start and called the garage. Doug wanted us to move the compressor to the gate for the mechanics. They came out just before lunch and removed the plugs to clean them and return after lunch. After lunch the compressor was running so we moved it back to the work site. Drove the first 5' AQ rod real fast to about 8" of stickup. It looked as if it was slowing down. We added another 5' rod and drove it (slowly) about a foot, where it refused on something very hard. We pounded for about 8 minutes with little or no progress. Final stickup was 49.5".

DP-25 Feb. 9, 1995, Thursday. **WEATHER:** Very cold, sun with clouds moving in. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** Drove 5' of rod. Started slowly as in cap material then several fast zones as in voids. Second 5' rod went through several fast zones. Good indicators for a trench. Added three 2' rods and a 1' rod. The first 2' section went rapidly. The second one drove likewise all but the last few inches. Drove about 3" into the this 2' section and

called that bottom of the trench. Added 1 screen and three 5' well risers (16') to complete the well and pulled back the appropriate distance.

DP-27 Feb. 9, 1995, Thursday. **WEATHER:** Very cold, sun with clouds moving in. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** First 5' rod drove very rapidly for the first 2' to 3', then the last part drove at a more normal rate. Drove to a stickup of about 8". Added 5' of rod and started to drive again. The last 8" of the first rod drove slowly. At a depth of about 6' it began to speed up as if it had passed through something. It never stopped making forward progress, just very slow progress. The last 3' to 4' drove uniquely. All progress was slow, there were, however, some changes in rate from slow to slower to slow again, etc. We completed this one as a well with about 12' of material (I think).

DP-26 Feb. 13, 1995, Monday **WEATHER:** 100% overcast, Temperature around freezing. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** Background of about 300cpm. First 4' of rod went quickly and slowed during the last foot. Second 5' rod drove without clear indication of voids, however, the last few inches drove as if it was in the bottom of the trench. We completed the well with a screen, two 5' & one 1' riser.

DP-24 Feb. 13, 1995, Monday **WEATHER:** 100% overcast, Temperature around freezing. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** Drove the first 5' rod at a steady fast rate, no indication of voids or rate changes, 5.75" on the stickup. Second 5' rod did have faster zones. Drove a few inches into a 2' section of rod; drove as if it were in the bottom of a trench. Finished well with a screen, two 5' , a 2' & a 1' riser. Total steel was two 5' + one 2'.

DP-31 Feb. 13, 1995, Monday **WEATHER:** 100% overcast, Temperature around freezing. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** First 5' went smooth & fast, no indication of voids. The second 5' section of rod did hit something and slowed down then went on through. Stopped with about 4" of stickup. Added two 2' and a 1' rod. When we started driving again, the last few inches of the second 5' section progressed a little then began to bounce as if it was on a piece of wood. We made progress (a little) then decided to measure down the ID with PVC well material to see if the point was still on. The PVC stuck up about 3" or 4" higher than it should have if the point were in place. It felt soggy as if it had soil packed up in the rod. I concluded that the point had come off and we had packed 3" or 4" of "stuff" in the sub. We added a screen, two 5' and pulled back. When we removed the two 2' rods and the 1' rod the top of the PVC was right at the top of the 10' of AQ rod. Therefore the "stuff" must have vibrated out and the well was in place. We added a 1' section of riser to finish the well.

DP-32 Feb. 13, 1995, Monday **WEATHER:** 100% overcast, Temperature around freezing. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** The first 4' drove at a steady rate; the last foot picked up a bit. Second 5' rod drove steadily. Added two 2' and a 1' rod and continued to drive. The 10' to 11' section drove as did the 5' to 10' then slowed as if it was in the bottom of the trench. Fast rates are the indications of trench plus the way it ended. Drove the first 2' section to a stickup of about 6". Well was finished with 14' of well material, in 12' of steel. PVC stuck out the top about 1'.

DP-34 Feb. 13, 1995, Monday **WEATHER:** 100% overcast, Temperature around freezing. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow as installer. **EVENTS (recorded at 1700 hrs. from memory):** The first 2' drove quickly, then slowed for about a foot then picked up again for the last 2'. The second 5' section had indications of voids and near the end of the second 5' section it looked as if it may have begun to bounce. I did not have any more information on this one on tape.

DP-33 Feb. 13, 1995, Monday **WEATHER:** 100% overcast, Temperature around freezing. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1700 hrs. from memory):** In maneuvering past 33 to get to 34 the flag was knocked over. Although I could not find the exact spot. I assumed that it was close, based on the drawing, etc. The reference stake refused at about 6". Moving it to the other side of the rod, it was set to 2" without any indication of obstructions. The drive point did not encounter any resistance, either. Drove the first 5' at a routine pace, nothing unusual, to a stickup of 2" to 3". The second 5' rod never went into the ground. The last 1" of the first 5' section began to bounce as if the point had come off. We used the PVC method to check and see. The rod was over a void. The seal stopped the well material so I do not know how deep the void is. We completed it as a shallow well. Adding 2' of AQ rod and a 2' and a 1' section of well material to finish the well. Finished well was 7' of AQ & 9' of PVC. Moved across the diversion ditch to set up on DP-35. I went back with Jay to get measurements for well locations.

