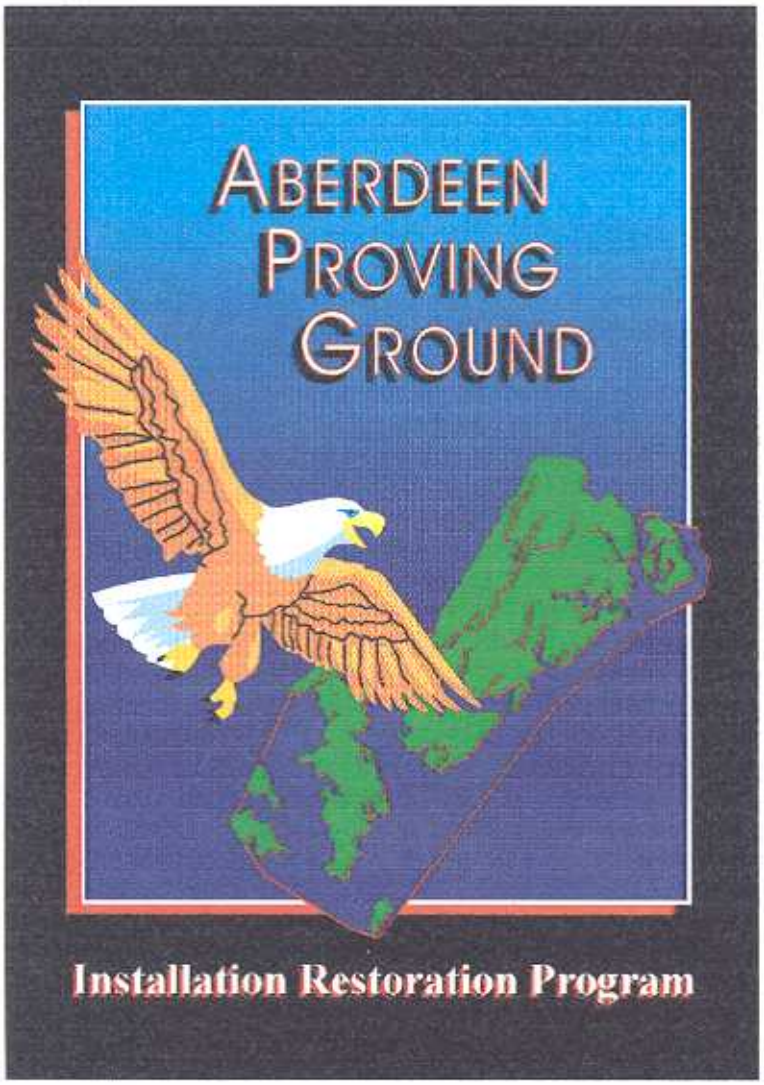


J-FIELD PHYTOREMEDIATION WELL AND LYSIMETER INSTALLATION REPORT

ABERDEEN PROVING GROUND, MARYLAND

APRIL 1997

J-FIELD PHYTOREMEDIATION WELL AND LYSIMETER INSTALLATION REPORT
ABERDEEN PROVING GROUND, MARYLAND

Prepared by
Roy F. Weston, Inc.(WESTON)

APRIL 1997

U.S. EPA Work Assignment No. 1-173
WESTON Work Order No. 03347-041-001-1173-01
U.S. EPA Contract No. 68-C4-0022

Richard J. Tobia
Task Leader

4/21/97
(Date)

Edward F. Gilardi, PhD, PE
Program Manager

4/21/97
(Date)

\173\tr\9704\wellinst.wpd

INTRODUCTION

One hundred eighty three hybrid poplar trees were planted from 25 March through 3 April 1996 in a one acre plot as a pilot-scale phytoremediation study at the J-Field Toxic Pits Site (J-Field) of Aberdeen Proving Ground (APG), Maryland. The objective of the project is to contain the flow of volatile organic compounds (VOCs) in the surficial groundwater by removal and destruction of the compounds through natural mechanisms.

Other objectives are to:

- determine the mechanisms responsible for VOC reduction.
- determine the aquifer draw down within the study area and the lateral extent of the trees influence.
- correlate findings from tree tissue and transpirational gas sampling with water quality data from the capillary fringe.

In order to meet these objectives it was determined that additional wells and lysimeters were needed to be installed at the site. Five additional groundwater monitor wells and four lysimeters were proposed and approved to be installed.

Site History

J-Field is located at the tip of Gunpowder Neck, Edgewood Area of the APG, Harford County, Maryland. The Toxic Pits area of J-Field was once the disposal site for chemical warfare agents, munitions, and industrial chemicals. The Toxic Pits area consists of two parallel disposal pits that are approximately 10-feet-deep by 15-feet-wide by 200-feet-long. Remnants of other pits extend into the marsh area to the east. The pits were used for open-pit burning and detonation from 1940 through 1980. During open burning, wood was first placed in the pit and the waste material, including high explosives, nerve agents, mustard agents, smoke materials, and solvents, were placed on top. The pit was then flooded with fuel oil and ignited. After the first burn, a reburn of the material was performed in the adjacent pit. Any remaining debris was pushed into the marsh. The area to the northeast of the pits appears to be the main pushout area for the debris.

The contaminants of concern are 1,1,2,2-tetrachloroethane (PCA), 1,1,2-trichloroethane (TCA), cis- and trans-1,2-dichloroethene (DCE), trichloroethene (TCE), and tetrachloroethene (PCE). The ecosystem of concern is the adjacent fresh water marsh, the Chesapeake Bay, and surrounding waterways.

OBSERVATIONS AND ACTIVITIES

Monitor Wells

Five 2-inch groundwater monitor wells were installed from 7 November through 15 November 1996. The placement of these wells was determined based on the objectives of the pilot-scale monitoring, site conditions, and accessability (Figure 1). Monitor wells were screened from approximately 3 to 13 feet below ground surface (bgs) (Table 1). This shallow screening interval will allow for the sampling and water level monitoring of the upper part of the surficial aquifer, where the trees will be removing water. J-Field Phytoremediation monitor well #1 (JFP-1) was placed as far up gradient of the phytoremediation study area as possible. The objective of the placement of this well is to obtain a representative sample of groundwater before being impacted by the trees. JFP-2 and JFP-3 were placed within the study area to monitor the trees affect on water quality and water table levels. JFP-4 was placed in-line, down gradient of JFP-1, JFP-2, and JFP-3 so that the affect of a larger planting area on water quality and groundwater elevations can be determined. JFP-5 was placed in the wooded area to the south of the site approximately 100 feet from the study border. This well will provide missing contaminant and elevation information south of the study area.

Lysimeters

Two sets of two lysimeters were installed near monitor wells JFP-2 and JFP-3 (Figure 1). The lysimeters were placed in pairs and set at depths of approximately 4 and 8-feet bgs (Table 1). The 4-foot lysimeter was placed closest to the well. These depths will allow for coverage of the capillary zone during seasonal highs and lows in the groundwater table. The data obtained from the lysimeters will be correlated with the surrounding tree tissue and transpirational off-gas data to

make a determination as to what degree the pilot study is working.

Installation

Drilling and installation of the wells and lysimeters were performed by A.C. Schultes of Maryland, Inc. The necessary Harford County permits were obtained by A.C. Schultes. Drilling was performed with 8.25-inch hollow stem augers (4.25 to 6.25 inch ID) and a Central Mine Equipment (CME-55) all-terrain vehicle (ATV) with rubber wheels. Prior to drilling, each location was hand augered with a 3-inch stainless steel auger and cleared for unexploded ordnance to a depth of 10 to 14 feet bgs. Personnel from Human Factors Applications, Inc. performed the clearance. Each open hole was screened for VOCs using a photoionization detector (HNu w/10.2 lamp) (Table 2).

New 2-inch polyvinyl chloride (PVC) schedule 40 well casing (Johnson Wheelabrator Systems) was used for the installation of the wells. Ten feet of 0.010-inch slotted well screen was installed in the bottom of each well. The wells were finished off to a minimum of 1-foot above the top of the screen with #1 grade sand (The Morie Co. Filtration Media) and then pelletized bentonite. A steel protective casing was then installed around the well. This casing was then cemented in with a 4-foot by 4-foot concrete pad finished to ground surface. The well designation was written in the concrete pad and each was banded with the county supplied metal tag (Appendix A and B). Wells listed as JFL #1 through #5 in the A.C. Schultes report should be listed as JFP-1 through JFP-5.

Due to problems in obtaining Teflon® lysimeter cups, ceramic lysimeter cups were installed. Timco™ ceramic cup type lysimeters and accessories were utilized for the installation. All other lysimeter parts were made of PVC. Lysimeters were assembled and checked according to the manufacturers instructions. The lysimeter heads were surrounded with a 200 mesh silica flour slurry before being finished off in the same manner as the wells with sand, bentonite, and a steel casing set in concrete.

Drill cuttings were drummed and later sampled for disposal. HNu readings were taken of the drums (Table 3). Based on these readings, JFP-1 cuttings were disposed of by APG. The remaining four drums were sampled for metals (Appendix C) and were approved by APG personnel to be disposed of on site. These drums were spread out over the tree area on 4 April 1997.

Well Development

Well development was performed using clean disposable Teflon bailers. At a minimum, 25 gallons was purged from each well (Table 2). Development water was pumped into a tank located on site which held groundwater from an ongoing pump test. This water was later disposed of by APG personnel.

Well and Lysimeter Survey

On 20 and 21 February 1997 a survey was performed by REAC personnel of the new wells and lysimeters in the tree planting area. Also as part of the survey, other wells in the area were surveyed. These new locations are presented on Figure 1. Elevations of the top of casing (TOC) were also taken for water level measurement purposes (Table 4). It was determined by this survey that the prior location of the wells in this area on previous maps were inaccurate.

FUTURE WORK

No future work, with the exception of regular monitoring of the wells and lysimeters, is planned at this time.

TABLE 1
Well and Lysimeter Installation Specifications
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

Location	Installed Depth (ft. bgs)	Screen Interval (ft. bgs)
JFP-1	14.1	3.6 to 13.6
JFP-2	14.0	3.5 to 13.5
JFP-3	13.0	2.5 to 12.5
JFP-4	14.0	3.5 to 13.5
JFP-5	13.75	3.75 to 13.75
JFL-1	4.0	3.5 to 4.0
JFL-2	7.5	7.0 to 7.5
JFL-3	4.0	3.5 to 4.0
JFL-4	7.5	7.0 to 7.5

ft. bgs = feet below ground surface

TABLE 2
Well and Lysimeter Installation and Development Data
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

Location	HNu (10.2) (units)	Development Water (gallons)	Recovery Rate
JFP-1	65	25	slow
JFP-2	<1	50	good
JFP-3	<1	50	good
JFP-4	<1	50	good
JFP-5	17	25	slow
JFL-1	<1	NA	NA
JFL-2	<1	NA	NA
JFL-3	<1	NA	NA
JFL-4	<1	NA	NA

NA = Not applicable

TABLE 3
Drill Cuttings Data
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

