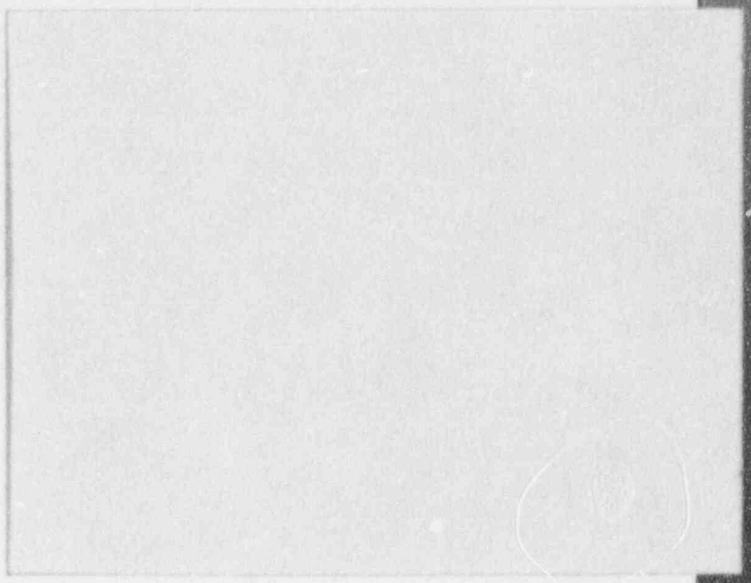


QUALITY

INTEGRITY

CREATIVITY

RESPONSIVENESS

RUST ENVIRONMENT & INFRASTRUCTURE

HYDROGEOLOGIC DATA REPORT
ANNE ARUNDEL COUNTY PROPERTY
DNSC CURTIS BAY DEPOT
BALTIMORE, MARYLAND
RUST E&I Project No. 86345

December 9, 1994

RUST Environment & Infrastructure
140 Stoneridge Drive
Columbia, South Carolina 29210

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES AND FIGURES

1.0 INTRODUCTION

1.1 Background

During May 17 and 18, 1993, RUST Environment & Infrastructure (RUST E&I) performed a limited ground-water assessment at the DNSC Curtis Bay Depot (CBD) as part of an overall Demolition and Disposal plan being prepared for the U.S. Army Defense Logistics Agency (DLA) by RUST Remedial Services (now RUST Federal Services, RFS). The site comprises a portion of the CBD now owned by Anne Arundel County. The assessment activities included collecting ground-water samples from five of six existing on-site monitoring wells and a preliminary evaluation of the site drainage and ground-water flow. A report of the findings was submitted by RUST E&I to the DLA and subsequently to the Nuclear Regulatory Commission (NRC) on June 15, 1993.

The NRC provided comments to the report in a letter from Mr. Dominick A. Orlando dated October 25, 1993. The letter presented a five-step approach to resolve concerns of the NRC staff. A Soil and Ground-Water Quality Assessment Work Plan (site assessment) was prepared by RUST E&I in June 1994 to address the comments provided by the NRC. The purpose of the assessment work plan is to address soil and ground-water conditions with regards to thorium nitrate. The majority of the assessment activities are proposed to be centered around nine World War I era transite-sided warehouses at the site that were formerly used to store thorium nitrate.

In their review of the Soil and Ground-Water Quality Assessment Work Plan, the NRC stated in a letter of October 7, 1994 that the proposed work plan did not fully address the NRC's concerns. A teleconference was held on November 1, 1994 between the NRC, DLA, RUST Federal Services, RUST E&I, and representatives of Anne Arundel County to discuss the NRC comments. During this meeting, it was agreed that RUST E&I would gather additional data about the hydrogeology of the site and make this submittal to the NRC. Upon their review and concurrence, RUST E&I will amend the work plan accordingly.

1.2 Data Collection

Mr. David Maxam, a RUST E&I hydrogeologist, traveled to Baltimore, Maryland on November 8, 1994 for the purpose of reviewing records concerning the site and vicinity on file at State and County agencies and to obtain additional field data from the monitoring wells on-site. A summary of the data collection activities is presented below:

- met with Mr. Kevin Reilly (DLA) to discuss the plans and progress of the activities to be performed.

- met with Meeks and Associates Surveying at the on-site trailer to show the six well locations and other features to be surveyed.

- measured water-levels in the six wells mentioned above and collected a ground-water sample from monitoring well MW-4.

- monitored well MW-1 for the purpose of determining the potential for tidal fluctuations in the shallow aquifer.

- conducted *in-situ* borehole permeability tests on monitoring wells MW-3, MW-4, MW-5, and MW-6.

- met with Mr. Richard Eskew at the Anne Arundel County Public Works to review and copy information pertinent to the Anne Arundel County site. Obtained permit numbers of water/monitoring wells in the vicinity of the site from County Health Department personnel.

- met with Mr. Grant Baker (Site Engineer, Curtis Bay Depot) and reviewed maps of the area.

- met Mr. Harry Hansen (Maryland Geological Survey) and obtained site and regional geologic and hydrogeologic information.

- met with Ms. Margaret Chauncey and Ms. Denise Swatzbaugh (Maryland Department of the Environment) and obtained information including copies of the State of Maryland Application for Permit to Drill a Well and the State of a Maryland Well Completion Report for wells located in the vicinity of the site.

2.0 HYDROGEOLOGIC CHARACTERIZATION

2.1 Site Description

The CBD is located in Curtis Bay, Maryland, a suburb of Baltimore, in northeastern Anne Arundel County. The CBD is located approximately 2 miles south of downtown Baltimore at the southernmost tip of Curtis Bay along the Patapsco River (Figure 1). The subject site is bounded on the north and west by Ordnance Road (MD710) and the Baltimore Beltway (I-695), on the east by Curtis Bay, and on the south by the Baymeadow Industrial Park.

The original depot area consisted of 826 acres and was used by the United States Army as an ordnance depot from 1918 to 1958. Starting in 1952, the depot was used to store critical and strategic materials. These materials include zinc, lead, chemicals, various ores and metals. Beginning in 1959 until the early 1970s, thorium nitrate was stored in nine transite-sided warehouses at the depot. The warehouses are included within a 85-acre tract of land that was once within the CBD, but is now owned by Anne Arundel County. This area is now separated from the depot property by a chain link security fence. The property was used by Anne Arundel County in the early 1980's for the subsurface injection of sewage sludge. Since 1982, no activities have been performed on the property.

The CBD site lies just north of Back Creek. Back Creek flows southward towards Furnace Creek which eventually flows into Curtis Creek and then into Curtis Bay. Topography of the site and vicinity consists of gently rolling swales. Land surface elevations in the vicinity of the site range from approximately 10 feet to 50 feet above mean sea level (msl).

The approximate locations of wells in the vicinity of the CBD are indicated on Figure 2. Driller's logs for all of the on-site wells and selected off-site wells are presented in Appendix A.

2.2 Regional Hydrogeology

The CBD is located approximately 5 miles southeast of the Fall Line, which defines the boundary between the Piedmont Physiographic Province to the northwest and the Coastal Plain Physiographic Province to the southeast. The site is underlain by roughly 400 feet of alluvial sediments which are underlain by crystalline bedrock (Bennett and Meyer, 1952). The Coastal Plain sediments beneath the site belong to the Lower Cretaceous Potomac Group.

The Potomac Group in the vicinity of the CBD is composed of the Patuxent Formation, the Arundel Formation, and the Patapsco Formation. Plio-Pleistocene sediments occur locally at higher elevations in the vicinity of the CBD. The Potomac Group sediments in the Baltimore area consist primarily of uncc..solidated clays, silts, sands, and gravels. Proportions of each lithology vary widely within the formation, both vertically and laterally over short distances. The Patuxent Formation is composed primarily of medium- to coarse-grained sand with gravel interbedded with relatively thin clays. The Patuxent Formation is separated from the overlying Patapsco Formation by the predominately clayey Arundel Formation. The Arundel Formation, or the Arundel Clay as it is sometimes called, is a dark gray to maroon, tough lignitic clay ranging in thickness from 25 to 200 feet in the Baltimore area (Bennett and Meyer, 1952). The overlying Patapsco Formation is composed of a sequence of interbedded variegated silty clay and fine- to medium-grained sand. Patapsco clays are often brightly mottled with pure white clays common (Glaser, 1968).

Figure 3 is a regional cross-section through the CBD. Wells AA-Ad11 and AA-Ad99 indicate the elevation of the Arundel Clay ranges from -111 to -160 feet msl. The Patapsco Formation includes at least two predominately clay units: the upper clay occurs from elevation 21 to -53 feet and the lower clay occurs from elevation -70 to -90 feet. In the vicinity of the CBD, the top of the upper clay in the Patapsco Formation occurs at elevation 6 to 0 feet and ranges from 13 to 33 feet thick.

Wells completed in the coastal plain deposits produce much higher volumes of water than those completed in the crystalline rocks to the west of the Fall Line. Ground water in the coastal plain

occurs under both water-table and artesian conditions. The Patuxent Formation is a major source of ground water in the coastal plain of Maryland. The formation receives recharge where it crops out in a band 3 to 5 miles wide at the Fall Line. Wells completed in the Patuxent Formation in Anne Arundel County have reported yields of up to 300 gallons per minute. Transmissivities of Patuxent Formation wells can range from 600 to greater than 180,000 gallons per day per foot. Storage coefficients have been reported from 1×10^{-5} to 8×10^{-4}. Large diameter wells completed in the Patapsco Formation average about 210 gallons per minute. Average transmissivities are about 31,600 gallons per day per foot. Storage coefficients range from 5×10^{-5} to 0.003 (Otton and others, 1964).

2.3 Site Hydrogeology

Glaser (1976) mapped most of the CBD as part of the silt-clay facies of the Potomac Group (Patapsco Formation). The westernmost portion of the CBD is mapped as part of the sand-gravel series. Figure 4 is a cross-section of the CBD using on-site wells. A surficial low-permeability sandy silt and clay overlies the uppermost water-bearing sand. The uppermost saturated sand overlies the upper clay unit of the Patapsco Formation, which as stated above, occurs at elevation 6 to 0 feet msl. Thus, the uppermost aquifer underlying the CBD is estimated to range in thickness from 10 to 40 feet.

Ground water in the uppermost sand likely occurs under water-table conditions, although ground water may be locally confined by the overlying low-permeability sandy silt and clay. Water levels in the wells shown on Figure 4 generally occur within sandy portions of the subsurface except at well MW-5 where the water level rises above the top of the sand unit.

3.0 GROUND-WATER OCCURRENCE

3.1 Ground-Water Levels

The land surface elevation and top of casing elevation for each of the on-site monitoring wells was determined by a registered land surveyor as part of this evaluation. Depths to ground water were measured with an electronic water level indicator initially on May 18, 1993 during the preliminary ground-water evaluation and subsequently on November 8 and November 11, 1994. The depths to ground water were referenced to the top of the PVC well casings. The depths to ground water were then converted to elevations relative to mean sea level. A summary of the ground-water levels and elevation data are presented on Table 1.

A water-table contour map of the shallow aquifer based on water level data collected on November 8, 1994 is presented on Figure 5. The ground-water elevation for well MW-2 was excluded from consideration in the figure because a review of the geologist log and well construction details indicates that the well was completed in the surficial clay, rather than in the uppermost water-bearing sand, and the water level in the well is perched.

Based on the November 8 and 11, 1994 ground-water elevations, ground water in the shallow aquifer generally flows across the site from west to east towards Curtis Bay. This general flow direction is consistent with the flow pattern observed from the preliminary evaluation conducted by RUST E&I in 1993. Based on the water-table surface contours presented on Figure 5, the horizontal hydraulic gradient (dh/dl) for the shallow aquifer is approximately 0.0054 ft/ft at the site.

3.2 Hydraulic Conductivity Testing

Hydraulic conductivity tests (slug tests) were performed on monitoring wells MW-3, MW-4, MW-5, and MW-6 to provide an estimate of horizontal hydraulic conductivity in the shallow aquifer beneath the site. Testing was not performed on monitoring well MW-2 because it is completed within a clay and contains insufficient water. Monitoring well MW-1 was not tested because it was utilized for the

tidal influence study. The data were collected with a Hermit 1000C data logger and pressure transducer. Hydraulic conductivity values were calculated using the Bouwer and Rice method (Bouwer, 1989). A lower confining unit was conservatively assumed to exist at an approximate elevation of -2 feet msl beneath the site based on the review of the regional geology presented in Section 2.2. The hydraulic conductivity values ranged from 0.2 ft/day (MW-5) to 50 ft/day (MW-4) and are summarized on Table 2. Slug test data, plots, and calculations are presented in Appendix B.

3.3 Ground-Water Movement

Estimates of the average linear ground-water flow velocity within the shallow aquifer were calculated using hydraulic conductivities obtained from the slug tests. Utilizing a hydraulic gradient of 0.0054 ft/ft, a range of hydraulic conductivity values from 0.2 ft/day to 50 ft/day and an assumed effective porosity of 0.20 (dimensionless), estimates of ground-water flow velocities were calculated using the modified form of the Darcy equation (Heath, 1983):

$$v = \frac{K\, dh/dl}{n}$$

where:

v	=	ground-water velocity (ft/day);
n	=	effective porosity (assumed to be 0.20);
K	=	hydraulic conductivity (ft/day); and
dh/dl	=	hydraulic gradient.

Estimates of ground-water flow velocity within the shallow aquifer on November 8, 1994 ranged from 0.0054 ft/day to 1.35 ft/day. The flow velocity calculated from averaging the hydraulic conductivity values from the four wells tested (14.43 ft/day) was 0.4 ft/day.

3.4 Tidal Influence

To investigate the potential for tidal influence to the shallow ground-water beneath the site, a pressure transducer and data recorder were placed in monitoring well MW-1 for a period of 43 hours (2580 minutes) over the period from 12:20 on November 9, 1994 to 07:40 on November 11, 1994. Water level fluctuations were recorded every 30 minutes during this period and plotted versus time. The raw data and graph of relative head versus time are presented in Appendix B.

Tide tables for the Chesapeake Bay at Ft. McHenry were obtained from the Maryland Department of Natural Resources and high/low tides marked on the graph. Analysis of the plot of water levels in well MW-1 indicates that a general rising trend of about 0.6 feet in the ground-water level occurred over the period. However, a cyclic pattern of rises and falls of about 0.05 feet that correspond slightly ahead of the high/low tide periods at Ft. McHenry can be observed in the data. Therefore, based on these observations, there appears to be a slight tidal influence of about 0.05 feet to the potentiometric head of the uppermost ground-water zone at the site.

3.5 Ground-Water Quality

Ground-water samples from monitoring wells MW-1, MW-2, MW-3 and MW-4 initially were obtained by Woodward-Clyde Consultants in December 1988 for analysis of volatile organic compounds (USEPA Method 8240) and priority pollutant metals (USEPA 7000 Series). None of the ground-water samples contained detectable concentration of volatile constituents. Concentrations of arsenic, chromium, and lead were detected in the samples from wells MW-1, MW-3 and MW-4 that exceeded the USEPA maximum contaminant level (MCL) for drinking water (Woodward-Clyde Consultants, 1989).

Ground water from newly installed wells MW-5 and MW-6 and wells MW-1 through MW-4 was sampled by Woodward-Clyde Consultants in December 1991. The ground-water samples were filtered upon collection and analyzed for dissolved metals (priority pollutant metals). None of the six ground-water samples contained concentrations of metals above their respective USEPA MCLs. Woodward-Clyde Consultants (1992) stated that the sample results indicated that on-site ground

water should be considered uncontaminated based upon heavy metal content and that the high metals concentrations detected in wells MW-1 through MW-4 during their 1989 investigation likely were due to the presence of suspended clays in the samples.

During the preliminary ground-water evaluation conducted in May 1993, ground-water samples from five of the monitoring wells at the site were obtained for chemical analyses by RUST E&I. Samples from wells MW-1, MW-2, MW-3, MW-5 and MW-6 were analyzed for thorium-228 and related daughter products. Analyses were conducted by General Engineering Laboratories, of Charleston, South Carolina. None of the constituents tested for were detected above the quantitation limits of 1.0 pCi/l. During the recent field work, the remaining monitoring well, MW-4 was sampled and analyzed for the following constituents: thorium-228 and related daughter products, radium-226, radium-228, gross alpha and gross beta. Analyses were conducted by Quanterra, of Richland, Washington. A summary of the ground-water quality data from all six of the monitoring wells at the site is presented on Table 3. Copies of the analytical results for well MW-4 are presented in Appendix C.

4.0 SUMMARY

The following is a summary of the additional hydrogeologic data that have been obtained.

- The sediments beneath the CBD belong to the Potomac Group. The uppermost formation beneath the site is the Patapsco Formation which is underlain by the Arundel Clay at elevations ranging from 111 to 160 feet below sea level (site elevations range from 10 to 50 feet above sea level). The Patuxent Formation occurs below the Arundel Clay, which ranges in thickness from 25 to 200 feet in the Baltimore area. The Patuxent Formation is the major source of ground water in this portion of the Maryland Coastal Plain.

- The Patapsco Formation consists of a sequence of sand units and clay units. An upper clay unit occurs at an elevation of 0 to 6 feet above sea level below the uppermost water-bearing sand. The thickness of the uppermost aquifer is estimated to range from 10 to 40 feet.

- Ground water generally occurs under water-table conditions near the surface at elevations ranging from 12 to 20 feet. Ground-water flows from the Anne Arundel County property to the east toward the CBD and Curtis Bay at an average rate of 0.4 feet/day.

- Tidal influence on ground water at the site is minimal (less than 0.1 foot per tidal cycle).

- Analyses of ground-water samples from the site indicate less than 1 pCi/l of thorium-228 and related daughter products.

5.0 REFERENCES

Bennett, R.R. and Meyer, R.R., 1952, Geology and ground-water resources of the Baltimore area: State of Maryland, Department of Geology, Mines and Water Resources, Bulletin 4, 573 p.

Bower, H., 1989, The Bouwer and Rice slug test - an update: Ground Water v. 27, no. 3, pp. 304 - 309.

Glaser, J.D., 1976, Geologic Map of Anne Arundel County: Maryland Geological Survey, Atlas Map No. 1.

Glaser, J.D., 1968, Coastal plain geology of southern Maryland: Maryland Geological Survey, Guidebook No. 1, 56 p.

Heath, R. C., 1983, Basic ground-water hydrology: U.S. Geological Water Supply Paper 2220, 84 p.

Otton, E. G., and others, 1964, Water resources of the Baltimore area Maryland: U.S. Geological Survey Water Supply Paper 1499-F, 105 p.

RUST Environment & Infrastructure, 1994, Soil and ground-water quality assessment work plan, Anne Arundel County Property, DNSC Curtis Bay Depot: 11 p.

RUST Environment & Infrastructure, 1993, Ground-water evaluation, DNSC Curtis Bay Depot: 4 p.

Woodward-Clyde Consultants, 1992, Ordnance road project, environmental services for soil and ground-water testing, report of findings: 12 p.

Woodward-Clyde Consultants, 1989, Site contamination assessment, U.S. Army Curtis Bay Ordinance Depot, Anne Arundel County, Maryland: 14 p.

TABLES

Table 1

SUMMARY OF WATER LEVELS
DNSC CURTIS BAY DEPOT
BALTIMORE, MARYLAND

RUST E&I Project No. 86345

Well Number	Date Measured	Land Surface Elevation	Height of Measuring Pt. Above Land Sur.	Elevation of Measuring Point (ft msl)	Water Level Below Measuring Pt.	Water Level Elevation (ft msl)	Measured By
MW-1	05/18/93	44.88	2.15	47.03	34.40	12.63	W. Gerald
	11/08/94				34.57	12.46	D. Maxam
	11/11/94				34.85	12.18	D. Maxam
MW-2	05/18/93	36.23	2.73	38.96	17.30	21.66	W. Gerald
	11/08/94				19.78	19.18	D. Maxam
	11/11/94				19.86	19.10	D. Maxam
MW-3	05/18/93	42.22	3.29	45.51	27.84	17.67	W. Gerald
	11/08/94				28.50	17.01	D. Maxam
	11/11/94				28.62	16.89	D. Maxam
MW-4	05/18/93	27.24	2.09	29.33	N/M	N/A	
	11/08/94				12.62	16.71	D. Maxam
	11/11/94				12.73	16.60	D. Maxam
MW-5	05/18/93	31.43	2.42	33.85	10.73	23.12	W. Gerald
	11/08/94				13.57	20.28	D. Maxam
	11/11/94				14.32	19.53	D. Maxam
MW-6	05/18/93	29.07	2.78	31.85	14.65	17.20	W. Gerald
	11/08/94				17.21	14.64	D. Maxam
	11/11/94				17.32	14.53	D. Maxam

NOTES: N/M = Not Measured
N/A = Not Applicable

cbd2c7t1.wk1

Table 2

SUMMARY OF HYDRAULIC CONDUCTIVITY VALUES-SLUG TEST DATA
DNSC CURTIS BAY DEPOT
BALTIMORE, MARYLAND

RUST E&I Project No. 86345

Well Number	Date Measured	Measured By	Test Type	Horizontal Hydraulic Conductivity (k) FT/DAY	CM/SEC
MW-3	11/09/94	D.Maxam	RISING HEAD	5.2	1.80E-03
MW-4	11/09/94	D.Maxam	RISING HEAD	50	1.70E-02
MW-5	11/08/94	D.Maxam	FALLING HEAD	0.20	7.00E-05
MW-6	11/09/94	D.Maxam	RISING HEAD	6.3	2.20E-03

Table 3

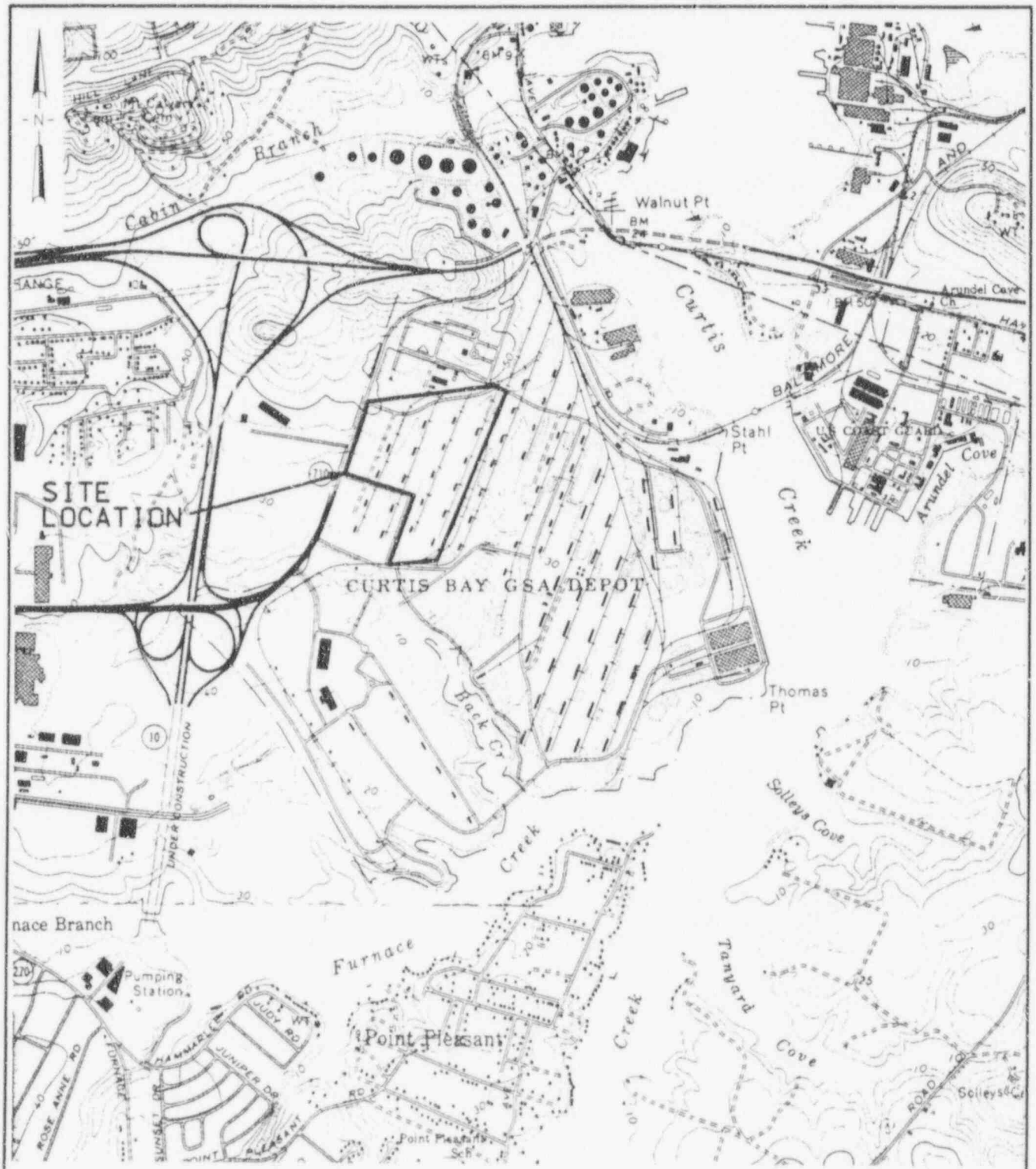
SUMMARY OF GROUND-WATER QUALITY DATA
DNSC CURTIS BAY DEPOT
BALTIMORE, MARYLAND

RUST E&I Project No. 86345

WELL NUMBER	DATE SAMPLED	THORIUM 228 (pCi/L)	THORIUM 230 (pCi/L)	THORIUM 232 (pCi/L)	ACTINIUM 228 (pCi/L)	BISMUTH 212 (pCi/L)	CESIUM 137 (pCi/L)	LEAD 212 (pCi/L)	RADIUM 226 (pCi/L)	RADIUM 228 (pCi/L)	THALLIUM 208 (pCi/L)	GROSS ALPHA (pCi/L)	GROSS BETA (pCi/L)
MW-1	05/18/93	<1.00	<1.00	<1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-2	05/18/93	<1.00	<1.00	<1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-3	05/18/93	<1.00	<1.00	<1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-4	11/09/94	5.75E-01	3.50E-01	4.02E-01	1.57E+01	1.49E+01	-5.56E+00	1.20E+01	6.83E-01	2.60E+00	4.75E+00	1.47E+01	1.69E+01
MW-5	05/18/93	<1.00	<1.00	<1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-6	05/18/93	<1.00	<1.00	<1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES: pCi/L = picocuries per liter.
NA = not analyzed.