Feb. 21, 1995, Tuesday. The plan was to remove the PVC, remove the seal and reinsert the well into the "void" as far as it would go. In pulling the well material out I counted one 1' section, three 2' sections and a screen, for a total of 8'. The well material was not 9' as previously recorded. My assumption is that in installing the well (originally) that I picked up two 2' sections that had been screwed together and laid in with the 5' sections.

Feb. 22, 1995, Wednesday. We set the hammer up without the tripod on DP-33 and pulled back 13.5" and inserted the 9' of PVC (a screen, one 5', one 2' and one 1' (See DP-33). I could hear water coming in as we finished. The pull back process using the free hammer started the rod then we removed the hammer and lifted it manually the remaining distance.

DP-35 Feb. 14, 1995, Tuesday. **WEATHER:** 100% overcast, temperature around 35 degrees. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1700 hrs. from memory):** Mandatory safety meeting at 9:00. Started work about 11:00. Doug needs to leave at 3:00, so we will work through lunch to maximize our time in the field. First 5' showed no trench signs. It drove as if it was in undisturbed material, i.e., native soil. At 6' to 7' progress had diminished considerably; steadily slowing down - not abruptly. Drove the second 5' rod to a stick up of 29". Finished the well with a screen, two 5' and a 1' riser. ten feet of steel and 12' of well material.

DP-36 Feb. 14, 1995, Tuesday. **WEATHER:** 100% overcast, temperature around 35 degrees. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1700 hrs. from memory):** Real wet area. First 5' drove at a steady rate with no trench signs. It appeared to be slowing near the end of the 5' section. Added two 2' rods, for Jay's count. We also had another 2' and a 1' as a driver. (The last 3' was not considered as string). Drove the next 4' easily with indications of voids, and added two more 2' rods for a total of 16'. At this point the string was made of the following: 5', 2', 2', 2', 1', 2', 2'. Near the top of the 1' section it slowed abruptly to the rate of trench bottom. The stickup of 4.5" did not include the upper 4' of rods. After pull back we removed the 1' and two 2' rods and then added a 2' rod for a total of 13' of steel. We finished the well with 15' of PVC material.

DP-37 Feb. 14, 1995, Tuesday. **WEATHER:** 100% overcast, temperature around 35 degrees. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1700 hrs. from memory):** First 5' section went rapidly. Added another 5' rod and drove it at a backfill material rate, no voids, however. Added three 2' rods. The first and second 2' rod drove as the previous 5' rod had driven. Drove to a stick up of 28.75". Added two more 2' rods. At about 15' the string slowed to "bottom of trench" rate. Drove this section to (14' to 16') to a stickup of 12". We removed the two 2' sections of AQ rod, leaving 16' of steel in the ground. Finished the well with 18' of material.

DP-38 Feb. 14, 1995, Tuesday. **WEATHER:** 100% overcast, temperature around 35 degrees. **DOSEMETER READING:** 20 to 20 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1700 hrs. from memory):** Drove the first 5' at a steady rate except for the first few inches. Drove to a stickup of 6.5". Charles hit something hard when setting the stake. He did drive through it, however. Added another 5' rod. Drove to 7" of stickup at a steady rate. Added two 2' rods, And drove the first 2' rod with some indication of rate change indicating voids. We drove this section (10' to 12') to a few inches of stickup. And removed the top 2' rod, leaving 12' of steel in the ground (two 5' rods and a 2' rod). Finished the well with 14' of PVC. This is the one where water

came out on Charles while he was inserting the well material.

Feb. 15, 1995. Rain today, field work not permitted. Worked on sheet piling project.

Feb. 16, 1995. Rain today, field work not permitted. Worked on order for sheet piling project and a game plan for installation.

DP-39 Feb. 20, 1995, Monday. **WEATHER:** Very pretty, temperature 50-60 degrees, clouds moving in all day, very pleasant. **DOSEMETER READING:** 21 to 22
CREW: Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Jim LaForest as installers. **EVENTS (recorded at 1700 hrs. from memory):** Started @ 10:45. The first 3' were driven with the hammer in reverse. It still drove rapidly or at about the same rate of most first sections. I reversed it at about 3' and continued to drive & drove it to a stickup of 12.75". Drove the second 5' to a stickup of 10". It drove as if it were in backfill material. Added three 2' and a 1' section, i.e., 17' in the string. First 2' section drove as did the previous 5' section; no indication of voids, fairly fast rate. Second 2' section drove faster than the previous one. We did not get to drive the third 2' section until we added two more 2' sections. When we did start driving, it drove as if it were in the bottom of the trench. Added 18' of PVC and pulled back to 88.5". We then removed the 1' and the two 2' sections and added a 2' section which left 16' of AQ rod with 1' of PVC sticking out.

