1. Keywords

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FUEL OIL NO. 2
GASOLINE 2103
GROUNDWATER CONTAMINATION
MONITORING WELLS
TOLUENE 2802

2. Start Date: FY 93 Quarter 2
End Date: FY 93 Quarter 2

3. HQ Division: 26 - WASTE DISPOSAL ENGINEERING DIV

4. Phase:

5. Program NO: 38

6. Survey Type: GM - HAZARDOUS WASTE MGT CONSULTATION

7. INSTALLATION OR SOURCE OF INFORMATION (CITY & STATE OR COUNTY ARE ESSENTIAL)
HS - USA HEALTH SERVICES COMMAND

8. Authors:

9. ARLOC/Activity: 11933 001 - WALTER REED AMC
Location: WASHINGTON
State: DC

10. Project Control Number: 26-K1HT-93

11. Title: GROUND-WATER QUALITY CONSULTATION

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USAEHA

U.S. Army Environmental Hygiene Agency

GROUND-WATER QUALITY CONSULTATION NO. 38-26-K 1 HT-93
FOREST GLEN SECTION
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC
8-10 FEBRUARY 1993

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DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND. MARYLAND 21010-5422

REPLY TO ATTENTION OF

24 MAY 1993

HSHB-ME-SG (40)

MEMORANDUM FOR Commander, Walter Reed Army Medical Center,
ATTN: HSHL-EH-P&E Div, Washington, DC 20307-5001

SUBJECT: Ground-Water Quality Consultation No. 38-26-K1HT-93, Forest Glen Section, Walter Reed Army Medical Center, Washington, DC, 8-10 February 1993

Two copies of report with Executive Summary are enclosed.

FOR THE COMMANDER:

Encl

WILLIAM T. BROADWATER
LTC, MS
Chief, Waste Disposal Engineering Division

CF (w/encl):
HQDA(ENVR-E)
DA, USAEHSC, Al-l-N: CEHSC-FU-S
CDR, HSC, AT-TN: HSCL-P (3 cy)
CDR, WRAMC. ATTN: PVNTMED Svc (2 cy)
CDR, USAEC, A-J-IN: ENAEC-TS-S
CDR, USAEC, AI-TN: ENAEC-RM(TIC) (2 cy)
CDR, USAEHA-N

DEPARTMENT OF THE ARMY
U S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND. MARYLAND 21010-5422

REPLY TO
ATTENTION OF

EXECUTIVE SUMMARY
GROUND-WATER QUALITY CONSULTATION NO. 38-26-K 1 HT-93
FOREST GLEN SECTION
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC
8-10 FEBRUARY 1993

1. PURPOSE. This consultation was conducted at the Forest Glen Section of Walter Reed Army Medical Center (WRAMC) to collect and analyze water samples from 20 ground-water monitoring wells; to determine the potential of adverse health and environmental impacts from ground-water contamination due to leaking underground storage tanks (USTs); to determine the direction of ground-water movement; to define the extent of a plume of contaminated ground water, and the migration of No. 2 fuel oil and/or its water soluble fraction.

2. CONCLUSIONS.

a. Ground-water flow direction is generally towards the west and southwest. The highest ground-water elevation occurs in well No. 5.

b. An acrylic bailer was used to determine the amount of product floating on the water surface within the 20 wells prior to the purging phase. A great deal of product was found in well No. 8, as the bailer was full of weathered oil. A sheen, about 1/16-inch thick. was found in wells Nos. 6, 101, and 104. Unmeasurable sheens were in wells Nos. 7. 14, 16. 102, and 103. There was a gasoline odor in well No. 11: however, there was no sheen visible.

c. Ground-water contamination from No. 2 fuel oil was detected as the result of spills or leaking USTs in wells Nos. 5, 6. 8, 14, 15, 101, 102, 103, and 104 based on the occurrence of naphthalenc. Naphthalene also was detected in the water sample from well No. 9 at 3 $\mu g/L$. However, a trace of naphthalene was detected in the field blank; therefore, the presence of naphthalene may or may not be present in the water sample fmm well No. 9. There is no drinking water standard for naphthalene.

d. Well No. 12 was the most contaminated and contained very large quantities of benzene, toluene, ethyl benzene. and total xylenes (BTEX). Well samples collected from wells Nos. 11 and 13 also contained BTEX. Other volatile compounds were also present in these three well samples. Although BTEX occurs in fuel oil. a large quantity of BTEX detected in the ground water is a good indication of gasoline contamination. Toluene was only detected in wells Nos. 11, 12, and 13. Samples from wells Nos. 1, 2. 3. 7. 10, and 16 were the least contaminated.

e. Benzene detected in water samples from wells Nos. 8, 11, 12, 13, and 102 exceeded the NPDWR MCL. Toluenc detected in the water sample from well No. 12 exceeded the NPDWR MCL.

3. RECOMMENDATIONS.

a. To ensure compliance with Federal and State regulations, a contract should bc immediately initiated for the State-approved precision testing of all untested USTs at WRAMC.

b. To ensure good environmental engineering practice, the following possible recommendations arc made for WRAMC:

(1) Pump and treat the ground water from wells Nos. 101, 102. and 104 in an alternating fashion. Some of the treated ground water could be injected upgradient into well No. 103 to force the contaminated water into these three wells.

(2) Pump and treat the water from wells Nos. 11, 12. and 13 to remove the gasoline and the weathered byproducts.

c. The data and interpretations presented herein should be coordinated with the UST Division of the Maryland Department of the Environment for their recommendations.

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DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

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REPLY TO ATTENTION OF

HSHB-ME-SG

GROUND-WATER QUALITY CONSULTATION NO. 38-26-K1HT-93
FOREST GLEN SECTION
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, DC
8-10 FEBRUARY 1993

1. REFERENCES. See Appendix A for a list of references.

II. AUTHORITY. AEHA Form 250-R, HSC, 2 February 1993.

III. PURPOSE This consultation was conducted at the Forest Glen Section of Walter Reed Army Medical Center (WRAMC) to collect and analyze water samples from 20 ground-water monitoring wells: to determine the potential of adverse health and environmental impacts from ground-water contamination due to leaking underground storage tanks; to determine the direction of ground-water movement; to define the extent of a plume of contaminated ground water, and the migration of No. 2 fuel oil and/or its water soluble fraction.

IV. GENERAL.

A. Personnel Contacted. A list of the personnel contacted during this consultation is provided in Appendix B.

B. U.S. Army Environmental Hygiene Agency (USAEHA) Consultation Personnel. The following USAEHA personnel accomplished the purging, sampling, and surveying of 20 ground-water monitoring welts:

1. Mr. David C. Bayha, Project Manager, Hydrologist, Waste Disposal Engineering Division (WDED);

2. Mr. Gary Duane Maners, Engineering Technician, WDED; and

3. SSG Myrna L. Miller, Preventive Medicine Technician, WDED.

Use of company names does not imply endorsement by the U.S. Army but is intended only to assist In identification of a specific produce.

C. Meeting with WRAMC Environmental and State of Maryland's Department of the Environment (MDE) Personnel. A meeting [among the project manager, Mr. Bayha; five personnel from WRAMC; and three personnel from the Underground Storage Tank (UST) Division of the MDE] was held on 21 January 1993 in Building 605 at the Forest Glen Section of WRAMC. The ground-water contamination problem between Buildings 500 and 512 at the Forest Glen Section of WRAMC was discussed. This contamination problem is caused by a leaking UST(s) and/or its (their) associated pipeline(s) containing No. 2 fuel oil. See Appendix B for a list of personnel at this meeting.

D. Location. The WRAMC comprises three geographically separate sections: the Main Section, Forest Glen Section, and Glen Haven Section (Figure 1). The Main and Glen Haven sections will only be discussed briefly since this report is concerned with leaking USTs and/or their associated pipelines at the Forest Glen Section. Forest Glen, which contains nearly 183 acres of land, is located in Montgomery County, Maryland, about 4.2 miles north-northwest of the Main Section and about 1 mile northwest of Silver Spring. Forest Glen is bounded by the Capital Beltway (I-495) on the north, Garfield Avenue to the south, Rock Creek on the southwest, Brookeville Road on the southeast, and the Baltimore & Ohio Railroad on the northeast (Figure 2) (references 1, 2, 3, and 4).

E. Mission. WRAMC is a major medical care, research and teaching center of international importance under the command jurisdiction of the United States Army Health Services Command (HSC), Fort Sam Houston, Texas, The Main Section contains the hospital and the major research and teaching facilities; Forest Glen is an auxiliary service, support and research area; and Glen Haven is the family housing for enlisted military personnel assigned to WRAMC (references 1, 2, 3, and 4).

F. Physiography. All three sections of WRAMC are located on the eastern edge of the Piedmont Plateau physiographic province of the Appalachian Highlands (reference 4).

G. Topography and Drainage. Elevations at Forest Glen range from 188 to 347 feet above sea level. Generally the average slope is about 15 percent; however, some slopes exceed 50 percent along stream beds. No perennial streams exist at Forest Glen; however, four ephemeral streambeds exist where surface water flows during heavy precipitation events. Forest Glen is composed of rolling hills, sloping toward the west and the Rock Creek drainage system (reference 4).

H. Background.

1. A Notice of Violation (NOV), NV-93-056, was issued on 22 December 1992 to WRAMC for the Forest Glen Section by MDF (reference 5). This NOV stated that on 4 December 1992, Mr. Robert Day, the MDE's UST Division Regional Environmental