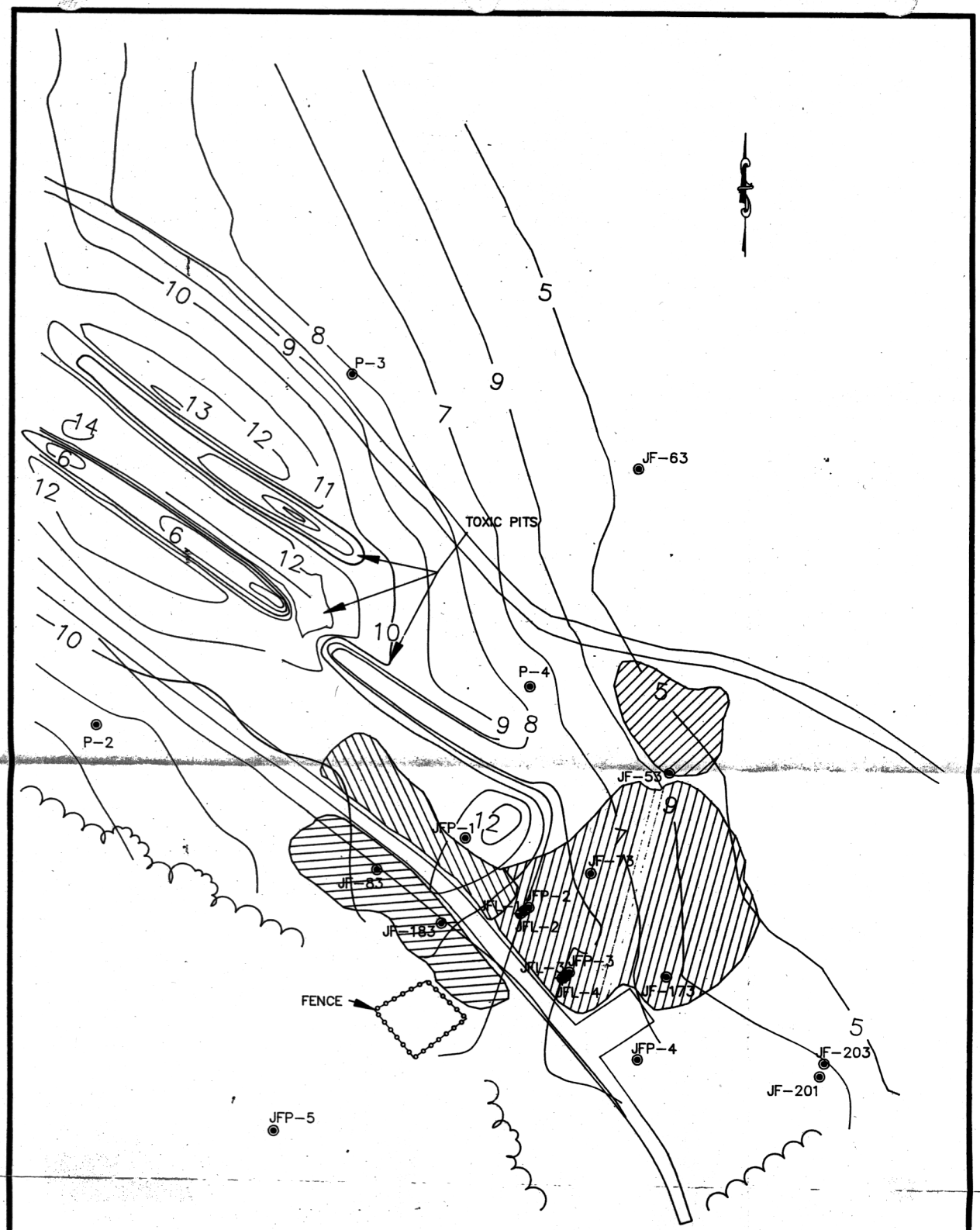
Location	HNu (10.2) (units)	Quantity[1] (gallons)
JFP-1	40	35
JFP-2, JFL-1 &2	1	50
JFP-3, JFL-3 & 4	ND	50
JFP-4	ND	20
JFP-5	3	25

ND = not detected
[1] = estimated

TABLE 4
Well and Lysimeter Elevations
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

Description (Harford County ID #)	Well #	Elevation to TOC (feet above MSL)
Argonne National Labs		
HA-94-0442	JF-201	9.06
HA-94-0443	JF-203	8.77
HA-94-0173	JF-173	9.65
HA-94-0436	JF-183	11.88
Princeton Aqua Science		
HA-81-0526	P-2	11.16
HA-81-0527	P-3	10.27
HA-81-0520	P-4	10.22
United States Geological Survey		
HA-88-1051	JF-53	8.10
HA-88-1054	JF-63	6.80
HA-88-1057	JF-73	10.04
HA-88-1060	JF-83	13.18
Weston/REAC		
HA-94-1334	JFP-1	11.76
HA-94-1335	JFP-2	11.04
HA-94-1336	JFP-3	10.42
HA-94-1337	JFP-4	10.45
HA-94-1338	JFP-5	8.40

MSL = mean sea level
TOC = top of casing



LEGEND:

- LYSIMETER
- MONITOR WELL
- 9 CONTOUR INTERVAL
- PHYTOREMEDIATION AREA

GRAPHIC SCALE

50 0 25 50 100

(IN FEET)

1 inch = 50 ft.

U.S. EPA ENVIRONMENTAL RESPONSE TEAM CENTER
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
68-C4-0022
W.O.# 03347-041-001-1173-01

FIGURE 1
MONITOR WELL AND LYSIMETER LOCATION MAP
J-FIELD PHYTOREMEDIATION STUDY
ABERDEEN PROVING GROUND, MD
APRIL 1997

AVARELA 173_A1.DWG 4/9/97

APPENDIX A
A.C. Schultes Technical Report
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

24 S. River Road, Edgewater, MD 21037, Phone: (410) 841-6710, Facsimile: (410) 841-6711

ROY F. WESTON
ABERDEEN PROVING GROUND
Edgewood, MD

ACSM JOB #3052

Established in 1921

Serving your needs in the Mid-Atlantic Region

A.C. SCHULTES, INC.
664 S. Evergreen Avenue
Woodbury, NJ 08096
(609) 845-5656
(609) 845-1335 FAX

A.C. SCHULTES OF DE, INC.
Route 13
Bridgeville, DE 19933
(302) 337-8254
(302) 337-8234 FAX

A.C. SCHULTES OF MD, INC.
24 S. River Road
Edgewater, MD 21037
(410) 841-6710
(410) 841-6711 FAX

A.C. SCHULTES MOTOR & PUMP
101 Jessup Road
Thorofare, NJ 08086
(609) 845-7400
(609) 848-8309 FAX

ROY F. WESTON
ABERDEEN PROVING GROUND
Edgewood, MD

ACSM JOB #3052

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- A. Driller's Log
- B. Permit Application
- C. Completion Report

II. Well JFL #2
- A. Driller's Log
- B. Permit Application
- C. Completion Report

III. Well JFL #3
- A. Driller's Log
- B. Permit Application
- C. Completion Report

IV. Well JFL #4
- A. Driller's Log
- B. Permit Application
- C. Completion Report

V. Well JFL #5
- A. Driller's Log
- B. Permit Application
- C. Completion Report

Telephone 410/841-6710
Fax # 410-841-6711

A.C. SCHULTES OF MARYLAND, INC.

24-26 SOUTH RIVER ROAD EDGEWATER MARYLAND 21037

Water Well Contractors

CUSTOM ER ROY F. WESTON, INC. JOB 3052

ADDRESS ABERDEEN PROVING GROUNDS DATE 11/13/96

LOCATION EDGEWOOD, MARYLAND WELL JFL #1

		FEET FROM GROUND SURFACE 0 TO _____		WELL LOG
GROUND	2.8'	0	1	TOPSOIL
		1	14	MED ORANGE SAND W/SOME CLAY
14'	4' CASING			
	10'			

PERMIT NO	HA-94-1334	DIAMETER OF WELL	2"	DEPT. OF WELL	14'
HRS PUMPED		SLOT SIZE	.010	TYPE OF CASING	2" PVC
CAPACITY G P M		DRILLING MACHINE NO	ATV	LENGTH OF CASING	4' 8"
STATIC LEVEL		DRILLER	K. DEROCHE	DISTANCE TO TOP OF Screen	4'
PUMPING LEVEL		GRAVEL	# MORIE	TYPE SCREEN	PVC
SPECIFIC CAPACITY		BAGS OF [redacted]/CEMENT	1	SIZE OF SCREEN	2"
PUMPED WITH		DATE WELL COMPLETED	11/13/96		
DEPTH OF GROUT	: 0' - 3'	DRILLER'S HELPER	J. AMIS		
DEPTH GRAVEL PACKED	3' - 14'				

KENNETH DEROCHE

WELL DRILLER'S SIGNATURE

(THIS NUMBER IS TO BE PUNCHED IN COLS 3-6 ON ALL CARDS)

PERMIT TO DRILL WELL

please print or type

HA - 94 - 1334 (70–79)

fill in this form completely

Date Received (APA) 11-12-96 (8 MM DD YY 13)

OWNER INFORMATION

'ted States Army
ast Name Owner First Name 34

Aberdeen Proving Ground
36 Street or RFD 55

Edgewodd MD
57 Town 70 State 72 Zip 76

DRILLER INFORMATION

David Hartman M D 517
Driller's Name 76 License No. 81

A.C. Schultes of Maryland, Inc.
Firm Name

24 South River Rd. Edgewater, MD 21037
Address

[signature] 11/8/96
Signature Date

B 3 LOCATION OF WELL

Harford County
8 COUNTY 21

Aberdeen Proving Ground
23 SUBDIVISION 42

SECTION 44 46 LOT 48 50

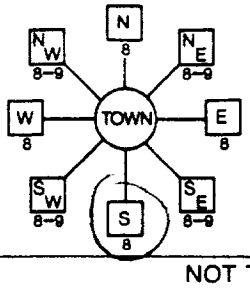
Edgewood
52 NEAREST TOWN 71

MILES FROM TOWN (enter 0 if in town) 7 (M I) 73 76 77 78

B 4

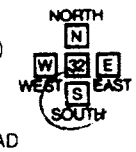
1 2

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Ricketts Point Rd.
11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



34 30 37

DISTANCE FROM ROAD

ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

2 WELL INFORMATION

2

APPROX. PUMPING RATE (GAL. PER MIN.) N/A 8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A 14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE APPROVAL
- EST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Harford 12
COUNTY NAME COUNTY NO.

STATE SIGNATURE ____ INSERT S → ____ 41

DATE ISSUED 11/13/96 [signature] 11/13/97
43 MM DD YY 48 CO SIGNATURE EXP. DATE

NORTH GRID 535 000 (50–55) EAST GRID 0999 000 (57–63)

APPROXIMATE DEPTH OF WELL 13 FEET (24–28)

APPROXIMATE DIAMETER OF WELL 2" NEAREST INCH

METHOD OF DRILLING (circle one)

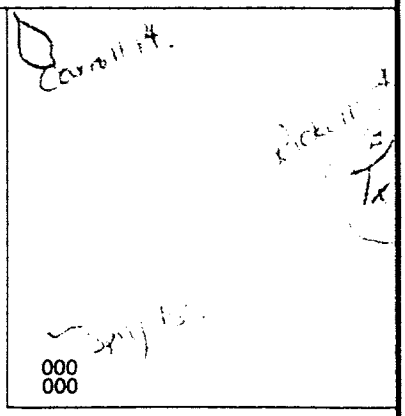
BORED (or Augered) JETTED Jetted & DRIVEN
AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
CABLE REVerse-ROTary DRive-POINT
other ____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ____ 52

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



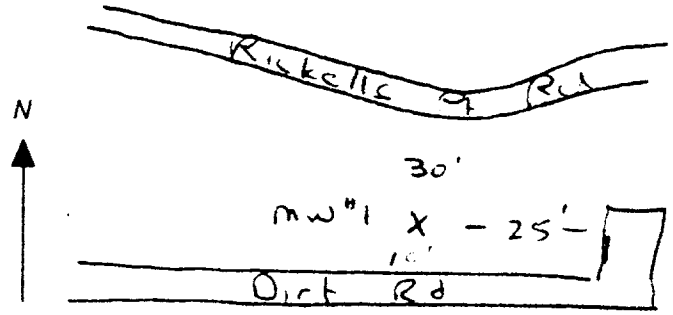
SOURCES OF DRILLING WATER
1. N/A
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 990

N 530

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP 54 63

WRITE INITIALS IN BOX 67 68

PERMIT No. HA - 94 - 1334 70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS

NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

DRILLER

...ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224.

C 1 1461 — SEQUENCE NO. (MDE USE ONLY)

THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 12

...T/CO USE ONLY
D... ...ceived

DATE WELL COMPLETED: 1 1 1 3 9 6

Depth of Well: 1 4 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": HA-94-1334

OWNER: V.S. Army (last name) (first name)

STREET OR RFD: Ricketts Point Rd TOWN: Edgewood MW1

SUBDIVISION: APG-Edgewood SECTION: LOT:

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
TOPSOIL	0	1	
MED ORANGE			
SAND/ SOME CLAY	1	14	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes Y no N

CIRCLE APPROPRIATE LETTER

A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED

ELECTRIC LOG OBTAINED

P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE MENTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD

DRILLERS LIC. NO. 517

SIGNATURE (IS... MATCH SIGNATURE ON APPLICATION)

LIC. NO.

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): yes Y no N

TYPE OF GROUTING MATERIAL (Circle one): CEMENT CM BENTONITE CLAY BC

NO. OF BAGS 1 NO. OF POUNDS 94

GALLONS OF WATER 6

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. (TOP) to 2 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	4

OTHER CASING (if used)

EACH CASING — diameter inch — depth (feet) from — to

SCREEN RECORD

screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

EACH SCREEN	DEPTH (nearest ft.)		
1	PL	4	14
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK from 2 to 14

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test): A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

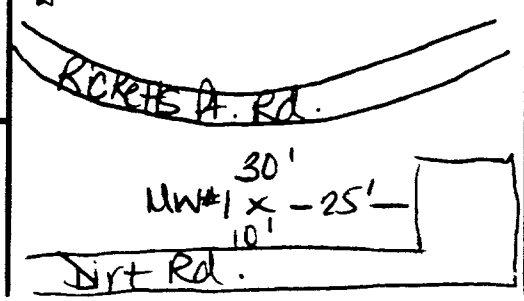
PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height): + above, − below

LAND SURFACE 3 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



Telephone 410/841-6710
Fax # 410-841-6711

A.C. SCHULTES OF MARYLAND, INC.