FIGURES



2000 0 2000 4000

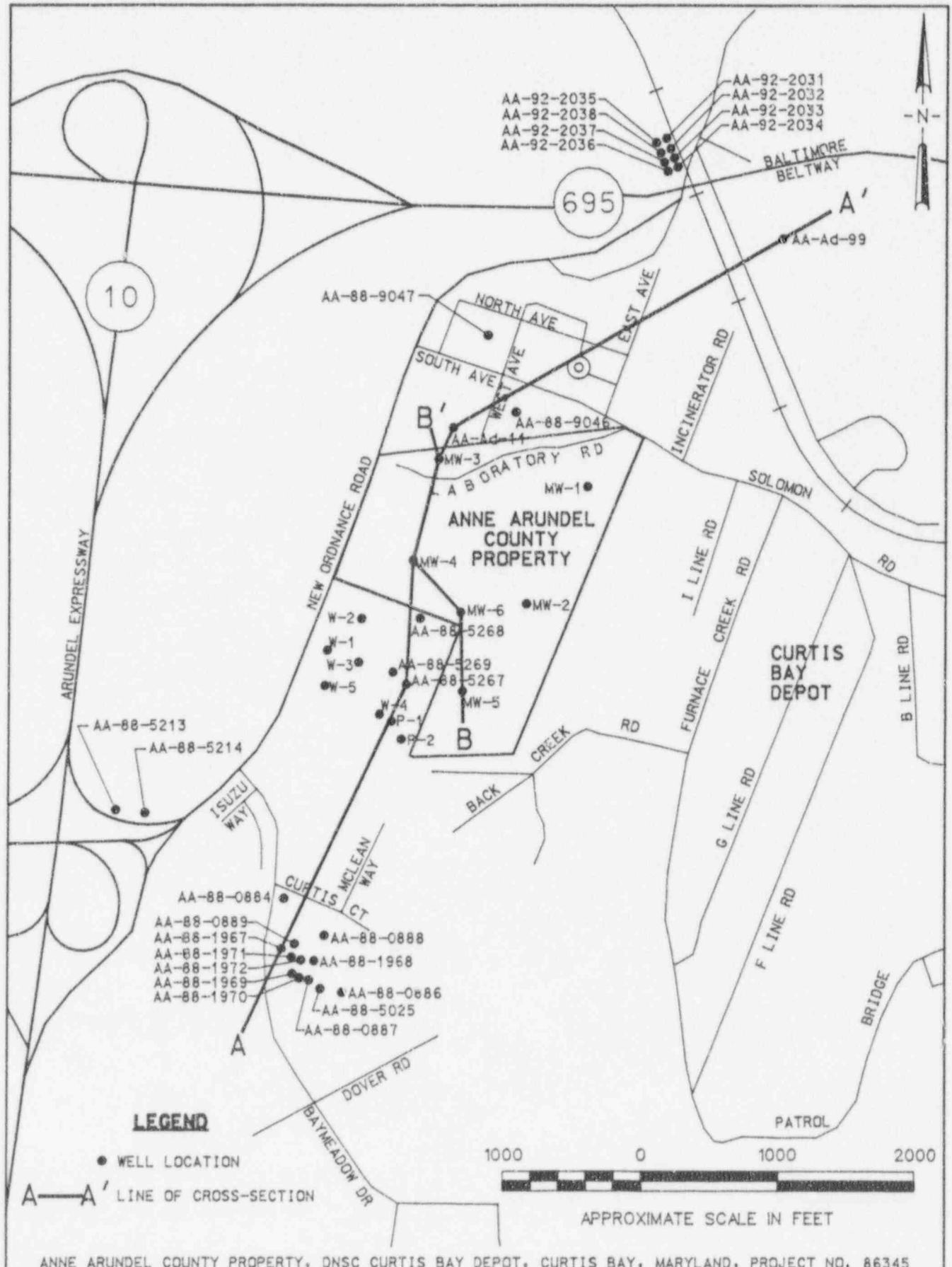
SCALE IN FEET

SOURCE:
U.S.G.S. 7.5 MINUTE SERIES TOPOGRAPHIC MAP: CURTIS BAY QUADRANGLE, MD (DATED 1969; PHOTOREVISED 1974)

ANNE ARUNDEL COUNTY PROPERTY, DNSC CURTIS BAY DEPOT, CURTIS BAY, MARYLAND, PROJECT NO. 86345

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 1
SITE LOCATION AND
TOPOGRAPHIC FEATURES



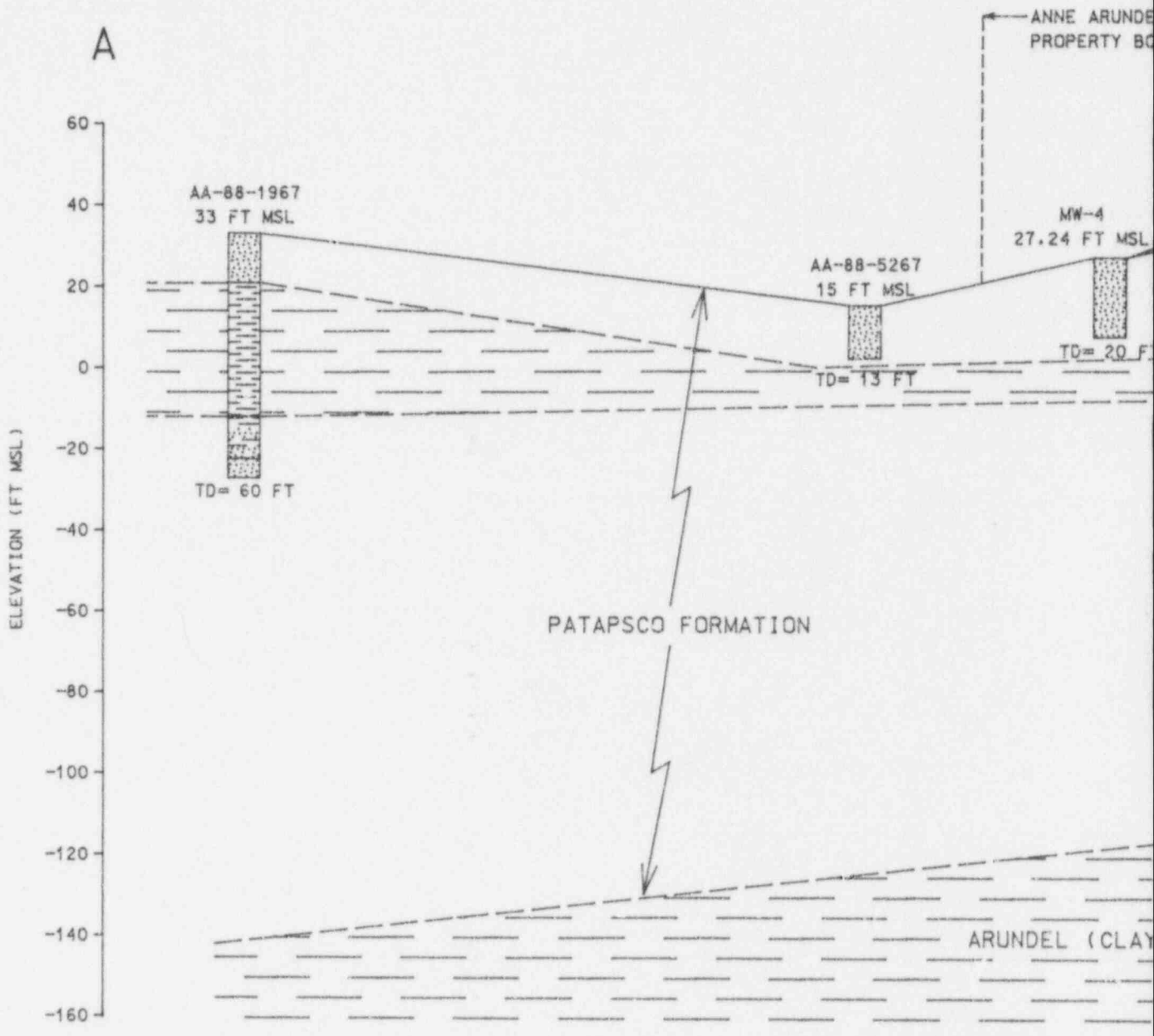
ANNE ARUNDEL COUNTY PROPERTY, DNSC CURTIS BAY DEPOT, CURTIS BAY, MARYLAND, PROJECT NO. 86345

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 2
WELL LOCATIONS IN THE
VICINITY OF THE
ANNE ARUNDEL COUNTY PROPERTY

SOUTHWEST

A



LEGEND

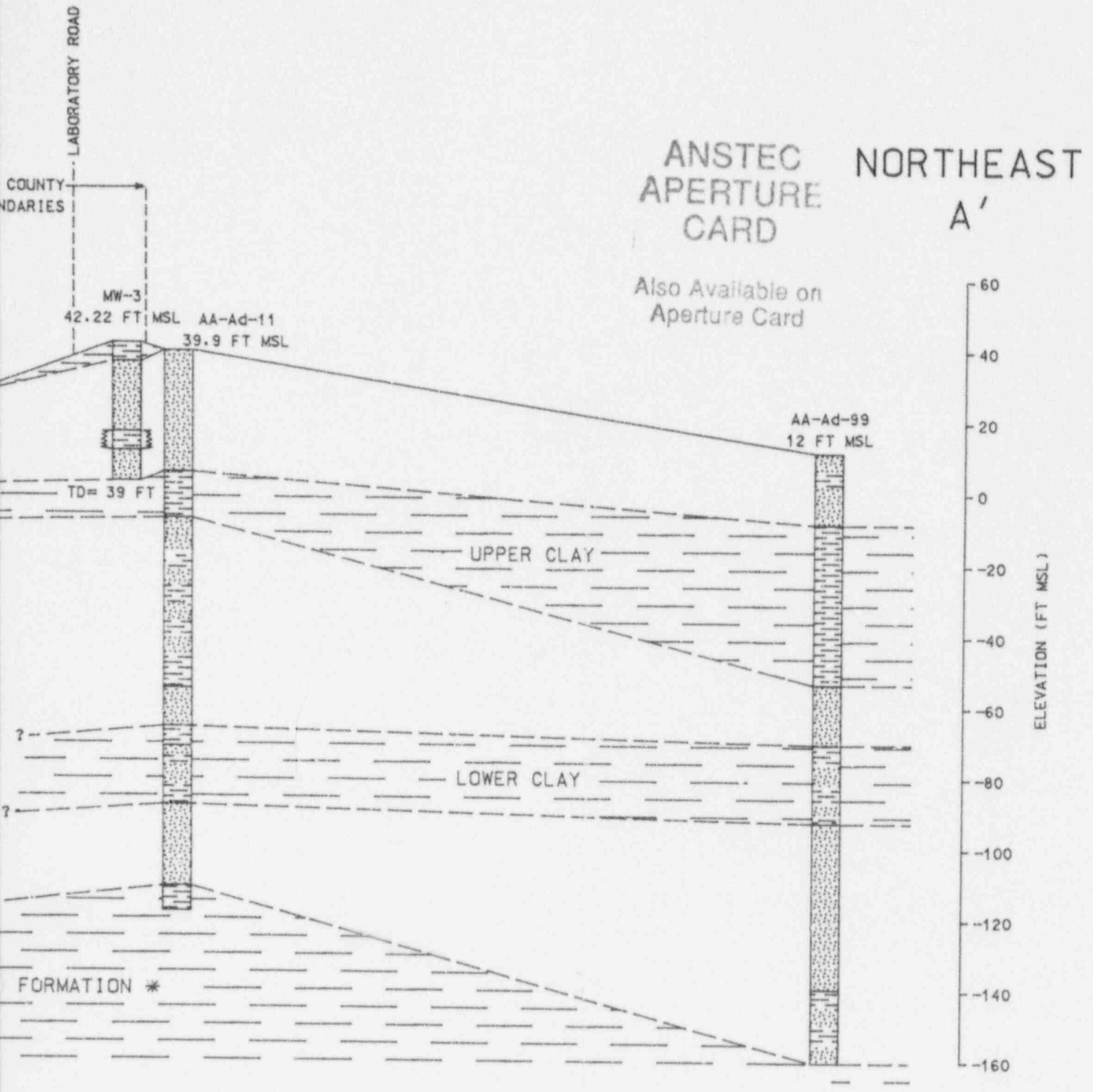
CLAY

SAND

INTERBEDDED CLAY AND SAND

* TOP OF ARUNDEL CLAY ESTIMATED FROM BENNETT AND MEYER, 1952

HORIZONTAL SCALE 1 IN = 600 FT
VERTICAL SCALE 1 IN = 40 FT
VERTICAL EXAGGERATION = 15X



9412290004.01

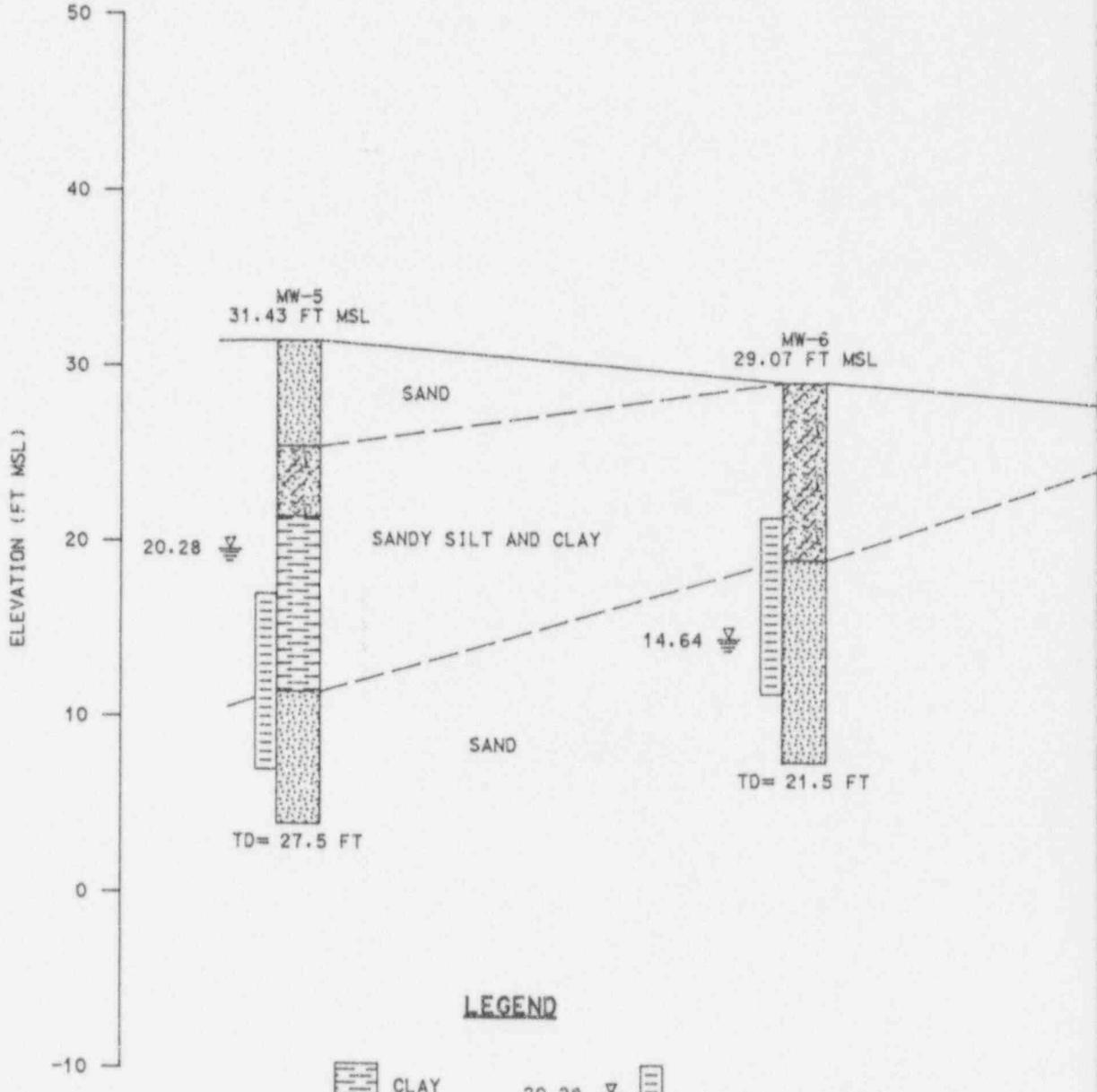
ANNE ARUNDEL COUNTY PROPERTY, DNSC CURTIS BAY DEPOT, CURTIS BAY, MARYLAND, PROJECT NO. 86345

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3
HYDROGEOLOGIC CROSS-SECTION
A - A'

SOUTH

B



LEGEND

CLAY

SAND

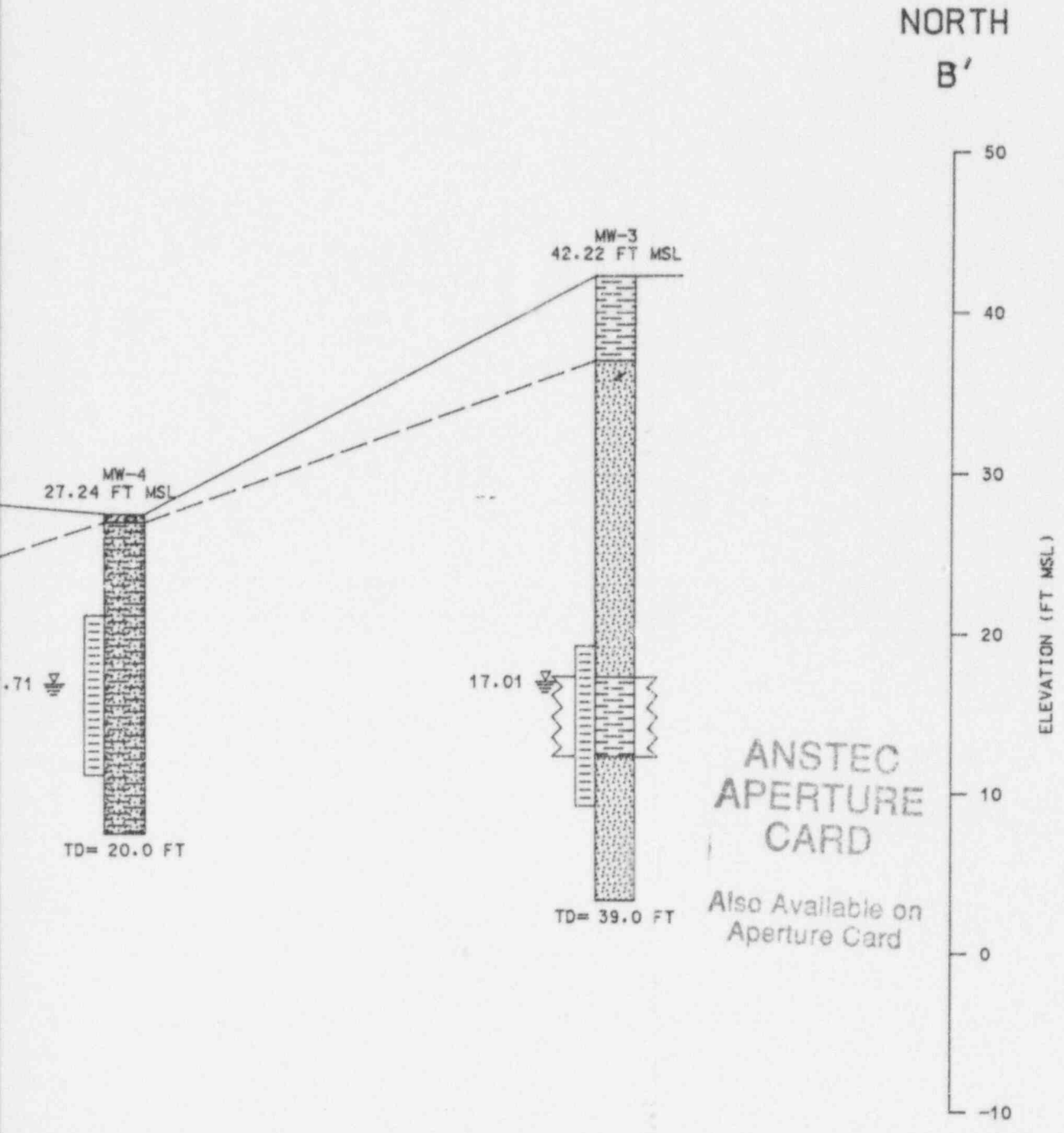
SILT

20.28

SCREENED INTERVAL WITH CORRESPONDING WATER LEVEL ELEVATION

WATER LEVELS MEASURED ON NOVEMBER 8, 1994

HORIZONTAL SCALE 1 IN = 200 FT
VERTICAL SCALE 1 IN = 10 FT
VERTICAL EXAGGERATION = 20X



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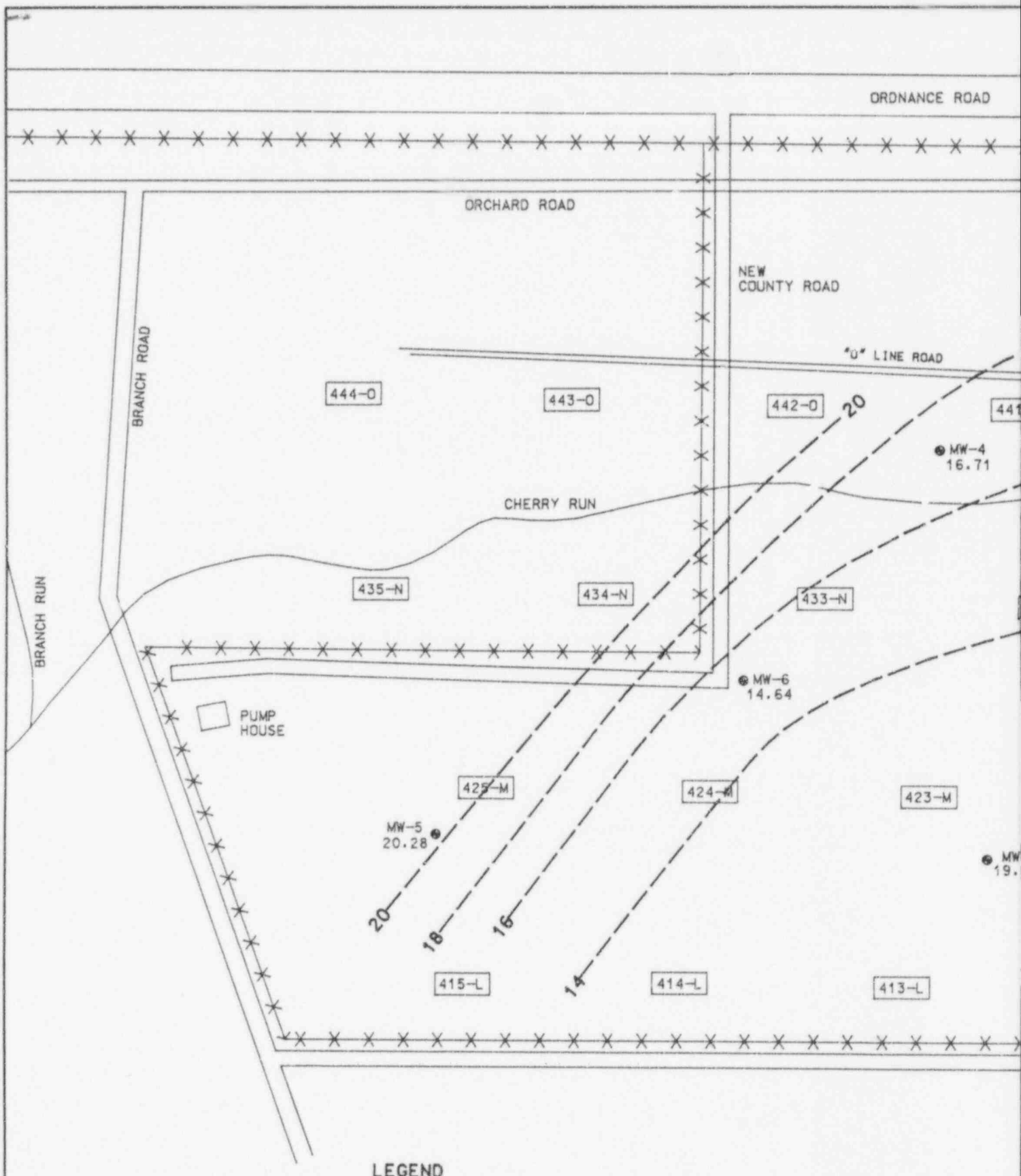
ANNE ARUNDEL COUNTY PROPERTY, DNSC CURTIS BAY DEPOT, CURTIS BAY, MARYLAND, PROJECT NO. 86345