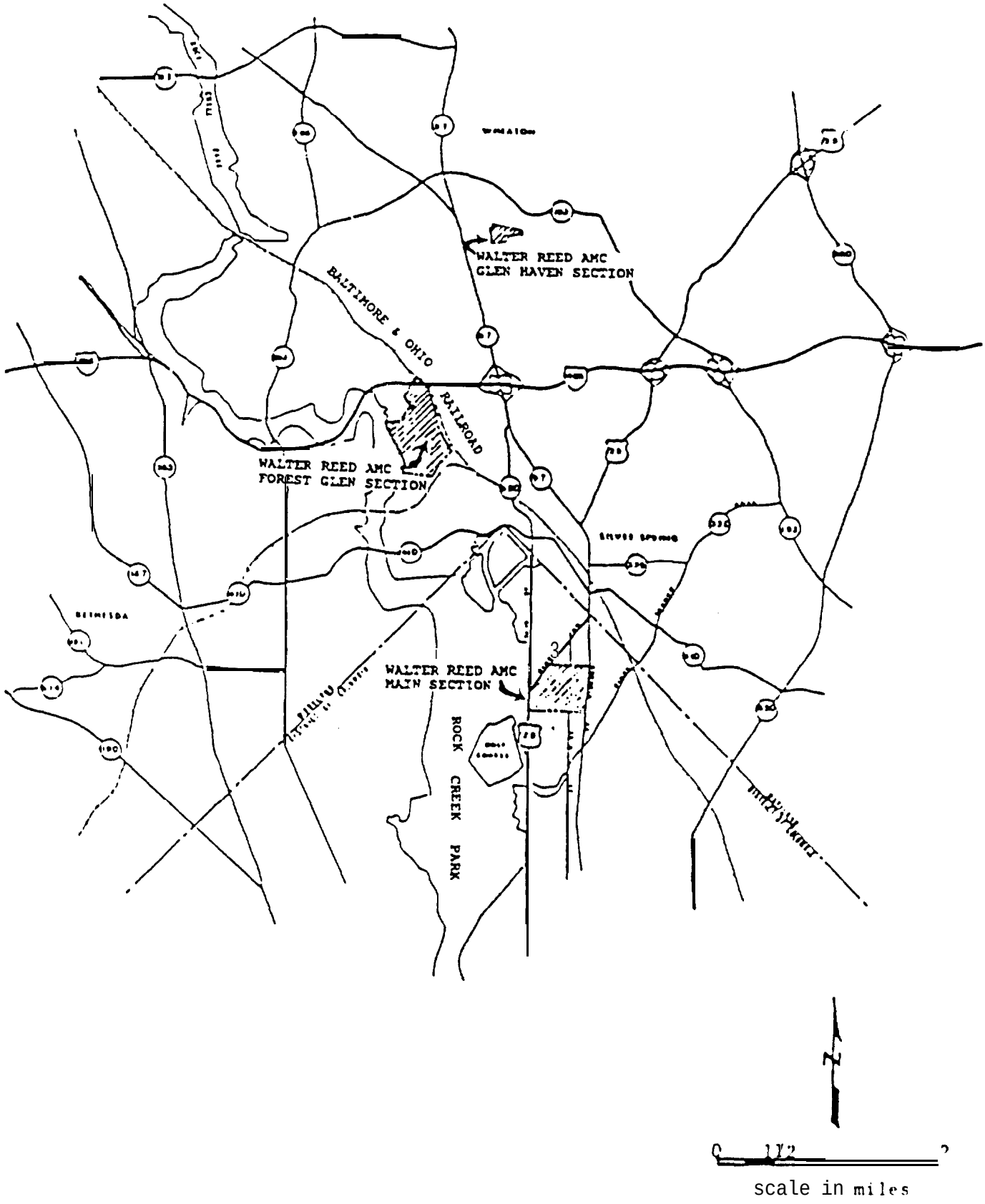

FIGURE 1. LOCATION MAP SHOWING THE MAIN SECTION, THE FOREST GLEN SECTION, AND THE GLEN HAVEN SECTION AT WALTER REED AMC

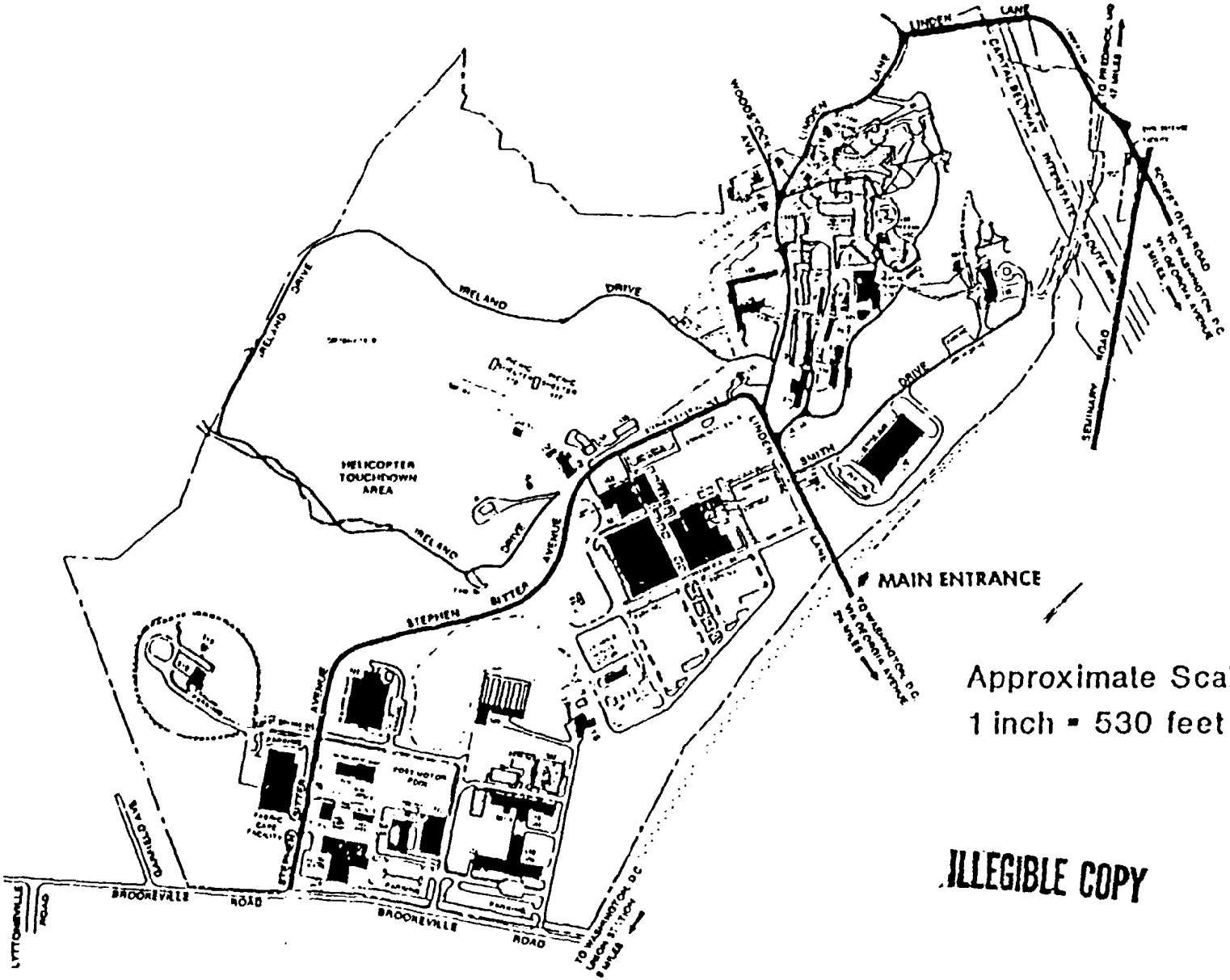

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FIGURE 2. MAP SHOWING THE FOREST GLEN SECTION OF WRAMC

Inspector, found that two required permanent monitoring pipes were not installed at the new UST for the emergency generator, which is located northwest of Building 512 at the Forest Glen Section. In addition, Mr. Day noted that one 10,000-gallon UST was removed and that free phase petroleum product was found in the excavation. He also noted that an UST at Building 500 was improperly abandoned. The above findings constituted a violation of the Code of Maryland Regulations (COMAR) 26.10.03.01E (3), 26.10.08.03, and 26.10.10.02. The NOV gave WRAMC 30 days to perform the following:

a. Install, properly construct, and develop 10 additional ground-water monitoring wells to determine if petroleum contamination is present in the ground water. These wells must be constructed at locations with prior approval of MDE, and must have 10 feet of screen both above and below the water table (reference 5).

b. Install a petroleum recovery system which is capable of:

(1) removing liquid and dissolved petroleum contamination from the ground water;

(2) creating and maintaining an effective radius of influence in order to retain the contamination onsite;

(3) 24-hour automatic operation;

(4) operating in an explosive-proof manner;

(5) automatic shutoff in case of an emergency or an overfill;

(6) maintaining a level of treatment that achieves 100 parts per billion (ppb) total sum of benzene, toluene, ethyl benzene, and total xylenes (BTEX) and 5 ppb benzene for discharge to surface waters;

(7) recording total ground water pumped and treated; and

(8) allowing the collection of pretreated and post treated samples (reference 5).

c. After completing items listed in paragraph b above WRAMC must:

(1) notify MDE in writing at least 5 days after the anticipated start-up of this system;

(2) sample the influent and effluent twice a month for the first 3 months of operation, then on a monthly basis unless ordered differently by MDE;

(3) submit a report to MDE of the recovery system's operation on a quarterly basis;

(4) provide keys to the recovery system to MDE; and

(5) sample and analyze (once per quarter for BTEX and (MTBE) the ground water from each of the monitoring wells (reference 5).

d. Complete a hydrogeological study in order to define the total extent of subsurface contamination. The hydrogeological study shall include a site map with well locations and well logs with corresponding permit numbers (reference 5).

e. Submit all data pertaining to product thickness, water levels, surface elevation, monthly and total-to-date product recovered on a monthly basis (reference 5).

2. All information, data, reports or plans generated for this site must be submitted to MDE. All remediation activities before their implementation or discontinuance must have the prior approval of MDE (reference 5).

3. Failure to perform these advised corrective actions could result in additional enforcement action from MDE which could include the issuance of civil penalties and other legal sanctions (reference 5).

4. A letter from WRAMC in reply to the 22 December 1992 NOV (NV-93-056) was sent to MDE on 5 February 1993. This letter stated that the UST, which Mr. Day believes to have been the source of the petroleum at Building 500, has not been located. A detailed investigation of the area by WRAMC personnel and a search of as-built drawings did not reveal the location of the tank; however, construction drawings from 1977 indicated that this UST was removed. The points in the NOV were answered in order by representatives from WRAMC (reference 6).

a. WRAMC's letter stated that three ground-water monitoring wells are scheduled to be installed no later than 29 January 1993 at locations designated by Mr. Day. Two monitoring pipes will be installed to the MDE specifications at Building 512 by 29 January 1993 (reference 6).

b. WRAMC's letter stated that USAEHA personnel will purge, measure water levels, and collect ground-water samples to determine the ground-water flow direction and water quality of these three wells during the second week in February 1993 (reference 6).

c. A recovery system will be provided for the ground-water remediation at Building 500. A statement of work (SOW) was drafted by WRAMC personnel as the first step for obtaining Requests for Proposals from contractors who can complete this type of work. It was anticipated that this job can be offered to contractors within 45 days, and the recovery work can begin within 120 days from 5 February 1993. The SOW will be designed to incorporate all the items in paragraphs IVH1b(1) through IVH1b(8), this report,(reference 6).

d. Items in paragraphs IVH1c(2) and IVH1c(5) of this report will be completed by WRAMC as directed by MDE, and included in the SOW. Items in paragraphs IVH1c(1), IVH1c(3), and IVH1c(4), this report, will be carried out by WRAMC personnel directly and reports forwarded to MDE (reference 6).

e. Initial work including the ground-water quality, well logs, and direction of ground-water flow will be carried out by USAEHA by completing a ground-water consultation (reference 6).

f. The Recovery System Contractor will perform the remainder of the required work for the overall project. A report will be written by the Recovery System Contractor concerning all data pertaining to product thickness, water levels, surface elevations, and total-to-date product recovered on a monthly basis (reference 6).

V. FINDINGS AND DISCUSSION.

A. Geohydrology.

1. Soils. The soils distribution at Forest Glen along with the area of investigation of this particular consultation are shown in Figure 3. The three predominant soil series at Forest Glen are the Brandywine loam, the Glenelg silt loam, and the Manor-Channery silt loam, each covering about 28 percent of the Forest Glen Section. The approximate remaining 16 percent is covered by the Glenville silt loam and the Wehadkee silt loam (reference 7).

2. Saprolite and Bedrock. Immediately below the soils at varying shallow depths at Forest Glen are gneissic to schistic saprolite which was present in most of the wells. Gneiss is a coarse-grained, foliated, metamorphic rock, which corresponds in composition to a granite (or other quartz and feldspar-containing igneous rock). This foliation occurs in subparallel to parallel orientation of micaceous minerals which dominate the composition of schist. Saprolite is a general geologic term for thoroughly decomposed rock, which has undergone weathering in place. In the WRAMC region, weathered metamorphic schists and/or gneisses overlie massive, crystalline, metamorphic schists and gneisses of Precambrian age (basement rocks). These metamorphic rocks have later been intruded by igneous rocks and quartz veins.

3. Ground-Water Occurrence.

a. Three nearby aquifers, the Patuxent, Patapsco, and the Magothy, are located about 22 miles southeast of WRAMC in a thick wedge of coastal sediments. Their locations and recharge areas are shown on Figure 4. All three sections of WRAMC are situated in the recharge area of the Patuxent Aquifer (references 4 and 7).