24-26 SOUTH RIVER ROAD EDGEWATER MARYLAND 21037

Water Well Contractors

CUSTOM ER ROY F. WESTON JOB 3052

ADDRESS ABERDEEN PROVING GROUNDS DATE 11/14/96

LOCATION EDGEWOOD, MARYLAND WELL JFL #2

		FEET FROM GROUND SURFACE 0 TO _____		WELL LOG
GROUND	2' 8"	0	1	TOPSOIL
		1	13	MED ORANGE SAND W/GRAVEL
13'6"	3'6" CASING			
	10'			

PERMIT NO	HA-94-1335	DIAMETER OF WELL	2"	DEPT. OF WELL	13' 6"
HRS PUMPED		SLOT SIZE	.010	TYPE OF CASING	PVC
CAPACITY G P M		DRILLING MACHINE NO	ATV	LENGTH OF CASING	3' 6"
STATIC LEVEL		DRILLER	K. DEROCHE	DISTANCE TO TOP OF Screen	3'6"
PUMPING LEVEL		GRAVEL	MORIE #1	TYPE SCREEN	PVC
SPECIFIC CAPACITY		BAGS OF [redacted]/CEMENT	1	SIZE OF SCREEN	2"
PUMPED WITH		DATE WELL COMPLETED	11/14/96		
DEPTH OF GROUT	: 0-1'6"	DRILLER'S HELPER	J. AMIS		
DEPTH GRAVEL PACKED	1'6"-13'6"				

K. DEROCHE

WELL DRILLER'S SIGNATURE

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

PERMIT TO DRILL WELL

please print or type

HA - 94 - 1335

70 fill in this form completely 79

Date Received (APA) 11-12-96

8 MM DD YY 13

OWNER INFORMATION

United States ARmy

Last Name Owner First Name 34

Aberdeen Proving Ground

36 Street or RFD 55

Edgewood MD

57 Town 70 State 72 Zip 76

DRILLER INFORMATION

David Hartman M D 517

Driller's Name 76 License No. 81

A.C. Schultes of Maryland, Inc.

Firm Name

24 South River Rd, Edgewater, MD 21037

Address

Signature 11/8/96

Date

B 3 LOCATION OF WELL

Harford County

8 COUNTY 21

Aberdeen Proving Ground

23 SUBDIVISION 42

SECTION 44 46 LOT 48 50

Edgewood

52 NEAREST TOWN 71

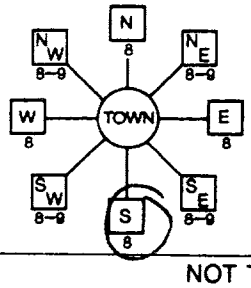
MILES FROM TOWN (enter 0 if in town) 7 M I

73 76 77 78

B 4

1 2

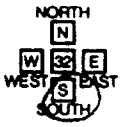
DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Ricketts Point Rd.

11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



34 35 37

DISTANCE FROM ROAD

ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

R 2 WELL INFORMATION

2

APPROX. PUMPING RATE (GAL. PER MIN.) N/A

8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A

14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)

F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION

2 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)

P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE APPROVAL

ST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Harford 12

COUNTY NAME COUNTY NO.

STATE SIGNATURE ____ INSERT S → ____ 41

DATE ISSUED 11/13/96 CO SIGNATURE 11/13/97

43 MM DD YY 48 EXP. DATE

NORTH GRID 535000 EAST GRID 0999000

50 55 57 63

APPROXIMATE DEPTH OF WELL 13 FEET

24 28

APPROXIMATE DIAMETER OF WELL 2" NEAREST INCH

METHOD OF DRILLING (circle one)

BORED (or Augered) JETTED Jetted & DRIVEN

3 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

3 CABLE REVerse-ROTary DRive-POINT

other ____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

N THIS WELL WILL NOT REPLACE AN EXISTING WELL

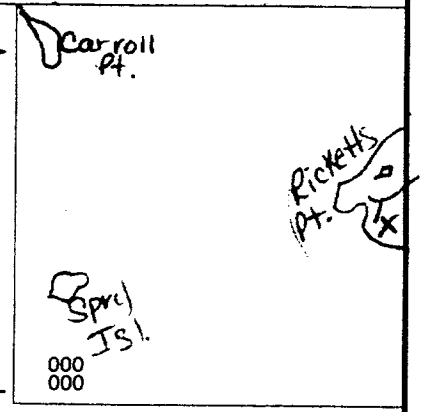
Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED

39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS

D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ____ 52

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



SOURCES OF DRILLING WATER

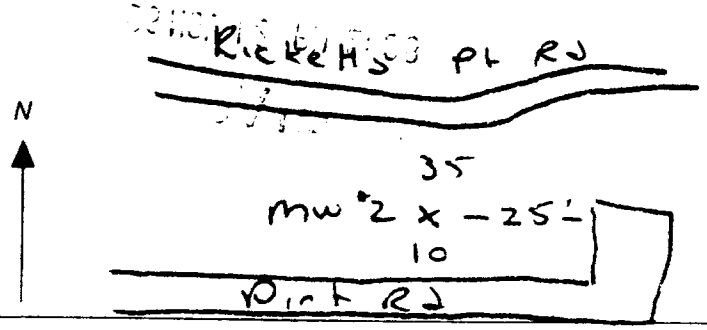
1. N/A
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 990 000

N 530 000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS, AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APPROP. PERMIT NUMBER GAP

54 63

WRITE INITIALS IN BOX

67 68

PERMIT No. HA - 94 - 1335

70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS

NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

COUNTY

OF ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224.

C 1 1460 — SEQUENCE NO. (MDE USE ONLY)

THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 12

STATE USE ONLY — Received

DATE WELL COMPLETED: 11 13 96

Depth of Well: 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": HA-94-1335

OWNER: U S Army

STREET OR RFD: Ricketts Point Rd (last name / first name) TOWN: Edgewood

SUBDIVISION: ARG - Edgewood SECTION: LOT:

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
TOP SOIL	0	1	
MED ORANGE SAND/GRAVEL	1	14	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes Y / no N

CIRCLE APPROPRIATE LETTER

A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED

E — ELECTRIC LOG OBTAINED

P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD

DRILLERS LIC. NO. 517

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): yes Y / no N

TYPE OF GROUTING MATERIAL (Circle one): CEMENT CM — BENTONITE CLAY BC

NO. OF BAGS 1 NO. OF POUNDS 94

GALLONS OF WATER 6

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. TOP to 2 ft. BOTTOM (enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	4

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD

screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

EACH SCREEN		DEPTH (nearest ft.)	
1	PL	4	14
2			
3			

SLOT SIZE 1 .010 2 3

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK from 2 to 14

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T — TELESCOPE CASING; (E.R.O.S.) — LOG INDICATOR; W Q — OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test)

A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES / NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

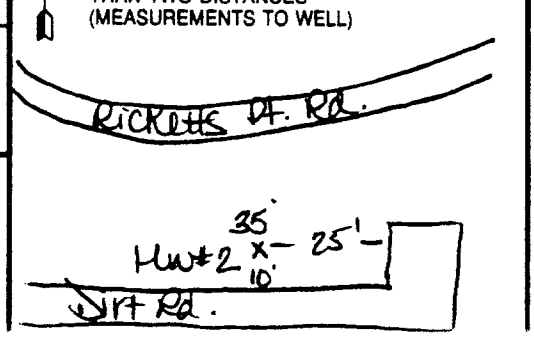
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height): + above / − below LAND SURFACE 3 (nearest) foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



Telephone 410/841-6710
Fax # 410-841-6711

A.C. SCHULTES OF MARYLAND, INC.

24-26 SOUTH RIVER ROAD EDGEWATER MARYLAND 21037

Water Well Contractors

CUSTOM ER ROY F. WESTON JOB 3052

ADDRESS ABERDEEN PROVING GROUNDS DATE 11/14/96

LOCATION EDGEWOOD, MARYLAND WELL JFL #3

		FEET FROM GROUND SURFACE 0 TO _____		WELL LOG
GROUND	2' 6"	0	1	TOPSOIL
		1	13	MED ORANGE SAND W/GRAVEL
13'6"	3'6" CASING			
	10'			

PERMIT NO	HA-94-1336	DIAMETER OF WELL	2"	DEPT. OF WELL	13' 6"
HRS PUMPED		SLOT SIZE	.010	TYPE OF CASING	PVC
CAPACITY G P M		DRILLING MACHINE NO	ATV	LENGTH OF CASING	3' 6"
STATIC LEVEL		DRILLER	K. DEROCHE	DISTANCE TO TOP OF Screen	3'6"
PUMPING LEVEL		GRAVEL	MORIE #1	TYPE SCREEN	PVC
SPECIFIC CAPACITY		BAGS OF [redacted]/CEMENT	1	SIZE OF SCREEN	2"
PUMPED WITH		DATE WELL COMPLETED	11/14/96		
DEPTH OF GROUT	: 0-1'6"	DRILLER'S HELPER	J. AMIS		
DEPTH GRAVEL PACKED	1'6"-13'6"				

K. DEROCHE

WELL DRILLER'S SIGNATURE

(MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND

PERMIT TO DRILL WELL

please print or type

HA -94 -1336

70 79

fill in this form completely

Date Received (APA)

11-12-96

MM DD YY 13

OWNER INFORMATION

ited States ARmy

ast Name Owner First Name 34

Aberdeen Proving Ground

36 Street or RFD 55

Edgewood, MD

7 Town 70 State 72 Zip 76

DRILLER INFORMATION

David HArtman

Driller's Name 76 License No. 81

M D 517

24C. Schultes of Maryland, Inc.

Firm Name

24 South River Rd. Edgewater, MD 21037

ddress

Signature Date 11/8/96

B 3 LOCATION OF WELL

Harford County

8 COUNTY 21

Aberdeen Proving Ground

23 SUBDIVISION 42

SECTION 44 46 LOT 48 50

Edgewood

52 NEAREST TOWN 71

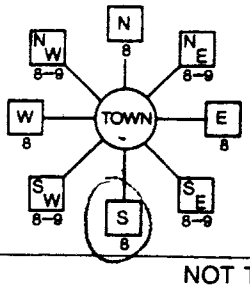
MILES FROM TOWN (enter 0 if in town) 7 73 76 77 78 M I

B 4

1 2

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)

N 8, NW 8-9, NE 8-9, W 8, TOWN, E 8, SW 8-9, S 8, SE 8-9

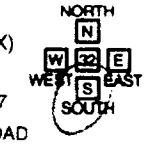


Ricketts Point Rd.

11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

NORTH N, W 32 E, WEST S EAST, SOUTH



34 37

DISTANCE FROM ROAD

ENTER FT/OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

E 2 WELL INFORMATION

1 2

APPROX. PUMPING RATE (GAL. PER MIN.) N/A 8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A 14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)

F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION

22 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)

P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE APPROVAL

T TEST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Harford 12

COUNTY NAME COUNTY NO.

STATE SIGNATURE ____ INSERT S → 41

DATE ISSUED 11/13/96 Barfung 11/13/97

43 MM DD YY 48 CO SIGNATURE EXP. DATE

NORTH GRID 535 000 50 55

EAST GRID 0999 000 57 63

APPROXIMATE DEPTH OF WELL 13 24 28 FEET

APPROXIMATE DIAMETER OF WELL 2" NEAREST INCH

METHOD OF DRILLING (circle one)

ORED (or Augered) JETTED Jetted & DRIVEN

30 R-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)

37 CABLE REVerse-ROTary DRive-POINT

her ____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

N THIS WELL WILL NOT REPLACE AN EXISTING WELL

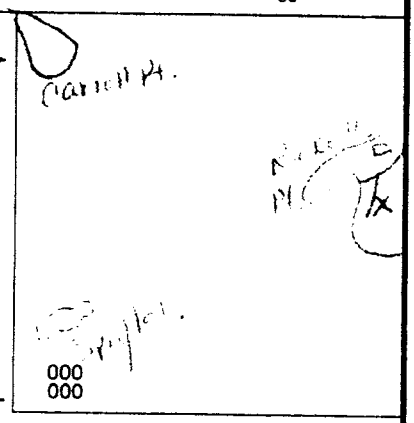
Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED

39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS

D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 52

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X



SOURCES OF DRILLING WATER

1. N/A
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 990

N 530

000
000

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION

N

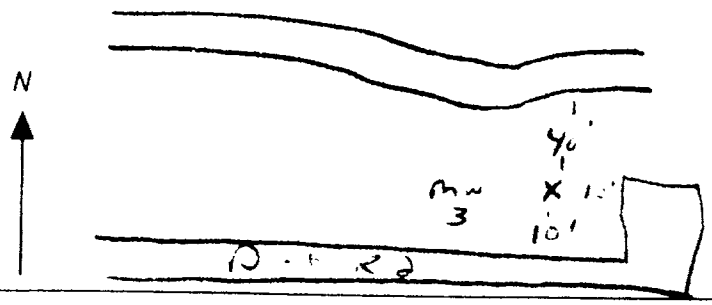
40'

MW 3

X 10'

10'

D. + R2



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

AP PERMIT NUMBER GAP 54 63

ORCE 67 68 WRITE INITIALS IN BOX PERMIT No. HA - 94 - 1336 70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS

E APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED

DRILLER

1 | 1462 | SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED ... COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 12

T/CO USE ONLY
DATE Received

DATE WELL COMPLETED 1 1 1 3 9 6

Depth of Well 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" H A - 9 4 - 1 3 3 6

OWNER U S Army (last name) (first name)
STREET OR RFD Ricketts Point Rd TOWN Edgewood MW3
SUBDIVISION APG-Edgewood SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
OP SOIL	0	1	
ED ORANGE AND/GRAVEL	1	14	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes Y no N

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
ELECTRIC LOG OBTAINED
TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CONDITIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD
DRILLERS LIC. NO. 517

SIGNATURE
(... SIGNATURE ON APPLICATION)

LIC. NO.

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes Y no N
TYPE OF GROUTING MATERIAL (Circle one)
CEMENT CM BENTONITE CLAY BC
NO. OF BAGS 1 NO. OF POUNDS 94
GALLONS OF WATER 6
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. to 2 ft. (TOP / BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL CO CONCRETE PL PLASTIC OT OTHER

MAIN CASING TYPE: PL
Nominal diameter top (main) casing (nearest inch)! 2
Total depth of main casing (nearest foot) 4

EACH CASING — OTHER CASING (if used): diameter inch, depth (feet) from to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL BR BRASS BRONZE HO OPEN HOLE PL PLASTIC OT OTHER

C 2

EACH SCREEN — DEPTH (nearest ft.)