DP-46 Feb. 20, 1995, Monday. **WEATHER:** Very pretty, temperature 50-60 degrees, clouds moving in all day, very pleasant. **DOSEMETER READING:** 21 to 22
CREW: Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Jim LaForest as installers. **EVENTS (recorded at 1700 hrs. from memory):** Started about 2:30. Realized after starting that I had positioned this one in the wrong trench. I was 1 trench west of dale's drawing. I called Dale to inform him of the mistake. He said to call it 46 (not 42 as originally labeled). First 5' drove with indication of voids and was very fast. The second 5' drove as if the point may have come off. Progress was evident but very slow. I drove it about a foot and considered it to be refusal. Rate was that of the bottom of a trench, however, it was only 6' deep. I used the PVC method to determine that the point was still on and finished it off as a well with 10' of AQ rod and 12' of PVC. Most of the last 5' was above ground after pull back. Pull back was 56".

DP-42 Feb. 20, 1995, Monday. **WEATHER:** Very pretty, temperature 50-60 degrees, clouds moving in all day, very pleasant. **DOSEMETER READING:** 21 to 22
CREW: Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow Jim LaForest as installers. **EVENTS (recorded at 1700 hrs. from memory):** This well drove identical to DP-46. First 5' drove with indication of voids and was very fast. The second 5' drove as if the point may have come off. Progress was evident but very slow. I drove it about a foot and considered it to be refusal. Rate was that of the bottom of a trench, however, it was only 6' deep. I used the PVC method to determine that the point was still on and finished it off as a well by removing the last 5' section and adding

a 2' AQ rod; i.e., 7' of steel. The well material was 9' (screen, 5', 2' & 1').

DP-41 Feb. 21, 1995, Tuesday. **WEATHER:** Moderate temp, lost of wind, making it chilly. We had rain, snow, sleet, clouds and sunshine, turning pleasant in the pm. **DOSEMETER READING:** 22 to 25 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow, Jim LaForest(& Tony Thomas) as installers.

EVENTS (recorded at 1700 hrs. from memory): Started in field about 9:00 due to weather. Drove the first 5' to a stickup of 6" to 8". It drove fast but no indication of voids. Drove the second 5' rod to a similar stickup. The first 2' drove slower than the last 2'. We added three 2' rods. The first two 2' rods drove at about the same rate as the second 5' rod had driven. Added two more 2' rods. The third 2' rod drove at about the same rate for the first foot then slowed as if it had gone into the bottom of the trench. Drove this section to a stickup of about 10". After pull back (should be 71"), I removed the two 2' rods, completing the AQ rod with two 5' rods and three 2' rods, i.e., 16' of AQ rod. The finished well was 18' of PVC, a screen, three 5' and a 2' riser. Finished about 10:40.

DP-43 Feb. 21, 1995, Tuesday. **WEATHER:** Moderate temp, lost of wind, making it chilly. We had rain, snow, sleet, clouds and sunshine, turning pleasant in the pm. **DOSEMETER READING:** 22 to 25 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow, Jim LaForest(& Tony Thomas) as installers.

EVENTS (recorded at 1700 hrs. from memory): Sited from Dale's measurements - no trench feature in that vicinity. Higher background area. Drove the first 3' of the 5' rod rapidly. The 3' to 4' zone slowed rapidly. We added three 2' rods and succeeded in driving to a stickup of 28.5", i.e., almost 9' deep. To accomplish this I coupled the hammer to the rod with the retracting sub. Since it was already coupled to the hammer, I simply reversed the hammer and pulled back and then installed the PVC. To finish the well I removed the top 2' section and added a 1' section for a total of 10' of AQ rod. Installed a screen, two 5' rods and a 1' rod (12' of PVC).

DP-40 Feb. 21, 1995, Tuesday. **WEATHER:** Moderate temp, lost of wind, making it chilly. We had rain, snow, sleet, clouds and sunshine, turning pleasant in the pm. **DOSEMETER READING:** 22 to 25 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow, Jim LaForest(& Tony Thomas) as installers.

EVENTS (recorded at 1700 hrs. from memory): Started driving this well at 2:30. Drove the first 5' at a very fast rate with no indication of voids. Added 5' and drove it fast also as if it were in backfill material. Added three 2' and a 1' rod. The first 2' section drove fast also. At ~13' it drove as if it had gone into the bottom of a trench. Drove this section to a stickup of about 8" to 10". Added 16' of PVC (screen and three 5' risers) and pulled back. To finish the well I removed the 2' and the 1' rod for 14' of AQ remaining and 16' of PVC. Finished at ~3:00.