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 4
HYDROGEOLOGIC CROSS-SECTION
B - B'



LEGEND

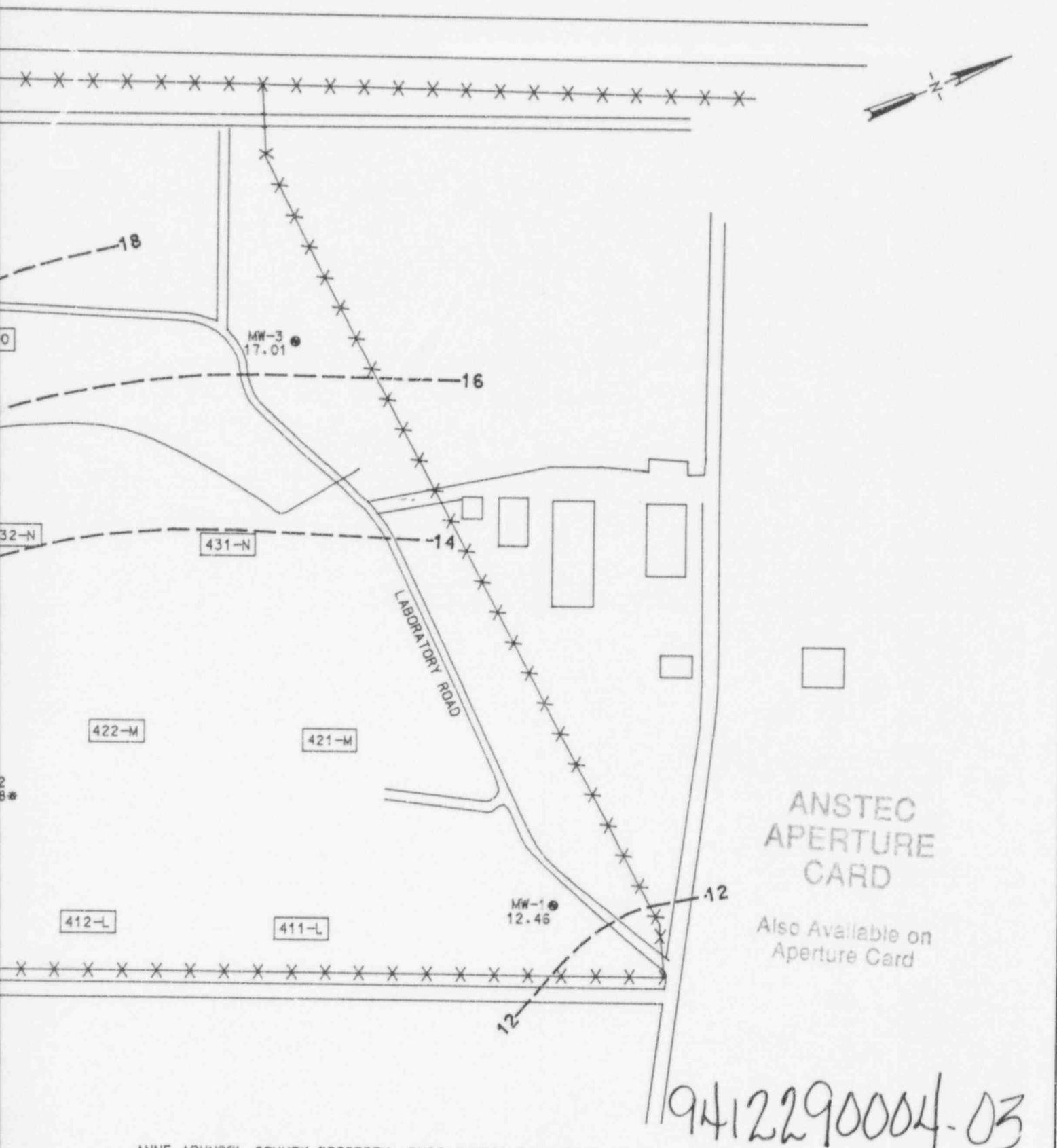
MW-1
12.46 ● MONITORING WELL LOCATION AND WATER LEVEL ELEVATION

411-L TRANSITE-SIDED WAREHOUSE

* NOTE: WATER LEVEL FROM WELL MW-2 NOT USED FOR CONTOURING THE POTENTIOMETRIC SURFACE BECAUSE OF PERCHED CONDITIONS

120 0 120

SCALE IN FEET



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ANNE ARUNDEL COUNTY PROPERTY, DNSC CURTIS BAY DEPOT, CURTIS BAY, MARYLAND, PROJECT NO.: 86345

RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 5
POTENTIOMETRIC SURFACE
ON 11/8/94

APPENDIX A
GEOLOGIC LOGS OF ON-SITE WELLS AND SELECTED OFF-SITE WELLS

LOG of BORING No. MW-1

DATE 6 Dec 88 SURFACE ELEV. _____ LOCATION See Figure 2

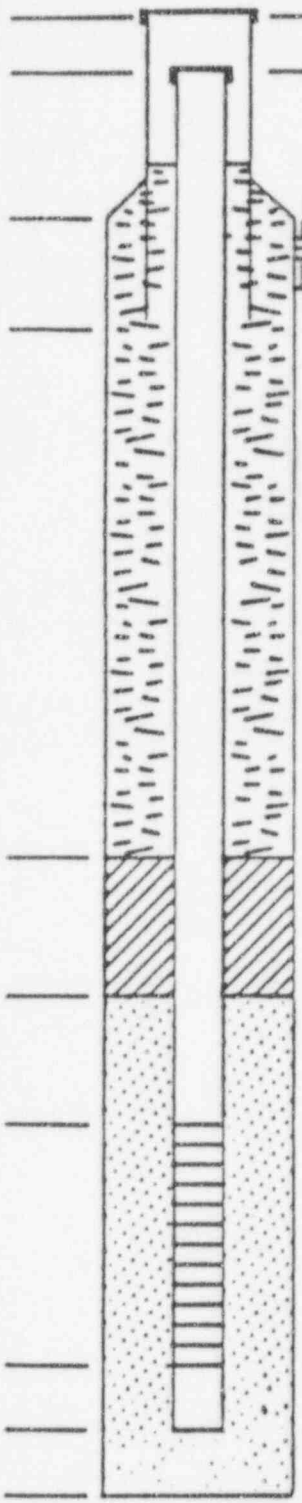
DEPTH, FEET	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	FID (ppm)			OTHER TESTS
0			6" black organic-rich sandy topsoil					
5		9	Stiff brown to red, mottled, silty CLAY, moist		0.0			0.02
10		20	-very stiff		0.0			0.02
15		34	-hard, siltier		0.0			0.02
20		133	Very dense, white, silty fine SAND, wet		0.2			0.02
25		180	-fine sand, dry		1.3			0.02
30		178			1.3			0.02
35		170	-wet		6.8			0.02
40			40.0 BOTTOM OF BORING					
45			OTHER TESTS = radiation levels in mrems/hr. LAB SAMPLE = composite from 5'-16.5'					

COMPLETION DEPTH 40.0' WATER DEPTH 35.5' DATE 6 Dec 88

SAMPLER: 2" O.D. SPLIT BARREL SAMPLER

ELEV. (Ft.) STICKUP (Ft.)

MONITORING WELL No. MW-1
PROJECT No. 88C1257
INSPECTED By CDG



2.25 TOP OF PROTECTIVE CASING

2.07 TOP OF INNER CASING (TIC)
MATERIAL: #40 PVC
DIAMETER: 4 inch

DEPTH BELOW GROUND SURFACE (Ft)

2.25 BOTTOM OF PROTECTIVE CASING
MATERIAL: Steel
DIAMETER: 6 inch
DESCRIPTION OF BACKFILL: cement/bentonite grout

DESCRIPTION OF BOREHOLE:
DIAMETER: 10 inch
METHOD DRILLED: HSA
DRILLING FLUID: None

25.00 TOP OF SEAL
DESCRIPTION: bentonite pellets-hydrated

27.00 BOTTOM OF SEAL / TOP OF FILTER PACK
DESCRIPTION: Morie #2 sand

28.50 TOP OF SCREEN
DIAMETER: 4 inch
SLOT SIZE: 0.020 inch
MATERIAL: #40 PVC

38.03 BOTTOM OF SCREEN/TOP OF BLANK SECTION

38.50 BOTTOM OF BLANK SECTION/BOTTOM OF WELL

40.00 BOTTOM OF FILTER PACK/BOTTOM OF BOREHOLE

GROUND WATER LEVEL
DEPTH FROM TIC 36.85
ELEVATION
DATE 12-8-88 TIME 1430

INSTALLATION
DATE OF COMPLETION 12-6-88 TIME 1700
DESCRIPTION OF DEVELOPMENT
compressed air for 1 hour

PROJECT: AWD/COKE
PROJECT NUMBER: 88C1257

MONITORING WELL REPORT

Fig.

LOG of BORING No. MW-2

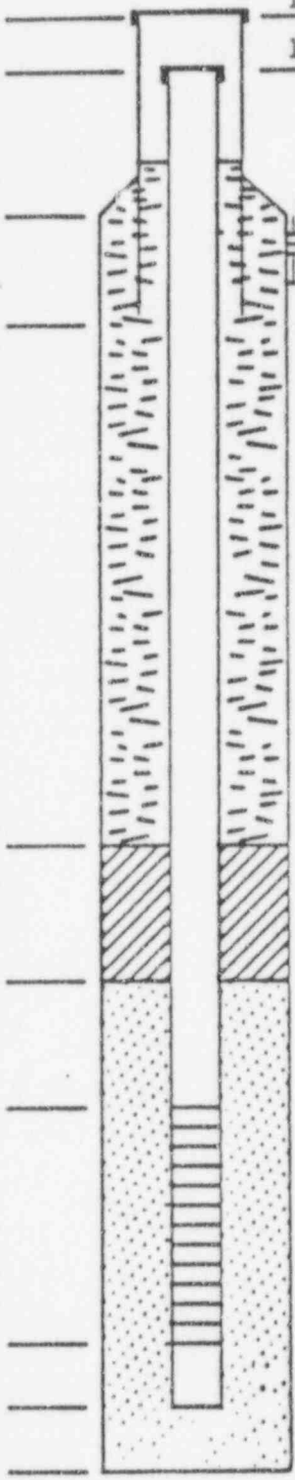
DATE 12-7-88 SURFACE ELEV. _____ LOCATION See Figure 2

DEPTH, FEET	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	FID (ppm)			OTHER TESTS
0			8" black, organic-rich, silty topsoil					
5		12	12" brown, silty fine SAND, wet		0.0			0.02
			6" gray, mottled silty CLAY, dry					
10		21	Very stiff, white mottled CLAY, dry		0.0			0.02
15					0.2			0.02
20								
			22.0 BOTTOM OF BORING					
2								
30			OTHER TESTS = radiation levels in mrems/hr LAB SAMPLE = composite from 5' - 16.5'					
35								
40								
45								

22' WATER DEPTH 15.0' DATE 12-7-88

MONITORING WELL No. MW-2
PROJECT No. 88C1257
INSPECTED By CDG

ELEV. (Ft.) STICKUP (Ft)



1.85 TOP OF PROTECTIVE CASING

1.65 TOP OF INNER CASING (TIC)
MATERIAL: #40 PVC
DIAMETER: 4 inch

DEPTH BELOW GROUND SURFACE (Ft)

2.65 BOTTOM OF PROTECTIVE CASING
MATERIAL: Steel
DIAMETER: 6 inch
DESCRIPTION OF BACKFILL: cement/bentonite grout

DESCRIPTION OF BOREHOLE:
DIAMETER: 6 inch
METHOD DRILLED: HSA
DRILLING FLUID: None

5.00 TOP OF SEAL
DESCRIPTION: bentonite pellets - hydrated

7.00 BOTTOM OF SEAL / TOP OF FILTER PACK
DESCRIPTION: Morie #2 sand

8.00 TOP OF SCREEN
DIAMETER: 4 inch
SLOT SIZE: 0.020 inch
MATERIAL: #40 PVC

17.53 BOTTOM OF SCREEN/TOP OF BLANK SECTION

18.00 BOTTOM OF BLANK SECTION/BOTTOM OF WELL

22.00 BOTTOM OF FILTER PACK/BOTTOM OF BOREHOLE

GROUND WATER LEVEL
DEPTH FROM TIC 16.43
ELEVATION
DATE 12-7-88 TIME 1700

INSTALLATION
DATE OF COMPLETION 12-7-88 TIME 1040
DESCRIPTION OF DEVELOPMENT
compressed air for 1 hour

PROJECT: AWD/COKE
PROJECT NUMBER: 88C1257

MONITORING WELL REPORT

Fig.

LOG of BORING No. MW-3

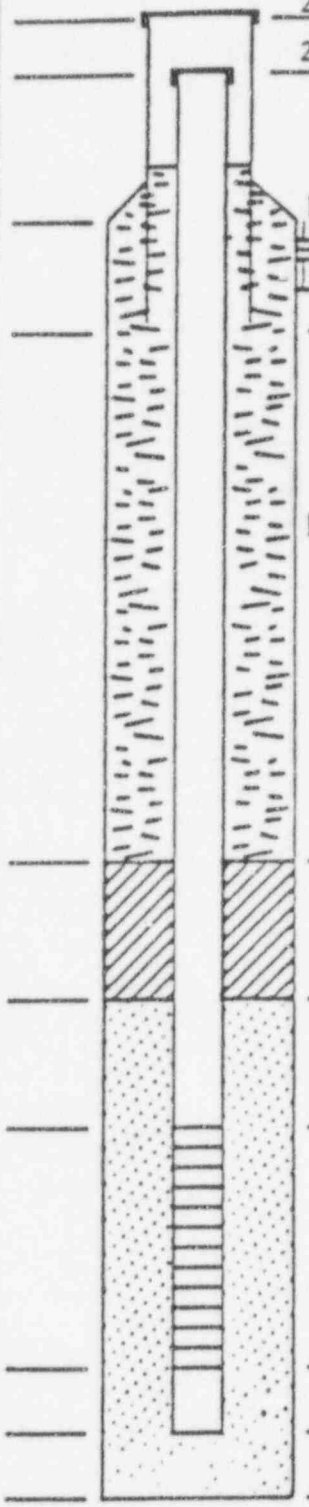
DATE 12-7-88 SURFACE ELEV. _____ LOCATION See Figure 2

DEPTH, FEET	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	FID (ppm)			OTHER TESTS
0			4" brown, organic-rich, silty topsoil					
5			4" brown CLAY, moist, plastic					
		27	14" white to gray, sandy SILT and fine SAND, dry		0.0			0.02
10		47	Dense, white, fine SAND, dry		0.0			0.02
15		42	-silty		0.1			0.02
20		27	-medium dense, trace reddish brown, medium sand		0.0			0.02
25		83	Hard, white to gray, CLAY, with silty sand interlayers		0.1			0.02
30			White, medium fine SAND, wet		0.0			0.02
35								
40			39.0 BOTTOM OF BORING OTHER TESTS = radiation levels in mrems/hr. LAB SAMPLE = composite from 5' - 31.5'					
45								

COMPLETION DEPTH 39.0' WATER DEPTH 29.0' DATE 12-7-88

MONITORING WELL No. MW-3
PROJECT No. 88C1257
INSPECTED By CDG

ELEV. (Ft.) STICKUP (Ft.)



2.47 TOP OF PROTECTIVE CASING

2.27 TOP OF INNER CASING (TIC)
MATERIAL: #40 PVC
DIAMETER: 4 inch

DEPTH BELOW GROUND SURFACE (Ft)

2.03 BOTTOM OF PROTECTIVE CASING
MATERIAL: Steel
DIAMETER: 6 inch
DESCRIPTION OF BACKFILL: none

DESCRIPTION OF BOREHOLE:
DIAMETER:
METHOD DRILLED:
DRILLING FLUID:

21.00 TOP OF SEAL
DESCRIPTION: bentonite pellets - hydrated

23.00 BOTTOM OF SEAL / TOP OF FILTER PACK
DESCRIPTION: Morie #2 sand

25.00 TOP OF SCREEN
DIAMETER: 4 inch
SLOT SIZE: 0.020 inch
MATERIAL: #40 PVC

34.53 BOTTOM OF SCREEN/TOP OF BLANK SECTION

35.00 BOTTOM OF BLANK SECTION/BOTTOM OF WELL

39.00 BOTTOM OF FILTER PACK/BOTTOM OF BOREHOLE

GROUND WATER LEVEL
DEPTH FROM TIC 30.65
ELEVATION
DATE 12-8-88 TIME 1420

INSTALLATION
DATE OF COMPLETION 12-7-88 TIME 1600
DESCRIPTION OF DEVELOPMENT
compressed air for 1 hour

PROJECT: AWD/COKE
PROJECT NUMBER: 88C1257

MONITORING WELL REPORT

Fig.

LOG of BORING No. MW-4

DATE 12-8-88 SURFACE ELEV. _____ LOCATION See Figure 2

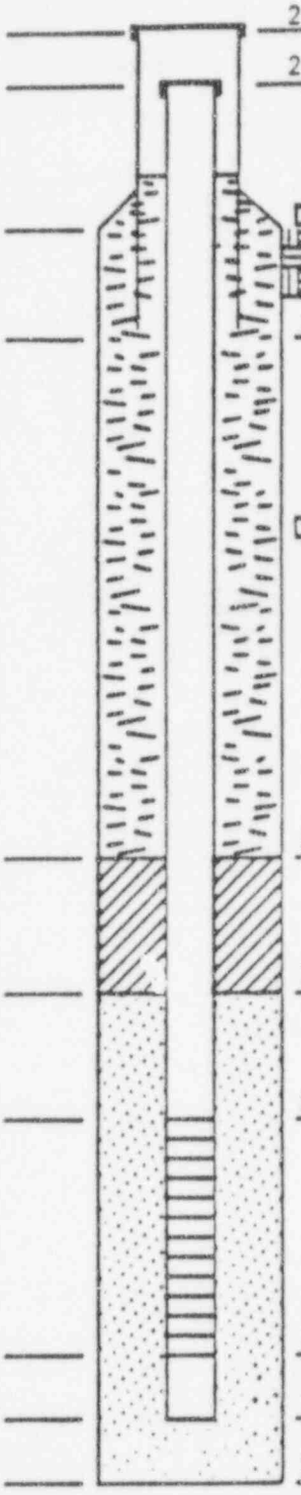
DEPTH, FEET	SAMPLES	SAMPLING RESISTANCE	DESCRIPTION	ELEVATION	FID (ppm)			OTHER TESTS
0			6" black, sandy-silty topsoil					
5		19	Medium dense, brown fine SAND, moist		0.7			0.02
10		24	- seam of rounded medium gravel		0.6			0.02
15		16	-wet, trace gray silty SAND		0.6			0.02
20			20.0 BOTTOM OF BORING					
25			OTHER TESTS = radiation levels in mrems/hr. LAB SAMPLE = composite from 5' - 15'					
30								
35								
40								
45								

COMPLETION DEPTH 20.0' WATER DEPTH 15.0' DATE 12-8-88

SAMPLER: 2" O.D. SPLIT BARREL SAMPLER

MONITORING WELL No. MW-4
PROJECT No. 88C1257
INSPECTED By CDG

ELEV. (Ft.) STICKUP (Ft)



2.27 TOP OF PROTECTIVE CASING

2.07 TOP OF INNER CASING (TIC)
MATERIAL: #40 PVC
DIAMETER: 4 inch

DEPTH BELOW GROUND SURFACE (Ft)

2.23 BOTTOM OF PROTECTIVE CASING
MATERIAL: Steel
DIAMETER: 6 inch
DESCRIPTION OF BACKFILL: cement/bentonite grout

DESCRIPTION OF BOREHOLE:
DIAMETER: 10 inch
METHOD DRILLED: HSA
DRILLING FLUID: None

5.00 TOP OF SEAL
DESCRIPTION: bentonite pellets - hydrated

7.00 BOTTOM OF SEAL / TOP OF FILTER PACK
DESCRIPTION: Morie #2 sand

8.50 TOP OF SCREEN
DIAMETER: 4 inch
SLOT SIZE: 0.020 inch
MATERIAL: #40 PVC

18.03 BOTTOM OF SCREEN/TOP OF BLANK SECTION

18.50 BOTTOM OF BLANK SECTION/BOTTOM OF WELL

20.0 BOTTOM OF FILTER PACK/BOTTOM OF BOREHOLE

GROUND WATER LEVEL
DEPTH FROM TIC 14.20
ELEVATION
DATE 12-8-88 TIME 1445

INSTALLATION
DATE OF COMPLETION 12-8-88 TIME 1230
DESCRIPTION OF DEVELOPMENT
compressed air for 1 hour

PROJECT: AWD/COKE
PROJECT NUMBER: 88C1257

MONITORING WELL REPORT

Fig.

LOG of BORING No. MW-5

Sheet 1 of 1

DATE 12/16/91 SURFACE ELEVATION _____ LOCATION _____

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	WELL	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	FIELD TEST	NMC, %	LL	PI	OVA (ppm)
0											
5		19		Reddish brown silty fine SAND							0
				Brown to gray clayey SILT	5.9						
10		15		Light gray to brown mottled CLAY	10.2						0
15		5		Dark gray mottled silty CLAY	14.9						0.4
20		10		Gray medium to fine silty SAND, wet	19.9						8
25		76		Gray to white silty fine SAND							0.2
					26.5						

Completion Depth: 26.5 Ft.

Project No.: _____

Project Name: ANNE ARUNDEL ORDNANCE ROAD

Drilling Method: MOBILE DRILL B-61

Water Depth: 20 ft., After COMP hrs.

_____ ft., After _____ hrs.

_____ ft., After _____ hrs.

_____ ft., After _____ hrs.

MONITORING WELL No. MW-5
PROJECT No. 91C1559
INSPECTED By C. GERBER

ELEV. (Ft.) STICKUP (Ft)

2.57 TOP OF PROTECTIVE CASING

2.27 TOP OF INNER CASING (TIC)
MATERIAL: PVC - SCHEDULE 40
DIAMETER: 4"

DEPTH BELOW GROUND SURFACE (Ft)

1.43 BOTTOM OF PROTECTIVE CASING
MATERIAL: PAINTED STEEL
DIAMETER: 6"
DESCRIPTION OF BACKFILL: CEMENT/BENTONITE GROUT

DESCRIPTION OF BOREHOLE:
DIAMETER: 8 1/4"
METHOD DRILLED: HOLLOW STEM AUGER
DRILLING FLUID: NONE

10.5 TOP OF SEAL
DESCRIPTION: HYDRATED BENTONITE PELLETS

13 BOTTOM OF SEAL / TOP OF FILTER PACK
DESCRIPTION: MEDIUM SAND

15 TOP OF SCREEN
DIAMETER: 4"
SLOT SIZE: 0.020"
MATERIAL: PVC - SCHEDULE 40

24.53 BOTTOM OF SCREEN/TOP OF BLANK SECTION

25 BOTTOM OF BLANK SECTION/BOTTOM OF WELL

27.5 BOTTOM OF FILTER PACK/BOTTOM OF BOREHOLE

GROUND WATER LEVEL
DEPTH FROM TIC 18.24
ELEVATION
DATE 12/18/91 TIME 11:22

INSTALLATION
DATE OF COMPLETION 12/16/91 TIME 11:00
DESCRIPTION OF DEVELOPMENT
HAND BAILED

PROJECT: ANNE ARUNDEL ORDANANCE ROAD
PROJECT NUMBER: 91C1559

MONITORING WELL REPORT

LOG of BORING No. MW-6

Sheet 1 of 1

DATE 12/16/91 SURFACE ELEVATION _____ LOCATION _____

DEPTH, ft.	SAMPLES	SAMPLING RESISTANCE	WELL	DESCRIPTION	STRATUM EL / DEPTH	SYMBOL	FIELD TEST	NMC, %	LL	PI	OVA (ppm)
0											
5		65		White to gray mottled fine sandy SILT							0.1
10		55		White fine SAND	9.9						1.0
15		26		- wet							0
20		31		White to tan medium SAND							1.0
					21.5						

Completion Depth: 21.5 Ft.

Project No.: _____

Project Name: ANNE ARUNDEL ORDNANCE ROAD

Drilling Method: MOBILE DRILL B-61

Water Depth: 15 ft., After COMP hrs.