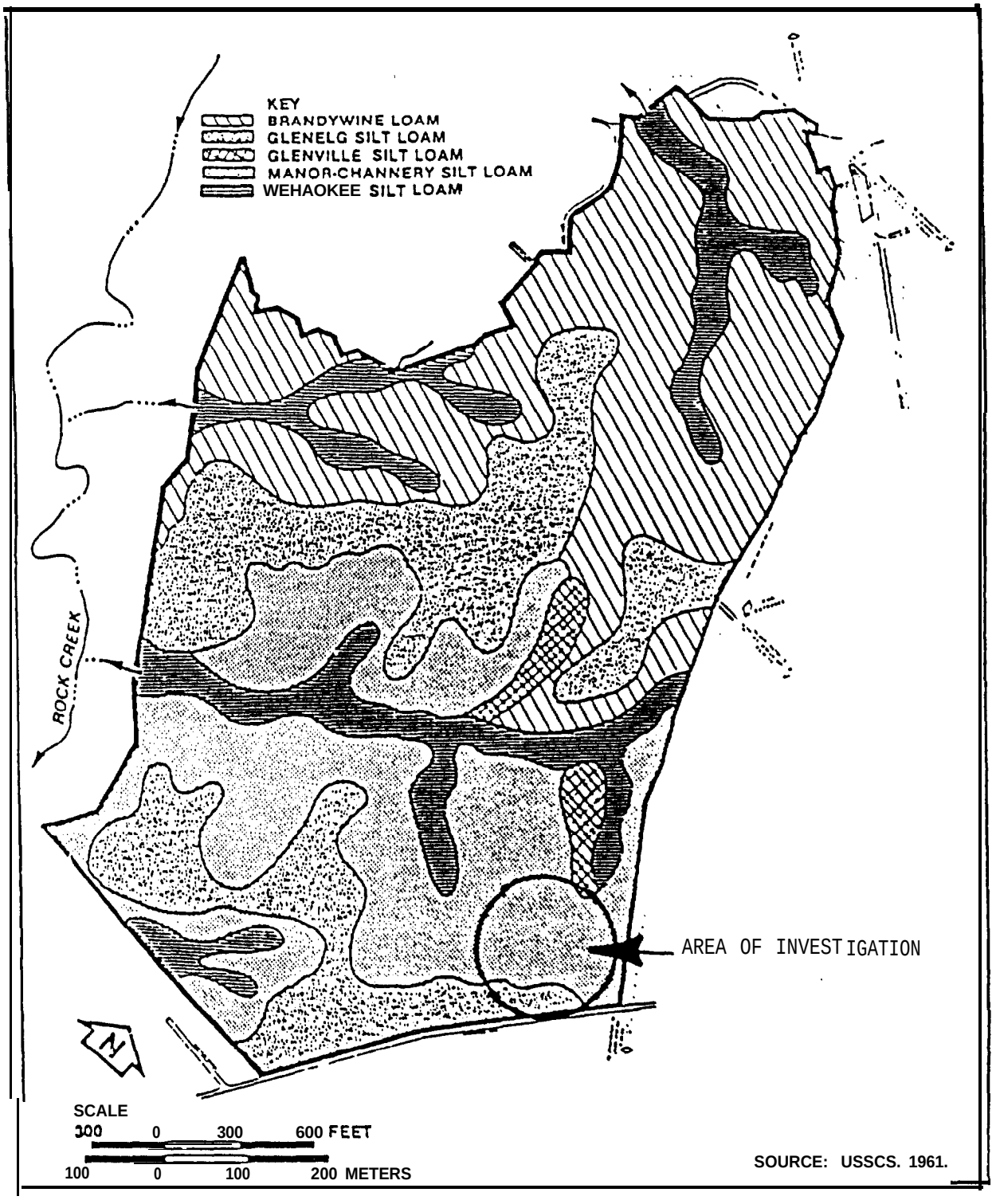

FIGURE 3. SOILS MAP OF THE FOREST GLEN SECTION, WALTER REED ARMY MEDICAL CENTER

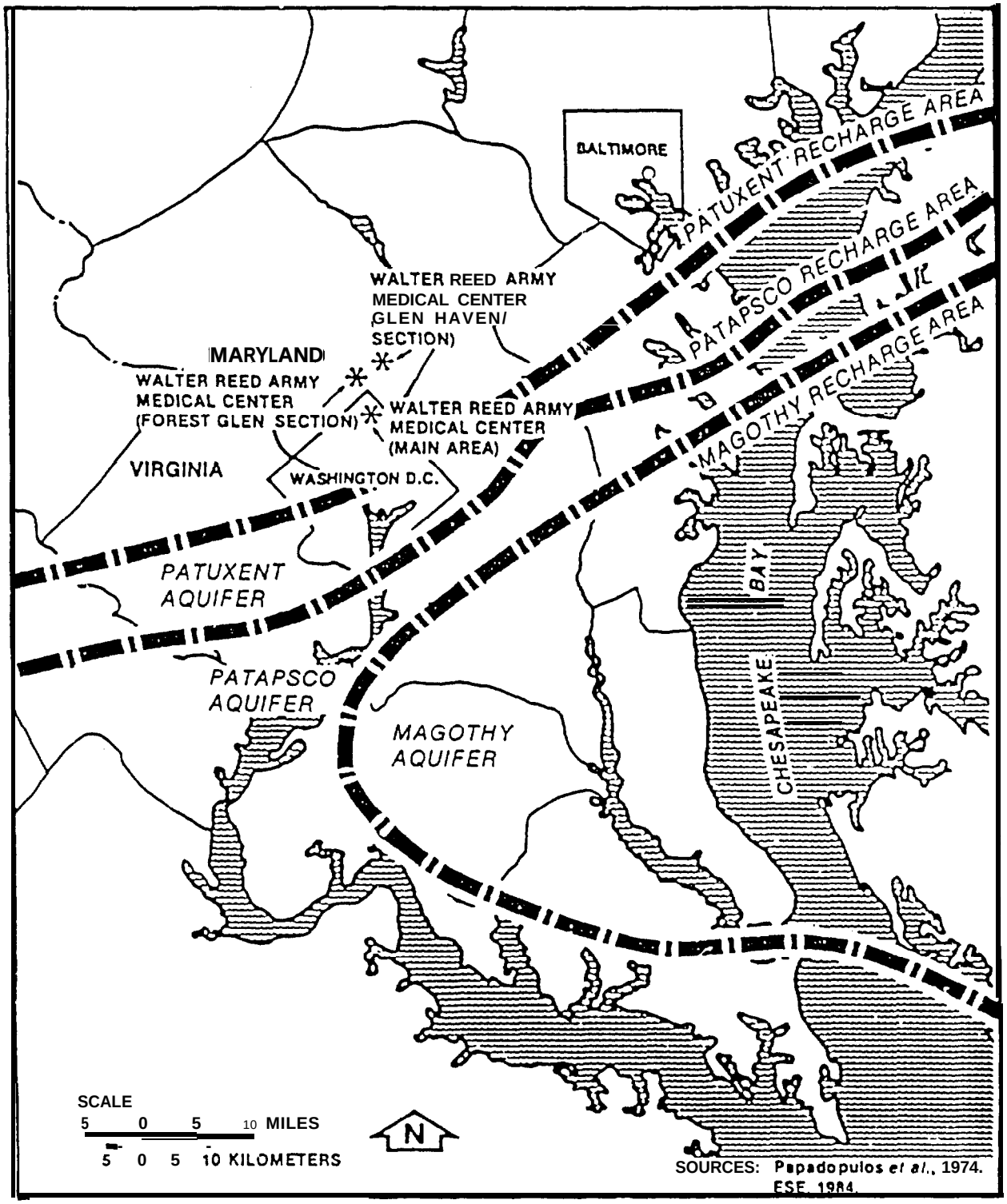

FIGURE 4. MAP SHOWING LOCATIONS OF THREE AQUIFER RECHARGE AREAS NEAR WALTER REED ARMY MEDICAL CENTER

b. There are no potable wells at any of the three sections of WRAMC. The subsurface storage of a sufficient quantity of potable ground water is low due to a thin mantle of soil, .hin terrace deposits of Pleistocene age, and a relatively thin residuum of saprolite. A northwest-southeast trending geologic cross-section across the northeast portion of the District of Columbia is shown on Figure 5 (references 4 and 7).

c. Public ground-water supplies provide less than 3 percent of the water currently consumed in the WRAMC area, and for economic reasons it is likely to remain a minor supplement. The amount of ground water that can be stored underground depends on the amount of precipitation, transpiration, slope of the land surface, and the porosity and permeability of the soil and the underlying rocks (references 1, 2, 4, and 7).

4. Ground-Water Monitoring Wells, See Figure 6 for a map showing the locations of the 20 ground-water monitoring wells.

a. Ten ground-water monitoring wells (Nos. I to 10), with 2-inch inside-diameter (ID) polyvinyl chloride (PVC) casing, were installed by this Agency during 19-30 June 1989 around and downgradient from an old leaking UST and its associated pipelines, containing No. 2 fuel oil, near Building 500 (Laboratory) at the Forest Glen Section of WRAMC. Well No. 8 was drilled at or near the reported location of an old removed UST which apparently had leaked in the past. During the drilling of well No. 8 in June 1989, the subsurface soil in some zones was stained and had a strong odor of oil (reference 7). The drilling, monitoring well construction, development and sampling procedure are discussed in Appendix C. The drilling logs are in Appendix D and the Ground-Water Sampling Field Data Logsheets are in Appendix E. Table 1 and Appendix E show the depths and the static water levels which were measured during 28-29 June 1989 (reference 7) and 8-10 February 1993.

b. Ten additional ground-water monitoring wells (Nos. 1 l-16 and 101-104), with 4-inch ID PVC casings, were installed much later by private contractors during December 1992 and early 1993. The well numbering system used by some of the private contractors on their wells were changed by the project manager, Mr. Bayha, in order to have well numbering consistency. The well numbers previously assigned by the contractors are shown in parentheses. Wells Nos. 11 (MW #1), 12 (MW #2), 13 (MW #3) were drilled by a private contractor; however, no drilling logs or completion data were available for these three wells. Wells Nos. 14 (106), 15 (105), and 16 (107) were drilled during 1-3 February 1993 by personnel from Connelly and Associates of Frederick, Maryland. Wells Nos. 101, 102, 103, and 104 were drilled during 7-8 December 1992 also by personnel from Connelly and Associates. The drilling logs of the seven other contractor-drilled wells are in Appendix D and the Ground-Water Sampling Field Data Logsheets are in Appendix E.

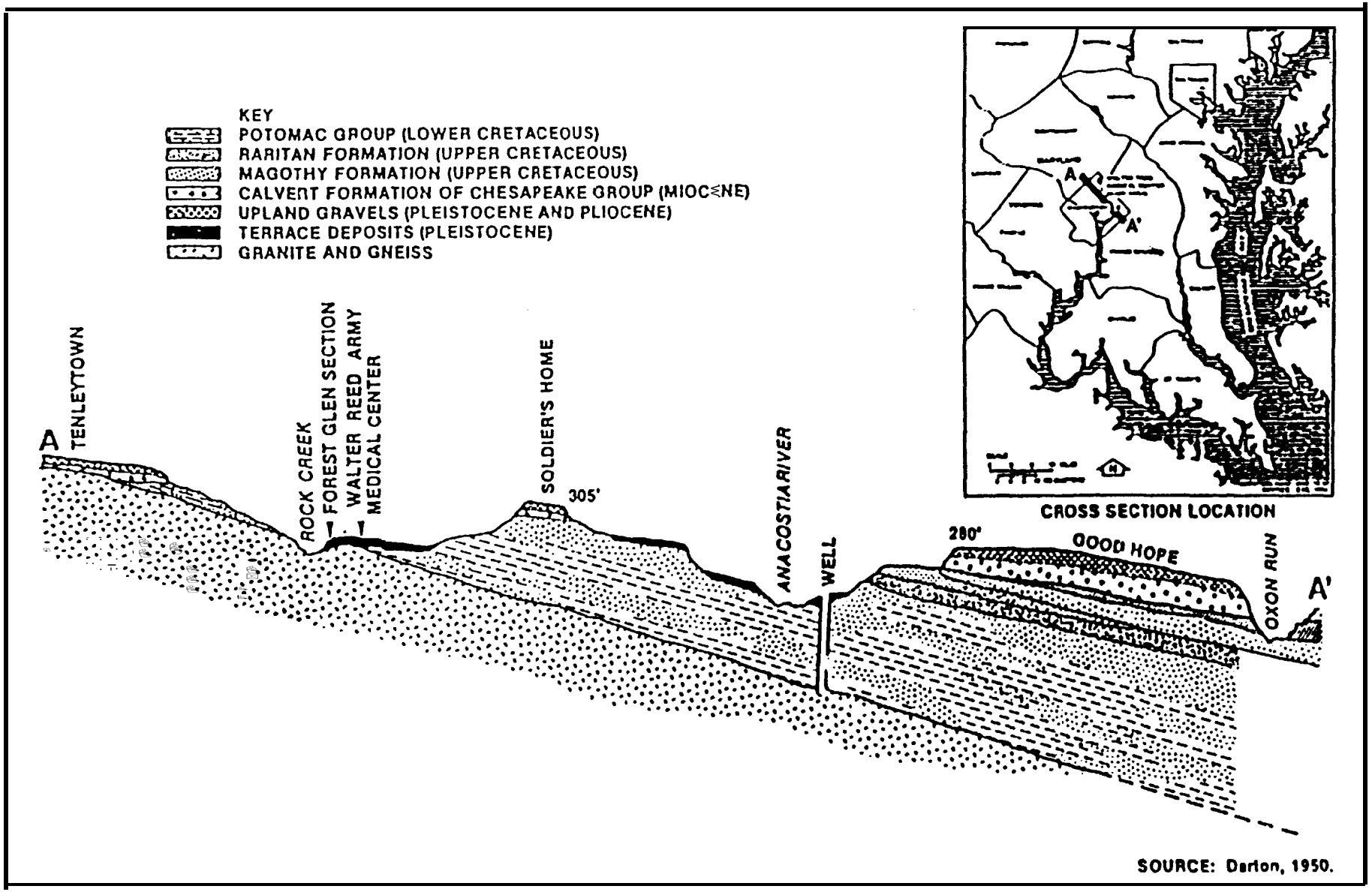

FIGURE 5. NORTHWEST-SOUTHEAST TRENDING GEOLOGIC CROSS-SECTION THROUGH THE DISTRICT OF COLUMBIA

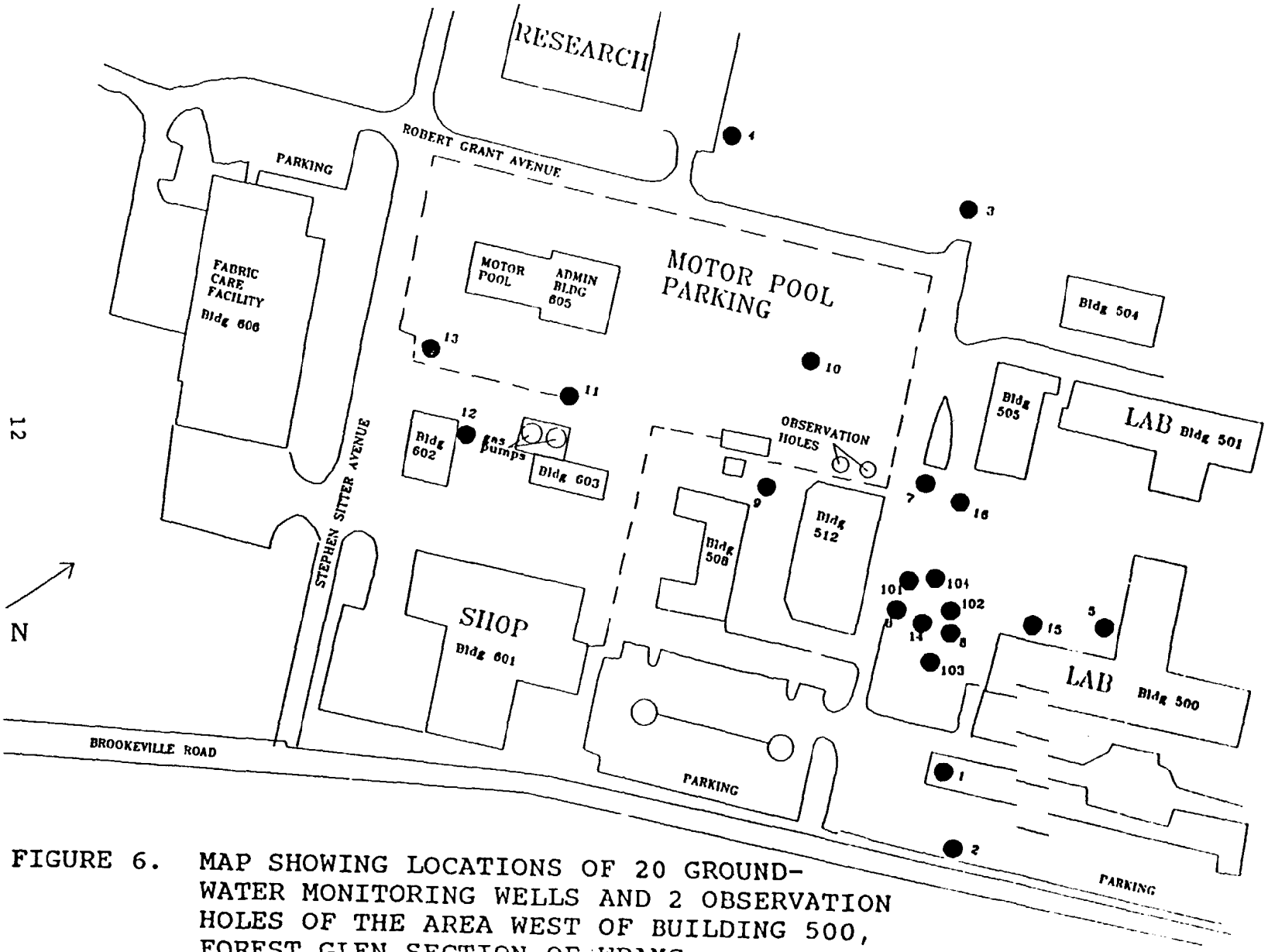

FIGURE 6. MAP SHOWING LOCATIONS OF 20 GROUND-WATER MONITORING WELLS AND 2 OBSERVATION HOLES OF THE AREA WEST OF BUILDING 500, FOREST GLEN SECTION OF WRAMC

TABLE 1. DEPTHS OF WELLS AND THEIR WATER LEVELS MEASURED IN FEET BELOW THE GROUND SURFACE DURING 28-29 JUNE 1989 AND 8-10 FEBRUARY 1993