Return to **DP-33** Feb. 21, 1995, Tuesday. **WEATHER:** Moderate temp, lost of wind, making it chilly. We had rain, snow, sleet, clouds and sunshine, turning pleasant in the pm. **DOSEMETER READING:** 22 to 23 **CREW:** Doug Jones, SSHO, Jay

Mitchell, log sheet & records, Norman Farrow, Jim LaForrest(& Tony Thomas) as installers. **EVENTS (recorded at 1700 hrs. from memory):** We returned to DP-33 to remove the seal and add more PVC to go into what I had described previously as a void. What I found was that I misfigured and the assumed void was not real. I removed the PVC of the following dimensions: three 2' risers and a 1' riser then the seal then the screen - for a total of 8' of PVC. A 1' piece was sticking out the top of 7' of PVC. When I reassembled the PVC without the seal it stopped abruptly as it commonly does when it is against the point. The conclusion was that the point was still on. Dale came out and we decided to extract the rods the 13+" and reassemble the well tomorrow. Dale also helped me to locate DP-45. There was an old corrugated well about where DP-44 was to go so Dan is going to sample it instead.

DP-45 Feb. 22, 1995, Wednesday. **WEATHER:** Cold in the morning, up to about 60 in the afternoon. Almost no clouds, lots of sunshine, little or no wind. **DOSEMETER READING:** 23 to 23 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow, Jim LaForrest as installers. **EVENTS (recorded at 1700 hrs. from memory):** Doug was not available until 12:30. We set the hammer up on DP-33 first and pulled back and inserted the PVC (See DP-33). Then moved the trailer to DP-45 and set it up. We were in an obvious depression. The first 5' drove very rapidly. At ~ 6' it refused instantly and after a short time of driving began to rebound. I went ahead and finished it as a well. We had two 5' AQ rods and a 2' rod (as driver) so I installed a screen, 2 and two 5' risers and pulled back to slightly over 13.5". We removed the 2' AQ rod to complete the well. After pull back the PVC stickup was about 4' higher than it should be. Driving on the PVC it seated to the expected measure. Indicating that the point had come back about 4" before expending. Finished the well with 10' of AQ and 12' of PVC.

Feb. 23, 1995, Thursday. Activities included: See Robert Mink about 6' lengths of 3/4" rebar ground to a blunt point on one end. **Should have them by mid next week.** See Henry about modifying the weir plate. **Should be ready by Monday or sooner.** See Henry about making a guide for driving the 3/4" rebar. **I made one.** Design and fab. a unistrut 4-man hammer carrier. **Completed.** Meet with Dale about PVC wells in seeps. **Probably use 2" or 3" shelby tubes to pull a core and stick the well in; add sand and backfill.**

All in preparation for setting the sheet piling and weir plate next week.

Feb. 27, 1995, Monday. Activities included: Preparation for meeting Feb. 28 & prep for sheet piling work: arrangements to bend 12 panels, cut and fit two tongues together, and maintenance on equipment.

Feb. 28, 1995, Tuesday. Activities included: Weekly meeting and resolution of audit findings in the morning.

Mar. 1, 1995, Wednesday. Installed weir plate and about 70' of sheet piling at Seep 1.

Mar. 2, 1995, Thursday. Installed sheet pilings at seep 3 & 4 before lunch. Installed 12 tracer gas wells, TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, &

TP12 after lunch. All wells were assembled with a point, 1' screen, a 2' riser, a 1' riser & a cap. The process was to drive a 30" shelby tube approximately 24" into the soil. rotate it and pull it out. As soon as it came out, the PVC well went in. Sand was poured in the annular space and the remaining void was backfilled with native soil. Due to soil conditions, the side walls collapsed as soon as the shelby tube was removed. The PVC well was pushed to the bottom of the void.

Mar. 6, 1995 No field work today. SSHO not available and ground is very wet due to rain most of the weekend and today.

Mar. 7, 1995 Installed sheet piling at SCS2. It was the most difficult of all to install. We started at 9:30 and finished at 1:30. We had one piling that refused on a very large root near the pipe. That sheet was only driven about 12" to 18".

Mar. 8, 1995 SSHO said no work today due to rain.

Mar. 9, 1995 Dedicated to probing near DP-45, 43, 27 and 21. DP-45, 43 & 27 were completed before lunch. DP-21 was completed after lunch. DP-45 first attempt refused at about 4.5'. It was located down slope of DP-45 by about 5'. The second attempt was about 10' below DP-45 and drove to at least 5'. Probe at DP-43 was about 3' west of DP-43 and drove to at least 5'. Probe at DP-27 was about 3' west and about 5' north of DP-27 and drove it to at least 5'. The first attempt at DP-21 drove to almost 6'. We made several other attempts (~6) only to refuse. Most refused at about 4', one at 2" (inches), and one about 1.5'.