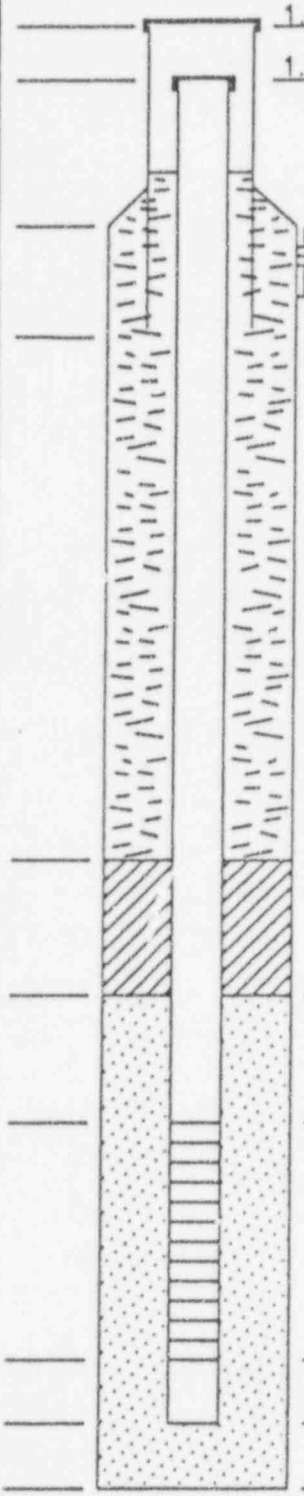
_____ ft., After _____ hrs.

_____ ft., After _____ hrs.

_____ ft., After _____ hrs.

MONITORING WELL No. MW-6
PROJECT No. 91C1559
INSPECTED By C.GERBER

ELEV. (Ft.) STICKUP (Ft)



1.95 TOP OF PROTECTIVE CASING

1.65 TOP OF INNER CASING (TIC)
MATERIAL: PVC - SCHEDULE 40
DIAMETER: 4"

DEPTH BELOW GROUND SURFACE (Ft)

3.05 BOTTOM OF PROTECTIVE CASING
MATERIAL: PAINTED STEEL
DIAMETER: 6"
DESCRIPTION OF BACKFILL: CEMENT/BENTONITE GROUT

DESCRIPTION OF BOREHOLE:
DIAMETER: 12 1/4"
METHOD DRILLED: HOLLOW STEM AUGER
DRILLING FLUID: MUNICIPAL WATER

6 TOP OF SEAL
DESCRIPTION: HYDRATED BENTONITE PELLETS

8 BOTTOM OF SEAL / TOP OF FILTER PACK
DESCRIPTION: MEDIUM SAND

10 TOP OF SCREEN
DIAMETER: 4"
SLOT SIZE: 0.020"
MATERIAL: PVC - SCHEDULE 40

19.53 BOTTOM OF SCREEN/TOP OF BLANK SECTION

20 BOTTOM OF BLANK SECTION/BOTTOM OF WELL

21.5 BOTTOM OF FILTER PACK/BOTTOM OF BOREHOLE

GROUND WATER LEVEL
DEPTH FROM TIC 18.25
ELEVATION
DATE 12/18/91 TIME 13:00

INSTALLATION
DATE OF COMPLETION 12/16/91 TIME 15:00
DESCRIPTION OF DEVELOPMENT
HAND BAILED 80 LITERS

PROJECT: ANNE ARUNDEL ORDANANCE ROAD
PROJECT NUMBER: 91C1559

MONITORING WELL REPORT

F 3

TABLE 16—*Continued*

	Thickness (feet)	Depth (feet)
AA-Ad 9		
Patapsco formation:		
Loam, sandy	34	34
Clay and gravel	14	48
Clay, white	15	63
Clay, red	14	77
Clay, blue	13	90
Sand and clay	59.5	149.5
AA-Ad 10		
Patapsco formation:		
Loam, sandy	20	20
Sand	9	29
Sand and gravel	9	38
Clay, white	9	47
Sand	55	102
Gravel, iron-cemented	6.5	108.5
AA-Ad 11		
Patapsco formation:		
Loam, sandy	20	20
Sand, coarse, sharp	10	30
Gravel	4	34
Clay, white	13	47
Sand and clay	48	95
Sand, fine (water)	11	106
Clay, sand, and gravel, white	22	128
Sand	23	151
Arundel clay:		
Clay, red	9	160
Arundel and Patuxent formations:		
Clay, brown	83	243
Patuxent formation:		
Sand	12	255
Clay, red	7	262
(Not reported)	38	300
AA-Ad 14		
Water	9	9
Recent deposits:		
River mud, soft	8	17
Patapsco formation:		
Clay	5	22
Sand, fine, trace of clay	13.5	35.5

TABLE 16—*Continued*

	Thickness (feet)	Depth (feet)
AA-Ad 15		
Water	24	24
Recent deposits:		
"River muck," soft	8	32
Patapsco formation:		
Sand, medium to hard	9	41
AA-Ad 16		
Patapsco formation:		
Loam, sandy	12	12
Sand and clay	58	70
Clay, red	5	75
Sand, coarse, sharp (water)	10	85
Sand; clay, red	43	128
Arundel clay:		
Clay, red	42	170
(Not reported)	12	182
AA-Ad 20		
Cretaceous sediments:		
Soil	4	4
Sand and gravel	68	72
Mud and sand	13	85
Clay, sandy, white	40	125
Sand, fine; mud	8	133
Clay, red and white	12	145
Sand, very fine	15	160
Sand, muddy	90	250
Clay, red	10	260
Clay, red and blue, tough	72	332
Clay, white	8	340
Clay, sandy, green	24	364
Sand, fine (water)	16	380
Sand, medium (water)	12	392
AA-Ae 4		
Pleistocene deposits:		
Clay, sandy	28	28
Patapsco formation:		
Clay, white, hard	34.7	62.7
Clay, sandy; brown streaks	20	82.7
Sand, white; drilled hard	5.3	88
Clay, hard	1.5	89.5

Table 11.—Selected logs of wells in the Baltimore area—Continued

Anne Arundel County	Thickness (feet)	Depth (feet)	Log type
Well AA Ad 98 (Altitude: 92 feet)			D
Sand	12	12	
Clay, red, white	6	18	
Clay, red, brown	6	24	
Clay, brown, sand	4	28	
Clay, gray	13	41	
Clay, red	6	47	
Clay, gray	22	69	
Clay, red	2	71	
Clay, white	2	73	
Clay, gray	4	77	
Clay, brown; sand, brown	6	83	
Sand, brown, white, coarse; gravel	13	96	
Sand; gravel; clay, white	5	101	
Clay, white	10	111	
Sand, brown, white, medium-coarse	12	123	
Sand; clay, white	4	127	
Clay, red, white	4	131	
Sand, brown, white, medium-fine	13	144	
Clay, white	7	151	
Sand, brown, white, coarse; gravel	12	163	
Sand, soft	.5	163.5	
Sand, brown, white, coarse	4.5	168	
Clay, white	1	169	
Sand, brown, white, coarse	16	185	
Sand; clay, pink	7	192	
Clay, red, white; sand	2	194	
Clay, white	7	201	
Clay, white; sand	14	215	
Clay, white	7	222	
Clay, red	3	225	
Clay, red, white	9	234	
Sand	1	235	
Clay, white	4	239	
Clay, white; sand	22	261	
Sand, brown, white, coarse-very coarse	10	271	
Clay, white	1.5	272.5	
Sand	.5	273	

Log type: D = Driller's log
G = Geologist's log from sample cuttings

Anne Arundel County (cont.)	Thickness (feet)	Depth (feet)	Log type
Well AA Ad 98 (cont.)			D
Sand, mixed; clay, white	12	285	
Sand, brown, white, fine-medium	9	294	
Sand; clay, white	1	295	
Sand, brown, white, coarse-very coarse	15	310	
Well AA Ad 99 (Altitude: 12 feet)			D
Clay, brown, white	7	7	
Sand	6	13	
Clay, white	1	14	
Clay, gray	2	16	
Clay, brown	2	18	
Sand	2	20	
Clay, gray	14	34	
Sand	1	35	
Clay, red	2	37	
Clay, gray, red	4	41	
Clay, gray	13	54	
Clay, white	1	55	
Clay, red, white	1	56	
Clay, red	4	60	
Clay, white	1	61	
Clay, brown	2	63	
Clay, white	2	65	
Sand, brown, white, coarse	17	82	
Clay, white	.6	82.6	
Sand. brown, white, coarse	2.4	85	
Clay, white	2	87	
Sand, white, medium-coarse	5	92	
Clay, white	7	99	
Rock	1	100	
Sand, white	2	102	
Clay, white	2	104	
Sand, white, brown; gravel	14	118	
Clay, white	1	119	
Sand, white, brown, medium	16	135	
Rock	6	141	
Sand, brown, medium	10	151	
Clay, white	4	155	
Sand; gravel	2	157	

Log type: D = Driller's log
G = Geologist's log from sample cuttings

Table 11.—Selected logs of wells in the Baltimore area—Continued

Anne Arundel County (cont.)	Thickness (feet)	Depth (feet)	Log type
Well AA Ad 99 (cont.)			D
Clay, white	5	162	
Sand	3	165	
Clay, white, brown; sand	7	172	
Rock	.4	172.4	
Clay, red	20.6	193	
Clay, white; sand	23	216	
Sand, brown, white, medium	9	225	
Clay, white	3	228	
Sand	2	230	
Clay, white	.6	230.6	
Sand	1.4	232	
Clay, white	3	235	
Sand, brown, white, fine	5	240	
Sand, brown, white, medium-coarse; clay streaks, white	19	259	
Clay, white	1	260	
Sand, brown, white, medium-coarse	5	265	
Clay, white	4	269	
Clay, white; sand	5	274	
Sand	3	277	
Clay, red, white	4	281	
Rock, soft	.4	281.4	
Clay, white; sand	10.6	292	
Sand	5	297	
Sand; clay, white	31	328	
Clay, white	8	336	
Sand	2	338	
Clay, white	2	340	
Sand	4	344	
Clay, white	.6	344.6	
Sand	1.4	346	
Clay, white	1	347	
Sand	8	355	
Clay, red, white	.6	355.6	
Sand	.4	356	
Clay, red, white	1	357	
Sand	3.2	360.2	
Clay, white	1.8	362	
Sand, water bearing	9	371	

Log type: D = Driller's log
G = Geologist's log from sample cuttings

Anne Arundel County (cont.)	Thickness (feet)	Depth (feet)	Log type
Well AA Ae 36 (Altitude: 30 feet)			D
Clay	39	39	
Sand	4	43	
Clay, sandy	43	86	
Sand	15	101	
Clay	16	117	
Sand	5	122	
Clay	30	152	
Sand	12	164	
Clay	18	182	
Sand	14	196	
Clay, sandy	18	214	
Clay, red	8	222	
Sand	13	235	
Clay, red	91	326	
Sand, white	96	422	
Clay, sandy	13	435	
Sand	71	506	
Clay	10	516	
Sand	8	524	
Clay	4	528	
Sand; gravel	29.5	557.5	
Clay; sand; mica	9.5	567	
Well AA Bd 97 (Altitude: 75 feet)			D
Top soil	3	3	
Sand, brown streaks; sandrock; clay, yellow, white	13	16	
Clay, white; sandrock	5	21	
Clay, white with streaks	2	23	
Clay, white; streaks of sand, white, fine	10	33	
Sand, white, fine	9	42	
Clay, white; streaks of sand, white, fine	13	55	
Sand, brown, medium	4	59	
Clay, white	2	61	
Sand, brown, coarse; gravel	1	62	
Clay, white; streaks of rock	34	96	
Clay, hard, red	4	100	
Clay, brown, white, hard	28	128	
Clay, brown, grey, hard	10	138	
Clay, gray streaks; sand	9	147	
	6	153	

Log type: D = Driller's log
G = Geologist's log from sample cuttings

EMERGENCY/TEMP NO. IF ANY

B 1 — SEQUENCE NO. (DP USE ONLY): 1282
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-88-1967
fill in this form completely

Date Received (APA): 01 30 89

OWNER INFORMATION

GOULDS INC
Last Name / Owner / First Name

BAYMEADOW Drive
Street or RFD

GLENBURNIE Md
Town / State / Zip

DRILLER INFORMATION

Bill Jefferys — License No. 407
Driller's Name

DELMARVA Drilling Co
Firm Name

Rt. 13 Bridgeville, Del.
Address

Bill Jeffrys — 1/24/89
Signature / Date

WELL INFORMATION

B 2

APPROX. PUMPING RATE (GAL. PER MIN.): 5

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): UNK

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

APPROXIMATE DEPTH OF WELL: 40 FEET

APPROXIMATE DIAMETER OF WELL: 4" 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
- S — THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D — THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE [LT] WRITE INITIALS IN BOX — PERMIT No AA-88-1967

SPECIAL CONDITIONS

LOCATION OF WELL

B 3

ANNE ARUNDEL
8 COUNTY

23 SUBDIVISION

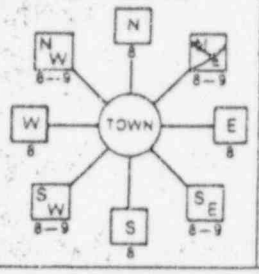
SECTION _____ LOT _____

GLEN BURNIE
52 NEAREST TOWN

MILES FROM TOWN (enter 0 if in town): 2 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



BAYMEADOW DRIVE
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)

100 DISTANCE FROM ROAD

ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

AA — 02
COUNTY NAME — COUNTY NO.

STATE SIGNATURE _____ INSERT S

DATE ISSUED: 01 30 89 — CO SIGNATURE: Treats — EXP DATE

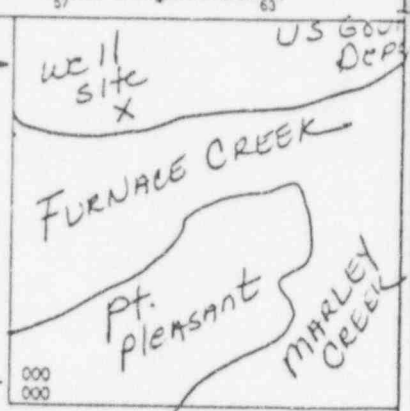
NORTH GRID: 4960000 — EAST GRID: 0919000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

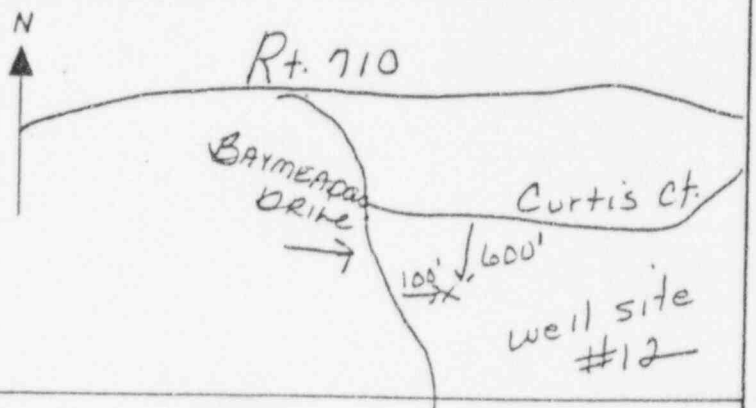
SOURCES OF DRILLING WATER
1. GOULDS INC
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 910
N 490



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



SEQUENCE NO. (DENV 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.

DATE Received: MAR 27 1989

DATE WELL COMPLETED: 03 01 89

COUNTY NUMBER: 02

Depth of Well: 60 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": AA-88-1967

OWNER: GOULDS INC.

STREET OR RFD: BAYMEADOW DRIVE

SUBDIVISION: _____ SECTION: _____ LOT: _____

TOWN: GLEN BURNIE, Md.

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
SILTY SAND	0	12	
CLAY	12	20	
SILTY CLAY	20	45	
SILTY CLAY & SAND	45	55	
SAND	55	60	

GROUTING RECORD

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

TYPE OF GROUTING MATERIAL

CEMENT **CM** BENTONITE CLAY **BC**

NO. OF BAGS 14 NO. OF POUNDS 1400

GALLONS OF WATER 84

DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. to 48 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	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	4	50

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 50	60
2		
3		

SLOT SIZE 1 0 2 3 0

DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 40 to 48

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

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

T (E.R.O.S.)

70 TELESCOPE CASING

72 LOG INDICATOR

74 75 76 OTHER DATA

C 3

PUMPING TEST

HOURS PUMPED (nearest hour) 1

PUMPING RATE (gal. per min. to nearest gal.) 3

METHOD USED TO MEASURE PUMPING RATE: Pail

WATER LEVEL (distance from land surface)

BEFORE PUMPING 21

WHEN PUMPING 37

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 EXCEPT HOME USE

TYPE OF PUMP INSTALLED

PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

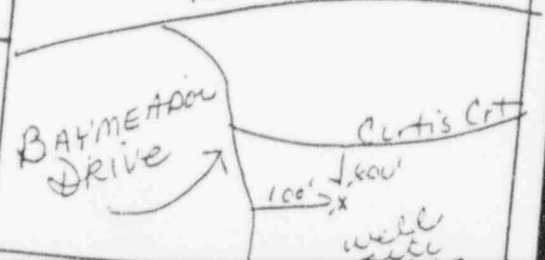
CASING HEIGHT (circle appropriate box and enter casing height): + above / − below LAND SURFACE

(nearest foot) 1

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)

Rte. 710



CIRCLE APPROPRIATE LETTER

WELL WAS ABANDONED AND SEALED

EN THIS WELL WAS COMPLETED

CTRIC LOG OBTAINED

WELL CONVERTED TO PRODUCTION

TIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN WITH COMAR 10.17.13 "WELL CONSTRUCTION" ORMANCE WITH ALL CONDITIONS STATED IN THE ONED PERMIT, AND THAT THE INFORMATION EREIN IS ACCURATE AND COMPLETE TO THE BEST EDGE.

DENT. NO. 407

GNATURE (WITH SIGNATURE ON APPLICATION)

ISOR (sign. of driller or journeyman r sitework if different from permittee)

C T 0145 SEQUENCE NO. (DENV 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 02

DATE Received MAR 27 1989

DATE WELL COMPLETED 03 01 89

Depth of Well 60 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-1967

OWNER GOULDS INC.

STREET OR RFD BAYMEADOW DRIVE (last name, first name) TOWN GLEN BURNIE, Md.

SUBDIVISION _____ 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
SILTY SAND	0	12	
CLAY	12	20	
SILTY CLAY	20	45	
SILTY CLAY + SAND	45	55	
SAND	55	60	

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

TYPE OF GROUTING MATERIAL

CEMENT CM BENTONITE CLAY BC

NO. OF BAGS 14 NO. OF POUNDS 1400

GALLONS OF WATER 84

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. to 48 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	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	4	50

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	50	60
2			
3			

SLOT SIZE 1 0 2 3 0

DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 60 to 48

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

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

T TELESCOPE CASING

(E.R.O.S.) LOG INDICATOR

WQ OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1

PUMPING RATE (gal. per min. to nearest gal.) 3

METHOD USED TO MEASURE PUMPING RATE Pail

WATER LEVEL (distance from land surface)

BEFORE PUMPING 21

WHEN PUMPING 27

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 EXCEPT HOME USE

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX SEE ABOVE:

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 LAND SURFACE

− below (nearest foot) 1

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 10.17.13 "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.

DRILLER'S IDENT. NO. 407

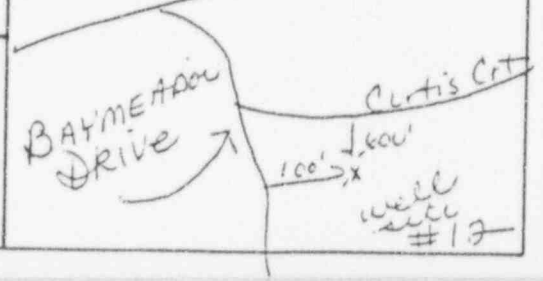
DRILLERS SIGNATURE Bill Griffith
(MUST MATCH SIGNATURE ON APPLICATION)

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

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)

N

Rte. 710



C1 3261 (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-8 ON ALL CARDS) — SEQUENCE NO. (DENV USE ONLY)

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

ST/CO USE ONLY
DATE Received 11/15/90

DATE WELL COMPLETED 10/15/90

Depth of Well 13 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-BB-5267

OWNER MD. STATE HIGHWAY ADMIN.
STREET OR RFD 2323 W. JOPPA RD (last name, first name) TOWN TOWSON MD
SUBDIVISION GLEN BURNIE 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
VARICOLORED SILT AND SAND	0	10.5	5'6" WATER
GRAY SAND	10.5	13	

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) Y N
TYPE OF GROUTING MATERIAL
CEMENT CM BENTONITE CLAY BC
NO. OF BAGS 1 NO. OF POUNDS 50
GALLONS OF WATER N/A
DEPTH OF GROUT SEAL (to nearest foot) from 5 ft. to 0 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	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	13

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

C2

EACH SCREEN

	DEPTH (nearest ft.)		
1	PL	13	3
2			
3			

SLOT SIZE .06 1/2 3
DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK from 13' to 3'
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX AA

C3 MONITORING WELL

PUMPING TEST N/A
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min. to nearest gal.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING
WHEN PUMPING
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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE
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 (nearest foot)

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

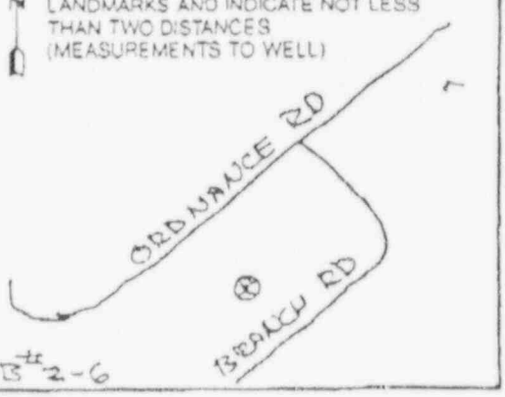
DRILLERS IDENT. NO. 0994

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

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

OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (B.R.O.S.) W.O.
TELESCOPE CASING — LOG INDICATOR — OTHER DATA

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)



ORIGINAL

C 1 | 3262 | SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received 11/15/90

DATE WELL COMPLETED 10/16/90

Depth of Well 13 ft (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-BB-5245

OWNER MD STATE HIGHWAY ADMIN. (last name, first name)

STREET OR RFD 2323 W. JOPPA RD TOWN TOWSON

SUBDIVISION GLEN BURNIE 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
BROWN SAND	0	9'	9' WATER
VARICOLORED SAND WITH LENSES OF CEMENTED SAND	9'	13'	

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) (Y) N

TYPE OF GROUTING MATERIAL

CEMENT CM BENTONITE CLAY BC

NO. OF BAGS 1 NO. OF POUNDS 50

GALLONS OF WATER

DEPTH OF GROUT SEAL (to nearest foot) from 3 ft. to 0 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	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	13

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

EACH SCREEN

		DEPTH (nearest ft.)	
1	PL	13	3
2			
3			

SLOT SIZE .006

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK from 13 to 3

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

C 3 — MONITORING WELL

PUMPING TEST

HOURS PUMPED (nearest hour)

PUMPING RATE (gal. per min. to nearest gal.)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING

WHEN PUMPING

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 EXCEPT HOME USE

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:

CAPACITY GALLONS PER MINUTE (to nearest gallon)

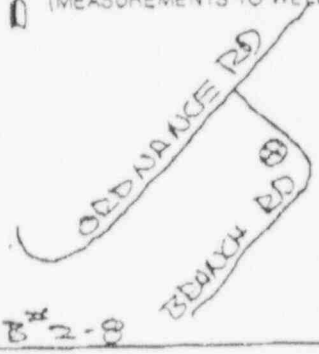
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height) + above – below LAND SURFACE (nearest foot)

C 2

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)



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

DRILLERS IDENT. NO. 0994

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION) Norbert Myers

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

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

T TELESCOPE CASING (EROS) LOG INDICATOR W.O. OTHER DATA

ORIGINAL

C 1 | 3263 | SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received 11/15/90

DATE WELL COMPLETED 10/16/90

Depth of Well 191 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-BB-5269

OWNER Md State Highway Administration (last name / first name)
STREET OR RFD 2323 W. Hoppes Rd TOWN Brookland Village
SUBDIVISION 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
Brown Sand	0.0'		
Trace of			✓
Silty Clay		13.0'	
Brown Sand	13.0'		
Trace of			✓
Silty Clay			
Trace of			
Gravel		20.5'	

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) YES: Y NO: N
TYPE OF GROUTING MATERIAL
CEMENT CM BENTONITE CLAY BC
NO OF BAGS 1 NO OF POUNDS 50
GALLONS OF WATER
DEPTH OF GROUT SEAL (to nearest foot)
from 4' ft. to 0 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	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2"	19'

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	14'	4'
2			
3			

SLOT SIZE 010
DIAMETER OF SCREEN 2" (NEAREST INCH)

GRAVEL PACK from 19' to 4'
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

C 3 MONITORING WELL

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min. to nearest gal.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING
WHEN PUMPING
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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE
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 (nearest foot)

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

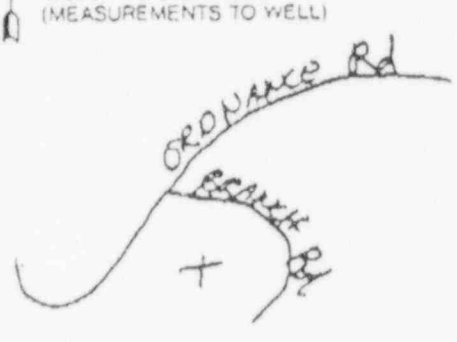
I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE

DRILLERS IDENT NO. 0994

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
Phillip D. Slifer

SITE SUPERVISOR (signature of driller or journeyman responsible for allwork if different from permittee)

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)



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

ORIGINAL

B 1 — SEQUENCE NO. (DP USE ONLY) (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-88-9046
fill in this form completely

Date Received (APA): 12/21/92

OWNER INFORMATION

BRANDT US ARMY RES.
Last Name / Owner / First Name

700 EAST ORDNANCE RD
Street or RFD

BALTIMORE MD 21226
Town / State / Zip

DRILLER INFORMATION

Michael N Ebert — 519
Driller's Name — License No.