Well Number	Static Water Level Measured During - une 1989	Static Water Level Measured During 8-10 February 1993	Well Depth
1	13.85	15.95	25.0
2	15.26	17.46	27.5
3	18.63	19.02	26.0
4	30.33	30.52	39.0
5	9.81	16.79	27.0
6	4.77	7.18	27.0
7	5.81	7.36	22.0
8	9.85	12.94	25.0
9	IO.49	11.90	22.0
IO	14.90	15.85	25.0
11	-----	17.93	30.1
12	-----	16.81	32.5
13	-----	14.20	30.6
14	-----	10.55	23.1
15	-----	14.53	44.9
16	-----	10.45	20.5
101	-----	7.60	24.0
102	-----	13.15	34.8
103	-----	15.25	34.1
104	-----	10.50	24.2

5. Direction of Ground-Water Flow.

a. Elevations of the tops of the 20 PVC well casings were determined to the nearest 0.01 foot. The height of the PVC well casings above and below the ground surface were measured to the nearest 0.01 foot. Table 2 shows the elevations of the tops of the PVC casings, which were surveyed by USAEHA personnel (Mr. Maners and SSG Miller) during 9-10 February 1993, and the water table elevations for each well. Water level measurements for wells Nos. 1, 2, 3, 4, 10, 11, 12, and 13 were determined on 8 February 1993. Water level measurements for wells Nos. 5, 8, 9, 14, 15, 102, and 103 were determined on 9 February 1993. Water level measurements for wells Nos. 6, 7, 16, 101, and 104 were determined on IO February 1993. There were no precipitation events during 8-10 February

TABLE 2. ELEVATIONS IN FEET OF TOP OF PVC CASINGS AND TOP OF THE WATER TABLE AT THE FOREST GLEN SECTION OF WRAMC DURING 8-10 FEBRUARY 1993

Well Number	Top of PVC Casing	Water Table	Well Number	Top of PVC Casing	Water Table
1	328.33	309.98	11	316.70	298.97
2	328.52	308.72	12	315.40	301.49
3	311.59	290.36	13	314.36	300.46
4	317.26	284.42	14	322.73	309.30
5	330.07	310.27	15	326.83	310.13
6	319.45	309.35	16	321.69	308.78
7	316.99	306.74	101	318.82	309.24
8	324.64	308.80	102	324.46	309.31
9	319.79	305.00	103	327.35	309.38
10	312.48	296.83	104	321.82	308.92

1993 to affect the ground-water levels. Ground water flows in the same direction as the surface water, generally toward the west and southwest. As can be seen from Figure 7 and Appendix E, the highest ground-water elevation occurs in well No. 5.

b. In June 1989, the highest ground-water table elevation in well No. 5 was believed to be due to a leaking air conditioning water cooling tower located near this well in the comer of Building 500. The water reportedly had flowed on the surface for years toward the southwest across the grass and then northwest from the street into a storm sewer. This leaking air conditioning water cooling tower apparently has been repaired. as the water which used to flow across the grass no longer does. The presence of an odor and a slight sheen of oil found while purging well No. 1 in June 1989 was a surprise as this well was supposed to be the "clean" upgradient well (reference 7). It can now be assured that the higher ground-water table elevation in well No. 5 is a natural occurrence, and not due to the air conditioning water cooling . wer.

B. Underground Storage Tanks.

1. Leaking petroleum, oil, and lubricant (POL)-containing USTs, which have caused ground-water contamination, have been documented at other State installations. The final UST technical requirements promulgated by the EPA give the initial response required by

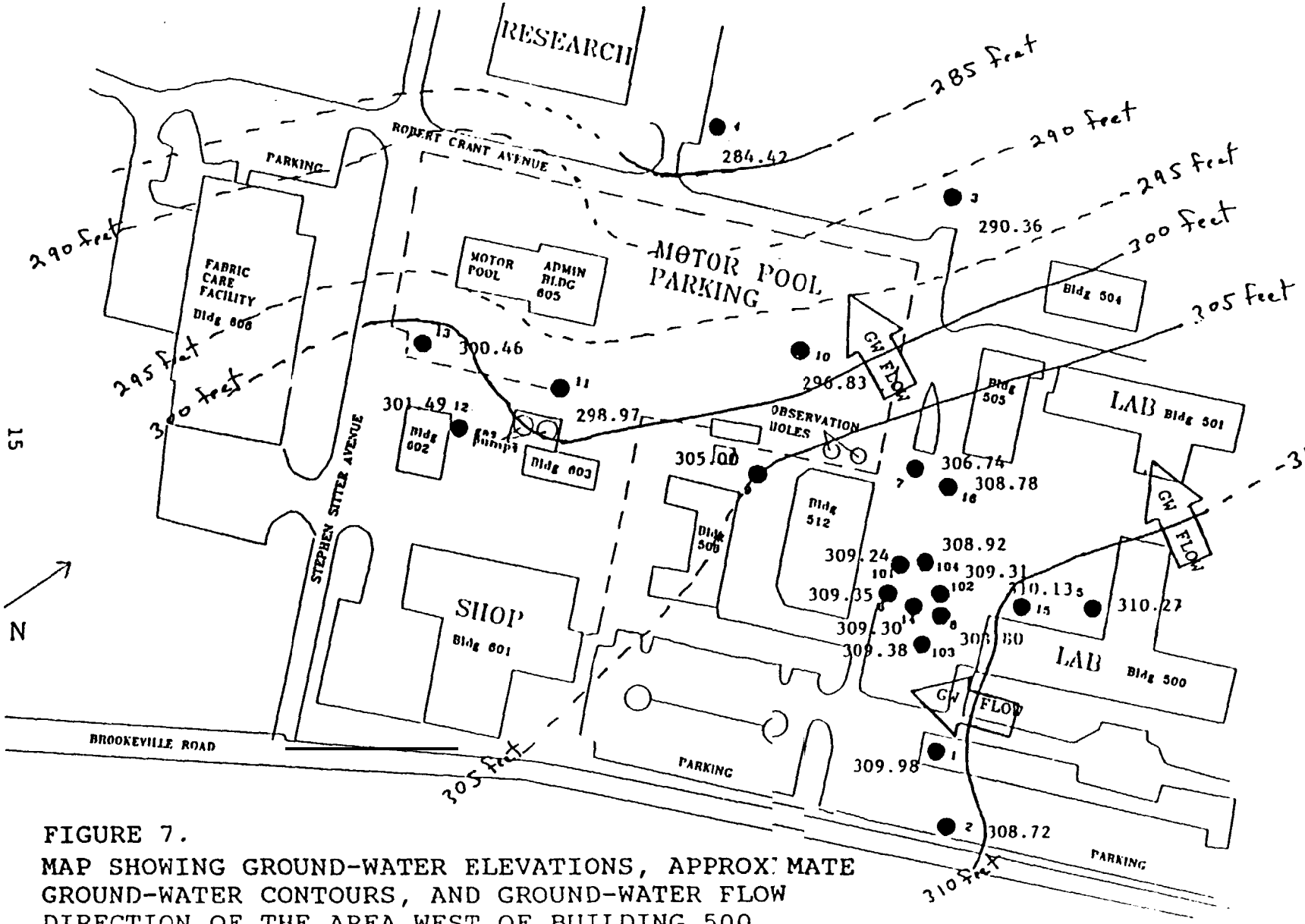

FIGURE 7.
MAP SHOWING GROUND-WATER ELEVATIONS, APPROXIMATE GROUND-WATER CONTOURS, AND GROUND-WATER FLOW DIRECTION OF THE AREA WEST OF BUILDING 500, FOREST GLEN SECTION, WALTER REED AMC

40 CFR 280.61 (reference 8). The MDE requires, upon confirmation of a release in accordance with COMAR 26.10.01.03 (reference 9) or after a release from the UST system, that oil spills and discharges shall be reported to their office immediately or no later than 2 hours after detection of the spill, and shall include: time and location of discharge; type and quantity of oil spilled; any assistance required; name, address, and telephone number of the person making the report; and any other pertinent information requested by MDE (references 3, 7, 8, and 9).

2. Initial abatement measures and site checks are required by 40 CFR 280.62 (reference 8). Unless directed to do otherwise by the State regulatory agency (MDE), owners and operators must perform the following abatement measures:

a. Remove as much of the regulated substance from the UST system as is necessary to prevent further release to the environment;

b. Visually inspect any aboveground releases or exposed below ground releases and prevent further migration of the released substance into surrounding soils and ground water:

c. Continue to monitor and mitigate any additional fire and safety hazards posed by vapors or free product that have migrated from the UST excavation zone and entered into subsurface structures (i.e., utility manholes; sewer, electrical, and water pipeline tunnels and other excavations; basements and crawl spaces: and adjacent wells, springs, and streams);

d. Remedy hazards posed by contaminated soils that are excavated or exposed as a result of release confirmation, site investigation, abatement, or corrective action activities. If these remedies include treatment or disposal of soils, the owner and operator must comply with applicable State and local requirements;

e. Measure for the presence of a release where contamination is most likely to be present at the UST site, unless the presence and source of the release have been confirmed in accordance with the site check required by 40 CFR 280.52(b) or the closure site assessment of 40 CFR 280.72(a) (reference 8). In selecting sample types, sample locations, and measurement methods, the owner and operator must consider the nature of the stored substance, the type of backfill, depth to ground water, and other factors as appropriate for identifying the presence and source of the release: and

f. Investigate to determine the possible presence of free product, and begin free product removal as soon as practicable and in accordance with 40 CFR 280.64 (references 7, 8, and 9).

3. In July 1989, there were 14 USTs in the immediate area of Building 500 and the Post Motor Pool at the Forest Glen Section (see Table 3) (references 7 and 10). The 12,000-gallon UST containing No. 2 fuel oil located near Building 500 was removed on or about 3 December 1992. The two 50,000-gallon USTs containing No. 2 fuel oil located near Building 500 were removed in January or February 1993. Three 5,000-gallon USTs were also removed near the gas pumps near Building 603 (see Figure 6 and Table 3).

TABLE 3. LOCATION OF 14 USTs, AMOUNT OF STORAGE, AND TYPE OF FUEL IN THE AREA OF BUILDING 500 AND THE POST MOTOR POOL, FOREST GLEN SECTION, WRAMC, AS OF 21 JULY 1989

Location (Building Number)	Number of Tanks	Total Capacity (Gallons)	Type of Fuel	Secondary Containment
500	2 each	50,000 each	No. 2	Direct Burial
500	1 each	12,000	No. 2	Direct Burial
505	1 each	2,000	No. 2	Direct Burial
508	1 each	10,000	No. 2	Direct Burial
511	2 each	15,000 each	No. 2	Direct Burial
601	1 each	15,000	No. 2	Direct Burial
605	1 each	5,000	No. 2	Direct Burial
606	1 each	50,000	No. 2	Direct Burial
606	1 each	12,000	No. 2	Direct Burial
603	2 each	5,000	Gasoline	Direct Burial
603	1 each	5,000	Diesel	Direct Burial

Source: Reference 10

C. Purging and Sampling the Ground-Water Monitoring Wells.

1. A graduated, clear, acrylic bailer was used to determine the amount of product floating on the water surface within the 20 wells prior to purging. A great deal of product was found in well No. 8, as the bailer was full of weathered oil and therefore was unmeasurable. The PVC stand pipe was quite stained. A sheen, about a l/16-inch thick, was found in wells Nos. 6, 101, and 104. Unmeasurable sheens were found in wells Nos. 7, 14, 16, 102, and 103. There was no sheen visible in wells Nos. 11 and 12; however, there

was an odor of possible gasoline. There were no sheens visible initially in wells Nos. 13 and 15. A sheen later developed while purging well No. 13 along with an odor of gasoline. A sheen later developed while purging well No. 15 along with small globs of weathered oil from near the bottom of well 15. No oil or gasoline odor or sheen was noticed in wells Nos. 1 through 5, 9, and 10.

2. The 20 ground-water monitoring wells were purged during 8-10 February 1993 using stainless steel bailers suspended with dedicated plastic-coated clothesline cord. In order to purge properly, a minimum of three well volumes were removed from each well prior to sampling. The 10 wells installed by USAEHA personnel during 28-29 June 1989 (wells Nos. l-10) were completed with 2-inch ID PVC well screen and solid casing. The other 10 wells installed by private contractors during 7-14 December 1992 (wells Nos. MW-101 to MW-104) and 1-3 February 1993 [wells Nos. 14 (106), 15 (105), and 16 (107)] were completed with 4-inch ID PVC well screen and solid casing (see Appendix E).

3. During the purging phase, the amount of ground water removed from wells Nos. l-10 ranged from 3.5 to 9.9 gallons with an average of 5.6 gallons. The amount of ground water removed from wells Nos. 1 1-16 and 101-104 ranged from 23.9 to 65.1 gallons with an average of 36.2 gallons. Copies of the Ground-Water Sampling Field Data Logsheets are in Appendix E. At least three volumes of standing water in each well were removed prior to sampling. The difference in the amount of water removed from wells Nos. l-10, and from wells Nos. 11-16 and 101-104 was due to the installation of 'L-inch ID PVC casing in wells installed by USAEHA personnel and 4-inch ID PVC casing in the other 10 wells installed by private contractors. Stainless steel bailers were used on each well during the purging phase, and Singlesample® disposable bailers were used during the sampling phase. See Appendix C for a description of the ground-water monitoring well sampling method.

D. Volatile Organic Analyses of the Ground Water.

1. Samples were collected during 8-10 February by USAEHA personnel and received by the USAEHA laboratory on 11 February. Volatile organic (VO) analyses were performed on 21-23 February 1993. The sample holding time of 14 days was met for all samples. Table 4 shows the VO chemical results.

2. There were significant detections of fuel-related aromatics in several ground-water samples, necessitating various dilutions. Trichlorofluoromethane was detected in the ground-water sample from well No. 4 at a level exceeding the quantitation upper limit of 50

® Singlesample is a registered trademark of Voss Technologies, San Antonio, Texas.