DP-49 Mar. 13, 1995, Monday. **WEATHER:** Beautiful, temp. hi was about 72. **DOSEMETER READING:** 28 to 30 **CREW:** Doug Jones, SSHO, Jim LaForrest, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1200 hrs. from recorder & memory):** Moved the tripod trailer from 7874 to BTT area and set up on DP-49 (replacement point for DP-21). We had trouble with the winch controls which cost us about 2 hours. We drove a 5' piece of AQ quickly and at a steady rate. Followed with three 2' rods and drove the first two as quickly and easily as the 5' rod. Added two more 2' rods for a total of 15'. About 11' it slowed slightly than picked up again after about 4". At about 13' it acted as if it went into the bottom of a trench. Added another 2' rod for a total of 17' and drove only about 6" more. Installed 15' of well material in a screen, a five, two 2' sections and another 5' section. The reason for the unorthodox arrangement was that we had a 5' and two 2' risers from the reinstallation of DP-33 (I think) that needed to be used. They had been in the well and were not to be put back into stock. Pulled back the appropriate distance and removed a 2' section of AQ rod. Added a 2'

section of well riser and pushed the well in place.

DP-50

Mar. 13, 1995, Monday. **WEATHER:** Beautiful, temp. hi was about 72. **DOSEMETER READING:** 28 to 30 **CREW:** Doug Jones, SSHO, Jim LaForrest, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1700 hrs. from recorder & memory):** The first 5' went quickly and evenly. The second 5' went likewise. Added three 2' rods for a total of 16'. 10' to 12' drove as the first 10' drove. At about 12', had a slow zone then it resumed its previous rate. Near 13', it acted as if it went into the bottom of a trench. Continued to drive to almost 14'. Inserted 16' of PVC (a screen and three 5' risers). [To make it fit we had to remove the last 5' section]. Pull back was as appropriate. Removed the 2' AQ rod and added the [above] 5' PVC riser. The well was finished with 14' of AQ and 16' of PVC.

DP-44

Mar. 13, 1995, Monday. **WEATHER:** Beautiful, temp. hi was about 72. **DOSEMETER READING:** 28 to 30 **CREW:** Doug Jones, SSHO, Jim LaForrest, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1720 hrs. from recorder & memory):** This well was moved to its maximum down slope "trenchy" location, near the deer fence inside the CRZ. The first 5' AQ rod went quickly and steadily. Add another 5' rod and drove it. There was a faster zone about 7' to 8'. Near 9' it acted as if it had gone into a trench bottom. Ended with 10' of AQ rod and 12' of PVC. One screen, two 5' and one 1' riser.

DP-47

Mar. 13, 1995, Monday. **WEATHER:** Beautiful, temp. hi was about 72. **DOSEMETER READING:** 28 to 30 **CREW:** Doug Jones, SSHO, Jim LaForrest, log sheet & records, Norman Farrow & Charles Lamb as installers. **EVENTS (recorded at 1740 hrs. from recorder & memory):** Was sited about 10' down trench-line from stake #7 toward DP-37. first two 5' rods drove very rapidly and at a steady rate. Added three 2' sections. The first two 2' sections progressed similarly to the previous 10'. Added two more 2' sections for a total of five 2' sections; a total of 20' of AQ rod. The 14' to 16' rod slowed considerably. Drove it only about 12"; for a total depth of about 15'. With 20' of AQ rod we installed 18' of PVC; a screen, three 5', one 2' riser. After pull back we removed two 2' AQ rods. Well was completed with 16' of AQ rod and 18' of PVC.

DP-48

Mar. 14, 1995, Monday. **WEATHER:** Beautiful, temp. hi was about 74. **DOSEMETER READING:** 30 to 30 **CREW:** Doug Jones, SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Jim LaForrest as installers. **EVENTS (recorded at 1200 hrs. from recorder & memory):** This one, theoretically is to be the last one. Down trench of stake #6 and on line with DP-38. The first 5' section of AQ rod deflected off something early in driving. We adjusted the tripod relative to the rod and drove the

second 5' section. Except for a slow zone at about 6' the first 10' drove steadily and easily. Drove the second 5' section to a stickup of about 8" to 10". We added three 2' rods for a total of 16'. The first two, 2' sections drove as did the first 10' did. Added two more 2' sections and began driving. At about 15' it acted as if it went into the bottom of the trench. Drove that third 2' section to a stickup of 2" to 3", for a total of 16' of AQ in the ground. Installed an 18' well made up of a screen, three 5' risers, and a 2' riser and pulled back the appropriate distance. We removed two 2' AQ sections to finish the well with 16' of AQ rod and 18' of PVC. Finished this DP by 11:00 and spent the remainder of the day cleaning up equipment to move it off site. After cleanup we went to all the new sites and got azimuths & distances.