C.W. Ober + Son
Firm Name

1364 Rockridge Rd. Forestville Md 20747
Address

Michael N Ebert — 12-21-92
Signature — Date

LOCATION OF WELL

B 3

ANNE ARUNDEL
COUNTY

SUBDIVISION

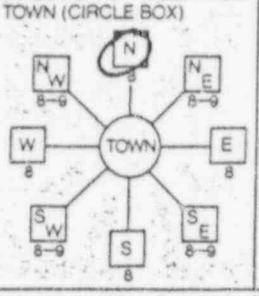
SECTION — LOT

BALTIMORE
NEAREST TOWN

MILES FROM TOWN (enter 0 if in town): 1 MI

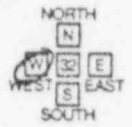
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



Ordnance Rd
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



DISTANCE FROM ROAD: 440
ENTER FT or MI: FT

WELL INFORMATION

2

APPROX. PUMPING RATE (GAL. PER MIN.)

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

AA — COUNTY NAME — COUNTY NO.

STATE SIGNATURE — INSERT S

DATE ISSUED: 12/21/92 — CO SIGNATURE — EXP. DATE

NORTH GRID: 4980000 — EAST GRID: 0915000

APPROXIMATE DEPTH OF WELL: 240 FEET

APPROXIMATE DIAMETER OF WELL: 4 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

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

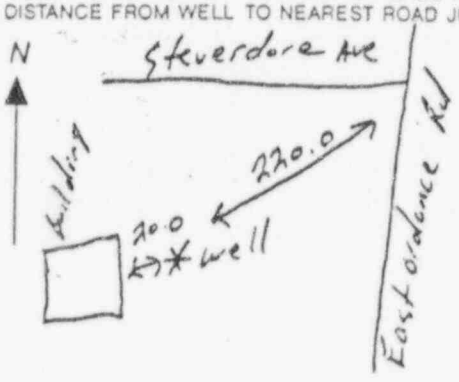
E 498
N 915
000 000

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
- S — THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D — THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

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 (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: JS (WRITE INITIALS IN BOX) PERMIT No. AA-88-9046

SPECIAL CONDITIONS

ORIGINAL

C 1 [illegible] SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received FEB 1 1 1993

DATE WELL COMPLETED 01 16 93

Depth of Well 45 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-90446

OWNER Brandt US Army Reserve

STREET OR RFD 700 last name East Ordance Rd first name TOWN Baltimore md 21226

SUBDIVISION _____ 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
orange sand + gravel	0	20	
White clay	20	35	
orange sand	35	45	✓

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

TYPE OF GROUTING MATERIAL

CEMENT CM BENTONITE CLAY BC

NO. OF BAGS 4 NO. OF POUNDS 160

GALLONS OF WATER 30

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. (TOP) to 23 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	4	25

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	25	45
2			
3			

SLOT SIZE .020 2 _____ 3 _____

DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 23.0 to 45.0

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1

PUMPING RATE (gal. per min. to nearest gal.) 1

METHOD USED TO MEASURE PUMPING RATE Timer

WATER LEVEL (distance from land surface)

BEFORE PUMPING 35

WHEN PUMPING 41

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 EXCEPT HOME USE

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:

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 0 (nearest foot)

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

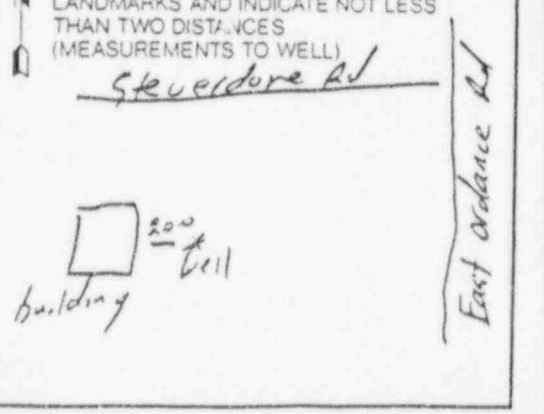
I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRINTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. MD 519

DRILLER'S SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION) Michael Mitchell

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

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)



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

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

B 1 [ ] SEQUENCE NO. (DP USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-188-9047
fill in this form completely

Date Received (APA): 12/21/92

OWNER INFORMATION

BRANDT US ARMY RES
Last Name — Owner — First Name

700 EAST ORDANCE RD
Street or RFD

BALTIMORE MD 21226
Town — State — Zip

DRILLER INFORMATION

Michael N Ebert — 519
Driller's Name — License No.

C.W. OVER + Son, MD 21084
Firm Name

1364 Rock Ridge Rd Jarrettsville
Address

Michael N Ebert — 12-21-92
Signature — Date

B 2 — WELL INFORMATION

APPROX. PUMPING RATE (GAL. PER MIN.): 1

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY): 1

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

APPROXIMATE DEPTH OF WELL: 40 FEET

APPROXIMATE DIAMETER OF WELL: 4 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
- S — THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D — THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

FORCE: /S (WRITE INITIALS IN BOX) PERMIT No. AA-88-9047

B 3 — LOCATION OF WELL

ANNE ARUNDEL
COUNTY

SUBDIVISION

SECTION — LOT

BALTIMORE
NEAREST TOWN

MILES FROM TOWN (enter 0 if in town): 1 M I

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NW, NE, W, TOWN, E, SW, S, SE

Ordanace Rd
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH, WEST, EAST, SOUTH

DISTANCE FROM ROAD: 300

ENTER FT or MI: FT

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA — COUNTY NO.: 02

STATE SIGNATURE — INSERT S

DATE ISSUED: 12/21/92 — CO SIGNATURE — EXP. DATE

NORTH GRID: 49800 — EAST GRID: 0913000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

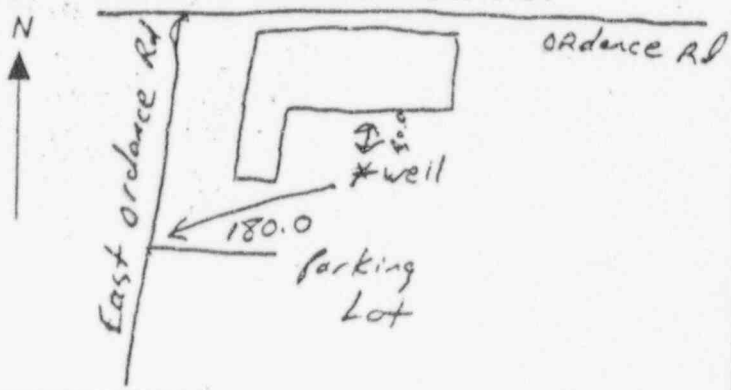
SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 498
N 915
000 000

X

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



SPECIAL CONDITIONS

ORIGINAL

C 1 | 6638 | SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received FEB 1 1993

DATE WELL COMPLETED 01/16/93

Depth of Well 35 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-88-9047

OWNER Brandt U.S ARMY Reserve
STREET OR RFD 200 East ORdance Rd. (last name) (first name) TOWN Baltimore md 21226
SUBDIVISION _____ 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
orange sand	0	25	
orange sand	25	30	✓
White clay	30	35	✓

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) YES (Y) no (N)
TYPE OF GROUTING MATERIAL
CEMENT (CM) BENTONITE CLAY (BC)
NO. OF BAGS 4 NO. OF POUNDS 160
GALLONS OF WATER 80
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 13 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	4	15

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	15	35
2			
3			

SLOT SIZE 1 .020 2 _____ 3 _____
DIAMETER OF SCREEN 4 (NEAREST INCH)

GRAVEL PACK from 13.0 to 35.0
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

C 3

PUMPING TEST
HOURS PUMPED (nearest hour) 1
PUMPING RATE (gal. per min. to nearest gal.) 3
METHOD USED TO MEASURE PUMPING RATE Timer
WATER LEVEL (distance from land surface)
BEFORE PUMPING 25
WHEN PUMPING 30

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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
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
0 (nearest foot)

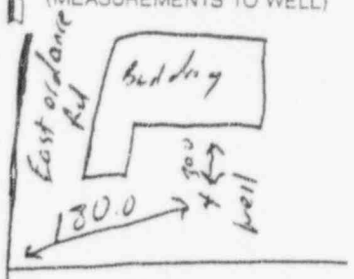
CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

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.

DRILLERS IDENT. NO. MWD 519
Michael Nathan Rhea
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

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

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)



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

Rec'd

B 1 08229 SEQUENCE NO. (DP USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-92-0830
fill in this form completely

Date Received (APA): 931206 02

OWNER INFORMATION

Last Name / Owner / First Name: HAMMS
Street or RFD: PO BOX 5
Town: PASADENA State: MD Zip: 21122

DRILLER INFORMATION

Driller's Name: RICHARD D SIES SI License No.: 028
Firm Name: NFE INC
Address: 3401 CARLINS PARK DR BALTO MD 21215
Signature: Richard D Sies Sr Date: 11-12-93

B 2 WELL INFORMATION MONITORING WELL

APPROX. PUMPING RATE (GAL. PER MIN.)
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY) N/A

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

APPROXIMATE DEPTH OF WELL 20 FEET

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
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

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

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: GAP

SOURCE: 15 WRITE INITIALS IN BOX PERMIT No. AA-92-0830

SPECIAL CONDITIONS

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL
SUBDIVISION:
SECTION LOT
NEAREST TOWN: BROOKLYN
MILES FROM TOWN (enter 0 if in town): 2 MI

B 4 DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NW, NE, W, E, SW, (S), SE

NEAR WHAT ROAD: ORDNANCE RD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH, WEST, (EAST), SOUTH

DISTANCE FROM ROAD: 150
ENTER FT or MI: FT

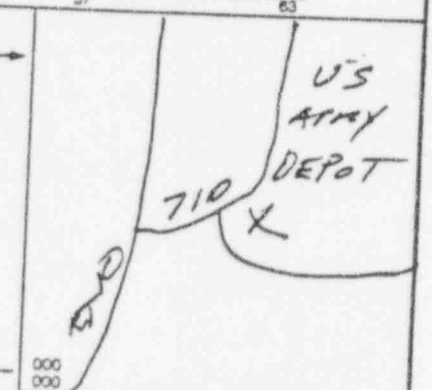
NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02
STATE SIGNATURE INSERT S
DATE ISSUED: 120793 CO. SIGNATURE EXP. DATE
NORTH GRID: 495000 EAST GRID: 0915000

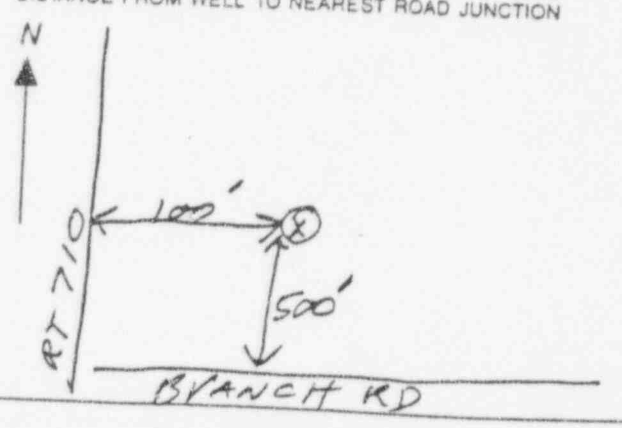
SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE
E 910.000
N 490.000



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



MW-1

ORIGINAL

C1 5184 SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received JAN 3 1994

DATE WELL COMPLETED 12 28 93

Depth of Well 30 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-92-0833

OWNER HAYES
STREET OR RFD PO BOX 5 (last name) (first name) TOWN PASADENA MD 21122
SUBDIVISION _____ 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
		20.0	✓
TAN SAND	0.0	30.0	

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes (Y) no (N)
TYPE OF GROUTING MATERIAL
CEMENT (CM) BENTONITE CLAY (BC)
NO. OF BAGS 1 NO. OF POUNDS 50
GALLONS OF WATER 4
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. to 3 ft. (enter 0 if from surface)

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

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	5

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

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

C2

EACH SCREEN	DEPTH (nearest ft.)	
1	PL	5 30
2		
3		

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

GRAVEL PACK from 3 to 30
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

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

C3 MONITORING WELL N/A

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min. to nearest gal.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING
WHEN PUMPING
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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED
PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
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
2 (nearest foot)

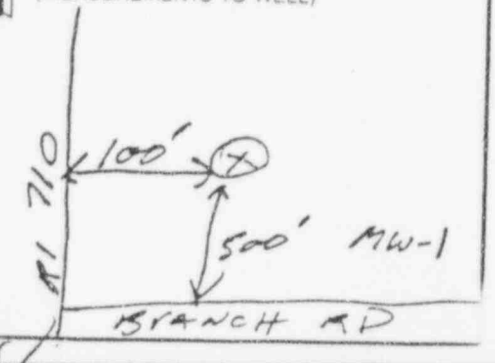
CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

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.

DRILLERS IDENT. NO. 028
Richard P. Klein Sr.
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

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

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)



B 1 08228 SEQUENCE NO. (DP USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER AA-92-0833
fill in this form completely

Date Received (APA) 9 3 1 2 0 6 06

B 3 LOCATION OF WELL

OWNER INFORMATION

HARMS
Last Name | Owner | First Name

PO BOX 15
Street or RFD

PASADENA MD 21122
Town | State | Zip

ANNE ARUNDEL
COUNTY

SUBDIVISION

SECTION | LOT

BROOKLYN
NEAREST TOWN

MILES FROM TOWN (enter 0 if in town) 2 MI

DRILLER INFORMATION

RICHARD D SIES SR 028
Driller's Name | License No.

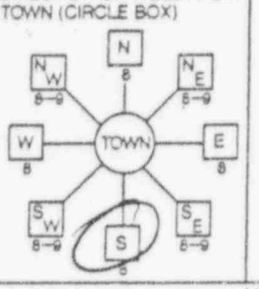
NFE INC
Firm Name

3401 CATLINS PARK DR BALTO MD 21215
Address

Richard D. Sies Sr 11-12-93
Signature | Date

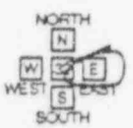
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX)



ORDNANCE RD
NEAR WHAT ROAD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX)



250
DISTANCE FROM ROAD

ENTER FT or MI F

B 2 WELL INFORMATION MONITORING WELL

APPROX. PUMPING RATE (GAL. PER MIN.)

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

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

AA
COUNTY NAME | COUNTY NO. 02

STATE SIGNATURE | INSERT S

DATE ISSUED 12 07 93 | EXP. DATE

NORTH GRID 49500 | EAST GRID 0911500

APPROXIMATE DEPTH OF WELL 20 FEET

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

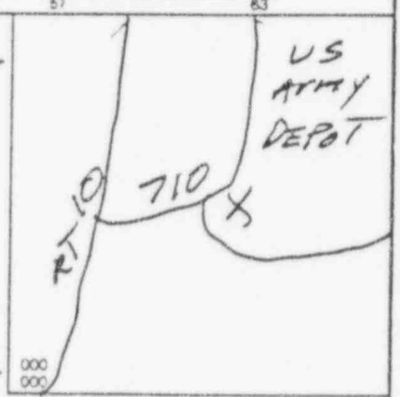
other

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE

E 910.000
N 490.000

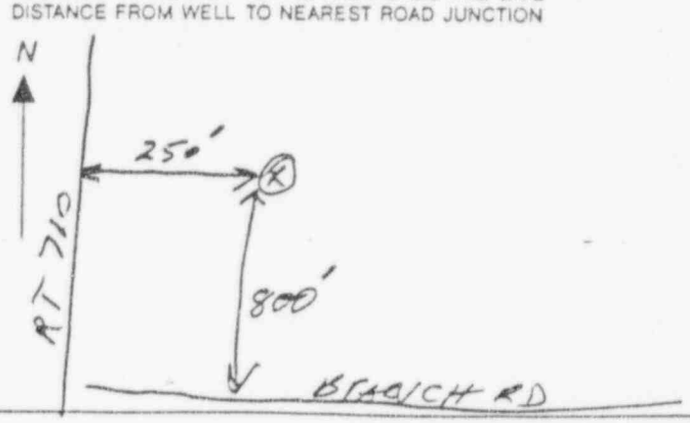


REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

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 (OEP USE ONLY)

APPROP. PERMIT NUMBER GAP

FORCE J/S WRITE INITIALS IN BOX PERMIT No AA-92-0833

SPECIAL CONDITIONS

MW-2

ORIGINAL

C 1 | 5137 | SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received JAN 3 1991

DATE WELL COMPLETED 12/28/89

Depth of Well 20 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-92-0630

OWNER HARRIS
STREET OR RFD Box 5 (last name) (first name)
TOWN PASADENA MD 21122
SUBDIVISION _____ 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
		10.0	✓
TAN SAND	0.0	20.0	

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) — yes (Y) / no (N)
TYPE OF GROUTING MATERIAL
CEMENT (CM) BENTONITE CLAY (BC)
NO. OF BAGS 1 NO. OF POUNDS 50
GALLONS OF WATER _____
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 3 ft. (BOTTOM)
(enter 0 if from surface)

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

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	5

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

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

C 2

EACH SCREEN		DEPTH (nearest ft.)	
1	PL	5	20
2			
3			

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

GRAVEL PACK from 3 to 20.0
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

C 3 MONITORING WELL N/A

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min. to nearest gal.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING
WHEN PUMPING
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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED
PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
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 (nearest foot) 2

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

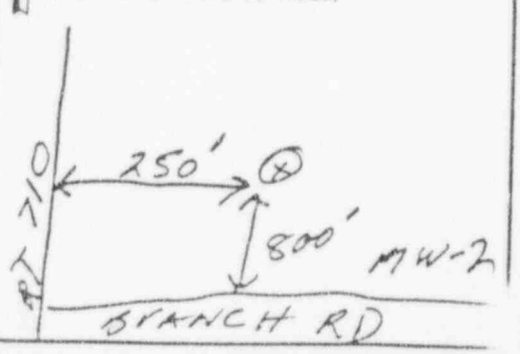
I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 028
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION) Richard D. Lisk

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

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

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)



EMERGENCY/TEMP NO IF ANY

B	1	08226	SEQUENCE NO. (DP USE ONLY)

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

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-92-0834
fill in this form completely

Date Received (APA): 931206   05 KH

OWNER INFORMATION

Last Name / Owner / First Name: HARMS
Street or RFD: PO BOX 5
Town: PASADENA   State: MD   Zip: 21122

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL
SUBDIVISION:
SECTION: LOT:
NEAREST TOWN: BROOKLYN
MILES FROM TOWN (enter 0 if in town): 2 MI

DRILLER INFORMATION

Driller's Name: RICHARD D SIESS JR   License No.: 028
Firm Name: NFE INC
Address: 3401 CARLINS PARK Dr BALTO MD 21215
Signature: [signature]   Date: 11-12-93

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): N, NE, E, SE, S, SW, W, NW — S circled

NEAR WHAT ROAD: ORDNANCE RD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH / EAST / SOUTH / WEST — E circled

DISTANCE FROM ROAD: 400   ENTER FT or MI: FT

B 2 WELL INFORMATION MONITORING WELL

APPROX. PUMPING RATE (GAL. PER MIN.): N/A
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY):

NOT TO BE FILLED IN BY DRILLER — HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA   COUNTY NO.: 02
STATE SIGNATURE: INSERT S
DATE ISSUED: 120793   CO. SIGNATURE: [signature]   EXP. DATE
NORTH GRID: 495000   EAST GRID: 0915000

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

APPROXIMATE DEPTH OF WELL: 20 FEET

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

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

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

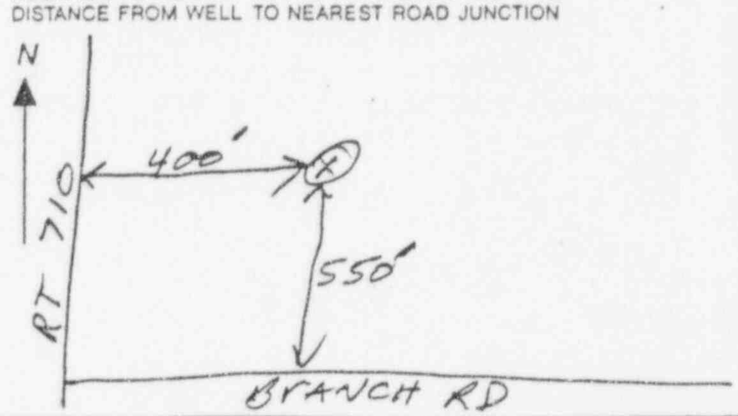
WRITE THE BOX NUMBER FROM THE MAP HERE
E 910.000
N 490.000

REPLACEMENT OR DEEPENED WELLS (CIRCLE APPROPRIATE BOX)

- N THIS WELL WILL NOT REPLACE AN EXISTING WELL — circled
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE):

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 (OEP USE ONLY)

APPROP. PERMIT NUMBER: G A P

FORCE: TS (WRITE INITIALS IN BOX)   PERMIT No.: AA-92-0834

SPECIAL CONDITIONS   MW-3

ORIGINAL

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

C 1 5183 SEQUENCE NO. (DENV USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

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

COUNTY NUMBER

ST/CO USE ONLY
DATE Received: JAN - 3 1994

DATE WELL COMPLETED: 1 2 2 9 9 3

Depth of Well: 2 0 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": AA-92-0834

OWNER: HARMS
STREET OR RFD: PO BOX 5 (last name / first name)
TOWN: PASADENA MD 21122
SUBDIVISION: ______ 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
		13.0	✓
TAN SAND	0.0	20	

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.

DRILLERS IDENT. NO. 028

Richard Dobbins Sr.
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

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: CEMENT **(C M)** BENTONITE CLAY B C

NO. OF BAGS: 1 NO. OF POUNDS: 50
GALLONS OF WATER: 4

DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. (TOP) to 3 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	5

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.)