1	PL	4	14
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____
DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK from 2 to 14
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

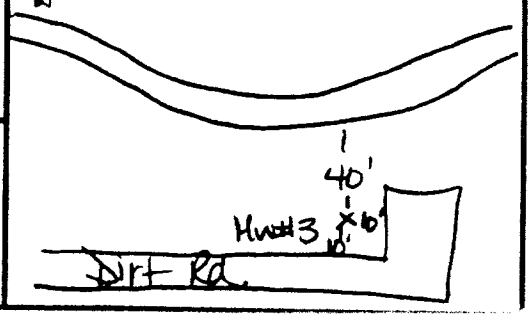
MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING ft.
WHEN PUMPING ft.
TYPE OF PUMP USED (for test)
A air P piston T turbine
C centrifugal R rotary O other (describe below)
J jet S submersible

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height)
+ above
− below
LAND SURFACE 3 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



Telephone 410/841-6710
Fax # 410-841-6711

A.C. SCHULTES OF MARYLAND, INC.

24-26 SOUTH RIVER ROAD EDGEWATER MARYLAND 21037

Water Well Contractors

CUSTOM ER **ROY F. WESTON** JOB **3052**

ADDRESS **ABERDEEN PROVING GROUNDS** DATE **11/13/96**

LOCATION **EDGEWOOD, MARYLAND** **WELL JFL #4**

		FEET FROM GROUND SURFACE 0 TO _____		WELL LOG
GROUND	2' 8"	0	1	TOPSOIL
		1	13	MED ORANGE SAND W/GRAVEL
13'6"	3'6" CASING			
	10'			

PERMIT NO	HA-94-1337	DIAMETER OF WELL	2"	DEPT. OF WELL	13' 6"
HRS PUMPED		SLOT SIZE	.010	TYPE OF CASING	PVC
CAPACITY G P M		DRILLING MACHINE NO	ATV	LENGTH OF CASING	3' 6"
STATIC LEVEL		DRILLER	K. DEROCHE	DISTANCE TO TOP OF Screen	3'6"
PUMPING LEVEL		GRAVEL	MORIE #1	TYPE SCREEN	PVC
SPECIFIC CAPACITY		BAGS OF ~~CLAY~~/CEMENT	1	SIZE OF SCREEN	2"
PUMPED WITH		DATE WELL COMPLETED	11/13/96		
DEPTH OF GROUT	: 0-1'6"	DRILLER'S HELPER	J. AMIS		
DEPTH GRAVEL PACKED	1'6"-13'6"				

K. DEROCHE

WELL DRILLER'S SIGNATURE

(MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

PERMIT TO DRILL WELL

please print or type

HA - 94 - 1337

70 fill in this form completely 79

Date Received (APA) 7-12-96 (MM DD YY) 13

OWNER INFORMATION

ted States ARmy
ast Name Owner First Name 34

Aberdeen Proving Ground
36 Street or RFD 55

Edgewood MD
7 Town 70 State 72 Zip 76

DRILLER INFORMATION

David Hartman (M) D 517
Driller's Name 76 License No. 81

A.C. Schultes of Maryland, Inc.
Firm Name

24 South River Rd. Edgewater, MD 21037
Address

[signature] 11/8/96
Signature Date

B 3 LOCATION OF WELL

Harford County
8 COUNTY 21

Aberdeen Proving Ground
23 SUBDIVISION 42

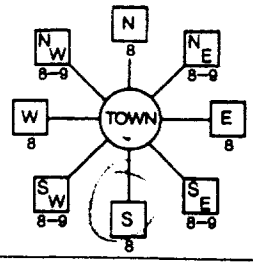
SECTION 44 46 LOT 48 50

Edgewood
52 NEAREST TOWN 71

MILES FROM TOWN (enter 0 if in town) 7 (M I)
73 76 77 78

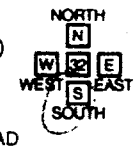
B 4

1 2
DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Ricketts Point Rd.
11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



34 100 37
DISTANCE FROM ROAD
ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

B 2 WELL INFORMATION

1 2

APPROX. PUMPING RATE (GAL. PER MIN.) N/A
8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A
14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)

F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION

22 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)

P PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE APPROVAL

ST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Harford 12
COUNTY NAME COUNTY NO.

STATE SIGNATURE ____ INSERT S → ____ 41

DATE ISSUED 11/13/96 [signature] 11/13/97
43 MM DD YY 48 CO SIGNATURE EXP. DATE

NORTH GRID 535 000
50 55

EAST GRID 0999 000
57 63

APPROXIMATE DEPTH OF WELL 13 FEET
24 28

PPROXIMATE DIAMETER OF WELL 2" NEAREST INCH

METHOD OF DRILLING (circle one)

30 ORED (or Augered) JETTED Jetted & DRIVEN
IR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
37 CABLE REVerse-ROTary DRive-POINT
her ____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

N THIS WELL WILL NOT REPLACE AN EXISTING WELL

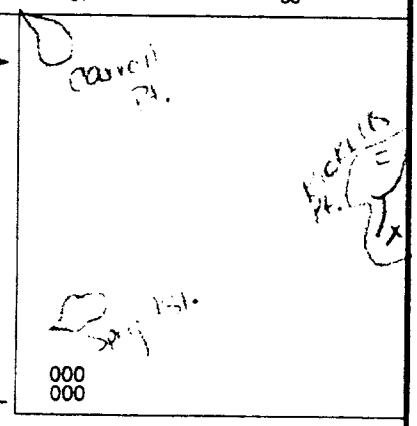
Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED

39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS

D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ____ 52

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



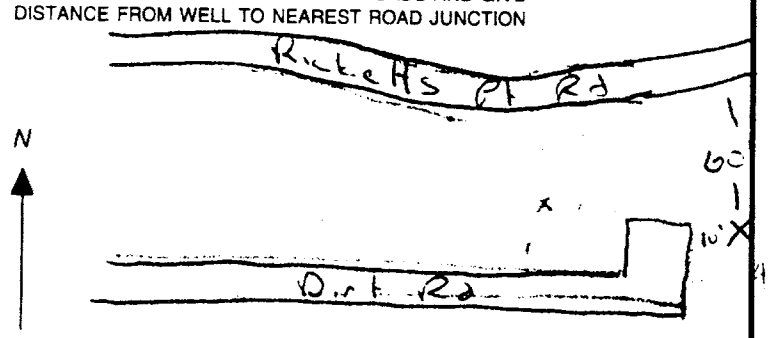
SOURCES OF DRILLING WATER
1. N/A
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 990

N 530

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

APP PERMIT NUMBER GAP
54 63

WRITE INITIALS IN BOX PERMIT No. HA - 94 - 1337
67 68 70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS

- APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

DRILLER

1 | 1463 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER: 12

DATE RECEIVED (CO USE ONLY): 13

DATE WELL COMPLETED: 11 13 96 (15–20)

Depth of Well: 14 (22–26) (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": HA-94-1337 (28–37)

OWNER: U S Army

STREET OR RFD: Ricketts Point Rd (last name / first name) TOWN: Edgewood MD

SUBDIVISION: APG-Edgewood SECTION: LOT: 3

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
TOP SOIL	0	1	
MED ORANGE SAND/SOME CLAY	1	14	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER

- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- T — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD

DRILLERS LIC. NO. 517

SIGNATURE (MATCH SIGNATURE ON APPLICATION)

LIC. NO.

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT [CM] (45–46) BENTONITE CLAY [BC] (45–46)

NO. OF BAGS 1 NO. OF POUNDS 94

GALLONS OF WATER 6

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. (48–52) TOP to 2 ft. (54–58) BOTTOM (enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60–61)	2 (63–64)	4 (66–70)

OTHER CASING (if used)

EACH CASING — diameter inch — depth (feet) from — to

SCREEN RECORD

screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

EACH SCREEN		DEPTH (nearest ft.) from	to
1	PL (8–9)	4 (11–15)	14 (17–21)
2	(23–24)	(26–30)	(32–36)
3	(38–39)	(41–45)	(47–51)

SLOT SIZE 1 .010 2 3

DIAMETER OF SCREEN 2 (56–60) (NEAREST INCH)

GRAVEL PACK from 2 to 14

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (70) (E.R.O.S.) (72) W Q (74–76)

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) (8–9)

PUMPING RATE (gal. per min.) (11–15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING (17–20) ft.

WHEN PUMPING (22–25) ft.

TYPE OF PUMP USED (for test)

- [A] air (27)
- [P] piston (27)
- [T] turbine (27)
- [C] centrifugal (27)
- [R] rotary (27)
- [O] other (describe below) (27)
- [J] jet (27)
- [S] submersible (27)

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31–35)

PUMP HORSE POWER (37–41)

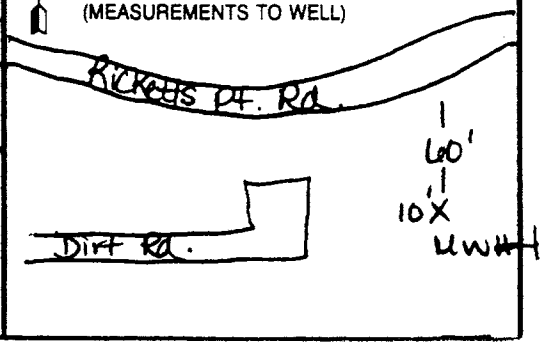
PUMP COLUMN LENGTH (nearest ft.) (43–47)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above [−] below (49) LAND SURFACE 3 (50–51) (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



Telephone 410/841-6710
Fax # 410-841-6711

A.C. SCHULTES OF MARYLAND, INC.

24-26 SOUTH RIVER ROAD EDGEWATER MARYLAND 21037

Water Well Contractors

CUSTOM ER ROY F. WESTON JOB 3052

ADDRESS ABERDEEN PROVING GROUNDS DATE 11/14/96

LOCATION EDGEWOOD, MARYLAND WELL JFL #5

		FEET FROM GROUND SURFACE 0 TO _____		WELL LOG
GROUND	2' 8"	0	1	TOPSOIL
		1	14	MED ORANGE SAND W/GRAVEL
14'	4' CASING			
	10'			

PERMIT NO	HA-94-1338	DIAMETER OF WELL	2"	DEPT. OF WELL	14'
HRS PUMPED		SLOT SIZE	.010	TYPE OF CASING	2" PVC
CAPACITY G P M		DRILLING MACHINE NO	ATV	LENGTH OF CASING	4' 8"
STATIC LEVEL		DRILLER	K. DEROCHE	DISTANCE TO TOP OF Screen	4'
PUMPING LEVEL		GRAVEL	MORIE #1	TYPE SCREEN	PVC
SPECIFIC CAPACITY		BAGS OF [redacted]/CEMENT	1	SIZE OF SCREEN	2"
PUMPED WITH		DATE WELL COMPLETED	11/14/96		
DEPTH OF GROUT	: 0-3'	DRILLER'S HELPER	J. AMIS		
DEPTH GRAVEL PACKED	3' - 14'				

K. DEROCHE

WELL DRILLER'S SIGNATURE

(MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

PERMIT TO DRILL WELL

please print or type

HA - 94 - 1338

70 fill in this form completely 79

Date Received (APA) 11-12-96 (MM DD YY 13)

OWNER INFORMATION

ted States ARmy
ast Name Owner First Name 34

Aberdeen Proving Ground
36 Street or RFD 55

Edgewood MD
57 Town 70 State 72 Zip 76

DRILLER INFORMATION

David HArtman (M D 517)
Driller's Name 76 License No. 81

A.C. Schultes of Maryland, Inc.
Firm Name

24 South River Rd. Edgewater, MD 21037
Address

[signature] 11/8/96
Signature Date

B 3 LOCATION OF WELL

Harford County
8 COUNTY 21

Aberdeen Proving Ground
23 SUBDIVISION 42

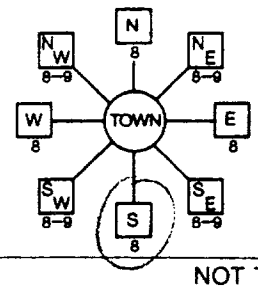
SECTION 44 46 LOT 48 50

Edgewood
52 NEAREST TOWN 71

MILES FROM TOWN (enter 0 if in town) 7 (M I)
73 76 77 78

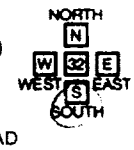
B 4

1 2
DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Ricketts Point Rd.
11 NEAR WHAT ROAD 30

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



34 50 37

DISTANCE FROM ROAD

ENTER FT OR MI 38 39

TAX MAP: ____ BLK: ____ PARCEL ____

B 2 WELL INFORMATION

1 2

APPROX. PUMPING RATE (GAL. PER MIN.) N/A
8 12

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A
14 20

USE FOR WATER (CIRCLE APPROPRIATE BOX)

- D HOME (SINGLE OR DOUBLE HOUSEHOLD UNIT ONLY)
- F FARMING (LIVESTOCK WATERING & AGRICULTURAL IRRIGATION
- 22 I INDUSTRIAL, COMMERCIAL, STATE AND FEDERAL GOV. OTHER (REQUIRES APPROPRIATION PERMIT)
- F PUBLIC OR PRIVATE WATER COMPANY (REQUIRES APPROPRIATION PERMIT AND STATE APPROVAL
- I EST, OBSERVATION, MONITORING (MAY REQUIRE APPROPRIATION PERMIT)

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

Harford 12
COUNTY NAME COUNTY NO.