TABLE 4. VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND-WATER SAMPLES COLLECTED FROM GROUND-WATER MONITORING WELLS AT THE FOREST GLEN SECTION OF WRAMC DURING 8- 10 FEBRUARY 1993

Well Number	Organic Compound	Amount in micrograms per liter (µg/L)
Field Blank	Naphthalene	Trace
Field Blank	Chloroform	3
1	sec-Butylbenzene	Trace
4	Chloroform	Trace
4	Trichlorofluoromethane	70
5	Chloroform	6
5	Naphthalene	19
5	1,2,4-Trimethylbenzene	6
6	Naphthalene	28
7	tert-Butylbenzene	Estimated value 0.5
8	Benzene	17
8	n-Butylbenzene	28
8	sec-Butylbenzene	21
8	Chlorofon	13
8	Isopropylbenzene	20
8	Naphthalene	230
8	n-Propylbenzene	33
9	Naphthalcne	3
11	Benzene	150
11	Ethylbenzene	100
11	Toluene	420
11	1,2,4-Trimethylbenzene	92
11	O-Xylene	140
11	M&P-Xylene	310
12	Benzenc	7,000
12	Ethylbenzene	200
12	Napht halene	250
12	Toluene	6,100
12	1,2,4-Trimethylbenzene	800
12	1,3,5-Trimethylbenzene	230

TABLE 4. VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND-WATER SAMPLES COLLECTED FROM GROUND-WATER MONITORING WELLS AT THE FOREST GLEN SECTION OF WRAMC DURING 8- 10 FEBRUARY 1993 (Continued)

Well Number	Organic Compound	Amount in micrograms per liter (µg/L)
12	0-Xylene	800
12	M&P-Xylene	2,500
13	Benzene	570
13	Chloroform	97
13	Ethylbenzene	81
13	Naphthalene	120
13	Toluene	210
13	1,2,4-Trimethylbenzene	110
13	1,3,5-Trimethylbenzene	52
13	0-Xylene	310
13	M&P-Xylene	150
14	Naphthalene	60
15A	Chloroform	8
ISA	Ethylbenzene	25
15A	Isopropylbenzene	7
15A	p-Isopropyltoluene	4
15A	Naphthalene	50
15A	n-Propy I benzene	10
15A	1,2,4-Trimethylbenzene	15
15.4	1,3,5-Trimethylbenzene	18
15A	M&P-Xylene	4
15B	Ethylbenzene	28
15B	Naphthalene	72
15B	1,2,4-Trimethylbenzene	Trace
101	Naphthalene	13
102	Benzene	27
102	Ethylbenzene	23
102	Naphthalene	130
102	n-Propylbenzene	11
102	1,2,4-Trimethylbenzene	26

TABLE 4. VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND-WATER SAMPLES COLLECTED FROM GROUND-WATER MONITORING WELLS AT THE FOREST GLEN SECTION OF WRAMC DURING 8- 10 FEBRUARY 1993 (Continued)

Well Number	Organic Compound	Amount in micrograms per liter (µg/L)
102	1,3,5-Trimethylbenzene	13
102	M&P-Xylene	Trace
103	Naphthalene	89
104	sec-Butylbenzene	Trace
104	p-Isopropyltoluene	II
104	Naphthalene	69
104	1,2,4-Trimethylbenzene	61
104	1,3,5-Trimethylbenzene	27
104	0-Xylene	14
104	M&P-Xylene	29

micrograms per liter (µg/L) or parts per billion (ppb). Non-target compounds were present in many of the ground-water samples. The tentatively identified compounds and unknowns (TICs) are shown in Table 5. In several instances, dilutions were performed due to the unknown content, not the level of the compounds. Samples from wells Nos. 1, 2, 3. 9, 10, and 16 required no dilution. The dilution factor for the samples from wells Nos. 4. 5, 7. and 15A was two times. The dilution factor for the samples from wells Nos. 8. 101, 102. 103, and 104 was 5 times. The dilution factor for the samples from wells Nos. 6, 14, and 15B was 10 times. The dilution factor for the samples from wells Nos. 11, 12, and 13 was 25 times. An additional dilution factor for the sample from well No. 12 was 200 times. The analysis of the 200-fold dilution of the ground-water sample from well No. 12 was performed on 5 March 1993. The values reported on Tables 4 and 5 can all be compared to one another, since the laboratory had already quantified these values for the various dilutions. Matrix spikes were analyzed on ground-water samples from wells Nos. 1 and 103 with acceptable recoveries for every compound spiked. All internal standard area counts and retention times complied with the method quality control (QC) requirements. The surrogate recoveries were within the laboratory established limits.

TABLE 5. TENTATIVELY IDENTIFIED VOLATILE ORGAN-K COMPOUNDS (TICs) DETECTED IN GROUND-WATER SAMPLES COLLECTED FROM GROUND-WATER MONITORING WELLS AT THE FOREST GLEN SECTION OF WRAMC DURING 8-10 FEBRUARY 1993, AND THEIR ESTIMATED CONCENTRATIONS

Well Number	Organic Compound	CAS Number	Amount in micrograms per liter (µg/L) Est. Conc.
1	1 h-indene, 2,3-dihydro	496177	5
1	1 h-indene, 2,3-dihyd-1-methyl	767588	6
1	unknown hydrocarbon	none	6
1	unknown aromatic	none	6
1	unknown aromatic	none	4
2	I h-indcne, 2,3-dihyd-1-methyl	767588	5
2	1 h-indene, 2,3-dihy-1,6-dimet	17059482	5
2	sulfonated aromatic	none	10
5	1 h-indene, 2,3-dihydro	496177	10
5	1 h-indenc, 2,3-dihyd-1-methyl	767588	18
5	unknown aromatic	none	10
5	unknown	none	10
5	naphthalcne, tetrahydro-meth	none	12
6	cyclohexane	4923777	50
6	unknown	none	40
6	unknown	none	60
6	unknown	none	70
6	unknown	none	70
8	unknown	none	35
8	unknown aromatic	none	35
8	unknown	none	45
8	unknown	none	55
8	unknown	none	45
14	unknown aromatic	none	40
14	unknown	none	40

See footnote on page 24.

TABLE 5. TENTATIVELY IDENTIFIED VOLATILE ORGANIC COMPOUNDS (TICs) DETECTED IN GROUND-WATER SAMPLES COLLECTED FROM GROUND-WATER MONITORING WELLS AT THE FOREST GLEN SECTION OF WRAMC DURING 8-10 FEBRUARY 1993, AND THEIR ESTIMATED CONCENTRATIONS (Continued)

Well Number	Organic Compound	CAS Number*	Amount in micrograms per liter (µg/L) Est. Conc.
14	unknown aromatic	none	40
14	unknown	none	90
14	unknown	none	40
15A	unknown hydrocarbon	none	8
15A	1 h-indene, 2,3-dihyd-1-methyl	767588	10
15A	unknown	none	20
ISA	unknown	none	8
ISA	unknown	none	8
15B	benzene, ethyl	100414	20
15B	1 h-indene, 2,3-dihyd-1-methyl	767588	20
15B	unknown	none	40
15B	unknown	none	20
15B	unknown	none	20
16	1 h-indene, 2,3-dihydro	496177	3
16	1 h-indene, 2,3-dihyd-1-methyl	767588	7
16	1 h-indene, 2,3-dihy-1,6-dimet	17059482	8
16	unknown	none	4
16	unknown	none	3
101	1 h-indene, 2,3-dihydro	496177	25
101	unknown aromatic	none	20
101	1 h-indene, 2,3-dihyd- l-methyl	767588	20
101	unknown	none	20
101	unknown	none	50
102	1 h-indene, 2,3-dihydro	496177	20
102	undecane	1120214	35

See footnote on page 24.

TABLE 5. TENTATIVELY IDENTIFIED VOLATILE ORGANIC COMPOUNDS (TICs) DETECTED IN GROUND-WATER SAMPLES COLLECTED FROM GROUND-WATER MONITORING WELLS AT THE FOREST GLEN SECTION OF WRAMC DURING 8-10 FEBRUARY 1993, AND THEIR ESTIMATED CONCENTRATIONS (Continued)

Well Num	Organic Compound	CAS Number*	Amount in micrograms per liter (µg/L) Est. Conc.
102	unknown aromatic	none	25
102	aromatic	none	35
102	unknown hydrocarbon	none	30
103	I h-indcnc, 2,3-dihydro	496177	25
103	unknown aromatic	none	20
103	1 h-indcnc, 2,3-dihyd-1-methyl	767588	20
103	unknown	none	45
103	unknown	none	20
104	unknown hydrocarbon	none	70
104	unknown aromatic	none	35
104	unknown hydrocarbon	none	45
104	unknown hydrocarbon	none	55
104	unknown hydrocarbon	none	35

* CAS number is derived from the Chemical Abstract Service.

3. The ground-water samples Nos. 15A and 15B were collected from the same well, but at different times. Sample No. 15A was collected immediately after purging at 1700 on 9 February 1993 using a stainless steel bailer. Sample No. 15B was collected at 0920 on IO February 1993 after two bailers of water were removed from the well.

4. Ground-water contamination from No. 2 fuel oil as the result of spills or leaking USTs was detected in wells Nos. 5, 6, 8, 14, 15A, 15B, 101, 102, 103, and 104 based on the occurrence of naphthalene at 19, 28, 230, 60, 50, 72, 13, 130, 89. and 69 µg/L, respectively. Naphthalene was also detected in the water sample from well No. 9 at 3 µg/L.

However, a trace of naphthalene was detected in the field blank; therefore. the presence of naphthalene may or may not be present in the water sample from well No. 9. There is no drinking water standard for naphthalene.

5. The water sample from well No. 12 was the most contaminated, containing benzene, toluene, ethylbenzene, and xylene (BTEX) at 7,000; 6,100; 200; and 3,300 µg/L (0-Xylene and M&P-Xylene have been combined), respectively. Other volatile compounds were also present in these three well samples (Table 4). Although BTEX occurs in fuel oil, a large quantity of BTEX detected in the ground water is a good indication of gasoline contamination. Note that toluene was only detected in wells Nos. 11, 12. and 13. According to the elevation of the water table, well No. 12 is the upgradient well for wells Nos. 11 and 13 (see Figure 7). The BTEX quantity in the water sample from well No. I 1 was detected at 150, 420, 100, and 450 µg/L, respectively. The BTEX quantity in the water sample from well No. 13 was detected at 570, 210, 81, and 460 µg/L, respectively (Table 4). Wells Nos. 11, 12, and 13 are located in an area where gasoline USTs were located and later removed due to leaks. The water samples from wells Nos. 1, 2, 3, 7, 10, and 16 were the least contaminated, although there were some TICs found in some of these water samples (Tables 4 and 5). See Appendix F for a listing of all volatile organic compounds analyzed and their respective detection limits.

6. Benzene detected in water samples from well No. 8 at 17 µg/L, well No. 11 at 150 µg/L, well No. 12 at 7,000 µg/L, well No. 13 at 570 µg/L, and well No. 102 at 27 µg/L exceeded the Nationai Primary Drinking Water Regulation (NPDWR) maximum contaminant limit (MCL) of 5 µg/L. Toluene detected in the water sample from well No. 12 at 6,100 µg/L exceeded the NPDWR of 1 .000 µg/L (references 11 and 12).

VI. CONCLUSIONS.

A. Ten ground-water monitoring wells were drilled around and downgradient from a leaking UST located near Building 500 by USAEHA personnel during 19-30 June 1989. Ten additional ground-water monitoring wells were drilled in this same area by private contractors in December 1992 and in February 1993 (paragraphs VA4a and VA4b, this report).

B. Ground-water flow direction is generally towards the west and southwest. The highest ground-water elevation occurs in well No. 5 (paragraphs VA5a and VA5b, this report).

C. An acrylic bailer was used to determine the amount of product floating on the water surface within the 20 wells prior to the purging phase. A great deal of product was found in well No. 8, as the bailer was full of weathered oil. A sheen about l/Id-inch thick, was

found in welis Nos. 6, 101, and 104. Unmeasurable sheens were in wells Nos. 7, 14, 16, 102, and 103. There was a gasoline odor in well No. 11; however, there was no sheen visible (paragraph VC1 , this report).

D. Ground-water contamination from No. 2 fuel oil was detected as the result of spills or leaking USTs in wells Nos. 5, 6, 8, 14, 15, 101, 102, 103, and 104 based on the occurrence of naphthalene. Naphthalene was also detected in the water sample from well No. 9 at 3 µg/L. However, a track of naphthalene was detected in the field blank; therefore, the presence of naphthalene may or may not be present in the water sample from well No. 9. There is no drinking water standard for naphthalene (paragraph VD4, this report).

E. Well No. 12 was the most contaminated and contained very large quantities of BTEX. Other volatile compounds were also present in these three well samples. Although BTEX occurs in fuel oil, a large quantity of BTEX detected in the ground water is a good indication of gasoline contamination. Toluene was only detected in wells Nos. 11, 12, and 13. According to the elevation of the water table, well No. 12 is upgradient of wells Nos. 11 and 13. Samples from wells Nos. 1, 2, 3, 7, 10, and 16 were the least contaminated (paragraph VD5, this report).

F. Benzene detected in water samples from wells Nos. 8, 11, 12, 13, and 102 exceeded the NPDWR MCL. Toluene detected in the water sample from well No. 12 exceeded the NPDWR MCL (paragraph VD6, this report).

VII. RECOMMENDATIONS.

A. To ensure regulatory compliance with 40 CFR 280.40 and COMAR 26.10.01, a contract should be immediately initiated for the State-approved precision testing of all untested USTs at WRAMC.

B. To ensure good environmental engineering practice, the following possible recommendations are made for WRAMC:

1. Pump and treat the ground water from wells Nos. 101, 102, and 104 in an alternating fashion. Some of the treated ground water could be injected upgradient into well No, 103 to force the contaminated water into these three wells.