Mar. 15 Comp. time used. No work today.

Mar. 16 Comp. time used. No work today.

Mar. 20 No field work today. Charles needed the truck for WAG 5 work.

DP-51 Mar. 21, 1995, Tuesday. **WEATHER:** Fantastic, warm and bright.

DOSEMETER READING: 30 to 30. **CREW:** Paul Abston (am) Doug Jones (pm), SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers.

EVENTS (recorded at 1630 hrs. from memory): Near the eastern most diversion ditch. Sited by Dale & in the same trench with DP-2 & DP-34. Drove the first 5' to a stick up of 5" at a steadily decreasing rate as if it were in native soil (not in a trench). Added another 5' rod and drove it to about 8'. then coupled it rigidly to the drive head to eliminate the bounce and maximize the penetration. Near 24" of stick up we considered forward progress to be negligible. We pulled back the appropriate distance without breaking the coupling. We finished the well with 10' of AQ rod and 12' of PVC in a screen two 5' risers and a 1' riser.

DP-52 Mar. 21, 1995, Tuesday. **WEATHER:** Fantastic, warm and bright.

DOSEMETER READING: 30 to 30. **CREW:** Paul Abston (am) Doug Jones (pm), SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers.

EVENTS (recorded at 1645 hrs. from memory): Dale had staked this location for us at an obvious depression of about 1' to 2'. The first 5' rod did drive quickly as if it were in a trench. Drove it to a stick up of a few inches. Added another 5' section and just as the first 5' section went into the ground it refused on something hard. We coupled the hammer rigidly to the rod and continued to drive for five minutes with little or no progress. We pulled back with out the PVC in place. To finish the well, after pull back, we removed the second 5' piece and had to drive a wooden stake in next to the first 5' rod to hold it in position. We then added 7' of PVC material in a screen, a 5' riser and a 1' riser.

DP-53 Mar. 21, 1995, Tuesday. **WEATHER:** Fantastic, warm and bright.

DOSEMETER READING: 30 to 30. **CREW:** Paul Abston (am) Doug Jones (pm), SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers.

EVENTS (recorded at 1700 hrs. from memory): The first 5' of AQ rod did not drive as in a trench. There was a steady decline in the rate from beginning to end as if it

were in native soil. Drove it to a stick up of 2" and added two 2' rods. Drove to a stick up of 29.25" and called it quits. No indication of trench during driving or from surface features. Took about 14 minutes to go about 24". Finished the well with 7' of steel (after removing one of the 2' sections) and 9' of PVC in a screen, a 5' riser and a 2' riser and a 1' riser.

DP-54 Mar. 21, 1995, Tuesday. **WEATHER:** Fantastic, warm and bright.

DOSEMETER READING: 30 to 30. **CREW:** Paul Abston (am) Doug Jones (pm), SSHO, Jay Mitchell, log sheet & records, Norman Farrow & Charles Lamb as installers.

EVENTS (recorded at 1710 hrs. from recorder and memory): Site was located by Dale near Lagoon road and west of the western most diversion ditch. The first 7' of rod had no indication of voids but drove as if it were in backfill material. Added two more 2' rods for a total of 11'. 7' to 9' section may be increased in rate. Added two 2' sections for a total of 15'. At about 12' it slowed abruptly as it does when we are in the bottom of a trench. Ended with about 10" to 12" of stick up on the 11' to 13' section. Finished the well with 13' of steel and added 15' of PVC material in a screen, two 5' sections and two 2' sections.

DP-55 Mar. 23, 1995, Thursday. **WEATHER:** Very warm and sunny; nice day

DOSEMETER READING: 31 to 32 **CREW:** Paul Abston, SSHO, Jay Mitchell, log sheet & records, Jim LaForrest & Norman Farrow as installers. **EVENTS (recorded at 1230**

hrs. from memory): Located off DP-34; 90 degrees (magnetic) east of north and 17 feet along that azimuth. The first 5' section drove fast. Added another 5' and 2' section and drove them to a stickup of ~15"; fast and slow zones indicating trench. Average rate was fairly fast, however. Added five 1' sections and near the top of the 2' section it acted as if it went into the bottom of the trench. Drove to a stick up of 5" to 8" on the 2' section. Added 14' of PVC in a screen, two 5' sections, a 2' and a 1' riser and pulled back. Total steel was 12' (after removing the five 1' sections after pullback) and 14' of PVC. Finished the day cleaning equipment and moving it to 7874. There are several more days of clean up, fix up and put up before the project is done (for us).