STATE SIGNATURE ____ INSERT S → 41

DATE ISSUED 11/13/96 [signature] 11/13/97
43 MM DD YY 48 CO SIGNATURE EXP. DATE

NORTH GRID 000 (50 55) EAST GRID 000 (57 63)

APPROXIMATE DEPTH OF WELL 13 FEET
24 28

APPROXIMATE DIAMETER OF WELL 2" NEAREST INCH

METHOD OF DRILLING (circle one)

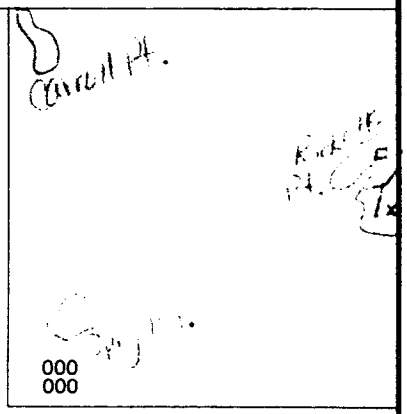
- 38 ORED (or Augered) JETTED Jetted & DRIVEN
- 37 AIR-ROTary AIR-PERcussion ROTARY (Hydraulic Rotary)
- CABLE REVerse-ROTary DRive-POINT
- ther ____

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- 39 S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY-CONTACT LOCAL APPROVING AUTHORITY FOR POLICY ON STANDBY WELLS
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENED (IF AVAILABLE) 41 ____ 52

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X →



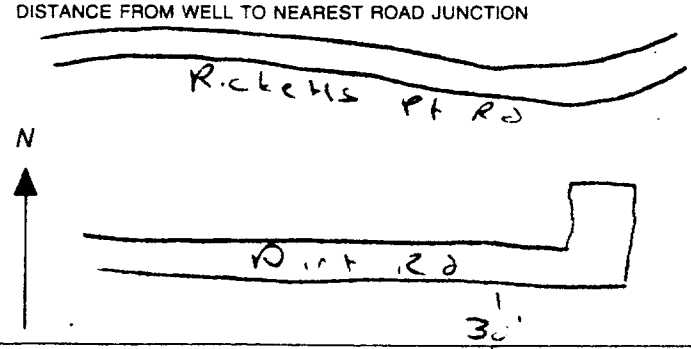
SOURCES OF DRILLING WATER
1. N/A
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 990

N 530

DRAW A SKETCH BELOW SHOWING LOCATION OF WELL IN RELATION TO NEARBY TOWNS AND ROADS AND GIVE DISTANCE FROM WELL TO NEAREST ROAD JUNCTION



Not to be filled in by driller (MDE OR COUNTY USE ONLY)

PERMIT NUMBER GAP
54 63

FORCE 67 68 WRITE INITIALS IN BOX PERMIT No. HA - 94 - 1338
70 71 72 73 74 75 76 77 78 79

SPECIAL CONDITIONS

NOTE - APPROVING AUTHORITIES SHOULD USE SEPARATE SHEET IF NEEDED -

DRILLER

OF ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND 21224.

C 1 1464 — SEQUENCE NO. (MDE USE ONLY)

THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 12

STATE USE ONLY — Received

DATE WELL COMPLETED: 11 13 96

Depth of Well: 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": HA-94-1338

OWNER: U S Army

STREET OR RFD: Ricketts Point Rd (last name / first name) TOWN: Edgewood Md 5

SUBDIVISION: APG Edgewood SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
TOP SOIL	0	1	
MED ORANGE SAND/GRAVEL	1	14	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes Y / no N

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

TYPE: MWD/MSD/MGD

DRILLERS LIC. NO. 517

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes Y / no N

TYPE OF GROUTING MATERIAL (Circle one): CEMENT CM — BENTONITE CLAY BC

NO. OF BAGS 1 — NO. OF POUNDS 94

GALLONS OF WATER 6

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. to 2 ft. (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL — CO CONCRETE — PL PLASTIC — OT OTHER

MAIN CASING TYPE: PL — Nominal diameter top (main) casing (nearest inch): 2 — Total depth of main casing (nearest foot): 4

OTHER CASING (if used)
EACH CASING — diameter inch — depth (feet) from — to

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL — BR BRASS BRONZE — HO OPEN HOLE — PL PLASTIC — OT OTHER

C 2

EACH SCREEN — DEPTH (nearest ft.)

1	PL	4	14
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK from 2 to 14

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING — LOG INDICATOR — OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING ft.

WHEN PUMPING ft.

TYPE OF PUMP USED (for test): A air — P piston — T turbine — C centrifugal — R rotary — O other (describe below) — J jet — S submersible

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO): YES / NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

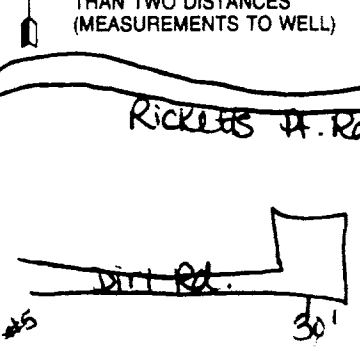
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height): + above / − below LAND SURFACE 3 (nearest foot)

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



APPENDIX B
Well and Lysimeter Logs
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

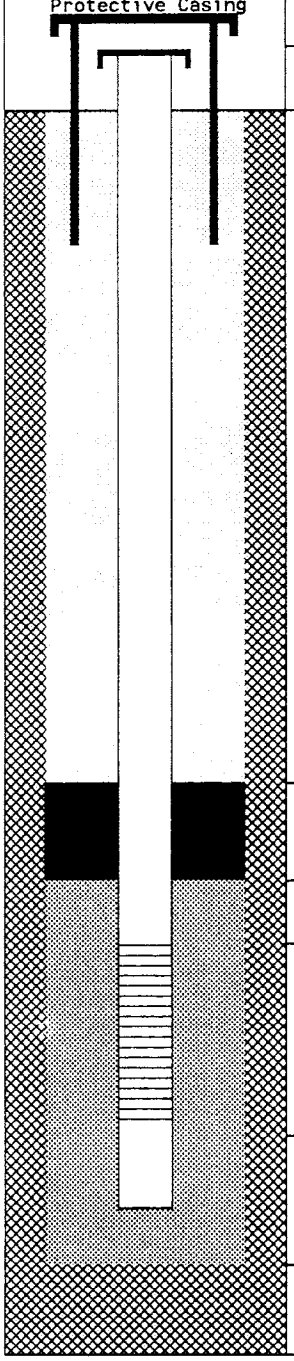
Well Completion Summary — *Roy F. Weston, Inc.*

CLIENT: ABERDEEN PROVING GRO
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFP-1
START DATE: 11/12/96
COMPLETION DATE: 11/12/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	2.80
0.00	GS	0.00
1.00	BN	-1.00
2.60	SP	-2.60
3.60	SC	-3.60
13.60	BS	-13.60
14.10	TD	-14.10

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, SCREENED, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 ***inch*** ***Interval:*** 0.00 to 3.60 ***ft.***
Type : PVC 40

Stick Up Inner Casing: 0.00 ***ft.*** ***Protective Casing:*** 2.80 ***ft.***

Casing Grout: C/B ***Interval:*** 0.00 to 1.00 ***ft.***

Seal Type: BENTONITE PELLETS ***Interval:*** 1.00 to 2.60 ***ft.***

Sand Pack Type : #1 MORIE SAND ***Interval:*** 2.60 to 14.10 ***ft.***
Grain Size : ***Median Diameter:***
Screen Diameter: 2.00 ***inch*** ***Interval:*** 3.60 to 13.60 ***ft.***
Type : PVC ***Slots:*** 0.010 ***inches***

Silt Trap Interval: 13.60 to 14.10 ***ft.***
Backfill Type: ***Interval:*** 0.00 to 0.00 ***ft.***
Collapsed Type: ***Interval:*** 0.00 to 0.00 ***ft.***

WELL DEVELOPMENT

Date: / /
Method:
Yield: ***Purged Volume:*** 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
DTW = 7.0 FT. BGS (TOC)

NOTE: Well Diagram Not to Scale ***Elevations are feet above Mean Sea Level***

GEOLIS Copyright (c) 1990, 1996 Roy F. WESTON, Inc. (SINGRAPH-96) 04/15/97

Well Completion Summary

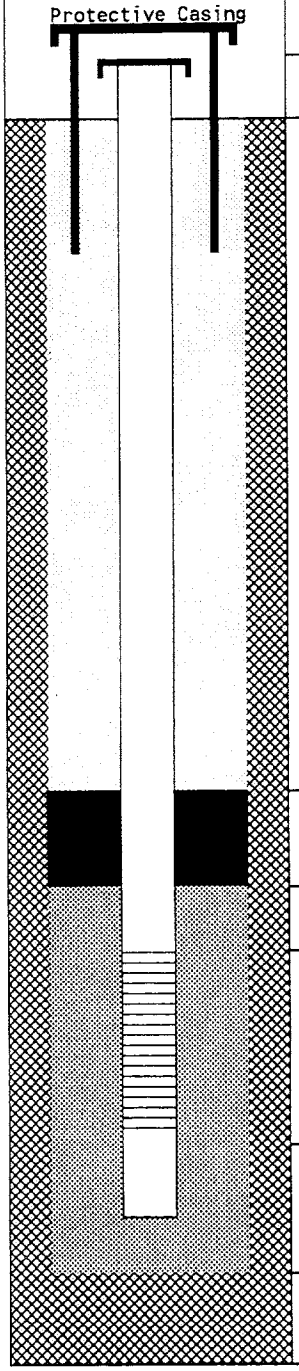
Roy F. Weston, Inc.