	Type	From	To
1	PL	5	20
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN: 2 (NEAREST INCH)

GRAVEL PACK from 3 to 20

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

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

C 3 MONITORING WELL

N/A

PUMPING TEST
- HOURS PUMPED (nearest hour)
- PUMPING RATE (gal. per min. to nearest gal.)
- METHOD USED TO MEASURE PUMPING RATE
- WATER LEVEL (distance from land surface): BEFORE PUMPING / WHEN PUMPING

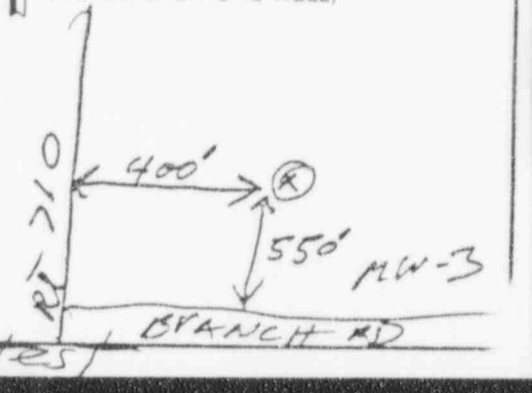
TYPE OF PUMP USED (for test): A air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

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

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS EXCEPT HOME USE

- TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
- 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: 2 (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)



ORIGINAL

B 1 08227 SEQUENCE NO. (DP USE ONLY)
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
APPLICATION FOR PERMIT TO DRILL WELL
please print or type

STATE PERMIT NUMBER: AA-92-0832
fill in this form completely

Date Received (APA): 931206

OWNER INFORMATION

Last Name / Owner / First Name: HARMS
Street or RFD: PO BOX 5
Town: PASADENA State: MD Zip: 21122

DRILLER INFORMATION

Driller's Name: RICHARD DSIES SR License No.: 0281
Firm Name: NFE INC
Address: 3401 CAYLINS PARK DR BALTO MD 21215
Signature: [signature] Date: 11-12-93

B 2 WELL INFORMATION MONITORING WELL

APPROX. PUMPING RATE (GAL. PER MIN.) N/A
AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

APPROXIMATE DEPTH OF WELL: 20 FEET

APPROXIMATE DIAMETER OF WELL: 2 NEAREST INCH

METHOD OF DRILLING (circle one)

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

REPLACEMENT OR DEEPENED WELLS
(CIRCLE APPROPRIATE BOX)

- **(N circled)** THIS WELL WILL NOT REPLACE AN EXISTING WELL
- Y THIS WELL WILL REPLACE A WELL THAT WILL BE ABANDONED AND SEALED
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER: G A P
FORCE: JS (WRITE INITIALS IN BOX) PERMIT No: AA-92-0833

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL
SUBDIVISION:
SECTION: LOT:
NEAREST TOWN: BROOKLYN
MILES FROM TOWN (enter 0 if in town): 2 MI

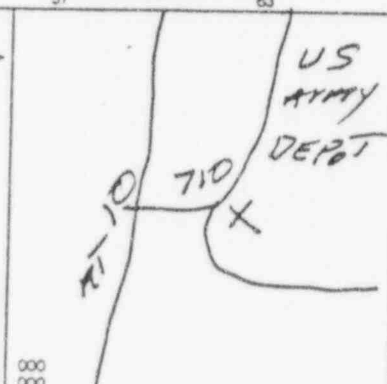
B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): S (circled)
NEAR WHAT ROAD: ORDNANCE RD
ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): E (circled)
DISTANCE FROM ROAD: 650 ENTER FT or MI: FT

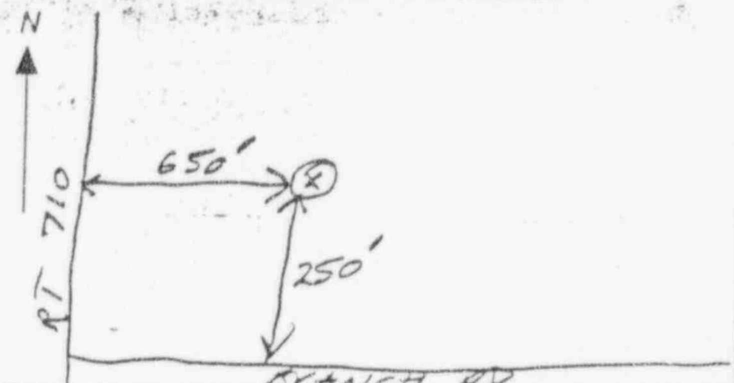
NOT TO BE FILLED IN BY DRILLER
HEALTH DEPARTMENT APPROVAL

COUNTY NAME: AA COUNTY NO.: 02
STATE SIGNATURE: INSERT S
DATE ISSUED: 120793 CO. SIGNATURE: [signature] EXP. DATE
NORTH GRID: 495000 EAST GRID: 915000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X
SOURCES OF DRILLING WATER
1.
2.
3.
WRITE THE BOX NUMBER FROM THE MAP HERE
E 910.000
N 490.000



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



SPECIAL CONDITIONS

MW-4

ORIGINAL

C 1 5185 SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received JAN - 3 1994

DATE WELL COMPLETED 12 29 93

Depth of Well 20 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL" AA-92-0332

OWNER HARMS
STREET OR RFD PO last name BOX 5 first name TOWN PASADENA MD 21122
SUBDIVISION 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
		15.0	✓
TAN SAND	0.0	20	

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) (Y) N
TYPE OF GROUTING MATERIAL
CEMENT (CM) BENTONITE CLAY BC
NO. OF BAGS 1 NO. OF POUNDS 50
GALLONS OF WATER 4
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. to 5 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	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	5

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

	TYPE	DEPTH (nearest ft.) from	to
1	PL	5	20
2			
3			

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

GRAVEL PACK from 3 to 20
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

C 3 MONITORING WELL N/A

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min. to nearest gal.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING
WHEN PUMPING
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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
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 2 (nearest foot)

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

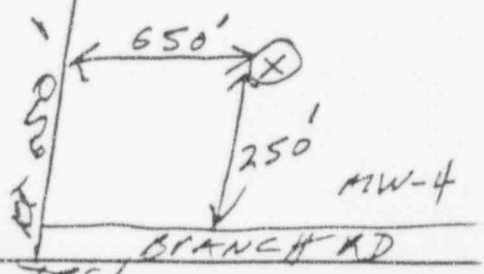
I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS IDENT. NO. 028
Richard P. Lin Jr
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

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

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

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)



ORIGINAL

EMERGENCY/TEMP NO IF ANY

B 1 ·0822·5 SEQUENCE NO. (DP USE ONLY) (THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)	STATE OF MARYLAND APPLICATION FOR PERMIT TO DRILL WELL please print or type	STATE PERMIT NUMBER AA-92-0831 fill in this form completely

Date Received (APA) 931206 03 [illegible]

OWNER INFORMATION

HARMS — Last Name / Owner / First Name
PO BOX 5 — Street or RFD
PASADENA MD 21122 — Town / State / Zip

DRILLER INFORMATION

Driller's Name: RICHARD D. SIES SR — License No. 028
Firm Name: NFE INC
Address: 3401 CARLINS PARK DR BALTO MD 21215
Signature: Richard D Sies Jr — Date: 11-12-93

B 2 WELL INFORMATION MONITORING WELL

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

AVERAGE DAILY QUANTITY NEEDED (GAL. PER DAY)

USE FOR WATER (CIRCLE APPROPRIATE BOX)

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

APPROXIMATE DEPTH OF WELL 20 FEET

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
- S THIS WELL WILL REPLACE A WELL THAT WILL BE USED AS A STANDBY
- D THIS WELL WILL DEEPEN AN EXISTING WELL

PERMIT NUMBER OF WELL TO BE REPLACED OR DEEPENDED (IF AVAILABLE)

Not to be filled in by driller (OEP USE ONLY)

APPROP. PERMIT NUMBER GAP

FORCE JS WRITE INITIALS IN BOX PERMIT No. AA-92-0831

B 3 LOCATION OF WELL

COUNTY: ANNE ARUNDEL
SUBDIVISION:
SECTION ____ LOT ____
NEAREST TOWN: BROOKLYN
MILES FROM TOWN (enter 0 if in town) 2 MI

B 4

DIRECTION OF WELL FROM TOWN (CIRCLE BOX): NW N NE W TOWN E SW **(S)** SE

NEAR WHAT ROAD: ORDNANCE RD

ON WHICH SIDE OF ROAD (CIRCLE APPROPRIATE BOX): NORTH N, WEST W, 32, **(E)** EAST, S SOUTH

DISTANCE FROM ROAD 290 ENTER FT or MI FT

NOT TO BE FILLED IN BY DRILLER HEALTH DEPARTMENT APPROVAL

COUNTY NAME AA COUNTY NO. 02

STATE SIGNATURE ____ INSERT S

DATE ISSUED 120793 SIGNATURE [signature] EXP. DATE

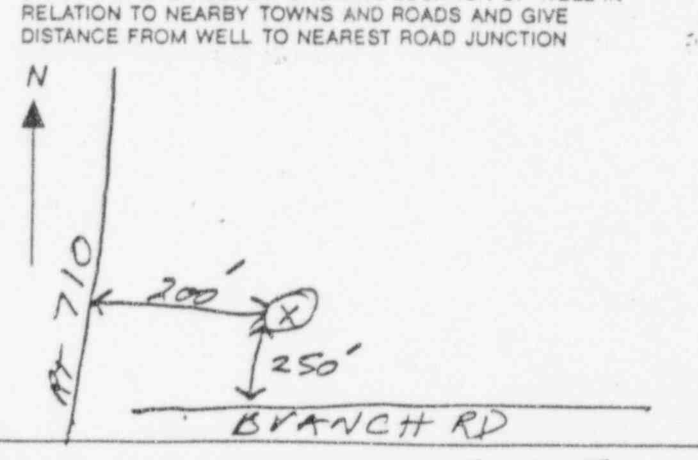
NORTH GRID 495000 EAST GRID 0915000

SHOW MAJOR FEATURES OF BOX & LOCATE WELL WITH AN X

SOURCES OF DRILLING WATER
1.
2.
3.

WRITE THE BOX NUMBER FROM THE MAP HERE
E 910.000
N 490.000

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



SPECIAL CONDITIONS

MW-5

ORIGINAL

C 1 ... 5186 SEQUENCE NO. (DENV 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

ST/CO USE ONLY
DATE Received: JAN 4 3 1994

DATE WELL COMPLETED: 1 2 2 9 9 3

Depth of Well: 1 0 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": AA-92-0831

OWNER: Harms (last name) first name
STREET OR RFD: PO BOX 5 TOWN: PESEDENA MD 21122
SUBDIVISION ______ 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
		5.0	✓
TAN SILTY SAND	0.0	10.0	

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.

DRILLERS IDENT. NO. 028

Richard D. [signature] Sr.
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

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: CEMENT **(CM)** BENTONITE CLAY BC
NO. OF BAGS 1 NO. OF POUNDS 50
GALLONS OF WATER 4
DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. (TOP) to 3 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	5

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	Type	DEPTH (nearest ft.) from	to
1	PL	5	10
2			
3			

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

GRAVEL PACK from 3 to 10
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

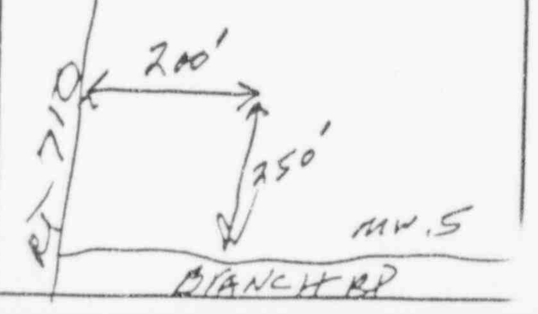
OEP USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T TELESCOPE CASING; (E.R.O.S.) LOG INDICATOR; W Q OTHER DATA

C 3 MONITORING WELL
N/A

PUMPING TEST
HOURS PUMPED (nearest hour)
PUMPING RATE (gal. per min. to nearest gal.)
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING
WHEN PUMPING
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 EXCEPT HOME USE
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX - SEE ABOVE:
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: 2 (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
HYDRAULIC DATA

RUST Environment & Infrastructure
COLUMBIA, SOUTH CAROLINA

HORIZONTAL HYDRAULIC CONDUCTIVITY
Method of Bouwer and Rice, 1976
After H. Bouwer, 1989

PROJECT NAME: DNSC Curtis Bay Depot
CITY, STATE : Baltimore, Maryland
PROJECT NO. : 86345

WELL NUMBER : MW-3
DATE OF TEST: 09-NOV-94
TEST BY : D.MAXAM

WELL/AQUIFER DATA - PARTIALLY PENETRATING WELL

Casing Diameter (in)	=	4.00
Borehole Diameter (in)	=	6.00
Depth to Top of Screen (ft)	=	25.00
Depth to Bottom of Screen (ft)	=	34.53
Depth to Static Water Level (ft)	=	25.33
Depth to Lower Confining Unit (ft)	=	44.20
Assumed Filter Pack Porosity (frac)	=	0.30

EQUATION PARAMETERS

req = Well Radius taking into account the filter pack (ft)	=	0.20
rw = Radius of the borehole (ft)	=	0.25
Le = Length of well through which water enters (ft)	=	9.20
Lw = Distance from water table to bottom of screen (ft)	=	9.20
H = Distance from water table to lower confining unit (ft)	=	18.87
A = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	2.8
B = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	0.45
Re = Effective radius over which headloss (y) is dissipated (ft)	=	2.62
yo = Change in head at time (t)=0, (ft)	=	0.75
yt = Change in head at time t, (ft)	=	0.20
t = Elasped time at which head change = yt,	=	1.8
Units of time as measured in the field	=	MIN

KEY EQUATIONS

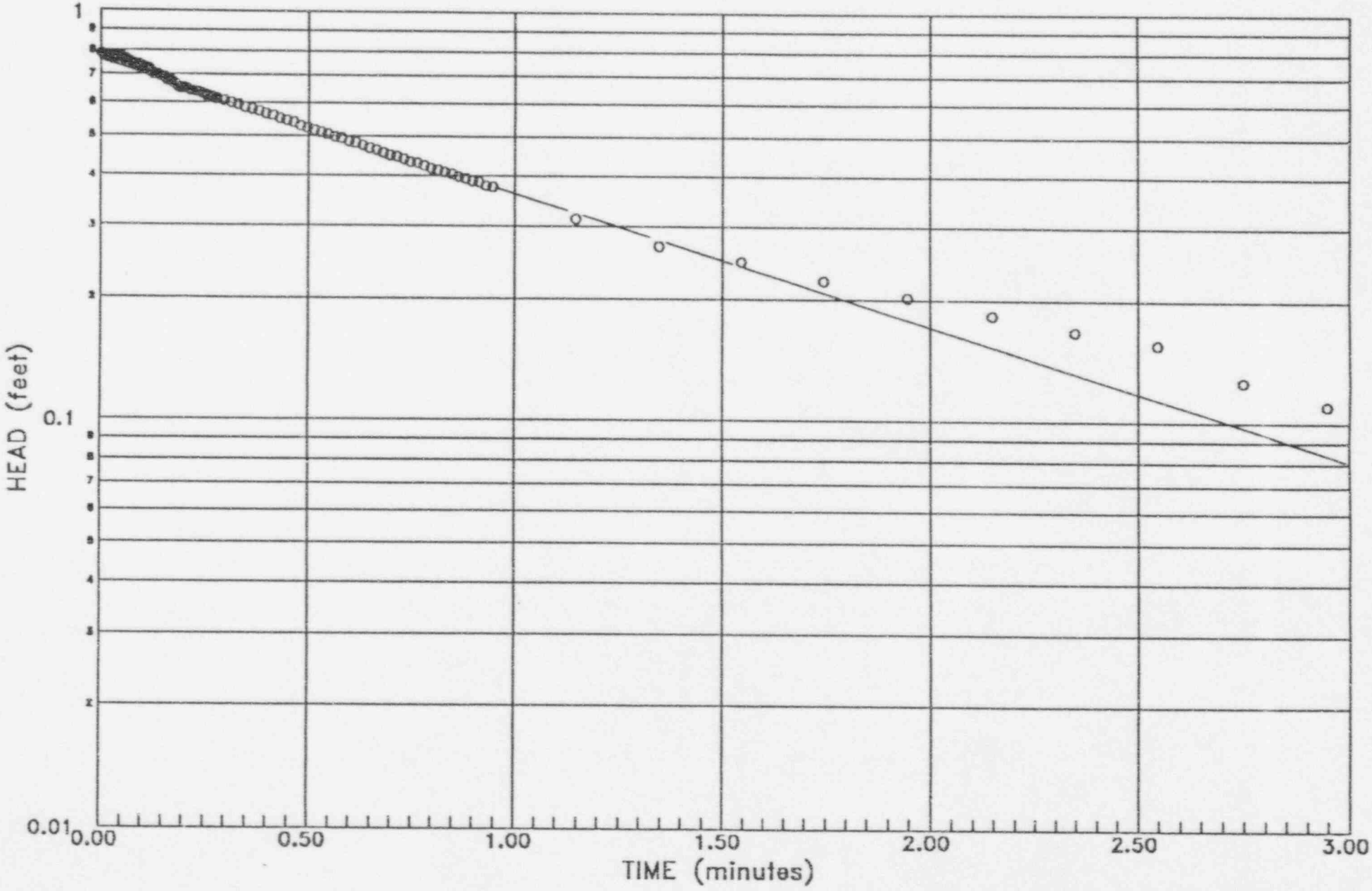
$$\ln(Re/rw)=1/((1.1/\ln(Lw/rw))+(A+B*\ln((H-Lw)/rw))/(Le/rw)$$

$$Kh=(req^2*\ln(Re/rw)/2Le)(1/t)(\ln(yo/yt))$$

RESULTS

Kh = Horizontal Hydraulic Conductivity	(ft/day) =	0.52E+01
	(cm/sec) =	0.18E-02
	(gpd/ft^2) =	0.39E+02

Hydraulic Conductivity Test, MW-3 – Rising Head
DNSC Curtis Bay Depot
Baltimore, Maryland
November 9, 1994



Soil and Ground-Water Quality Assessment
DNSC Curtis Bay Depot
Baltimore, Maryland
RUST E&I Project No. 86345.

Rising Head Test		Well Number: MW-3 Date: Nov. 9, 1994	
Raw Data		Reduced Data	
Elasped Time	Value	Time (Minutes)	Head (feet)
0	-0.025		
0.0033	-0.025		
0.0066	0.088		
0.01	0.791		
0.0133	0.794		
0.0166	-0.018		
0.02	0.053		
0.0233	0.452		
0.0266	0.702		
0.03	0.762		
0.0333	0.762		
0.0366	0.781		
0.04	0.778		
0.0433	0.781		
0.0466	0.785		
0.05	0.778		
0.0533	0.785	0	0.785
0.0566	0.781	0.0033	0.781
0.06	0.775	0.0067	0.775
0.0633	0.772	0.01	0.772
0.0666	0.778	0.0133	0.778
0.07	0.778	0.0167	0.778
0.0733	0.775	0.02	0.775
0.0766	0.772	0.0233	0.772
0.08	0.778	0.0267	0.778
0.0833	0.775	0.03	0.775
0.0866	0.772	0.0333	0.772
0.09	0.772	0.0367	0.772
0.0933	0.766	0.04	0.766
0.0966	0.769	0.0433	0.769
0.1	0.766	0.0467	0.766
0.1033	0.772	0.05	0.772
0.1066	0.759	0.0533	0.759
0.11	0.756	0.0567	0.756
0.1133	0.762	0.06	0.762
0.1166	0.756	0.0633	0.756
0.12	0.753	0.0667	0.753

0.1233	0.753	0.07	0.753
0.1266	0.747	0.0733	0.747
0.13	0.743	0.0767	0.743
0.1333	0.743	0.08	0.743
0.1366	0.74	0.0833	0.74
0.14	0.737	0.0867	0.737
0.1433	0.74	0.09	0.74
0.1466	0.731	0.0933	0.731
0.15	0.734	0.0967	0.734
0.1533	0.731	0.1	0.731
0.1566	0.728	0.1033	0.728
0.16	0.724	0.1067	0.724
0.1633	0.724	0.11	0.724
0.1666	0.721	0.1133	0.721
0.17	0.721	0.1167	0.721
0.1733	0.712	0.12	0.712
0.1766	0.705	0.1233	0.705
0.18	0.705	0.1267	0.705
0.1833	0.699	0.13	0.699
0.1866	0.699	0.1333	0.699
0.19	0.699	0.1367	0.699
0.1933	0.696	0.14	0.696
0.1966	0.693	0.1433	0.693
0.2	0.693	0.1467	0.693
0.2033	0.69	0.15	0.69
0.2066	0.69	0.1533	0.69
0.21	0.683	0.1567	0.683
0.2133	0.677	0.16	0.677
0.2166	0.677	0.1633	0.677
0.22	0.674	0.1667	0.674
0.2233	0.674	0.17	0.674
0.2266	0.671	0.1733	0.671
0.23	0.667	0.1767	0.667
0.2333	0.661	0.18	0.661
0.2366	0.658	0.1833	0.658
0.24	0.655	0.1867	0.655
0.2433	0.648	0.19	0.648
0.2466	0.648	0.1933	0.648
0.25	0.652	0.1967	0.652
0.2533	0.652	0.2	0.652
0.2566	0.648	0.2033	0.648
0.26	0.648	0.2067	0.648
0.2633	0.645	0.21	0.645
0.2666	0.642	0.2133	0.642
0.27	0.639	0.2167	0.639
0.2733	0.639	0.22	0.639
0.2766	0.639	0.2233	0.639

0.28	0.636	0.2267	0.636
0.2833	0.636	0.23	0.636
0.2866	0.636	0.2333	0.636
0.29	0.633	0.2367	0.633
0.2933	0.633	0.24	0.633
0.2966	0.629	0.2433	0.629
0.3	0.629	0.2467	0.629
0.3033	0.626	0.25	0.626
0.3066	0.623	0.2533	0.623
0.31	0.623	0.2567	0.623
0.3133	0.623	0.26	0.623
0.3166	0.62	0.2633	0.62
0.32	0.62	0.2667	0.62
0.3233	0.617	0.27	0.617
0.3266	0.617	0.2733	0.617
0.33	0.614	0.2767	0.614
0.3333	0.614	0.28	0.614
0.35	0.607	0.2967	0.607
0.3666	0.601	0.3133	0.601
0.3833	0.595	0.33	0.595
0.4	0.585	0.3467	0.585
0.4166	0.579	0.3633	0.579
0.4333	0.573	0.38	0.573
0.45	0.566	0.3967	0.566
0.4666	0.56	0.4133	0.56
0.4833	0.55	0.43	0.55
0.5	0.544	0.4467	0.544
0.5166	0.538	0.4633	0.538
0.5333	0.528	0.48	0.528
0.55	0.522	0.4967	0.522
0.5666	0.516	0.5133	0.516
0.5833	0.509	0.53	0.509
0.6	0.503	0.5467	0.503
0.6166	0.497	0.5633	0.497
0.6333	0.493	0.58	0.493
0.65	0.484	0.5967	0.484
0.6666	0.481	0.6133	0.481
0.6833	0.474	0.63	0.474
0.7	0.468	0.6467	0.468
0.7166	0.462	0.6633	0.462
0.7333	0.455	0.68	0.455
0.75	0.449	0.6967	0.449
0.7666	0.446	0.7133	0.446
0.7833	0.44	0.73	0.44
0.8	0.433	0.7467	0.433
0.8166	0.43	0.7633	0.43
0.8333	0.424	0.78	0.424

0.85	0.417	0.7967	0.417
0.8666	0.414	0.8133	0.414
0.8833	0.408	0.83	0.408
0.9	0.405	0.8467	0.405
0.9166	0.398	0.8633	0.398
0.9333	0.395	0.88	0.395
0.95	0.389	0.8967	0.389
0.9666	0.386	0.9133	0.386
0.9833	0.379	0.93	0.379
1	0.376	0.9467	0.376
1.2	0.313	1.1467	0.313
1.4	0.269	1.3467	0.269
1.6	0.246	1.5467	0.246
1.8	0.221	1.7467	0.221
2	0.202	1.9467	0.202
2.2	0.183	2.1467	0.183
2.4	0.167	2.3467	0.167
2.6	0.155	2.5467	0.155
2.8	0.126	2.7467	0.126
3	0.11	2.9467	0.11
3.2	0.094	3.1467	0.094
3.4	0.085	3.3467	0.085
3.6	0.075	3.5467	0.075
3.8	0.066	3.7467	0.066
4	0.06	3.9467	0.06
4.2	0.053	4.1467	0.053
4.4	0.05	4.3467	0.05
4.6	0.044	4.5467	0.044
4.8	0.041	4.7467	0.041
5	0.038	4.9467	0.038
5.2	0.034	5.1467	0.034
5.4	0.028	5.3467	0.028
5.6	0.025	5.5467	0.025
5.8	0.025	5.7467	0.025
6	0.025	5.9467	0.025
6.2	0.028	6.1467	0.028
6.4	0.025	6.3467	0.025
6.6	0.006	6.5467	0.006
6.8	0.009	6.7467	0.009
7	0.012	6.9467	0.012
7.2	0.015	7.1467	0.015
7.4	0.015	7.3467	0.015
7.6	0.015	7.5467	0.015
7.8	0.019	7.7467	0.019
8	0.015	7.9467	0.015
8.2	0.009	8.1467	0.009
8.4	0.009	8.3467	0.009

8.6	0.009	8.5467	0.009
8.8	0.009	8.7467	0.009
9	0.012	8.9467	0.012
9.2	0.012	9.1467	0.012
9.4	0.012	9.3467	0.012
9.6	0.012	9.5467	0.012
9.8	0.012	9.7467	0.012
10	0.009	9.9467	0.009
12	0.009	11.9467	0.009

RUST Environment & Infrastructure
COLUMBIA, SOUTH CAROLINA

HORIZONTAL HYDRAULIC CONDUCTIVITY
Method of Bouwer and Rice, 1976
After H. Bouwer, 1989

PROJECT NAME: DNSC Curtis Bay Depot
CITY, STATE : Baltimore, Maryland
PROJECT NO. : 86345

WELL NUMBER : MW-4
DATE OF TEST: 09-NOV-94
TEST BY : D.MAXAM

WELL/AQUIFER DATA - PARTIALLY PENETRATING WELL

Casing Diameter (in)	=	4.00
Borehole Diameter (in)	=	10.00
Depth to Top of Screen (ft)	=	8.50
Depth to Bottom of Screen (ft)	=	18.03
Depth to Static Water Level (ft)	=	10.64
Depth to Lower Confining Unit (ft)	=	29.24
Assumed Filter Pack Porosity (frac)	=	0.30

EQUATION PARAMETERS

req = Well Radius taking into account the filter pack (ft)	=	0.27
rw = Radius of the borehole (ft)	=	0.42
Le = Length of well through which water enters (ft)	=	7.39
Lw = Distance from water table to bottom of screen (ft)	=	7.39
H = Distance from water table to lower confining unit (ft)	=	18.60
A = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	2.1
B = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	0.35
Re = Effective radius over which headloss (y) is dissipated (ft)	=	2.44
yo = Change in head at time (t)=0, (ft)	=	0.25
yt = Change in head at time t, (ft)	=	0.05
t = Elasped time at which head change = yt,	=	0.4
Units of time as measured in the field	=	MIN