INVENTORY OF RUNNING TALLY AS OF Mar. 23, 1995:

#	DP-##	INSTALLED	ABANDONED	STEEL	PVC	
1	DP-16A	Jan. 24	yes	7'	0	
2	DP-16	Jan. 24		10'	12'	
3	DP-14	Jan. 25		15'	17'	
4	DP-13	Jan. 25		12'	14'	
5	DP-15	Jan. 25		14'	16'	
6	DP-17	Jan. 26		14'	16'	
7	DP-18	Jan. 27		14'	16'	
8	DP-19	Jan. 27		12'	14'	5+5+1+1
9	DP-20	Jan. 27		10'	12'	
10	DP-22	Feb. 6		15'	17'	
11	DP-23	Feb. 6		12'	14'	
12	DP-21.1	Feb. 6	no	5'	7'	

13	DP-21A	Feb. 6	yes	5'	0
14	DP-21A1	Feb. 6	yes	5'	0
15	DP-21A2	Feb. 6	yes	5'	0
16	DP-29	Feb. 8		10'	12'
17	DP-30	Feb. 8		13'	15'
18	DP-28A	Feb. 9	yes	10'	0'
19	DP-25	Feb. 9		15'	16'
20	DP-27	Feb. 9		10'	12'
21	DP-26	Feb. 13		10'	12'
22	DP-24	Feb. 13		12'	14'
23	DP-31	Feb. 13		10'	12'
24	DP-32	Feb. 13		12'	14'
25	DP-34	Feb. 13		10'	12'
26	DP-33	Feb. 13&22		7'	9'
27	DP-35	Feb. 14		10'	12'
28	DP-36	Feb. 14		13'	15'
29	DP-37	Feb. 14		16'	18'
30	DP-38	Feb. 14		12'	14'
31	DP-39	Feb. 20		16'	18'
32	DP-46	Feb. 20		10'	12'
33	DP-42	Feb. 20		7'	9'
34	DP-41	Feb. 21		16'	18'
35	DP-43	Feb. 21		10'	12'
36	DP-40	Feb. 21		14'	16'
37	DP-45	Feb. 22		10'	12'
38	TP-1	Mar. 2		0'	4'
39	TP-2	Mar. 2		0'	4'
40	TP-3	Mar. 2		0'	4'
41	TP-4	Mar. 2		0'	4'
42	TP-5	Mar. 2		0'	4'
43	TP-6	Mar. 2		0'	4'
44	TP-7	Mar. 2		0'	4'
45	TP-8	Mar. 2		0'	4'
46	TP-9	Mar. 2		0'	4'
47	TP-10	Mar. 2		0'	4'
48	TP-11	Mar. 2		0'	4'
49	TP-12	Mar. 2		0'	4'
50	DP-49	Mar. 13		13'	15'
51	DP-50	Mar. 13		14'	16'
52	DP-44	Mar. 13		10'	12'
53	DP-47	Mar. 13		16'	18'
54	DP-48	Mar. 14		16'	18'
55	DP-51	Mar. 21		10'	12'
56	DP-52	Mar. 21		5'	7'
57	DP-53	Mar. 21		7'	9'

58	DP-54	Mar. 21	13'	15'
59	DP-55	Mar. 23	12'	14'

AS OF	JAN 31	FEB 28	MAR 23 (end of field work)
WORK DAYS SINCE PROJECT BEGAN	6	15	14
DAYS IN THE FIELD (WELL INSTALLATIONS)	4	11.5	17
TOTAL WELLS	8	37	59
WELLS PER FIELD DAY RATE	2	3.2	3.5
WELLS PER DAY RATE	1.6	1.7	1.7
H&S DAYS - WORK NOT ALLOWED	0	5.5	6.5
EQUIPMENT DOWN TIME	2	4	4
OTHER DOWNTIME	0	0	7.5
# OF NON-PRODUCTIVE PENETRATIONS	1	5	5
STEEL USED TO DATE	108'	408'	524'
PVC USED TO DATE	117'	427'	611'

DRIVE POINT MATERIAL PURCHASED FOR WAG 4

WELL MATERIAL	QUANTITY	EXPENDED
5' riser	160	
2' riser	80	
1' riser	80	
Total footage	1,048	611
1' screen	60	60
caps & points	60	60
seals	100	60
AQ MATERIAL		
5' rods	160	
2' rods	40	
1' rods	0	
Total footage	872	524
Points	60	47
Subs	50	47

APPENDIX G

**SAMPLING AND ANALYSIS
METHODOLOGY FOR THE
TRACER STUDY**

APPENDIX G, TRACER STUDY DISCUSSION

Description of Tracer Study Implementation

The tracer study originally was planned to potentially address all six of the seep discharge areas identified early in the study. To conserve materials and prevent the sampling from becoming too large a task, it was decided that a maximum of three areas could undergo active tracing simultaneously. Because it was necessary to wait until virtually all the drive points had been installed and sampled to be able to confidently select injection and sampling points, it was recognized that the onset of dry weather conditions could limit the testing to the first three areas chosen. This placed a priority on selecting the most important sites for the initial tracing work. Based on the information available immediately before the start of the tests, contributing trenches for SCS 6, SCS 4, and SCS 3 were given the highest priority.