CLIENT: APG
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFP-2
START DATE: 11/13/96
COMPLETION DATE: 11/13/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	2.80
0.00	GS	0.00
1.50	BN	-1.50
2.50	SP	-2.50
3.50	SC	-3.50
13.50	BS	-13.50
14.00	TD	-14.00

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, SCREENED, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* — *Interval:* 0.00 to 3.50 *ft.*
Type : PVC 40

Stick Up Inner Casing: 0.00 *ft.* — *Protective Casing:* 2.80 *ft.*

Casing Grout: C/B — *Interval:* 0.00 to 1.50 *ft.*

Seal Type: BENTONITE PELLETS — *Interval:* 1.50 to 2.50 *ft.*

Sand Pack Type : #1 MORIE SAND — *Interval:* 2.50 to 14.00 *ft.*
Grain Size : — *Median Diameter:*
Screen Diameter: 2.00 *inch* — *Interval:* 3.50 to 13.50 *ft.*
Type : PVC — *Slots:* 0.010 *inches*

Silt Trap Interval: 0.00 to 0.00 *ft.*
Backfill Type: — *Interval:* 0.00 to 0.00 *ft.*
Collapsed Type: — *Interval:* 0.00 to 0.00 *ft.*

WELL DEVELOPMENT

Date: / /
Method:
Yield: — *Purged Volume:* 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:

NOTE: Well Diagram Not to Scale

Elevations are feet above Mean Sea Level

GEOLIS Copyright (c) 1990, 1996 Roy F. WESTON, Inc. (SINGRAPH-96)

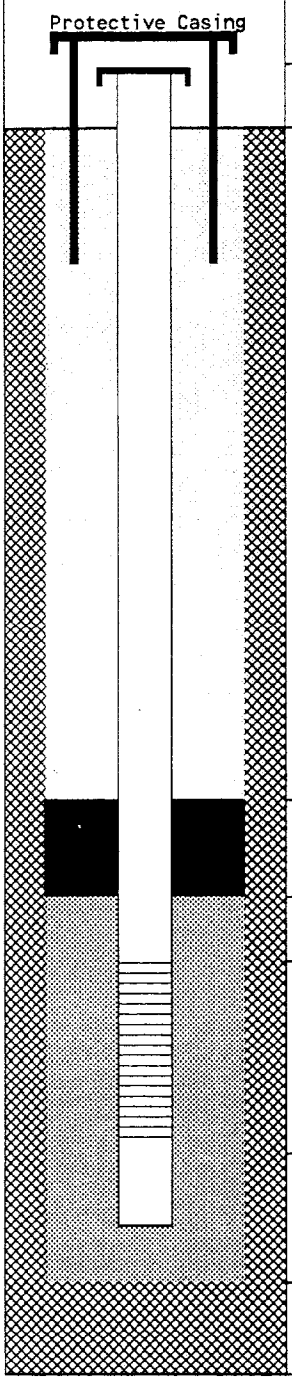
04/10/97

Well Completion Summary — *Roy F. Weston, Inc.*

CLIENT: ABERDEEN PROVING GRO
SITE NAME: J-FIELD
DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFP-3
START DATE: 11/12/96
COMPLETION DATE: 11/12/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	2.80
0.00	GS	0.00
0.50	BN	-0.50
1.50	SP	-1.50
2.55	SC	-2.55
12.50	BS	-12.50
13.00	TD	-13.00

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, SCREENED, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 ***inch*** ***Interval:*** 0.00 to 2.50 ***ft.***
Type : PVC 40

Stick Up Inner Casing: 0.00 ***ft.*** ***Protective Casing:*** 0.00 ***ft.***

Casing Grout: C/B ***Interval:*** 0.00 to 0.50 ***ft.***

Seal Type: BENTONITE PELLETS ***Interval:*** 0.50 to 1.50 ***ft.***

Sand Pack Type : #1 MORIE SAND ***Interval:*** 1.50 to 13.00 ***ft.***
Grain Size : ***Median Diameter:***
Screen Diameter: 2.00 ***inch*** ***Interval:*** 2.55 to 12.50 ***ft.***
Type : PVC ***Slots:*** 0.010 ***inches***

Silt Trap Interval: 12.50 to 13.00 ***ft.***
Backfill Type: ***Interval:*** 0.00 to 0.00 ***ft.***
Collapsed Type: ***Interval:*** 0.00 to 0.00 ***ft.***

WELL DEVELOPMENT

Date: / /
Method:
Yield: ***Purged Volume:*** 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
DTW = 5' BGS

NOTE: Well Diagram Not to Scale ***Elevations are feet above Mean Sea Level***

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Well Completion Summary

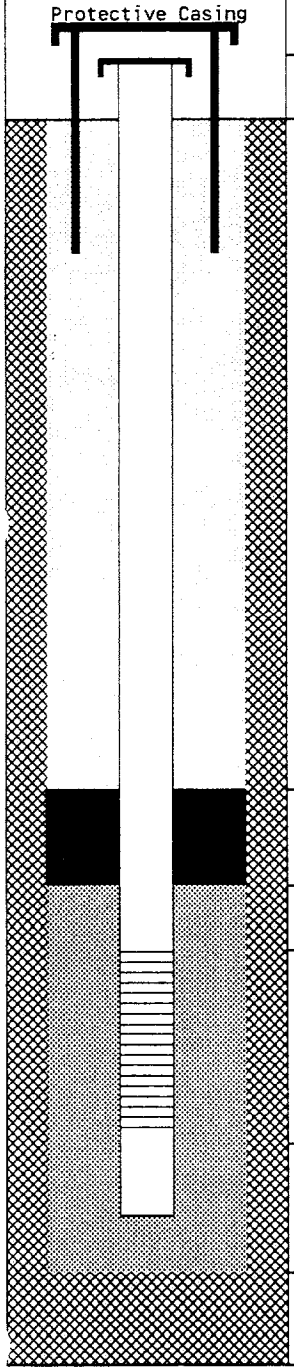
Roy F. Weston, Inc.

CLIENT: APG
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFP-4
START DATE: 11/12/96
COMPLETION DATE: 11/12/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	2.80
0.00	GS	0.00
1.50	BN	-1.50
2.50	SP	-2.50
3.50	SC	-3.50
13.50	BS	-13.50
14.00	TD	-14.00

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, SCREENED, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* — *Interval:* 0.00 to 3.50 *ft.*
Type : PVC 40

Stick Up Inner Casing: 0.00 *ft.* — *Protective Casing:* 2.80 *ft.*

Casing Grout: C/B — *Interval:* 0.00 to 1.50 *ft.*

Seal Type: BENTONITE PELLETS — *Interval:* 1.50 to 2.50 *ft.*

Sand Pack Type : #1 MORIE SAND — *Interval:* 2.50 to 14.00 *ft.*
Grain Size : — *Median Diameter:*
Screen Diameter: 2.00 *inch* — *Interval:* 3.50 to 13.50 *ft.*
Type : PVC — *Slots:* 0.010 *inches*

Silt Trap Interval: 13.50 to 14.00 *ft.*
Backfill Type: — *Interval:* 0.00 to 0.00 *ft.*
Collapsed Type: — *Interval:* 0.00 to 0.00 *ft.*

WELL DEVELOPMENT

Date: / /
Method:
Yield: — *Purged Volume:* 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:

NOTE: Well Diagram Not to Scale

Elevations are feet above Mean Sea Level

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Lysimeter Completion Summary

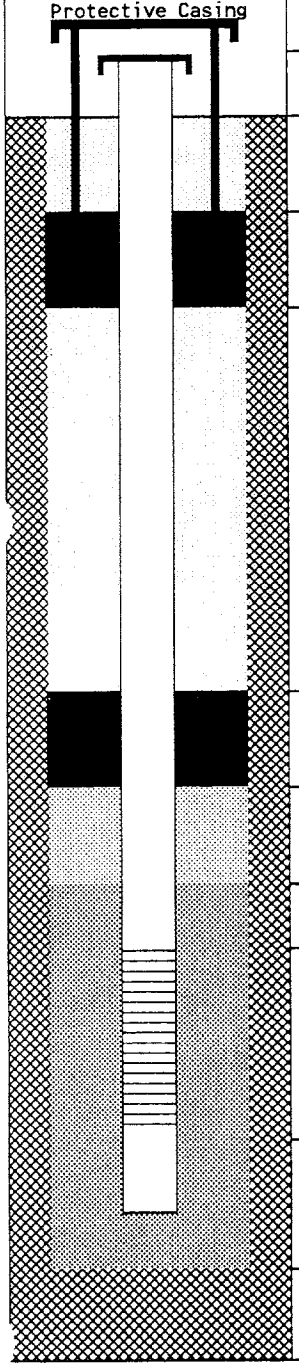
Roy F. Weston, Inc.

CLIENT: ABERDEEN PROVING GRO
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFL-4 DEEP
START DATE: 11/13/96
COMPLETION DATE: 11/13/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	0.00
0.00	GS	0.00
1.00	BN	-1.00
2.00	SP1	-2.00
4.42	BN	-4.42
5.42	SP2	-5.42
5.75	SP3	-5.75
7.12	TL	-7.12
7.50	BL	-7.50
7.50	TD	-7.50

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, LYSIMETER, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 ***inch*** ***Interval:*** 0.00 to 7.12 ***ft.***
Type : PVC 40

Stick Up Inner Casing: 0.00 ***ft.*** ***Protective Casing:*** 0.00 ***ft.***
Casing Grout: C/B ***Interval:*** 0.00 to 1.00 ***ft.***

Seal Type 1: BENTONITE PELLETS ***Interval:*** 1.00 to 2.00 ***ft.***
Seal Type 2: BENTONITE PELLETS ***Interval:*** 4.42 to 5.42 ***ft.***
Sand Pack Type 1: SILICA FLOUR ***Interval:*** 2.00 to 4.42 ***ft.***
Sand Pack Type 2: #1 MORIE SAND ***Interval:*** 5.42 to 5.75 ***ft.***
Sand Pack Type 3: #1 MORIE SAND ***Interval:*** 5.75 to 7.12 ***ft.***
Screen Diameter: 2.00 ***inch*** ***Interval:*** 7.12 to 7.50 ***ft.***
Type : ***Slots:*** ***inches***

Silt Trap Interval: 0.00 to 0.00 ***ft.***
Backfill Type: ***Interval:*** 0.00 to 0.00 ***ft.***
Collapsed Type: ***Interval:*** 0.00 to 0.00 ***ft.***

WELL DEVELOPMENT

Date: / /
Method:
Yield: ***Purged Volume:*** 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
TL = Top Lysimeter Cup
BL = Botm Lysimeter Cup
TD = Total Depth
= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
SILICA FLOUR 200 MESH USED FOR SAND PACT 2 (SP2)

NOTE: Well Diagram Not to Scale

Elevations are feet above Mean Sea Level

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Well Completion Summary

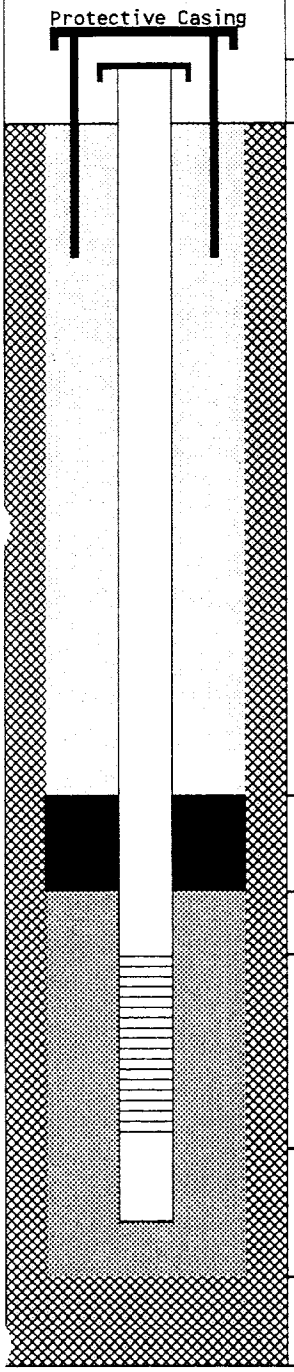
Roy F. Weston, Inc.

CLIENT: ABERDEEN PROVING GRO
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFP-5
START DATE: 11/13/95
COMPLETION DATE: 11/13/95

WATER LEVELS



DEPTH		ELEV.
0.00	TC	2.80
0.00	GS	0.00
1.50	BN	-1.50
2.50	SP	-2.50
3.75	SC	-3.75
13.75	BS	-13.75
14.25	TD	-14.25

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, SCREENED, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 *inch* — *Interval:* 0.00 to 3.75 *ft.*
Type : PVC 40

Stick Up Inner Casing: 0.00 *ft.* — *Protective Casing:* 2.80 *ft.*

Casing Grout: C/B — *Interval:* 0.00 to 1.50 *ft.*

Seal Type: BENTONITE PELLETS — *Interval:* 1.50 to 2.50 *ft.*

Sand Pack Type : #1 MORIE SAND — *Interval:* 2.50 to 14.25 *ft.*
Grain Size : — *Median Diameter:*
Screen Diameter: 2.00 *inch* — *Interval:* 3.75 to 13.75 *ft.*
Type : PVC — *Slots:* 0.010 *inches*

Silt Trap Interval: 13.75 to 14.25 *ft.*
Backfill Type: — *Interval:* 0.00 to 0.00 *ft.*
Collapsed Type: — *Interval:* 0.00 to 0.00 *ft.*

WELL DEVELOPMENT

Date: / /
Method:
Yield: — *Purged Volume:* 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
SC = Top Screen
BS = Bottom Screen
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:

NOTE: Well Diagram Not to Scale

Elevations are feet above Mean Sea Level

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Lysimeter Completion Summary

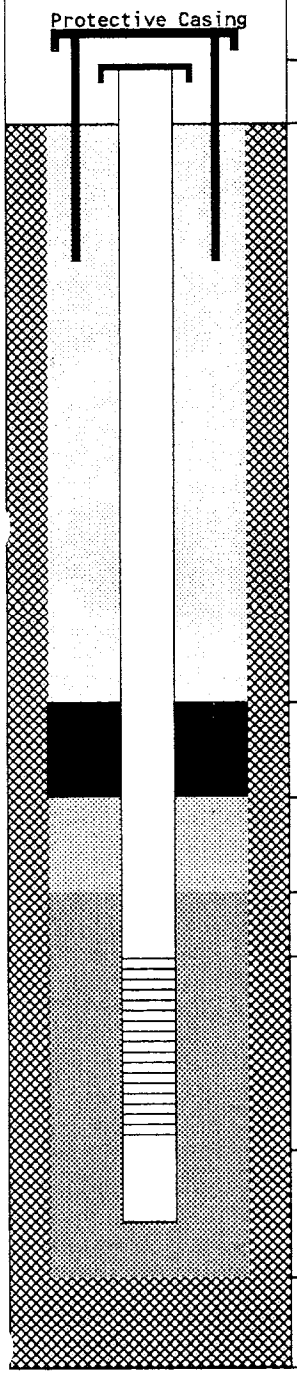
Roy F. Weston, Inc.