2. Pump and treat the water from wells Nos. 11, 12, and 13 to remove the gasoline and the weathered byproducts.

C. Coordinate the data and interpretations presented in this report with the UST Division of the MDE for their recommendations.

David C. Bayha

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Hydrologist
Water Quality Engineering Division

APPROVED:

John W. Bauer

JOHN W. BAUER, P.G.
Program Manager
Ground Water and Solid Waste
Management

APPENDIX A

REFERENCES

1. Draft Copy of "Master Plan Report for Walter Reed Army Medical Center, Main Section, Washington, DC, prepared by Astore, Architects & Urban Designers, PC, under Contract Number DACA3 1-84-C-0089 by the COE, Baltimore District, 20 March 1989.

2. Draft Copy of "Master Plan Report for Walter Reed Army Medical Center, Forest Glen Section, Washington, DC, prepared by Astore, Architects & Urban Designers, PC, under Contract Number DACA31-84-C-0089 by the COE, Baltimore District, 20 March 1989.

3. Memorandum, USAEHA, HSHB-ME-SH, 26 April 1990, subject: Environmental Program Review No. 37-26-7146-90, Walter Reed Army Medical Center. Washington, DC, 10-21 July 1989.

4. Report No. 342, Installation Assessment of Headquarters, Walter Reed Army Medical Center, Washington, DC, and Noncontiguous Sections Forest Glen, Silver Spring, Maryland, and Glen Haven, Wheaton, Maryland, prepared by Environmental Science and Engineering, Inc., for U.S. Army Toxic and Hazardous Materials Agency, June 1984.

5. Copy of Certified Letter to WRAMC, from Department of the Environment, State of Maryland, 22 December 1992, subject: Notice of Violation NV-93-056.

6. Copy of Letter to Department of the Environment, State of Maryland, from WRAMC, 5 February 1993, subject: Reply to Notice of Violation NV-93-056.

7. Memorandum, USAEHA, HSHB-ME-SG, 30 November 1989, subject: Ground-Water Quality Study No. 38-26-0354-90, Forest Glen Section, Walter Reed Army Medical Center. Washington, DC, 19-30 June 1989.

8. Title 40, Code of Federal Regulations (CFR), 1992 rev, Part 280, Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks (UST).

9. Code of Maryland Regulations, Title 26 - Department of the Environment, Subtitle 10 - Oil Pollution and Tank Management, Chapter 01 - Oil Pollution and Tank Management, adopted effective 28 January 1985, as amended.

10. Memorandum, USAEHA, HSHB-MESH, 26 April 1990, subject: Envimnmental Program Review No. 37-26-7146-90, Walter Reed Army Medical Center, Washington, DC, 10-21 July 1989.

11. Final Rule, National Primary Drinking Water Regulations-Synthetic Organic Chemicals and Inorganic Chemicals; Monitoring for Unregulated Contaminants; National Primary Drinking Water Regulations Implementations; National Secondary Drinking Water Regulations, 56 FR 3526, 30 January 1991.

12. Title 40, CFR, 1992 rev, Part 141, National Primary Drinking Water Regulations.

APPENDIX B

PERSONNEL CONTACTED

WRAMC

1. Donald Stormcnt, P.E., Environmental Engineer, Planning and Environmental (P&E) Division, Directorate of Engineering and Housing (DEH).

2. Jack Miller, P.E., Environmental Engineer, P&E Division, DEH.

3. David Henry, Construction Branch, EP&S Division, DEH.

4. James Robinson, Jr, Operations Foreman, Directorate of Logistics (DOL).

5. Michael H. Shaw, Assistant Transportation Motor Officer, DOL.

STATE OF MARYLAND REPRESENTATIVE

1. Kenneth D. Carter, Geologist, UST Division? MDE.

2. Robert Day, Regional Environmental Inspector, Enforcement Section, UST Division, MDE.

3. John J. Smiechowski, Regional Supervisor, Enforcement Section, UST Division, MDE.

APPENDIX C

DESCRIPTION OF FIELD METHODS

I. GENERAL. Detailed drilling logs are shown in Appendix D. The 10 ground-water monitoring wells, installed by USAEHA personnel in June 1989, were constructed using 2-inch inside diameter (ID), lo-feet long, schedule 40, polyvinyl chloride (PVC) pipe and screen with flush-threaded joints. The well screens consisted of 0.010 or 0.020-inch factory-installed slots. These wells were screened within and also above the water-bearing strata with 5- to 20-foot lengths of screen, and the tops of the well screen were set above the water table to allow any free-floating No. 2 fuel oil to enter the well. The solid well pipe was screwed on above the screens and a portion of this solid pipe was normally allowed to extend above the ground surface. All the monitoring wells were gravel packed using size No. 3. clean, 100-pound bagged gravel (silica rock) placed within the annular space between the borehole walls and the well screen. A bentonite seal was placed above the sand generally followed by cement, which was brought to the surface. A 6-inch ID, steel pipe, fitted with a top and a welded hasp for subsequent locking with a padlock, was generally placed around the 2-inch ID PVC pipe, and pushed into the cement. More cement was added both inside the annular space between the steel and PVC pipe and outside the steel pipe. A generalized diagram of the well construction is shown on Figure C-l. No attempt is mddc to describe the drilling or well development methods of the 10 ground-water monitoring wells installed by private contractors.

2. MONITORING WELL DEVELOPMENT. The monitoring well development of the 20 wells was accomplished by surging and bailing using a stainless steel bailer. No water or air was introduced into the monitoring well during development. In order to eliminate cross-contamination from well to well, the stainless steel bailers were washed with Alconox®, rinsed with tap water, and rinsed again with distilled water prior to their being used again. For each monitoring well, the water level was determined using an electric (battery-operated) water level indicator. The volume of standing water in each well was calculated from this measurement (see Appendix E). Development was considered sufficient when the well was purged three times the volume of the standing water in the well. or when relatively clean water was retrieved from the well during development, However, the water did not always become relatively clear during the bailing from these 20 wells. Some of the wells were contaminated with weathered No. 2 fuel oil or gasoline.

®Alconox is a registered trademark of Alconox. Inc.. New York, New York.

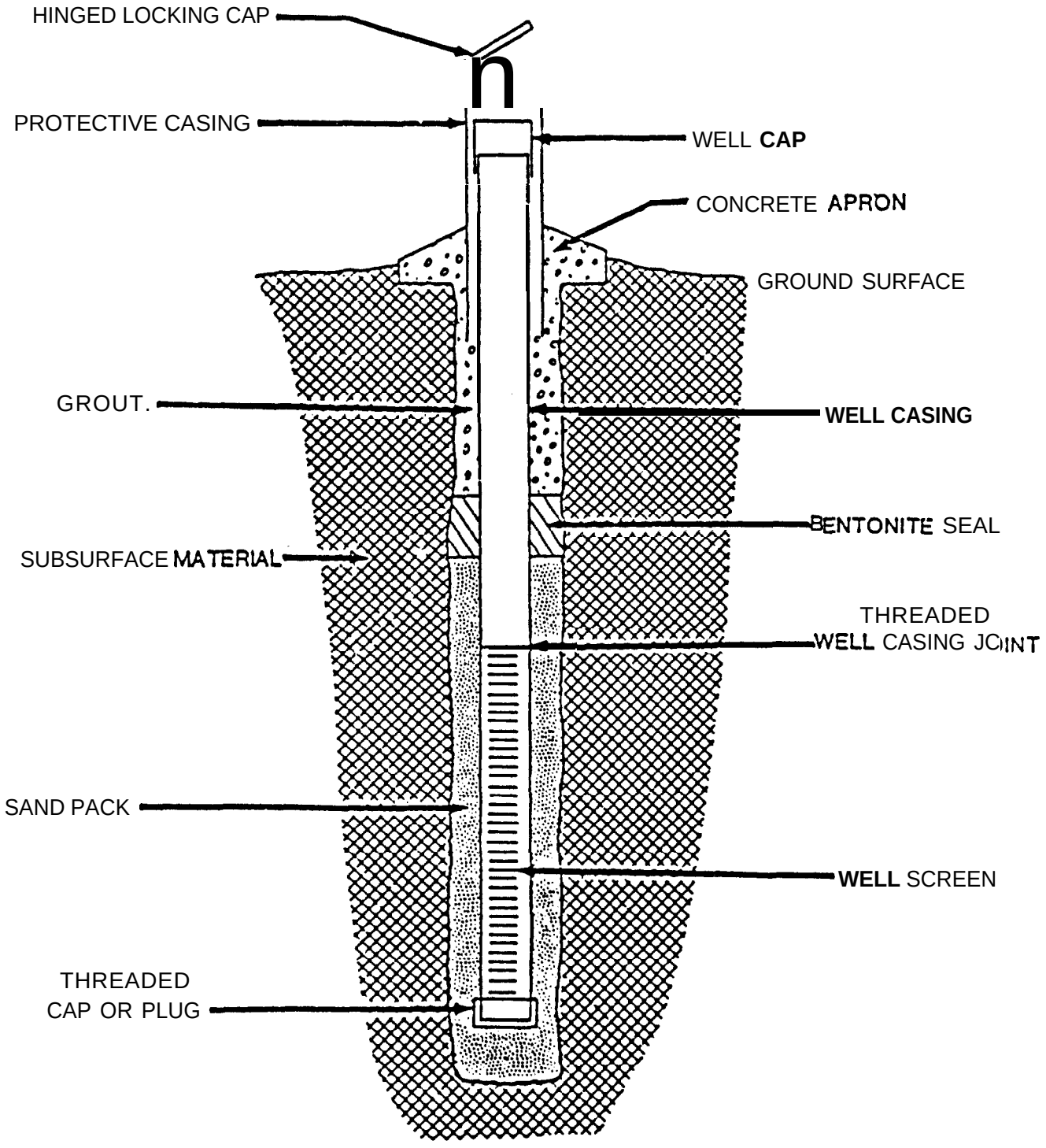

FIGURE C-1

GENERALIZED MONITORING WELL CONSTRUCTION

3. MONITORING WELL SAMPLING TECHNIQUES. Each well was sampled with a Singlesample disposable bailer, suspended in most cases by the same dedicated plastic-lined clothesline cord. Ground-water samples from each well were placed in three 40-milliliter glass vials with a Teflon® septum for subsequent volatile (purgeable) organic analyses by this Agency's laboratory.

®Teflon is a registered trademark of E.I. DuPont de Nemours and Co., Inc., Wilmington, Delaware.

APPENDIX D

DRILLING LOGS

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 20-21 June 1989
LOCATION 65 feet southeast of south corner of Buildina 500 (Laboratory) GEOLOGIST David C. Bavha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Manarum, Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
2.5'		Grayish-brown, silty, loamy, micaceous, clayey soil, with *some* sand and small gravel. Medium damp, somewhat plastic.	No oil odor. Easy drilling.
5'	Split-spoon sample 2.5 to 5 feet	Gneissic to schistic saprolite. White to yellowish-tan, light brown and dark brown in color in some portions of the sample. Muscovite and biotite mica, quartz grains, and clay in place as it appears in gneiss and/or schist. The clay is the result of in-place weathering of the feldspars. A large amount of mica found in silt size particles The quartz grains range in size from fine silt to sand size.	No oil odor. Easy drilling.
10'			
13.85		Top of Water ▽	
15'			No oil odor Easy drilling.
17'	Soil sample 15-17'	Same as above. Contains 1/2 to 3/4-inch chert gravel.	No oil odor. Somewhat harder drilling (chert)
20'	Soil sample 17-18'	Gneissic to schistic saprolite. Same as above from 2.5 to 15 feet	Oil odor on auger. Easy drilling.

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 20-21 June 1989
LOCATION 65 feet southeast of south corner of Building 500 (Laboratory) GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Mangrum, Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'		Same as above.	Oil odor present
21.5'	Soil sample 21.5' to 23.5'	Same as above.	Oil odor present
25'		Bottom of Hole	

Added 20.0 feet of 0.010-inch screen and 6.9 feet of solid PVC casing. Total amount of PVC pipe in hole is 26.9 feet. There is 2.4 feet of solid PVC casing above ground and 4.5 feet of solid PVC casing below ground. The top of the screen is at 4.50 feet below the ground surface.

Added 3 each 100-lb bags of sand. Top of sand at 3.0 feet below ground surface. Added 1/2 bucket of bentonita. Top of dry bentonite at 1.0 foot below ground level. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION 75 feet east from No. 1. Next to boundary fence at Brookeville Road.
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
DATE 21 June 1989
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Manarum, Gene Hawkins, & Walker Rollins
BORE HOLE Well No. 2

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
		Blacktop driveway. Bank gravel.	
1.4'		Grayish-brown, silty, loamy, micaceous, clayey soil, with some sand and small-sized gravel. Medium dry, not plastic. Saprolite (same as in well No. 1) with some small-sized gravel and sand.	No oil odor. Easy drilling.
5'		Saprolite (same as in well No. 1) with small-sized gravel (1/4-inch diameter and sand. Medium dry, not plastic.	No oil odor. Easy drilling.
8'	Bag sample 8-10'	Light tan to orangeish-brown in color. Clayey silt with some small-sized gravel and sand.	No oil odor. Easy drilling.
10'		Saprolite (same as in well No. 1) Medium dry, not plastic.	No oil odor. Easy drilling.
15'			
15.26		-Top of Water	
			No oil odor. Harder drilling,
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Annv Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 21 June 1989
LOCATION 75 feet east from No. 1. Next to boundary fence B okev ille Road. GEOLOGIST David C. Bavha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Mangrum, Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 2

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20′	Split spoon	Saprolite. Dry to moist, somewhat plastic. Very hard drilling.	
21′		Saprolite, medium dry, not plastic.	No oil odor.
23′		Same as above. Medium dry, not plastic.	Easier drilling. No oil odor. (Fewer returns)
25′			
27.5′		-3ottom of Hole	
		Added 20.0 feet of 0.0l0-inch screen and 10.0 feet of solid PVC casing. Total amount of PVC pipe in hole is 30.0 feet. There is 2.34 feet of solid PVC casing above ground and 7.66 feet of solid PVC casing below ground. The top of the screen is at 7.66 feet below the ground surface.	
		Added 3 each 100-lb bags of sand. Top of sand at at 2.7 feet below ground surface. Added 1/2 bucket of bentonite. Top of dry bentonite at 1.0 foot below the ground surface. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protec ive steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALIATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 22 June 1989
LOCATION 120 feet west of Bldg 504 and 59.4 feet northwest of centerline of Robert Grant Road GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Mangrum, Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/6-inch hollow stem auaer BORE HOLE Well No. 3

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
4'		Gravel backfill, 1 to l/Z-inch in size and decreasing downward to sand, silt, and clay.	Easy drilling. No oil odor. Dry
5'		Saprolite. Damp, somewhat plastic.	Easy drilling. No oil odor.
6'		Light tan to orangeish-brown sandy, clayey silt with mica.	Easy drilling. No oil odor. Dry
10'			
15'			
16'		Brown with gray streaks. Saprolite. Damp to moist, medium plastic.	Easy drilling. No oil odor.
18'			
18.6'		Top of Water	
20'		Dark gray-brown saprolite. Moist to wet, plastic.	Easy drilling. No oil odor.