KEY EQUATIONS

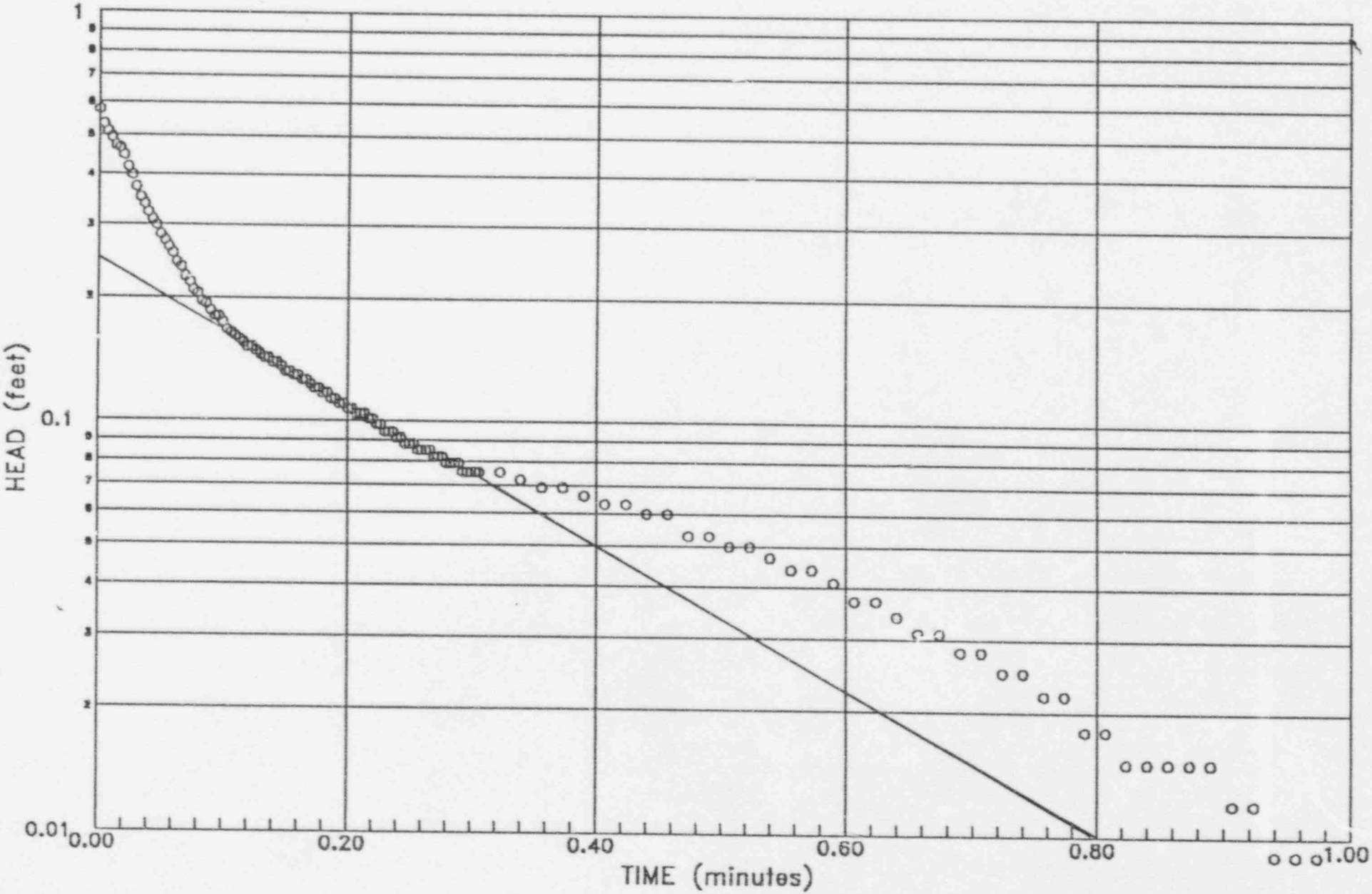
$$\ln(Re/rw)=1/((1.1/\ln(Lw/rw))+(A+B*\ln((H-Lw)/rw))/(Le/rw)$$

$$Kh=(req^2*\ln(Re/rw)/2Le)(1/t)(\ln(yo/yt))$$

RESULTS

Kh = Horizontal Hydraulic Conductivity (ft/day) = 0.50E+02
(cm/sec) = 0.17E-01
(gpd/ft^2) = 0.37E+03

Hydraulic Conductivity Test, MW-4 – Rising Head
DNSC Curtis Bay Depot
Baltimore, Maryland
November 9, 1994



Soil and Ground-Water Quality Assessment
DNSC Curtis Bay Depot
Baltimore, Maryland
RUST E&I Project No. 86345.

Rising Head Test		Well Number: MW-4 Date: Nov. 9, 1994	
Raw Data		Reduced Data	
Elasped Time	Value	Time (Minutes)	Head (feet)
0	-0.041		
0.0033	0.307		
0.0066	0.389		
0.01	0.582		
0.0133	0.367		
0.0166	-0.113		
0.02	0.231		
0.0233	0.284		
0.0266	0.576	0	0.576
0.03	0.531	0.0034	0.531
0.0333	0.509	0.0067	0.509
0.0366	0.493	0.01	0.493
0.04	0.471	0.0134	0.471
0.0433	0.465	0.0167	0.465
0.0466	0.446	0.02	0.446
0.05	0.417	0.0234	0.417
0.0533	0.398	0.0267	0.398
0.0566	0.373	0.03	0.373
0.06	0.351	0.0334	0.351
0.0633	0.338	0.0367	0.338
0.0666	0.322	0.04	0.322
0.07	0.31	0.0434	0.31
0.0733	0.3	0.0467	0.3
0.0766	0.284	0.05	0.284
0.08	0.275	0.0534	0.275
0.0833	0.265	0.0567	0.265
0.0866	0.256	0.06	0.256
0.09	0.243	0.0634	0.243
0.0933	0.237	0.0667	0.237
0.0966	0.224	0.07	0.224
0.1	0.218	0.0734	0.218
0.1033	0.208	0.0767	0.208
0.1066	0.205	0.08	0.205
0.11	0.196	0.0834	0.196
0.1133	0.193	0.0867	0.193
0.1166	0.186	0.09	0.186
0.12	0.18	0.0934	0.18

0.1233	0.18	0.0967	0.18
0.1266	0.174	0.1	0.174
0.13	0.167	0.1034	0.167
0.1333	0.164	0.1067	0.164
0.1366	0.161	0.11	0.161
0.14	0.158	0.1134	0.158
0.1433	0.155	0.1167	0.155
0.1466	0.151	0.12	0.151
0.15	0.151	0.1234	0.151
0.1533	0.148	0.1267	0.148
0.1566	0.145	0.13	0.145
0.16	0.142	0.1334	0.142
0.1633	0.142	0.1367	0.142
0.1666	0.139	0.14	0.139
0.17	0.139	0.1434	0.139
0.1733	0.136	0.1467	0.136
0.1766	0.132	0.15	0.132
0.18	0.132	0.1534	0.132
0.1833	0.129	0.1567	0.129
0.1866	0.129	0.16	0.129
0.19	0.126	0.1634	0.126
0.1933	0.126	0.1667	0.126
0.1966	0.123	0.17	0.123
0.2	0.12	0.1734	0.12
0.2033	0.12	0.1767	0.12
0.2066	0.117	0.18	0.117
0.21	0.117	0.1834	0.117
0.2133	0.113	0.1867	0.113
0.2166	0.113	0.19	0.113
0.22	0.11	0.1934	0.11
0.2233	0.11	0.1967	0.11
0.2266	0.107	0.2	0.107
0.23	0.107	0.2034	0.107
0.2333	0.104	0.2067	0.104
0.2366	0.104	0.21	0.104
0.24	0.104	0.2134	0.104
0.2433	0.101	0.2167	0.101
0.2466	0.101	0.22	0.101
0.25	0.098	0.2234	0.098
0.2533	0.098	0.2267	0.098
0.2566	0.094	0.23	0.094
0.26	0.094	0.2334	0.094
0.2633	0.094	0.2367	0.094
0.2666	0.091	0.24	0.091
0.27	0.091	0.2434	0.091
0.2733	0.088	0.2467	0.088
0.2766	0.088	0.25	0.088

0.28	0.088	0.2534	0.088
0.2833	0.085	0.2567	0.085
0.2866	0.085	0.26	0.085
0.29	0.085	0.2634	0.085
0.2933	0.085	0.2667	0.085
0.2966	0.082	0.27	0.082
0.3	0.082	0.2734	0.082
0.3033	0.082	0.2767	0.082
0.3066	0.079	0.28	0.079
0.31	0.079	0.2834	0.079
0.3133	0.079	0.2867	0.079
0.3166	0.079	0.29	0.079
0.32	0.075	0.2934	0.075
0.3233	0.075	0.2967	0.075
0.3266	0.075	0.3	0.075
0.33	0.075	0.3034	0.075
0.3333	0.075	0.3067	0.075
0.35	0.075	0.3234	0.075
0.3666	0.072	0.34	0.072
0.3833	0.069	0.3567	0.069
0.4	0.069	0.3734	0.069
0.4166	0.066	0.39	0.066
0.4333	0.063	0.4067	0.063
0.45	0.063	0.4234	0.063
0.4666	0.06	0.44	0.06
0.4833	0.06	0.4567	0.06
0.5	0.053	0.4734	0.053
0.5166	0.053	0.49	0.053
0.5333	0.05	0.5067	0.05
0.55	0.05	0.5234	0.05
0.5666	0.047	0.54	0.047
0.5833	0.044	0.5567	0.044
0.6	0.044	0.5734	0.044
0.6166	0.041	0.59	0.041
0.6333	0.037	0.6067	0.037
0.65	0.037	0.6234	0.037
0.6666	0.034	0.64	0.034
0.6833	0.031	0.6567	0.031
0.7	0.031	0.6734	0.031
0.7166	0.028	0.69	0.028
0.7333	0.028	0.7067	0.028
0.75	0.025	0.7234	0.025
0.7666	0.025	0.74	0.025
0.7833	0.022	0.7567	0.022
0.8	0.022	0.7734	0.022
0.8166	0.018	0.79	0.018
0.8333	0.018	0.8067	0.018

0.85	0.015	0.8234	0.015
0.8666	0.015	0.84	0.015
0.8833	0.015	0.8567	0.015
0.9	0.015	0.8734	0.015
0.9166	0.015	0.89	0.015
0.9333	0.012	0.9067	0.012
0.95	0.012	0.9234	0.012
0.9666	0.009	0.94	0.009
0.9833	0.009	0.9567	0.009
1	0.009	0.9734	0.009
1.2	-0.003		
1.4	-0.009		
1.6	-0.022		
1.8	-0.028		
2	-0.038		
2.2	-0.047		
2.4	-0.053		
2.6	-0.06		
2.8	-0.069		
3	-0.075		
3.2	-0.082		
3.4	-0.085		
3.6	-0.085		
3.8	-0.082		
4	-0.082		
4.2	-0.085		
4.4	-0.085		
4.6	-0.088		
4.8	-0.088		
5	-0.088		
5.2	-0.088		
5.4	-0.091		
5.6	-0.091		
5.8	-0.091		
6	-0.094		
6.2	-0.094		
6.4	-0.094		
6.6	-0.098		
6.8	-0.098		
7	-0.098		
7.2	-0.101		
7.4	-0.101		
7.6	-0.101		
7.8	-0.101		
8	-0.104		
8.2	-0.104		
8.4	-0.104		

8.6	-0.107
8.8	-0.107
9	-0.107
9.2	-0.107
9.4	-0.11
9.6	-0.11
9.8	-0.107
10	-0.107
12	-0.11
14	-0.113
16	-0.113
18	-0.113
20	-0.113
22	-0.113

RUST Environment & Infrastructure
COLUMBIA, SOUTH CAROLINA

HORIZONTAL HYDRAULIC CONDUCTIVITY
Method of Bouwer and Rice, 1976
After H. Bouwer, 1989

PROJECT NAME: DNSC Curtis Bay Depot
CITY, STATE : Baltimore, Maryland
PROJECT NO. : 86345

WELL NUMBER : MW-5
DATE OF TEST: 08-NOV-94
TEST BY : D.MAXAM

WELL/AQUIFER DATA - PARTIALLY PENETRATING WELL

Casing Diameter (in)	=	4.00
Borehole Diameter (in)	=	8.25
Depth to Top of Screen (ft)	=	15.00
Depth to Bottom of Screen (ft)	=	24.53
Depth to Static Water Level (ft)	=	11.90
Depth to Lower Confining Unit (ft)	=	33.40
Assumed Filter Pack Porosity (frac)	=	0.30

EQUATION PARAMETERS

req = Well Radius taking into account the filter pack (ft)	=	0.17
rw = Radius of the borehole (ft)	=	0.34
Le = Length of well through which water enters (ft)	=	9.53
Lw = Distance from water table to bottom of screen (ft)	=	12.63
H = Distance from water table to lower confining unit (ft)	=	21.50
A = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	2.5
B = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	0.40
Re = Effective radius over which headloss (y) is dissipated (ft)	=	3.30
yo = Change in head at time (t)=0, (ft)	=	1.16
yt = Change in head at time t, (ft)	=	0.50
t = Elasped time at which head change = yt,	=	20.0
Units of time as measured in the field	=	MIN

KEY EQUATIONS

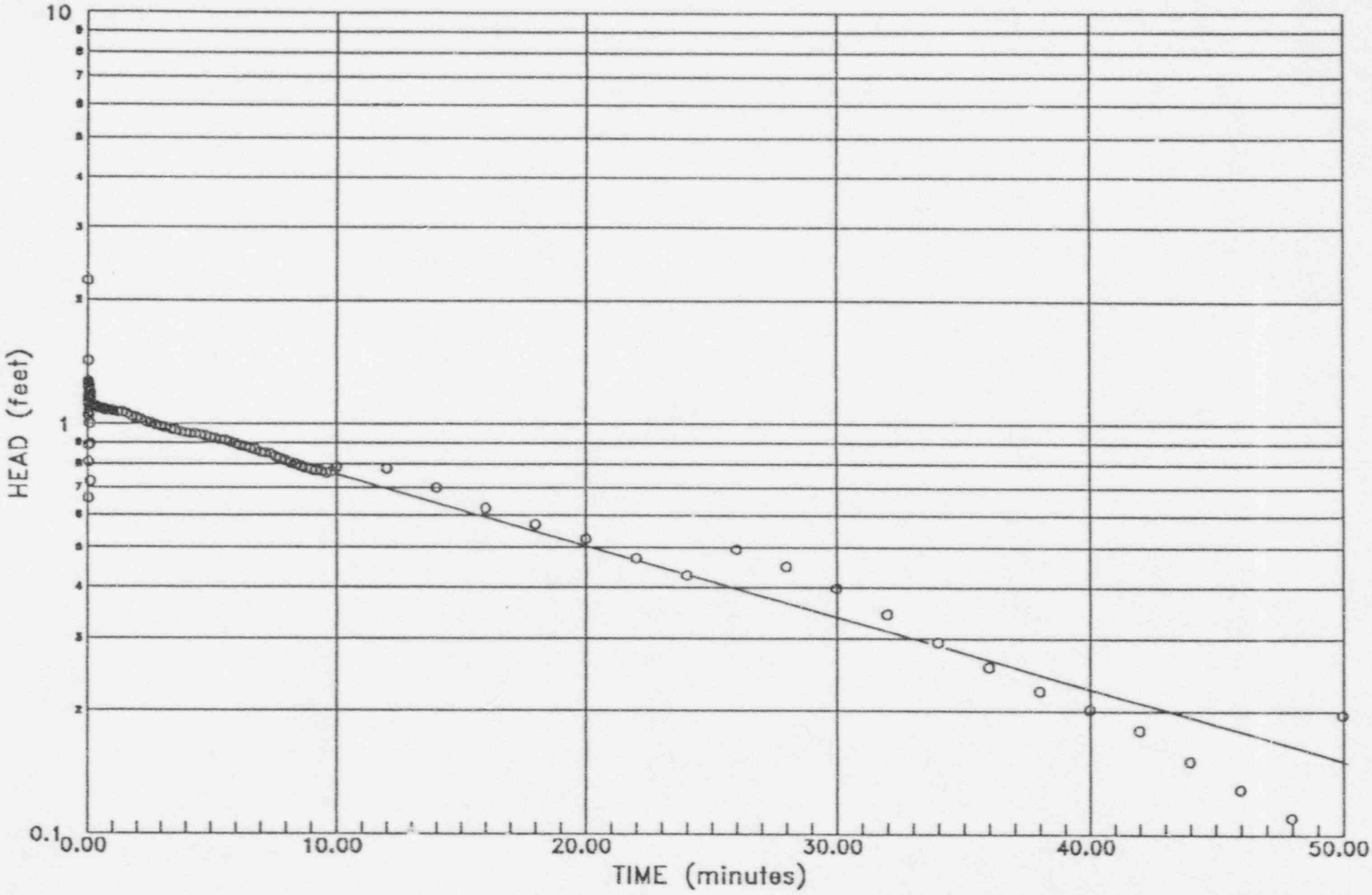
$$\ln(Re/rw)=1/((1.1/\ln(Lw/rw))+(A+B*\ln((H-Lw)/rw))/(Le/rw)$$

$$Kh=(req^2*\ln(Re/rw)/2Le)(1/t)(\ln(yo/yt))$$

RESULTS

Kh = Horizontal Hydraulic Conductivity	(ft/day) =	0.20E+00
	(cm/sec) =	0.70E-04
	(gpd/ft^2) =	0.15E+01

Hydraulic Conductivity Test, MW-5 – Falling Head
DNSC Curtis Bay Depot
Baltimore, Maryland
November 8, 1994



Soil and Ground-Water Quality Assessment
DNSC Curtis Bay Depot
Baltimore, Maryland
RUST E&I Project No. 86345.

Falling Head Test		Well Number: MW-5 Date: Nov. 8, 1994	
Raw Data		Reduced Data	
Elasped Time	Value	Time (Minutes)	Head (feet)
0	-0.066		
0.0033	-0.066		
0.0066	-0.069		
0.01	-0.072		
0.0133	-0.072		
0.0166	-0.072		
0.02	-2.225	0	2.225
0.0233	-1.123	0.0033	1.123
0.0266	-0.886	0.0066	0.886
0.03	-0.658	0.01	0.658
0.0333	-1.418	0.0133	1.418
0.0366	-1.047	0.0166	1.047
0.04	-1.228	0.02	1.228
0.0433	-0.807	0.0233	0.807
0.0466	-1.231	0.0266	1.231
0.05	-1.266	0.03	1.266
0.0533	-1.161	0.0333	1.161
0.0566	-1.171	0.0366	1.171
0.06	-0.889	0.04	0.889
0.0633	-1.044	0.0433	1.044
0.0666	-1.155	0.0466	1.155
0.07	-1.076	0.05	1.076
0.0733	-1.164	0.0533	1.164
0.0766	-1.244	0.0566	1.244
0.08	-1.196	0.06	1.196
0.0833	-1.24	0.0633	1.24
0.0866	-1.212	0.0666	1.212
0.09	-1	0.07	1
0.0933	-1.098	0.0733	1.098
0.0966	-0.724	0.0766	0.724
0.1	-1.066	0.08	1.066
0.1033	-1.177	0.0833	1.177
0.1066	-1.196	0.0866	1.196
0.11	-1.073	0.09	1.073
0.1133	-0.892	0.0933	0.892
0.1166	-1.142	0.0966	1.142
0.12	-1.177	0.1	1.177

0.1233	-1.088	0.1033	1.088
0.1266	-1.101	0.1066	1.101
0.13	-1.145	0.11	1.145
0.1333	-1.098	0.1133	1.098
0.1366	-1.117	0.1166	1.117
0.14	-1.12	0.12	1.12
0.1433	-1.107	0.1233	1.107
0.1466	-1.117	0.1266	1.117
0.15	-1.114	0.13	1.114
0.1533	-1.114	0.1333	1.114
0.1566	-1.114	0.1366	1.114
0.16	-1.114	0.14	1.114
0.1633	-1.114	0.1433	1.114
0.1666	-1.114	0.1466	1.114
0.17	-1.114	0.15	1.114
0.1733	-1.114	0.1533	1.114
0.1766	-1.114	0.1566	1.114
0.18	-1.114	0.16	1.114
0.1833	-1.114	0.1633	1.114
0.1866	-1.114	0.1666	1.114
0.19	-1.114	0.17	1.114
0.1933	-1.111	0.1733	1.111
0.1966	-1.111	0.1766	1.111
0.2	-1.111	0.18	1.111
0.2033	-1.114	0.1833	1.114
0.2066	-1.111	0.1866	1.111
0.21	-1.111	0.19	1.111
0.2133	-1.111	0.1933	1.111
0.2166	-1.111	0.1966	1.111
0.22	-1.111	0.2	1.111
0.2233	-1.111	0.2033	1.111
0.2266	-1.111	0.2066	1.111
0.23	-1.111	0.21	1.111
0.2333	-1.107	0.2133	1.107
0.2366	-1.107	0.2166	1.107
0.24	-1.107	0.22	1.107
0.2433	-1.107	0.2233	1.107
0.2466	-1.107	0.2266	1.107
0.25	-1.107	0.23	1.107
0.2533	-1.107	0.2333	1.107
0.2566	-1.107	0.2366	1.107
0.26	-1.107	0.24	1.107
0.2633	-1.107	0.2433	1.107
0.2666	-1.107	0.2466	1.107
0.27	-1.107	0.25	1.107
0.2733	-1.107	0.2533	1.107
0.2766	-1.104	0.2566	1.104

0.28	-1.104	0.26	1.104
0.2833	-1.104	0.2633	1.104
0.2866	-1.104	0.2666	1.104
0.29	-1.104	0.27	1.104
0.2933	-1.104	0.2733	1.104
0.2966	-1.104	0.2766	1.104
0.3	-1.104	0.28	1.104
0.3033	-1.104	0.2833	1.104
0.3066	-1.104	0.2866	1.104
0.31	-1.104	0.29	1.104
0.3133	-1.104	0.2933	1.104
0.3166	-1.104	0.2966	1.104
0.32	-1.104	0.3	1.104
0.3233	-1.104	0.3033	1.104
0.3266	-1.104	0.3066	1.104
0.33	-1.104	0.31	1.104
0.3333	-1.101	0.3133	1.101
0.35	-1.101	0.33	1.101
0.3666	-1.095	0.3466	1.095
0.3833	-1.095	0.3633	1.095
0.4	-1.095	0.38	1.095
0.4166	-1.092	0.3966	1.092
0.4333	-1.092	0.4133	1.092
0.45	-1.092	0.43	1.092
0.4666	-1.092	0.4466	1.092
0.4833	-1.092	0.4633	1.092
0.5	-1.088	0.48	1.088
0.5166	-1.088	0.4966	1.088
0.5333	-1.088	0.5133	1.088
0.55	-1.088	0.53	1.088
0.5666	-1.088	0.5466	1.088
0.5833	-1.088	0.5633	1.088
0.6	-1.088	0.58	1.088
0.6166	-1.085	0.5966	1.085
0.6333	-1.085	0.6133	1.085
0.65	-1.085	0.63	1.085
0.6666	-1.085	0.6466	1.085
0.6833	-1.082	0.6633	1.082
0.7	-1.082	0.68	1.082
0.7166	-1.085	0.6966	1.085
0.7333	-1.082	0.7133	1.082
0.75	-1.082	0.73	1.082
0.7666	-1.082	0.7466	1.082
0.7833	-1.082	0.7633	1.082
0.8	-1.082	0.78	1.082
0.8166	-1.082	0.7966	1.082
0.8333	-1.079	0.8133	1.079

0.85	-1.079	0.83	1.079
0.8666	-1.079	0.8466	1.079
0.8833	-1.079	0.8633	1.079
0.9	-1.079	0.88	1.079
0.9166	-1.079	0.8966	1.079
0.9333	-1.079	0.9133	1.079
0.95	-1.079	0.93	1.079
0.9666	-1.079	0.9466	1.079
0.9833	-1.076	0.9633	1.076
1	-1.076	0.98	1.076
1.2	-1.07	1.18	1.07
1.4	-1.07	1.38	1.07
1.6	-1.057	1.58	1.057
1.8	-1.044	1.78	1.044
2	-1.035	1.98	1.035
2.2	-1.025	2.18	1.025
2.4	-1.012	2.38	1.012
2.6	-1.003	2.58	1.003
2.8	-0.993	2.78	0.993
3	-0.987	2.98	0.987
3.2	-0.978	3.18	0.978
3.4	-0.971	3.38	0.971
3.6	-0.962	3.58	0.962
3.8	-0.956	3.78	0.956
4	-0.949	3.98	0.949
4.2	-0.946	4.18	0.946
4.4	-0.943	4.38	0.943
4.6	-0.94	4.58	0.94
4.8	-0.933	4.78	0.933
5	-0.927	4.98	0.927
5.2	-0.921	5.18	0.921
5.4	-0.914	5.38	0.914
5.6	-0.911	5.58	0.911
5.8	-0.902	5.78	0.902
6	-0.895	5.98	0.895
6.2	-0.886	6.18	0.886
6.4	-0.88	6.38	0.88
6.6	-0.87	6.58	0.87
6.8	-0.864	6.78	0.864
7	-0.854	6.98	0.854
7.2	-0.848	7.18	0.848
7.4	-0.845	7.38	0.845
7.6	-0.832	7.58	0.832
7.8	-0.822	7.78	0.822
8	-0.813	7.98	0.813
8.2	-0.804	8.18	0.804
8.4	-0.797	8.38	0.797