CLIENT: ABERDEEN PROVING GRO
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFL-1 SHALLOW
START DATE: 11/13/96
COMPLETION DATE: 11/13/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	0.00
0.00	GS	0.00
0.92	BN	-0.92
1.92	SP1	-1.92
2.25	SP2	-2.25
3.00	TL	-3.00
4.00	BL	-4.00
4.00	TD	-4.00

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, LYSIMETER, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 ***inch*** ***Interval:*** 0.00 to 3.50 ***ft.***
Type : PVC 40

Stick Up Inner Casing: 0.00 ***ft.*** ***Protective Casing:*** 0.00 ***ft.***
Casing Grout: C/B ***Interval:*** 0.00 to 2.25 ***ft.***

Seal Type 1: BENTONITE PELLETS ***Interval:*** 0.92 to 3.25 ***ft.***
Seal Type 2: ***Interval:*** 3.25 to 3.55 ***ft.***
Sand Pack Type 1: SILICA FLOUR ***Interval:*** 1.92 to 2.25 ***ft.***
Sand Pack Type 2: #1 MORIE SAND ***Interval:*** 2.25 to 3.67 ***ft.***

Screen Diameter: 2.00 ***inch*** ***Interval:*** 3.00 to 4.00 ***ft.***
Type : ***Slots:*** ***inches***

Silt Trap Interval: 0.00 to 0.00 ***ft.***
Backfill Type: ***Interval:*** 0.00 to 0.00 ***ft.***
Collapsed Type: ***Interval:*** 0.00 to 0.00 ***ft.***

WELL DEVELOPMENT

Date: / /
Method:
Yield: ***Purged Volume:*** 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
TL = Top Lysimeter Cup
BL = Botm Lysimeter Cup
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
SILICA FLOUR 200 MESH USED FOR SAND PACK2 (SP2)

NOTE: Well Diagram Not to Scale

Elevations are feet above Mean Sea Level

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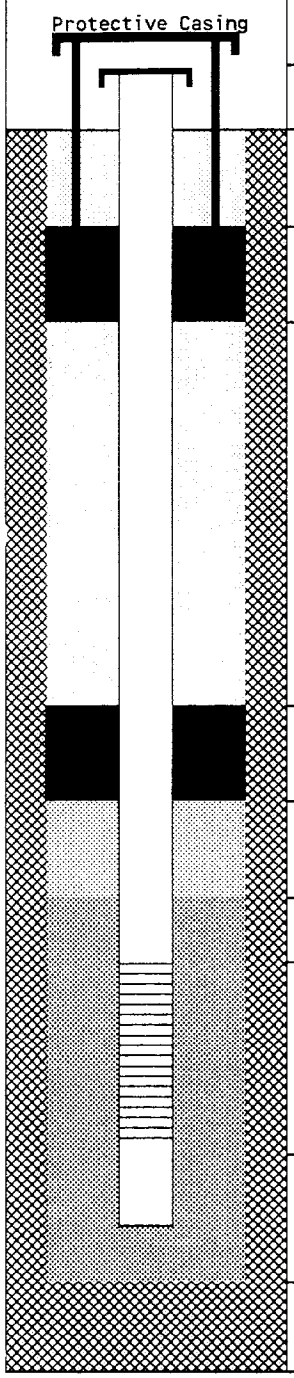
CLIENT: APG
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFL-2 DEEP
START DATE: 11/13/96
COMPLETION DATE: 11/13/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	0.00
0.00	GS	0.00
1.00	BN	-1.00
2.00	SP1	-2.00
4.42	BN	-4.42
5.42	SP2	-5.42
5.75	SP3	-5.75
7.12	TL	-7.12
7.50	BL	-7.50
7.50	TD	-7.50

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, LYSIMETER, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 ***inch*** ***Interval:*** 0.00 to 7.12 ***ft.***
Type : PVC 40

Stick Up Inner Casing: 0.00 ***ft.*** ***Protective Casing:*** 0.00 ***ft.***
Casing Grout: C/B ***Interval:*** 0.00 to 1.00 ***ft.***

Seal Type 1: BENTONITE PELLETS ***Interval:*** 1.00 to 2.00 ***ft.***
Seal Type 2: BENTONITE PELLETS ***Interval:*** 4.42 to 5.42 ***ft.***
Sand Pack Type 1: SILICA FLOUR ***Interval:*** 2.00 to 4.42 ***ft.***
Sand Pack Type 2: #1 MORIE SAND ***Interval:*** 5.42 to 5.75 ***ft.***
Sand Pack Type 3: #1 MORIE SAND ***Interval:*** 5.75 to 7.12 ***ft.***
Screen Diameter: 2.00 ***inch*** ***Interval:*** 7.12 to 7.50 ***ft.***
Type : ***Slots:*** ***inches***

Silt Trap Interval: 0.00 to 0.00 ***ft.***
Backfill Type: ***Interval:*** 0.00 to 0.00 ***ft.***
Collapsed Type: ***Interval:*** 0.00 to 0.00 ***ft.***

WELL DEVELOPMENT

Date: / /
Method:
Yield: ***Purged Volume:*** 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
TL = Top Lysimeter Cup
BL = Botm Lysimeter Cup
TD = Total Depth
= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
SILICA FLOUR 200 MESH USED FOR SAND PACK 2 (SP2)

NOTE: Well Diagram Not to Scale ***Elevations are feet above Mean Sea Level***

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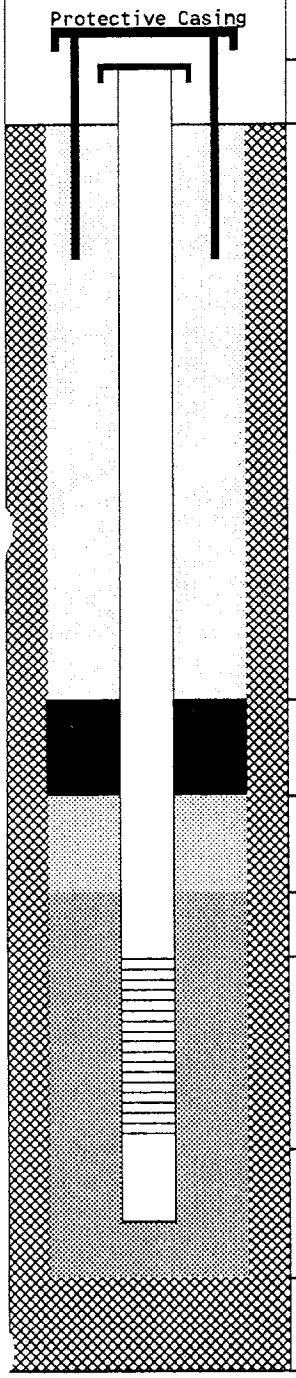
Lysimeter Completion Summary — *Roy F. Weston, Inc.*

CLIENT: APG
SITE NAME: J-FIELD

DRILLING FIRM: A.C. SHULTES
INSPECTOR: G. NEWHART

WELL ID: JFL-3 SHALLOW
START DATE: 11/13/96
COMPLETION DATE: 11/13/96

WATER LEVELS



DEPTH		ELEV.
0.00	TC	0.00
0.00	GS	0.00
0.92	BN	-0.92
1.92	SP1	-1.92
2.25	SP2	-2.25
3.67	TL	-3.67
4.00	BL	-4.00
4.00	TD	-4.00

DRILLING SUMMARY

Driller:
Drilling Fluid:
Well Type: SINGLE CASED, LYSIMETER, PROTECTED

WELL DESIGN CONSTRUCTION

Casing #1 Diameter: 2.00 ***inch*** ***Interval:*** 0.00 to 3.50 ***ft.***
Type : PVC 40

Stick Up Inner Casing: 0.00 ***ft.*** ***Protective Casing:*** 0.00 ***ft.***
Casing Grout: C/B ***Interval:*** 0.00 to 2.25 ***ft.***

Seal Type 1: BENTONITE PELLETS ***Interval:*** 0.92 to 1.92 ***ft.***
Seal Type 2: ***Interval:*** 2.25 to 3.67 ***ft.***
Sand Pack Type 1: SILICA FLOUR ***Interval:*** 1.92 to 2.25 ***ft.***
Sand Pack Type 2: #1 MORIE SAND ***Interval:*** 2.25 to 3.00 ***ft.***

Screen Diameter: 2.00 ***inch*** ***Interval:*** 3.67 to 4.00 ***ft.***
Type : ***Slots:*** ***inches***

Silt Trap Interval: 0.00 to 0.00 ***ft.***
Backfill Type: ***Interval:*** 0.00 to 0.00 ***ft.***
Collapsed Type: ***Interval:*** 0.00 to 0.00 ***ft.***

WELL DEVELOPMENT

Date: / /
Method:
Yield: ***Purged Volume:*** 0.0 gal

COMMENTS

TC = Top of Casing
GS = Ground Surface
BN = Top Seal
BW = Bottom of Well
SP = Top Sand Pack
TL = Top Lysimeter Cup
BL = Botm Lysimeter Cup
TD = Total Depth

= Grout
= Seal
= Sand Pack
= Formation

Additional Comments:
SILICA FLOUR 200 MESH USED FOR SANDPACK 2 (SP2)

NOTE: Well Diagram Not to Scale ***Elevations are feet above Mean Sea Level***

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APPENDIX C
Analytical Memorandum Report
J-Field Phytoremediation Well and Lysimeter Installation Report
Aberdeen Proving Ground, Maryland
April 1997

ANALYTICAL MEMORANDUM REPORT

Prepared by
Roy F. Weston, Inc.

J-Field Phytoremediation
Aberdeen, MD

December, 1996

EPA Work Assignment No. 1-173
WESTON Work Order No. 03347-041-001-1173-01
EPA Contract No. 68-C4-0022

Submitted to
H. Compton
EPA-ERTC

Dan Crouse for RT 12/17/96
R. Tobia Date
Task Leader

Vinod Kansal 12/17/96
V. Kansal Date
Analytical Section Leader

E. Gilardi 12/17/96
E. Gilardi Date
Program Manager

Analysis by:
Envirotech Research

Prepared by:
J. Tomaszewicz

Reviewed by:
M. Barkley

\1173\DEL\AR\9612\J-FIELD\REPORT

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Appendix will be furnished on request.

Table 1.1 Results of the Analysis for TAL Metals in Soil
WA# 1-173 J-Field Phytoremediation

Dry Weight Basis

Sample No.		Method Blank		9009		9010		9011		9012	
Location		Lab		JFP-2		JFP-3		JFP-4		JFP-5	
Percent Solids		100		82		82		83		79	
Analyte	Analysis Method	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg	Conc mg/kg	MDL mg/kg
Aluminum	ICAP	U	11	6200	27	6900	27	4700	26	5700	28
Antimony	ICAP	U	0.46	U	1.1	U	1.1	U	1.1	U	1.2
Arsenic	ICAP	U	0.30	4.1	0.73	2.4	0.73	2.7	0.73	3.4	0.76
Barium	ICAP	U	0.16	30	0.39	27	0.39	19	0.39	28	0.41
Beryllium	ICAP	U	0.02	0.39	0.05	0.24	0.05	0.20	0.05	0.48	0.05
Cadmium	ICAP	U	0.04	U	0.10	U	0.10	U	0.10	0.18	0.10
Calcium	ICAP	17	9.6	1400	23	1200	24	950	23	430	25
Chromium	ICAP	U	0.10	8.9	0.24	9.5	0.24	6.8	0.24	8.5	0.25
Cobalt	ICAP	U	0.11	4.0	0.27	3.0	0.27	3.1	0.27	17	0.28
Copper	ICAP	U	0.41	6.2	1.0	7.2	1.0	4.8	1.0	6.7	1.0
Iron	ICAP	U	4.8	13000	12	11000	12	7900	12	11000	12
Lead	ICAP	U	0.17	7.5	0.41	7.8	0.41	6.7	0.41	6.1	0.43
Magnesium	ICAP	U	8.8	950	21	1200	21	960	21	1200	22
Manganese	ICAP	U	0.09	65	0.22	54	0.22	54	0.22	62	0.23
Nickel	ICAP	U	0.16	6.4	0.39	8.0	0.39	6.5	0.39	41	0.41
Potassium	ICAP	U	23	350	55	600	55	320	55	530	58
Selenium	ICAP	U	0.47	U	1.1	U	1.1	U	1.1	U	1.2
Silver	ICAP	U	0.09	U	0.22	U	0.22	U	0.22	U	0.23
Sodium	ICAP	U	39	U	96	U	96	U	95	U	100
Thallium	ICAP	U	0.44	U	1.1	U	1.1	U	1.1	U	1.1
Vanadium	ICAP	U	0.12	16	0.29	13	0.29	9.2	0.29	9.8	0.30
Zinc	ICAP	U	0.36	21	0.87	24	0.88	19	0.87	230	0.91