The decision was made to use three noble gases as the groundwater tracers in each seep area. The gases chosen were helium, neon, and argon. These noble gases make ideal tracers in groundwater because they are inert, they have little or no effect on the chemical or physical properties of the water (such as ionic strength and density), they can be analyzed to natural background concentrations (and the background concentrations that may exist are easily quantifiable), and the gases are relatively inexpensive.

Tracer injection. The method of tracer injection was developed at ORNL (Sanford and Solomon 1995) for use in long-term field-scale tracer studies. The method involves dissolving the tracer gas in the groundwater by allowing the gas to diffuse through a coil of Teflon tubing. The injection system consists of approximately 100 ft of 1/16-in.-diameter Teflon tubing wrapped into a cylindrical coil approximately 1/2-in. in diameter and 15 in. in length. The ends of the Teflon tubing are connected to 1/8-in.-diameter copper refrigeration tubing. The infusion coil was installed at the bottom of the drive point wells so that the injection of the tracer gases would occur through a 1-ft-long slotted section. The two pieces of copper tubing were run up the inside of the drive point well to the surface, where one end was connected to a gas regulator attached to a cylinder of the tracer gas, and the other end was opened to the atmosphere as a vent.

This method of tracer injection has advantages in comparison with other injection methods. One advantage is that Teflon tubing is permeable to most gases; therefore, the noble gases can diffuse through the tubing and dissolve into the groundwater, minimizing the formation of gas bubbles in the well that could enter the aquifer and reduce permeability in the vicinity of the injection well. A second advantage is that once the tracer gas is flowing through the tubing, the injection is continuous and little maintenance of the system is required.

Sample collection and analysis. The method of collecting samples of the dissolved gases in the groundwater also was developed at ORNL (Sanford, Solomon, and Shropshire 1994) for use in noble-gas tracer studies. The passive-diffusive sampler consists of an automobile tire valve stem, equipped with a removable valve, silver-soldered onto an 8.8-cm length of 5/16-in. outside diameter (OD) copper refrigeration tube that is crimped and soldered at the opposite end. A 10.6-cm length of 3/16-in. inside diameter (ID), 5/16-in. OD silicone rubber tubing is used, having one end plugged and the internal volume of the tubing filled with silica sand. The sand reduces the total internal volume of the tubing so that the time to equilibration with the dissolved gases in the groundwater

is decreased. The silicone tubing is attached to a screwdriver-type metal valve cap that has two small holes in its top. A stainless steel ball bearing is placed inside the cap as it is threaded on to the valve stem. The ball bearing depresses the valve and the two holes allow the internal volumes of the sampler and the silicone tubing to become continuous. The sampler then can be placed down a well into the groundwater, and the gases in the sampler system eventually will reach equilibrium with the dissolved gases in the groundwater.

The samplers were collected once each week from each monitoring well. When one sampler was removed, another was put in its place. The samplers were brought to the laboratory, where samples of the collected gas were analyzed using a vacuum extraction system, which is designed to extract the gases from the sampler and then inject them into a gas chromatograph equipped with a thermal conductivity detector. This analytical system is used regularly for analysis of gas samples for other noble-gas tracer experiments at ORNL.

The main advantage of the sample collection method is that no water sample is required. The sample tubes are retrieved, decontaminated on-site, and then taken to the laboratory. No need exists for the special handling requirements associated with collection and analyses of contaminated waters.

APPENDIX H

**WATER LEVEL DATA
COLLECTED AT WAG 4**

Well 0064 Hydrograph

Well 0114 Hydrograph

Chart7

Well 0181 Hydrograph

0182

Well 0186 Hydrograph

Well 0188 Hydrograph

Well 0189 Hydrograph

0190

Well 0190 Hydrograph

H-10

Well 0191 Hydrograph

Well 0196 Hydrograph

Well 0203 Hydrograph

0407

Well 0407 Hydrograph

0410

Well 0410 Hydrograph

0680

Well 0680 Hydrograph

0682

Well 0682 Hydrograph

Chart17

Well 0683 Hydrograph

Well 0684 Hydrograph

0685

Well 0685 Hydrograph

0686

Well 0686 Hydrograph

0687

Well 0687 Hydrograph

Well 0688 Hydrograph

Well 1859 Hydrograph

1860

Well 1860 Hydrograph

H-25

Well 2573 Hydrograph

2579

Well 2579 Hydrograph

Chart23

Well 4318 Hydrograph

4319hourly

Well 4319 Hydrograph

Well 4327 Hydrograph

Well 4328 Hydrograph

Well 4329 Hydrograph

4361

Well 4361 Hydrograph

4365

Well 4365 Hydrograph

H-34

Well 4366 Hydrograph

4366

4378

Well 4378 Hydrograph

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