8.6	-0.788	8.58	0.788
8.8	-0.781	8.78	0.781
9	-0.775	8.98	0.775
9.2	-0.769	9.18	0.769
9.4	-0.766	9.38	0.766
9.6	-0.759	9.58	0.759
9.8	-0.766	9.78	0.766
10	-0.784	9.98	0.784
12	-0.778	11.98	0.778
14	-0.699	13.98	0.699
16	-0.623	15.98	0.623
18	-0.569	17.98	0.569
20	-0.525	19.98	0.525
22	-0.471	21.98	0.471
24	-0.427	23.98	0.427
26	-0.496	25.98	0.496
28	-0.449	27.98	0.449
30	-0.398	29.98	0.398
32	-0.344	31.98	0.344
34	-0.294	33.98	0.294
36	-0.256	35.98	0.256
38	-0.224	37.98	0.224
40	-0.202	39.98	0.202
42	-0.18	41.98	0.18
44	-0.151	43.98	0.151
46	-0.129	45.98	0.129
48	-0.11	47.98	0.11
50	-0.196	49.98	0.196
52	-0.132	51.98	0.132
54	-0.091	53.98	0.091
56	-0.053	55.98	0.053
58	-0.025	57.98	0.025
60	0		
62	0.006		
64	0.034		
66	0.06		
68	0.082		
70	-0.025		
72	-0.028		

RUST Environment & Infrastructure
COLUMBIA, SOUTH CAROLINA

HORIZONTAL HYDRAULIC CONDUCTIVITY
Method of Bouwer and Rice, 1976
After H. Bouwer, 1989

PROJECT NAME: DNSC Curtis Bay Depot
CITY, STATE : Baltimore, Maryland
PROJECT NO. : 86345

WELL NUMBER : MW-6
DATE OF TEST: 09-NOV-94
TEST BY : D.MAXAM

WELL/AQUIFER DATA - PARTIALLY PENETRATING WELL

Casing Diameter (in)	=	4.00
Borehole Diameter (in)	=	12.25
Depth to Top of Screen (ft)	=	10.00
Depth to Bottom of Screen (ft)	=	19.53
Depth to Static Water Level (ft)	=	14.54
Depth to Lower Confining Unit (ft)	=	31.00
Assumed Filter Pack Porosity (frac)	=	0.30

EQUATION PARAMETERS

req = Well Radius taking into account the filter pack (ft)	=	0.31
rw = Radius of the borehole (ft)	=	0.51
Le = Length of well through which water enters (ft)	=	4.99
Lw = Distance from water table to bottom of screen (ft)	=	4.99
H = Distance from water table to lower confining unit (ft)	=	16.46
A = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	1.9
B = Coefficient of Le/rw from Figure 2, (from H. Bouwer)	=	0.30
Re = Effective radius over which headloss (y) is dissipated (ft)	=	1.86
yo = Change in head at time (t)=0, (ft)	=	0.70
yt = Change in head at time t, (ft)	=	0.35
t = Elasped time at which head change = yt,	=	2.0
Units of time as measured in the field	=	MIN

KEY EQUATIONS

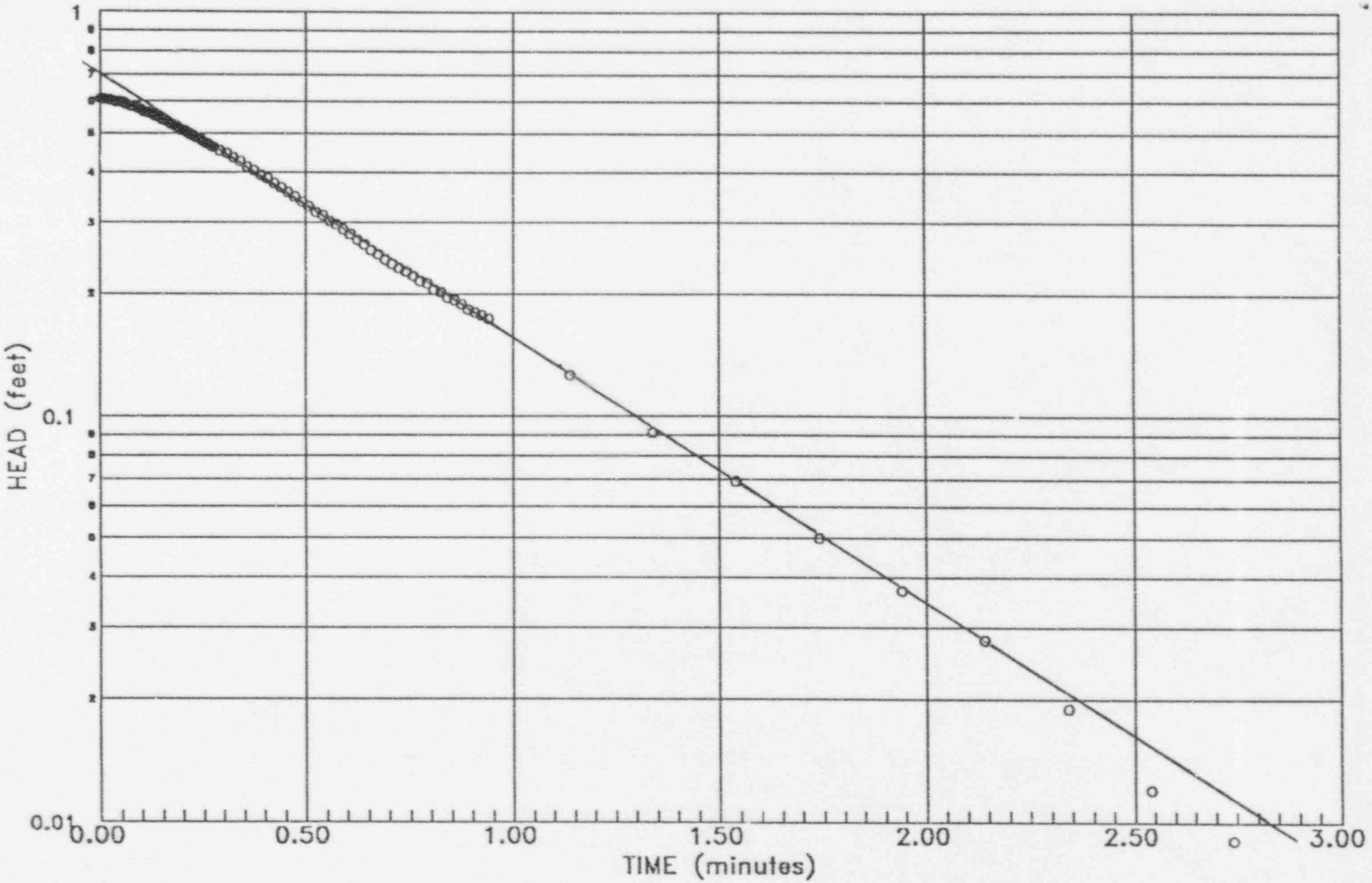
$$\ln(Re/rw)=1/(1.1/\ln(Lw/rw))+(A+B*\ln((H-Lw)/rw))/(Le/rw)$$

$$Kh=(req^2*\ln(Re/rw)/2Le)(1/t)(\ln(yo/yt))$$

RESULTS

Kh = Horizontal Hydraulic Conductivity	(ft/day) =	0.63E+01
	(cm/sec) =	0.22E-02
	(gpd/ft^2) =	0.47E+02

Hydraulic Conductivity Test, MW-6 - Rising Head
DNSC Curtis Bay Depot
Baltimore, Maryland
November 9, 1994



Soil and Ground-Water Quality Assessment
DNSC Curtis Bay Depot
Baltimore, Maryland
RUST E&I Project No. 86345.

Rising Head Test		Well Number: MW-6 Date: Nov. 9, 1994	
Raw Data		Reduced Data	
Elasped Time	Value	Time (Minutes)	Head (feet)
0	-0.006		
0.0033	-0.006		
0.0066	0.012		
0.01	0.25		
0.0133	0.155		
0.0166	0.3		
0.02	0.208		
0.0233	0.316		
0.0266	0.512		
0.03	0.547		
0.0333	0.566		
0.0366	0.576		
0.04	0.585		
0.0433	0.588		
0.0466	0.595		
0.05	0.598		
0.0533	0.601		
0.0566	0.601		
0.06	0.607	0	0.607
0.0633	0.607	0.0033	0.607
0.0666	0.61	0.0066	0.61
0.07	0.607	0.01	0.607
0.0733	0.607	0.0133	0.607
0.0766	0.607	0.0166	0.607
0.08	0.604	0.02	0.604
0.0833	0.604	0.0233	0.604
0.0866	0.604	0.0266	0.604
0.09	0.601	0.03	0.601
0.0933	0.598	0.0333	0.598
0.0966	0.601	0.0366	0.601
0.1	0.598	0.04	0.598
0.1033	0.601	0.0433	0.601
0.1066	0.598	0.0466	0.598
0.11	0.598	0.05	0.598
0.1133	0.595	0.0533	0.595
0.1166	0.595	0.0566	0.595
0.12	0.588	0.06	0.588

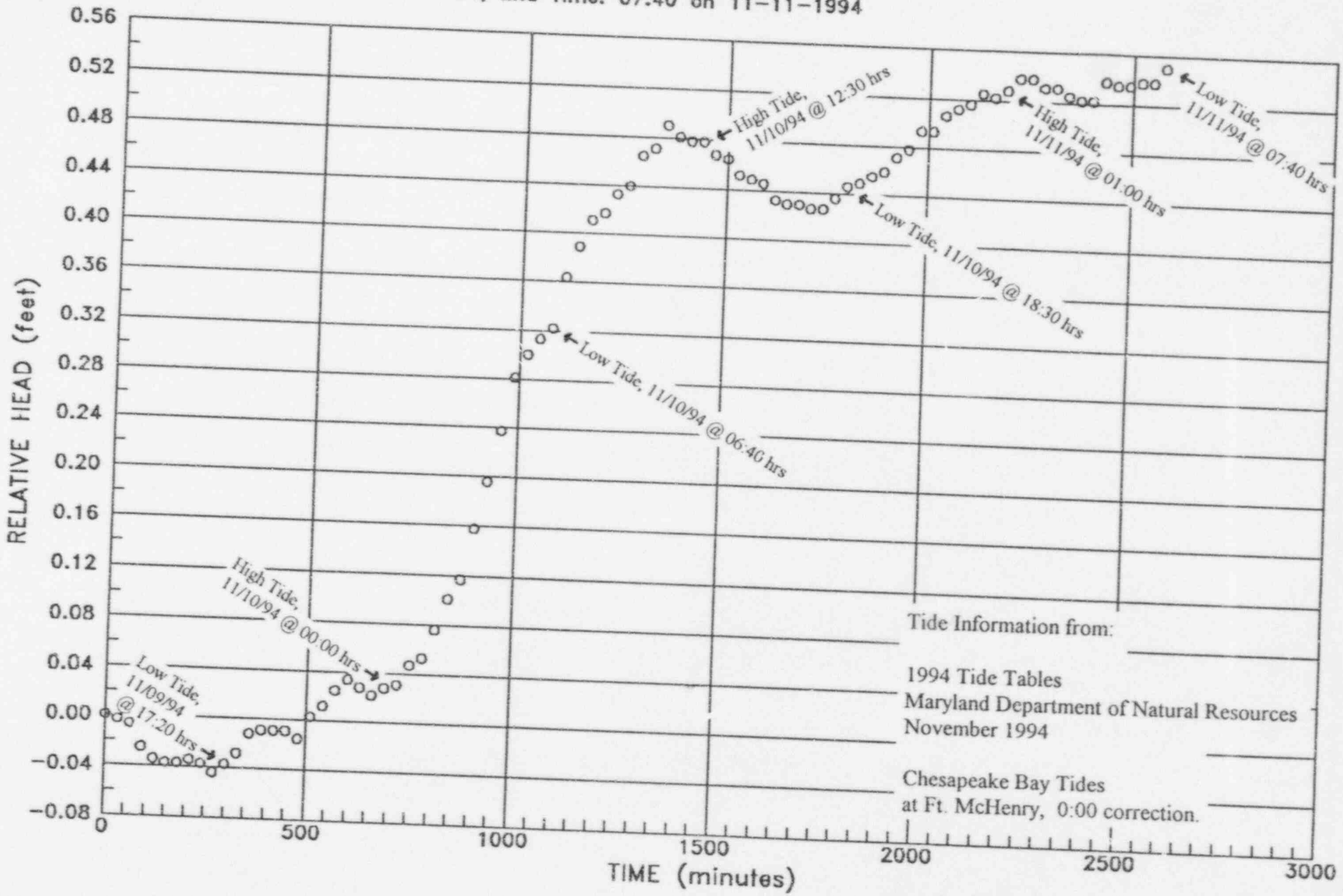
0.1233	0.588	0.0633	0.588
0.1266	0.585	0.0666	0.585
0.13	0.585	0.07	0.585
0.1333	0.582	0.0733	0.582
0.1366	0.582	0.0766	0.582
0.14	0.582	0.08	0.582
0.1433	0.582	0.0833	0.582
0.1466	0.576	0.0866	0.576
0.15	0.576	0.09	0.576
0.1533	0.573	0.0933	0.573
0.1566	0.573	0.0966	0.573
0.16	0.569	0.1	0.569
0.1633	0.566	0.1033	0.566
0.1666	0.566	0.1066	0.566
0.17	0.563	0.11	0.563
0.1733	0.563	0.1133	0.563
0.1766	0.56	0.1166	0.56
0.18	0.56	0.12	0.56
0.1833	0.557	0.1233	0.557
0.1866	0.553	0.1266	0.553
0.19	0.55	0.13	0.55
0.1933	0.55	0.1333	0.55
0.1966	0.547	0.1366	0.547
0.2	0.544	0.14	0.544
0.2033	0.544	0.1433	0.544
0.2066	0.541	0.1466	0.541
0.21	0.538	0.15	0.538
0.2133	0.538	0.1533	0.538
0.2166	0.535	0.1566	0.535
0.22	0.531	0.16	0.531
0.2233	0.531	0.1633	0.531
0.2266	0.528	0.1666	0.528
0.23	0.525	0.17	0.525
0.2333	0.525	0.1733	0.525
0.2366	0.522	0.1766	0.522
0.24	0.519	0.18	0.519
0.2433	0.519	0.1833	0.519
0.2466	0.516	0.1866	0.516
0.25	0.512	0.19	0.512
0.2533	0.509	0.1933	0.509
0.2566	0.509	0.1966	0.509
0.26	0.506	0.2	0.506
0.2633	0.506	0.2033	0.506
0.2666	0.503	0.2066	0.503
0.27	0.5	0.21	0.5
0.2733	0.5	0.2133	0.5
0.2766	0.496	0.2166	0.496

0.28	0.493	0.22	0.493
0.2833	0.493	0.2233	0.493
0.2866	0.49	0.2266	0.49
0.29	0.487	0.23	0.487
0.2933	0.487	0.2333	0.487
0.2966	0.484	0.2366	0.484
0.3	0.484	0.24	0.484
0.3033	0.481	0.2433	0.481
0.3066	0.478	0.2466	0.478
0.31	0.474	0.25	0.474
0.3133	0.474	0.2533	0.474
0.3166	0.471	0.2566	0.471
0.32	0.471	0.26	0.471
0.3233	0.468	0.2633	0.468
0.3266	0.465	0.2666	0.465
0.33	0.462	0.27	0.462
0.3333	0.462	0.2733	0.462
0.35	0.452	0.29	0.452
0.3666	0.446	0.3066	0.446
0.3833	0.436	0.3233	0.436
0.4	0.427	0.34	0.427
0.4166	0.414	0.3566	0.414
0.4333	0.405	0.3733	0.405
0.45	0.395	0.39	0.395
0.4666	0.386	0.4066	0.386
0.4833	0.376	0.4233	0.376
0.5	0.367	0.44	0.367
0.5166	0.357	0.4566	0.357
0.5333	0.348	0.4733	0.348
0.55	0.338	0.49	0.338
0.5666	0.329	0.5066	0.329
0.5833	0.319	0.5233	0.319
0.6	0.313	0.54	0.313
0.6166	0.303	0.5566	0.303
0.6333	0.297	0.5733	0.297
0.65	0.288	0.59	0.288
0.6666	0.281	0.6066	0.281
0.6833	0.272	0.6233	0.272
0.7	0.265	0.64	0.265
0.7166	0.256	0.6566	0.256
0.7333	0.25	0.6733	0.25
0.75	0.243	0.69	0.243
0.7666	0.237	0.7066	0.237
0.7833	0.231	0.7233	0.231
0.8	0.227	0.74	0.227
0.8166	0.221	0.7566	0.221
0.8333	0.215	0.7733	0.215

0.85	0.212	0.79	0.212
0.8666	0.205	0.8066	0.205
0.8833	0.202	0.8233	0.202
0.9	0.196	0.84	0.196
0.9166	0.193	0.8566	0.193
0.9333	0.189	0.8733	0.189
0.95	0.183	0.89	0.183
0.9666	0.18	0.9066	0.18
0.9833	0.177	0.9233	0.177
1	0.174	0.94	0.174
1.2	0.126	1.14	0.126
1.4	0.091	1.34	0.091
1.6	0.069	1.54	0.069
1.8	0.05	1.74	0.05
2	0.037	1.94	0.037
2.2	0.028	2.14	0.028
2.4	0.019	2.34	0.019
2.6	0.012	2.54	0.012
2.8	0.009	2.74	0.009
3	0.003	2.94	0.003
3.2	0		
3.4	0		
3.6	-0.003		
3.8	-0.006		
4	-0.006		
4.2	-0.006		
4.4	-0.009		
4.6	-0.009		
4.8	-0.012		
5	-0.012		
5.2	-0.012		
5.4	-0.015		
5.6	-0.015		
5.8	-0.012		
6	-0.015		
6.2	-0.015		
6.4	-0.012		
6.6	-0.012		
6.8	-0.015		
7	-0.015		
7.2	-0.015		
7.4	-0.015		
7.6	-0.015		
7.8	-0.015		
8	-0.015		
8.2	-0.012		
8.4	-0.015		

8.6	-0.012
8.8	-0.012
9	-0.012
9.2	-0.015
9.4	-0.015
9.6	-0.015
9.8	-0.015
10	-0.018
12	-0.015
14	-0.015
16	-0.015
18	-0.018
20	-0.018
22	-0.018
24	-0.022
26	-0.028
28	-0.028
30	-0.031
32	-0.031
34	-0.034

Water Level Fluctuations, MW-1
DNSC Curtis Bay Depot
Baltimore, Maryland
Start Time: 12:20 on 11-09-94, End Time: 07:40 on 11-11-1994



Soil and Ground-Water Quality Assessment
DNSC Curtis Bay Depot
Baltimore, Maryland
RUST E&I Project No. 86345.

Tidal Influence		Well Number: MW-1 Date: Nov. 9-11, 1994	
Raw Data		Reduced Data	
Elasped Time	Value	Time (Minutes)	Head (feet)
0	0		
30	-0.003		
60	-0.006		
90	-0.025		
120	-0.034		
150	-0.037		
180	-0.037		
210	-0.034		
240	-0.037		
270	-0.044		
300	-0.037		
330	-0.028		
360	-0.012		
390	-0.009		
420	-0.009		
450	-0.009		
480	-0.015		
510	0.003		
540	0.012		
570	0.025		
600	0.034		
630	0.028		
660	0.022		
690	0.028		
720	0.031		
750	0.047		
780	0.053		
810	0.076		
840	0.101		
870	0.117		
900	0.158		
930	0.196		
960	0.237		
990	0.281		
1020	0.3		
1050	0.313		
1080	0.322		

1110	0.364
1140	0.389
1170	0.411
1200	0.417
1230	0.433
1260	0.44
1290	0.465
1320	0.471
1350	0.49
1380	0.481
1410	0.478
1440	0.478
1470	0.468
1500	0.465
1530	0.452
1560	0.449
1590	0.446
1620	0.433
1650	0.43
1680	0.43
1710	0.427
1740	0.427
1770	0.436
1800	0.446
1830	0.449
1860	0.455
1890	0.459
1920	0.471
1950	0.478
1980	0.493
2010	0.493
2040	0.506
2070	0.512
2100	0.516
2130	0.525
2160	0.522
2190	0.528
2220	0.538
2250	0.538
2280	0.531
2310	0.531
2340	0.525
2370	0.522
2400	0.522
2430	0.538
2460	0.535
2490	0.535

2520	0.538
2550	0.538
2580	0.55

APPENDIX C
GROUND-WATER QUALITY DATA

Quanterra Environmental Services

Quanterra Incorporated
2800 George Washington Way
Richland, Washington 99352

509 375-3131 Telephone
509 375-5590 Fax

Analytical Data Package Prepared For

Rust Environmental & Infrast.

Radiochemical Analysis By

Quanterra Environmental Services
Richland Laboratory

Sample Delivery Group Number: 3826

CLIENT ID NUMBER	QUANTERRA ID NUMBER
MW-4(F)	41130501

Quanterra
Environmental Services

SAMPLE RESULTS

LAB NAME:	ITAS-RICHLAND	SDG:	3826
LAB SAMPLE ID:	41130501	MATRIX:	WATER
CLIENT ID:	MW-4(F)	DATE RECEIVED:	11/10/94

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
TH228	5.75E-01	3.5E-01	3.5E-01	1.41E-01	pCi/L	81.40%	RD3210
TH230	3.50E-01	2.7E-01	2.8E-01	2.34E-01	pCi/L	81.40%	RD3210
TH232	4.02E-01	2.9E-01	3.0E-01	2.34E-01	pCi/L	81.40%	RD3210
AC-228	1.57E+01	3.5E+01	3.5E+01	7.33E+01	pCi/L	N/A	RD3219
BI-212	1.49E+01	4.6E+01	4.6E+01	1.06E+02	pCi/L	N/A	RD3219
CS-137DA	-5.65E+00	7.6E+00	7.6E+00	1.23E+01	pCi/L	N/A	RD3219
PB-212	1.20E+01	1.3E+01	1.3E+01	2.50E+01	pCi/L	N/A	RD3219
RA-226DA	6.89E-01	1.1E-01	1.6E-01	8.30E-02	pCi/L	100.00%	RD3219
TL-208	4.75E+00	6.1E+00	6.1E+00	1.46E+01	pCi/L	N/A	RD3219
ALPHA	1.47E+01	5.3E+00	5.9E+00	3.59E+00	pCi/L	100.00%	RD3214
BETA	1.69E+01	3.5E+00	3.7E+00	4.53E+00	pCi/L	100.00%	RD3214
RA-228	2.60E+00	7.3E-01	9.3E-01	8.50E-01	pCi/L	83.10%	RD3203

Number of Results: 12

Quanterra
Environmental Services

BLANK RESULTS

LAB NAME: ITAS-RICHLAND SDG: 3826

LAB SAMPLE ID: L1130518 MATRIX: WATER

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	METHOD NUMBER
TH228	-1.20E-02	1.4E-02	1.4E-02	2.49E-01	pCi/L	74.90%	RD3210
TH230	-3.94E-03	7.9E-03	7.9E-03	1.98E-01	pCi/L	74.90%	RD3210
TH232	0.00E+00	0.0E+00	1.5E-01	1.33E-01	pCi/L	74.90%	RD3210
CS-137DA	6.96E+00	9.6E+00	9.6E+00	1.99E+01	pCi/L	N/A	RD3219
RA-226DA	6.85E-03	2.9E-02	2.9E-02	6.80E-02	pCi/L	100.00%	RD3219
ALPHA	3.64E-01	5.0E-01	5.1E-01	7.25E-01	pCi/L	100.00%	RD3214
BETA	2.45E-01	1.7E+00	1.7E+00	4.10E+00	pCi/L	100.00%	RD3214
RA-228	2.01E-01	3.2E-01	3.2E-01	7.53E-01	pCi/L	88.40%	RD3203

Number of Results: 8

Quanterra
Environmental Services

LABORATORY CONTROL SAMPLE

LAB NAME: ITAS-RICHLAND SDG: 3826

LAB SAMPLE ID: L113051S MATRIX: WATER

ISOTOPE	RESULT	COUNTING ERROR (2s)	TOTAL ERROR (2s)	MDA	REPORT UNIT	YIELD	EXPECTED	RECOVERY
TH230	8.70E+00	1.3E+00	1.7E+00	1.24E-01	pCi/L	82.20%	1.12E+01	77.68%
CS-137DA	1.15E+02	2.2E+01	2.5E+01	N/A	pCi/L	N/A	9.01E+01	127.64%
RA-226DA	9.27E+00	3.2E-01	1.5E+00	6.80E-02	pCi/L	100.00%	9.92E+00	93.45%
ALPHA	1.83E+01	2.7E+00	5.5E+00	7.79E-01	pCi/L	100.00%	2.25E+01	81.33%
BETA	1.71E+01	3.3E+00	3.5E+00	4.25E+00	pCi/L	100.00%	2.24E+01	76.34%
RA-228	7.42E+00	1.1E+00	2.0E+00	7.64E-01	pCi/L	90.70%	9.92E+00	74.80%

Number of Results: 6

RUST ENVIRONMENT & INFRASTRUCTURE

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