SUMMARY of ABBREVIATIONS

AA	Atomic Absorption				
B	The analyte was found in the blank				
BFB	Bromofluorobenzene				
BPQL	Below the Practical Quantitation Limit				
C	Centigrade				
D	(Surrogate Table) this value is from a diluted sample and was not calculated				
	(Result Table) this result was obtained from a diluted sample				
CLP	Contract Laboratory Protocol				
COC	Chain of Custody				
CONC	Concentration				
CRDL	Contract Required Detection Limit				
CRQL	Contract Required Quantitation Limit				
DFTPP	Decafluorotriphenylphosphine				
DL	Detection Limit				
E	The value is greater than the highest linear standard and is estimated				
EMPC	Estimated maximum possible concentration				
ICAP	Inductively Coupled Argon Plasma				
IDL	Instrument Detection Limit				
ISTD	Internal Standard				
J	The value is below the method detection limit and is estimated				
LCS	Laboratory Control Sample				
LCSD	Laboratory Control Sample Duplicate				
MDL	Method Detection Limit				
MQL	Method Quantitation Limit				
MI	Matrix Interference				
MS	Matrix Spike				
MSD	Matrix Spike Duplicate				
MW	Molecular Weight				
NA	either Not Applicable or Not Available				
NC	Not Calculated				
NR	Not Requested				
NS	Not Spiked				
% D	Percent Difference				
% REC	Percent Recovery				
PQL	Practical Quantitation Limit				
PPBV	Parts per billion by volume				
QL	Quantitation Limit				
RPD	Relative Percent Difference				
RSD	Relative Standard Deviation				
SIM	Selected Ion Mode				
U	Denotes not detected				
m^3	cubic meter	kg	kilogram	ng	nanogram
l(L)	liter	g	gram	pg	picogram
mL	milliliter	mg	milligram		
μL	microliter	μg	microgram		
*	denotes a value that exceeds the acceptable QC limit				

Abbreviations that are specific to a particular table are explained in footnotes on that table

Revision 11/22/96

Table 2.1 Results of the MS/MSD Analysis for TAL Metals in Soil
WA# 1-173 J-Field Phytoremediation

Dry Weight Basis

Analyte	Sample No.	Sample Conc. mg/kg	Original Conc. Spike mg/kg	Original Conc. Dup. mg/kg	Recovered Conc. Spike mg/kg	Recovered Conc. Dup. mg/kg	Percent Recovery Spike	Percent Recovery Dup.	RPD	Recommended Limit % Rec.	Recommended Limit RPD
Aluminum	9011	4680	241.8	241.8	6165	5265	NC	NC	NC	NA	NA
Antimony	9011	U	60.46	60.46	30.15	37.81	50 *	63 *	23	80-120	NA
Arsenic	9011	2.737	241.8	241.8	230.1	230.0	94	94	0	80-120	NA
Barium	9011	18.87	241.8	241.8	250.6	251.4	96	96	0	80-120	NA
Beryllium	9011	0.2029	6.05	6.05	6.055	6.076	97	97	0	80-120	NA
Cadmium	9011	U	6.05	6.05	5.740	5.684	95	94	1	80-120	NA
Calcium	9011	951.0	2418	2418	3218	3235	94	95	1	80-120	NA
Chromium	9011	6.764	24.18	24.18	30.40	29.93	98	96	2	80-120	NA
Cobalt	9011	3.098	60.46	60.46	62.39	62.80	98	99	1	80-120	NA
Copper	9011	4.816	30.23	30.23	35.15	34.71	100	99	1	80-120	NA
Iron	9011	7884	120.9	120.9	8060	7650	NC	NC	NC	NA	NA
Lead	9011	6.650	60.46	60.46	63.25	62.78	94	93	1	80-120	NA
Magnesium	9011	958.2	2418	2418	3315	3223	98	94	4	80-120	NA
Manganese	9011	53.61	60.46	60.46	119.9	120.7	110	111	1	80-120	NA
Nickel	9011	6.482	60.46	60.46	66.20	66.10	99	99	0	80-120	NA
Potassium	9011	316.9	2418	2418	2461	2383	89	85	5	80-120	NA
Selenium	9011	U	241.8	241.8	223.1	223.4	92	92	0	80-120	NA
Silver	9011	U	6.05	6.05	5.448	5.530	90	91	1	80-120	NA
Sodium	9011	U	2418	2418	2303	2295	95	95	0	80-120	NA
Thallium	9011	U	241.8	241.8	228.1	228.6	94	95	1	80-120	NA
Vanadium	9011	9.162	60.46	60.46	67.24	66.94	96	96	0	80-120	NA
Zinc	9011	19.44	60.46	60.46	81.84	79.75	103	100	3	80-120	NA

Table 2.2 Results of the Blank Spike Analysis for TAL Metals in Soil
WA# 1-173 J-Field Phytoremediation

Analyte	Sample Conc. mg/kg	Spiked Conc. mg/kg	Recovered Conc. mg/kg	Percent Recovery	Recommended Limit
Aluminum	U	200.0	192.7	96	80-120
Antimony	U	50.00	45.37	91	80-120
Arsenic	U	200.0	184.7	92	80-120
Barium	U	200.0	190.1	95	80-120
Beryllium	U	5.000	4.857	97	80-120
Cadmium	U	5.000	4.804	96	80-120
Calcium	16.81	2000	1889	94	80-120
Chromium	U	20.00	18.93	95	80-120
Cobalt	U	50.00	48.01	96	80-120
Copper	U	25.00	24.51	98	80-120
Iron	U	100.0	90.93	91	80-120
Lead	U	50.00	46.79	94	80-120
Magnesium	U	2000	1786	89	80-120
Manganese	U	50.00	47.61	95	80-120
Nickel	U	50.00	48.06	96	80-120
Potassium	U	2000	1716	86	80-120
Selenium	U	200.0	180.3	90	80-120
Silver	U	5.000	4.505	90	80-120
Sodium	U	2000	1811	91	80-120
Thallium	U	200.0	185.8	93	80-120
Vanadium	U	50.00	47.32	95	80-120
Zinc	U	50.00	48.97	98	80-120

Table 2.3 Results of the Duplicate Sample Analysis for TAL Metals in Soil
WA# 1-173 J-Field Phytoremediation

Dry Weight Basis

Sample No. 9011

Analyte	Sample Conc. mg/kg	Duplicate Conc. mg/kg	RPD	RPD Limit
Aluminum	4680	5634	19	20
Antimony	U	U	NC	20
Arsenic	2.737	1.532	56 *	20
Barium	18.87	20.98	11	20
Beryllium	0.2029	0.2351	15	20
Cadmium	U	U	NC	20
Calcium	951.0	951.4	0	20
Chromium	6.764	7.507	10	20
Cobalt	3.098	3.396	9	20
Copper	4.816	5.146	7	20
Iron	7884	8378	6	20
Lead	6.650	5.849	13	20
Magnesium	958.2	1103	14	20
Manganese	53.61	59.91	11	20
Nickel	6.482	7.299	12	20
Potassium	316.9	438.5	32 *	20
Selenium	U	U	NC	20
Silver	U	U	NC	20
Sodium	U	U	NC	20
Thallium	U	U	NC	20
Vanadium	9.162	9.666	5	20
Zinc	19.44	21.56	10	20

Table 2.4 Results of the LCS/LCSD Analysis for TAL Metals in Soil
WA# 1-173 J-Field Phytoremediation

Analyte	True Value LCS mg/kg	True Value LCSD mg/kg	Found Value LCS mg/kg	Found Value LCSD mg/kg	Percent Recovery LCS	Percent Recovery LCSD	RPD	Found Value Limits mg/kg	RPD Limit
Aluminum	6990.0	6990.0	6409.5	6203.5	92	89	3	4150.0-9830.0	NA
Antimony	35.0	35.0	36.6	36.0	105	103	2	3.2-66.8	NA
Arsenic	164.0	164.0	148.8	148.0	91	90	1	115.0-212.0	NA
Barium	439.0	439.0	386.2	393.1	88	90	2	321.0-557.0	NA
Beryllium	97.8	97.8	88.7	87.5	91	89	2	75.1-121.0	NA
Cadmium	112.0	112.0	99.3	98.2	89	88	1	82.1-143.0	NA
Calcium	2620.0	2620.0	2263.1	2230.2	86	85	1	1880.0-3360.0	NA
Chromium	96.2	96.2	88.0	87.1	92	91	1	73.5-119.0	NA
Cobalt	83.6	83.6	78.1	77.1	93	92	1	63.6-104.0	NA
Copper	140.0	140.0	126.8	124.7	91	89	2	110.0-169.0	NA
Iron	17000.0	17000.0	16134.7	16731.8	95	98	3	6940.0-27100.0	NA
Lead	96.1	96.1	84.5	83.7	88	87	1	70.6-122.0	NA
Magnesium	1750.0	1750.0	1525.6	1503.3	87	86	1	1240.0-2260.0	NA
Manganese	314.0	314.0	287.9	285.0	92	91	1	250.0-379.0	NA
Nickel	72.0	72.0	65.5	65.1	91	90	1	53.6-90.3	NA
Potassium	2170.0	2170.0	1940.7	1888.2	89	87	2	1220.0-3120.0	NA
Selenium	68.9	68.9	61.7	60.4	90	88	2	49.2-88.6	NA
Silver	82.5	82.5	72.7	71.7	88	87	1	60.9-104.0	NA
Sodium	288.0	288.0	220.7	230.7	77	80	4	185.0-391.0	NA
Thallium	86.0	86.0	75.7	73.1	88	85	3	40.9-131.0	NA
Vanadium	96.7	96.7	92.9	92.7	96	96	0	60.7-133.0	NA
Zinc	276.0	276.0	254.4	251.5	92	91	1	204.0-349.0	NA

Roy F. Weston, Inc.
GSA Raritan Depot
Building 209 Annex (Bay F)
2890 Woodbridge Avenue
Edison, New Jersey 08837-3679
908-321-4200 • Fax 908-494-4021

Envirotech Research
777 New Durham Road
Edison, NJ 08817

Attn: Kevin Hoogerhyde

14 November 1996

Project # 3347-141-001-1173 J Field Phytoremediation

As per Weston REAC Purchase Order number 72132, please analyze samples according to the following parameters:

Analysis/Method	Matrix	# of samples
TAL Metals except mercury SW-846-6010	Soil	5
Data package: See attached Deliverables Requirements		

Samples are expected to arrive at your laboratory between November 18-19, 1996. **All applicable QA/QC (MS/MSD) analysis as per method, will be performed on our sample matrix.** Preliminary sample and MS/MSD result tables plus a signed copy of our Chain of Custody must be faxed to REAC 5 business days after receipt of the sample. The complete data package is due 10 business days after receipt of the samples. The complete data package must include all items on the deliverables checklist.

Please submit all reports and technical questions concerning this project to **John Johnson at (908) 321-4248 or fax to (908) 494-4020**. Any contractual question, please call Cynthia Davison at (908) 321-4296.
Thank you

Sincerely,

Misty Bar

Misty Barkley
Data Validation and Report Writing Group Leader
Roy F. Weston, Inc. / REAC Project

MB:jj Attachments

cc. R. Singhvi
H.Compton
1173\non\mem\9611\sub\1173Con
V. Kansal
Subcontracting File
B. Lewan
C. Davison
R. Tobia
M. Barkley

REAC, Edison, NJ
(908) 321-4200
EPA Contract 68-C4-0022
Job R164

CHAIN OF CUSTODY RECORD

Project Name: J - Field, APG
Project Number: 1173
RFW Contact: Tobia Phone: x4299
Joan Johnson (908) 321-4200

No: 07319
SHEET NO. 1 OF 1

Sample Identification / **Analyses Requested**

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/Preservative	metals*			
69386	9009	JFP-2	S	11/15/96	1	4oz / 4oz.				
69387	9010	JFP-3	↓	↓	1	↓	↓			
69388	9011	JFP-4			1					
69389	9012	JFP-5			1					

f3830011

Matrix:

SD -	Sediment	PW -	Potable Water	S -	Soil
DS -	Drum Solids	GW -	Groundwater	W -	Water
DL -	Drum Liquids	SW -	Surface Water	O -	Oil
X -	Other	SL -	Sludge	A -	Air

Special Instructions:
* No mercury Needed

FOR SUBCONTRACTING USE ONLY

FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
4/Analysis	[signature]	11/15/96	B Lewis	11/16/96	1005	All/Analysis	B Lewis	11/16/96	[signature]	11/18/96	1643

FORM #4

8/94