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 22 June 1989
LOCATION 120 feet west of Bldg 504 and 59.4 feet northwest of centerline of Robert Grant Road GEOLOGIST David C. Bavha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Manarum, Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No, 3

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'		Same as above.	
22.5'		Medium brown to orangeish-brown saprolite. Dry.	Harder drilling. No oil odor.
25'			
26'		Bottom of Hole	
		Added 20.0 feet of 0.010-inch screen and 9.7 feet of solid PVC casing. Total amount of PVC pipe in hole is 29.7 feet. There is 2.21 feet of solid PVC casing above ground and 7.49 feet of solid PVC casing below ground. The top of the screen is at 7.49 feet below the ground surface.	
		Added 2 and 3/4 100-lb bags of sand. Top of sand at 5.5 feet below ground. Added 1/2 bucket of bentonite. Top of dry bentonite at 3.3 feet below ground level. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION 107 feet from the north-northeast corner of Blda. 511
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
DATE 22 June 1989
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Manarum, Gene Hawkins, & Walker Rollins
BORE HOLE Well No. 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
2'		Dark brown to medium brown clayey silt. Moist, plastic.	Easy drilling. No oil odor.
5'		Light qray-brown saprolite with mica. Slightly moist but almost dry. Not very plastic.	Stiff drilling. No oil odor.
10'			
15'			
17'		Gray-brown to dark tan saprolite, sand, silt, and mica. Dry to slightly moist. Not very plastic	Stiff drilling. No oil odor.
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
DATE 22 June 1989
LOCATION 107 feet from the north-northeast corner of Bldg. 511
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Lucius Manurum, Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/6-inch &low stem auuer
BORE HOLE Well No. 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20′		Same as above.	
25′			
30′			Medium to hard drilling. No oil odor.
30.3		Top of Water	
35′			
39′		Bottom of Hole	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center. Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 22 June 1989
LOCATION 107 feet from the north-northeast corner of Blda. B11a m m o n d (AEHA), L u GEOLOGIST David C. Bavha
DRILLERS Bill Smithson & Richard c i u s M a n a r u m , Gene Hawkins, & Walker Rollins
DRILL RIG Mobile B-53 w/d-inch hollow stem auger BORE HOLE Well No. 4

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
		Added 20.0 feet of O.OlO-inch screen and 20.0 feet of solid PVC casing. Total amount of PVC casing in hole is 40.0 feet. There is 2.32 feet of solid PVC casing above ground and 17.68 feet of solid PVC casing below ground. The top of the screen is at 17.68 feet below the ground surface. Added 3 and 1/2 100-lb bags of sand. Top of sand at 15.6 feet below ground. Added 1/2 bucket of bentonite. Top of dry bentonite at 13.7 feet below ground surface. Added sufficient water to hydrate the bentonite. After bantonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 23 June 1989
LOCATION About 20 feet SW from NW side and 40 feet NW from NW side of Building No. 500 GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Eusene McEntire & Walton Rollins (WRAMC)
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 5

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.5'		Top soil and grass. Reddish-brown to medium grayish-brown saprolite. Moist to wet. Plastic.	Easy drilling. No oil odor.
5'			
7'		Grayish-brown saprolite. Damp to moist. Somewhat plastic.	Stiff drilling. No oil odor.
8.81'		Top of Water ▽	
10'			
12'	Soil Sample 12-14'	Same as above.	Stiff drilling. Oil odor present.
15'	Soil Sample 15-17'	Darker gray than above to dark gray-brown saprolite. Wet to very moist, plastic.	Oil odor present: Stiff drilling.
17'		Same color as above but dryer than above.	Stiff drilling. Oil odor present.
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 23 June 1989
LOCATION About 20 feet SW from NW side and 40 feet NW from NW side of Building No. 500 GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Eugene McEntire and Walker Rollins (WRAMC)
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 5

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20′	Soil Sample 20-22′	Same as above. Wet to moist, plastic.	Stiff drilling. Oil odor present.
22′		Same as above.	Stiff drilling. Oil odor present.
25′			
27′		-Bottom of Hole-	
		Added 20.0 feet of 0.010-inch screen and 8.85 feet of solid PVC casing. Total amount of PVC pipe in hole is 20.85 feet. There is 3.01 feet of solid PVC casing above ground and 5.84 feet of solid PVC casing below ground. The top of the screen is at 5.84 feet below the ground surface.	
		Added 2 and 1/2 100-lb bags of sand. Top of sand at 3.0 feet below the ground surface. Added 1/2 bucket of bentonite. Top of dry bentonite at 1.0 foot below ground surface. Added sufficient water to hydrate the bentonite. After the bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
DATE 23 June 1989
LOCATION About 38 feet north-east from northeast side of Building 512
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), and Walker Rollins (WRAMC)
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
BORE HOLE Well No. 6

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.5'		Top soil.	
		Medium gray saprolite. Moist, plastic.	No oil odor present. Easy drilling.
3'			
4.77'	Soil Sample 3-5'	Same as above.	Oil odor present. Easy drilling.
		Top of Water- ▽	
5'		Same as above.	Oil odor present. Harder drilling.
8'	Soil Sample	Same as above, but dryer than above.	Oil odor is stronger.
9'		Medium gray to grayish-brown saprolite. Damp to dry, not very plastic.	Harder drilling.
10'			
14'		Probable water-bearing aquifer.	Easier drilling. Oil odor present. Water started flowing from hole.
15'			
18'		Same as above.	
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION About 38 feet northeast from northeast side of Building 5 Hammond (AEHA), and Walkers (WRAMC)
DRILL RIG Mot Rollin 53 w/6-inch hollow stem auger
DATE 23 June 1989
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard
BORE HOLE Well No. 6

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'		Same as above.	
25'			
27'		Bottom of Hole	
		Added 20.0 feet of 0.020-inch screen and 7.19 feet of solid PVC casing. Total amount PVC pipe in hole is 27.19 feet. There is 2.92 feet of solid PVC casing above ground and 4.27 feet of PVC casin below ground. The top of the screen is at 4.27 feet below ground. Added 2 and 1/2- 100-lb bags of sand. Top of sand at 3.0 feet below ground surface. Added 1/2 bucket of bentonite. Top of dry bentonite at 1.0 foot below ground surface. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
DATE 24 June 1989
LOCATION About 45 feet north from the north corner of Building 512
GEOLOGIST David C. Bavha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Walker Rollins and James Hemsley (WRAMC)
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
BORE HOLE Well No. 7

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.5'		Top Soil	
		Medium gray to grayish-brown saprolite with some gravel, sand, and clayey silt. Damp to moist, medium plastic.	No oil odor. Easy drilling.
5'			
5.81'		Top of Water ▽	
7'		Medium to dark grayish-brown (Mostly gray-brown saprolite with some gravel. Dry to damp, somewhat plastic.	Slight oil odor when compared to well No. 6. No soil sample collected.
10'			
15'		Same as above.	Harder drilling. Slight oil odor but fainter than above.
17'		Light to medium grayish-brown to light to medium gray saprolite. Dry to moist, not very plastic.	Slight oil odor but fainter than above.
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION About 45 feet north from the north corner of Buildina 512
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
DATE 24 June 1989
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Walker Rollins and James Hemsley (WRAMC)
BORE HOLE Well No. 7

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'		Same as above.	
22'		Bottom of Hole	
		Added 10.0 feet of 20.0-inch screen and 11.52 feet of solid PVC casing. Total amount of PVC pipe in hole is 21.52 feet. There is 2.89 feet of solid PVC casing above ground and 8.63 feet of solid PVC casing below ground. The top of the screen is at 8.63 feet below ground.	
		Added 2 each 100-lb bags of sand. Top of sand at 6.0 feet below ground surface. Added 1 bucket of bentonite. Top of dry bentonite at 2.5 feet below ground surface. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 24 June 1989
LOCATION About 45 feet SW from from west corner of Bldg. 500 & about 50 feet NE of Well No. 6 GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Walker Rollins and Nelson Rutherford (WRAMC)
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 8

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
		Brown to medium brown topsoil and weathered saprolite. Moist, plastic.	Easy drilling. No oil odor.
3'		Dark to medium gray saprolite. Moist, plastic.	Easy drilling. Slight oil odor. Odor stronger than in well No. 7 but less than in well No. 6.
5'			
6'		Same as above.	Gradually becoming normal drilling.
9.85'		Top of Water ▽	
10'			
14'			
15'		Medium gray to brownish-gray saprolite but more brown than above. Medium plastic.	Stronger oil odor than above.
	Split-Spoon 15-17'	Same as above.	Stronger oil odor than above. Harder drilling.
18'			
19'	Soil Sample from	Gray to medium gray saprolite. Not as moist than above. Plastic.	Oil odor. Not as strong as above.
20'		Same as above.	Oil odor but not as strong as above.

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form Is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 24 June 1989
LOCATION About 45 feet SW from GEOLOGIST David C. Bayha
from west comer of Bldg. 500 & DRILLERS Bill Smithson & Richard
about 550 feet NE of Well No. 6 Hammond (AEHA), Walker Rollins
DRILL RIG Mobile B-53 w/6-inch and Nelson Rutherford (WRAMC)
holBoW RtEm auHgOrLE Well No. 8

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'	outside of auger. Black to dark brown oil stain.	Same as above, but moist to almost wet. Highly plastic. Contains a thin gravel layer.	Oil odor but not as strong as found in the depth from 14 to 18 feet. Real hard drilling.
22'			
25'		Bottom of Hole	
		Added 5.0 feet of 0.010-inch screen on bottom, followed by 10 feet of 0.020-inch screen and 10.0 feet of solid PVC casing. The total amount of PVC in the hole is 25.0 feet. There is 2.90 feet of solid PVC casing above the ground and 7.10 feet of solid PVC casing below ground. The top of the screen is at 7.10 feet below ground.	
		Added 3 each 100-lb bags of sand. Top of sand at 5.0 feet below ground surface. Added 1 bucket of bucket of bentonite. Top of dry bentonite at 2.3 feet below ground. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION About 19 feet north from north corner of Building 508.
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
DATE 25 June 1989
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Dan Hogan, Roger Clark, and Nelson Rutherford
BORE HOLE Well No. 9

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.5'		Top soil Medium brown silty, sandy, saprolite. Dry to damp. Not plastic.	Easy drilling No oil odor. Medium hard drilling.
3'		Same as above.	Easier drilling than above. No oil odor.
5'			
9'			
10'		Same as above.	Medium hard drilling. No oil odor.
10.49'		-Top of Water ▽	
15'			
16'		Medium brown to brown saprolite. Moist, very plastic.	Medium hard drilling. No oil odor.
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION About 19 feet north from north corner of Building 508.
DRILL RIG Mobile B-53 w/6-inch hollow stem auger
DATE 25 June 1989
GEOLOGIST David C. Bavha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Dan Hogan, Roser Clark, and Nelson Rutherford
BORE HOLE Well No. 9

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'-			
22'		Bottom of Hole	
		Added 10.0 feet of 0.020-inch screen and 14.05 feet of solid PVC casing. Total amount of PVC pipe in hole is 24.05 feet. There is 2.89 feet of solid PVC casing above ground and 11.16 feet of solid PVC casing below ground. The top of the screen is at 11.16 feet below ground.	
		Added 2 each 100-lb bags of sand. Top of sand at 9.0 feet below the ground surface. Added 1 bucket of bentonite. Top of dry bentonite at 5.0 feet below ground. Added sufficient water to hydrate the bentonite. After bentonite seal was complete, the rest of the hole was later grouted to the surface and protective steel casing was added.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89
LOCATION About 210 feet NE of the NE side of Building 605 in the MotorPool parking lot.
DRILL RIG Mobile B-53 w/6-inch hollow stem auaer
DATE 28 June 1989
GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Nelson Rutherford (WRAMC)
BORE HOLE Well No. 10

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.2'		Blacktop pavement.	
1.5'		Crushed stone 1.5 to 3-inches in diameter. No oil odor. Easy drilling.	
5'		Dark gray sandy, silty clay. There is occasional metal debris brought up in the auger.	No oil odor, but a musty odor. Easy drilling. The auger drops very rapidly in some zones.
7'		Dark gray sandy, silty clay.	No fuel odor. A little harder drilling.
10'			
14.9'		Top of Water ▽	
15'			
20'			

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 38, 1 Jun 80, which will be used.

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG
(The proponent of this form is HSHB-ES)

INSTALLATION Walter Reed Army Medical Center, Forest Glen Section
PROJECT NUMBER 38-26-0354-89 DATE 28 June 1989
LOCATION About 210 feet NE of the NE side of Building 605 in the Motor Pool parking lot. GEOLOGIST David C. Bayha
DRILLERS Bill Smithson & Richard Hammond (AEHA), Nelson Rutherford
DRILL RIG Mobile B-53 w/6-inch hollow stem auger BORE HOLE Well No. 10

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
20'		Same as above	
25'		--Bottom of Hole	
		Added 10.0 feet of 0.020-inch screen and 16.0 feet of solid PVC casing. Total amount of PVC pipe in hole is 20.0 feet. There is 0.00 feet of solid PVC casing above ground and 10.0 feet of solid PVC casing below ground. The top of the screen is at 10.2 feet below ground as the top of the solid PVC is at 0.2 feet below ground.	
		Added 2 each 100-lb bags of sand. Top of sand at 7.5 feet below ground surface. Added 2 buckets of bentonite. Top of dry bentonite at 0.5 feet below ground. Added sufficient water to hydrate the bentonite. A flush-mount top was fitted on the top of the well so that vehicles could drive over this well.	

AEHA Form 130, 1 Nov 82
Replaces HSHB Form 78, 1 Jun 80, which will be used.

This well was renumbered by U
as Well No. 14

CONNELLY & ASSOCIATES
P.O. BOX 4005
FREDERICK, MD. 21701

For: Tri-County
Project No. TRI-84

Boring No. MW 10 b
Sheet ____ of ____

Job Name and Location Walter Reed Army Service Ctr Bldg 500
Boring Location

Date Begin 2/2/93
Date Completed 2/2/93
Depth of Soil 25.0
Depth of Rock —
Total Boring Depth 25.0

Casing Size, O.D. 6¼ HSA "
Hammer Weight "
Hammer Drop "
Core Bit Size "
Driller T. Connelly

Spoon Size, O.D. 2
Hammer Weight 140
Hammer Drop 30
Rig No. CME 75
Asst. Driller D. Potts

Progress & Ground Water Data

Date	Depth Reached	Depth Water	Hour
2/2/93	10.0	ENC.	
	25.0	15.0	cored

Ground Elev.
Datum Elev.
Depth Surf. Water
Weather

Depth From / To	Material Description	Sample No.	Sample Depth	Blows on Spoon 6" Intervals 0/6 6/12 12/18 18/24	Run No.	Depth of Run	Core Rec. (ft.)	REMARKS (water loss, cavities, etc.)	CASING BLOWS
0.0 / 14.5	SILT: Lt Br/Gr, mic. Sandy, tr. rock frags	1	5/7	5-5-7-7			1.0	slight fuel odor	0-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7
		2	6/12	7-4-7-7			1.5		
	FILL, moist to wet @ 10'	3	16/18	17-19-28-36		7-8 / 8-9	2.0	@10'	
14.5	FILL: Concrete	4	20/21.3	27-3 3 -50/3		9-10 / 10-11	1.3		
15.0	Rubble & gravel, wet, loose	5	25/25.0	50/.1			0.0		
15.0 / 16.0	CONCRETE slab							Set 4" well @ 25.0', 3' above grade	15-16
16.0 / 21.0	SAND: Lt Gr/wh, f-m, silty, mic., wet,								16-17, 17-18, 18-19, 19-20, 20-21, 21-22, 22-23
21.0 / 25.0	dense (SM) WEATHERED ROCK: Multi-Col., Sandy, mic. Soft gneiss.								23-24, 24-25, 25-26, 27-28, 28-29, 31-32, 32-33

This well was renumbered by USAEHA as Well No. 15

For Tri County
Project No. TRI 8A

CONNELLY & ASSOCIATES
P.O. BOX 4005
FREDERICK, MD. 21701

Boring No. MW105
Sheet ____ of ____

Job Name and Location Walker Army Service Center Bldg 500
Boring Location

Date Begin 2/1/93
Date Completed 2/1/93
Depth of Soil 50'
Depth Of Rock
Total Boring Depth Driller

Casing Size, O.D. 6¼ HSA. "
Hammer Weight "
Hammer Drop "
Core Bit Size "
T. McClelland

Spoon Size, O.D. 2 "
Hammer Weight 140 #
Hammer Drop Auto. "
Rig No. CME 55
Asst. Driller T. Hunt

Progress & Ground Water Data

Date	Depth Reached	Depth Water	Hour
2/1/93	50.0	DRY	COMPL
2/2/93	50.0	25.0	

Ground Elev.
Datum Elev.
Depth Surf. Water
Weather

BORING LOG Depth From To	Material Description	SPOON SAMPLE & ROCK CORE DATA Sample No.	Depth	Blows on Spoon 6" Intervals 0/6/12/18	Run No.	Depth of Run	Core Rec. (ft.)	REMARKS (water loss, cavities, etc.)	CASING Blows 0/6/12
0.0 · 0.8	TOPSOIL: DK Br, silty, moist, Soft	1	5/6	1-1-1-1			2.0		1-2 2-3 3-4 4-5 5-6 6-7
		2	9/11	13-16-21-30			1.8		
0.8 7.0	SILT: Lt Br, mic, Sandy, moist, Soft FILL (ML)	3	14/14.5	50/.5			0.5		7-8 8-9 9-10 10-11
		4	19/20	20-50/.5			1.0		
7.0 14.0	SAND: Lt Br/wh, f-m, Silty, mic. moist dense (SM)	5	24/26	33-35-35-38			1.7		11-12 12-13 13-14 14-15
		6	29/29.7	50/.2			0.2		
14.0 50.0	WEATH. ROCK: Multi-col., Sandy, Soft rock (SM)	7	34/34.3	50/.3			0.3		15-16 16-17 17-18 18-19 19-20 20-21 21-22 22-23
		8	39/39.2	50/.2			0.2		
		9	44/44.3	50/.3			0.3		
		10	49/49.2	50/.2			0.2		
								Set 4" well @ 50', 12' above	23-24 24-25 25-26 26-27 27-28 28-29
				D-24					

This we22 was renumbered by USAEHA as We21 No. 16

For Tri County Indust. | CONNELLY & ASSOCIATES | Boring No. MW 107

Project No. TRI 2A | P.O. BOX 4005 | Sheet ____ of ____

FREDERICK, M D . 2170

Job Name and Location Walter Reed Army Med Center

Boring Location

Date Begin	2/3/93	Casing Size, O.D.	6¼ HSA "	Spoon Size, O.D.	2 "
Date Complete	2/3/93	Hammer Weight	#	Hammer Weight	140 #
Depth of Soil	25.0	Hammer Drop	"	Hammer Drop	30 "
Depth of Rock	—	Core Bit Size	"	Rig No.	CME 75
Total Boring Depth	25.0	Driller	T. Connelly	Asst. Driller	T. Reeves

Progress & Ground Water Data

Date	Depth Reached	Depth Water	Hour
2/3/93	25.0	15.0	COMPL

Ground Elev.
Datum Elev.
Depth Surf. Water
Weather - - - - -

BORING LOG Depth From To	Material Description	SPOON SAMPLE & ROCK CORE DATA Sample No.	Sample Depth	Blows on Spoon 6" Intervals 0/6 6/12 12/18 18/24	Run No.	Depth of Run	Core Rec. (ft.)	REMARKS (water loss, cavities, etc.)	CASING BLOWS
0.0	FILL: SILT;								0-1
16.0	Br, Gr, mic,	1	5/7	1-3-3-3			1.0		1-2
	Sand, w/rock								2-3
		2	10/12	1-2-2-3			1.5		3-4
	frags, moist								4-5
	Soft (ML)	3	15/16.4	1-8-50/4			0.8		5-6
16.0	CONCRETE								6-7
18.0	SLAB	4	20/21.5	18-30-50/5			1.5		7-8
									8-9
18.0	WEATHERED	5	25.0/25.1	50/1			0.0		9-10
25.1	ROCK: Multi-col.								10-11
	Sandy, mic.,								11-12
	soft gneiss,								12-13
	dry								13-14
									14-15
								SI A" well @ 25', + 2' above grade	15-16
									16-17
									17-18
									18-19
									19-20
									20-21
									21-22
									22-23
									23-24
									24-25
									25-26
									26-27
									27-28
									28-29
									29-30
									30-31
									31-32

For TCI

Project No. TCI 6

CONNELLY & ASSOCIATES
P.O. BOX 4005
FREDERICK, MD. 21701

Boring No. MW-101

Sheet _____ of _____

Job Name and Location Walter Reed Army Med Center Bldg 500

Boring Location

Date Begin 12/7/92
Date Completed 12/7/92
Depth of Soil 25.0
Depth of Rock ____ Rig No. CME
Total Boring Dep Asst. Driller J. Connelly

Casing Size, O.D. 6¼ HSA " Hammer Weight / " Hammer Drop / "

Spoon Size, O.D. 2 " Hammer Weight 140 " Hammer Drop 30 "

75

Funk

Progress & Ground Water Data

Date	Depth Reached	Depth Water Encountered	Hour
12/7	15.0		

Ground Elev.
Datum Elev.
Depth Surf. Water
Weather

BORING LOG		SPOON SAMPLE & ROCK CORE DATA						REMARKS	CASING BLOWS
Depth From To	Material Description	Sample No.	Sample Depth	Blows on Spoon 6" Intervals 0/6 6/12 12/18 18/24	Run No.	Depth of Run	Core Rec. (Ft.)	(water loss, cavities, etc.)	0-1 1-2 2-3
0.0	TOPSOIL: Br, silty, w/roots	1	5/7	2-1-3-4			2.0		3.6
0.8		2	10/12	15-26-27-36			1.5'		4.
0.8	SILT: LtBr to Gr, mic., Sandy, moist, soft to	2	15/16	24-50/5			1.0	Fuel odor @ 5'-15'	7-8 8-9 9-10 10-11
10.0		4	20/21	50/3			0.3		
10.0	med dense (ML) SAND, Multi-col., f-m. Silty, micaceous								11-12 12-13 13-14 14-15
15.0	dense (SM) WEATHERED ROCK: Gr, Wh, banded								15-16 16-17 17-18 18-19
25.0	decomposed mic. Gneiss, soft rock							4" well set @ 25', 3' S.U. .020 screen 5'-25'	19-20 20-21 21-22 22-23
								Riser 0-5' Gravel pack 3-25'	23-24 24-25 25-26 26-27
								Bentonite seal @ 1.5-3.0' Cement grout 0-1.5'	27-28 28-29 29-30 30-31 31-32 32-33 33-34

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For TCI

Project No. TE1-8

CONNELLY & ASSOCIATES
P.O. BOX 4005
FREDERICK, MD, 21701

Boring No. MW-102

Sheet _____ of _____

Job Name and Location Walter Reed Army Med Center Diag 500

Boring Location _____

Date begin 12/7/92 Casing Size O.D. 6 1/4 HSA Spoon Size, O.D. 2

Date Completed 12/7/92 Hammer Weight _____ # Hammer Weight 140 #

Depth of Soil 35.0 Hammer Drop _____ " Hammer Drop 30 "

Depth of Rock — Core Bit Size _____ " Rig No. CME 75

Total Boring Depth 38.0 Driller T Connelly Asst.Driller J. Funk

Progress & Ground Water Data

Date	Depth Reached	Depth Water	Hour
12/7	50	27'	ENC.

Ground Elev. _____

Datum Elev. _____

Depth Surf. Water _____

Weather _____

BORING LOG		SPOON SAMPLE & ROCK CORE DATA						REMARKS	CASING BLOWS
Depth From To	Material Description	Sample No.	Sample Depth	Blows on Spoon 6" Intervals 0/6 6/12 12/18 18/24	Run No.	Depth of Run	Core Rec. (ft.)	(water loss, cavities, etc.)	0-1 1-2 2-3 3-4 4-5 5-6 6-7 7-8 8-9 9-10 10-11 11-12 12-13 13-14 14-15 15-16 16-17 17-18 18-19 19-20 20-21 21-22 22-23 23-24 24-25 25-26 26-27 27-28 28-29 29-30 30-31 31-32 32-33 33-34
0.0 / 0.5	TOPSOIL: DkBr, silty, w/roots, moist (OL)	1	5/7	1-2-2-4		—	2.0		
		2	10/12	6-11-17-19			2.0		
0.5 / 4.0	SILT: Br, mic. moist, med. stiff (ML)	3	15/16.4	14-34-50/4			1.4		
		4	20/20.4	50/.4			0.4		
4.0 / 10.0	SILT: Gr.Br, mic. f. sandy, tr. qtz pbls., moist, v.	5	25/25.5	50/.5			0.5	Fuel odor @10'.	
		6	30/30.4	50/.4			0.4		
10.0 / 16.0	Stiff (ML) SAND: Multi-col. mic. f-m, tr. qtz pbls. sl.								
16.0	moist, v dense (SM) WEATHERED ROCK:							Liquid petro	
35.0	LFB: /Wh decomposed Gneiss, sandy mic., Soft rock							Product visible on rods @ 27'	
								Set 4" well	

Q 3/86

For TCI

Project No. TRI-8

CONNELLY & ASSOCIATES
P.O. BOX 4005
FREDERICK, MD. 21701

Boring No. MW-103

Sheet _____ of _____

Job Name and Location Walter Reed Army Med Ctr Bldg 500

Boring Location _____

Date Begin 12/8/92
Date Completed 12/8/92
Depth of Soil 35.0
Depth 'of Rock -
Total Boring Depth 35.0

Caring Size, O.D. 4 1/4 HSA "
Hammer Weight _____ "
Hammer Dtop _____ "
Core Bit Size _____ "
Driller T. Connelly

Spoon Size, O.D. 2 "
Hammer Weight 140 "
Hammer Drop 30 "
Rig No. CME 75
Asst. Driller J. Eink

Progress & Ground Water Date'

Date	Depth Reached	Depth Water	Hour
12/8	25'	ENC.	

Ground Elev. _____
Datum Elev. _____
Depth Surf. Water _____
Ueothcr _____

BORING LOG		SPOON SAMPLE & ROCK CORE DATA						REMARKS	CASING BLOWS
Depth From To	Material Description	Sample No.	Sample Depth	Blows on Spoon 6" Intervals 0/6/12/18 / 6/12/18/24	Run No.	Depth of Run	Core Rec. (ft.)	(water loss, cavities, etc.)	0-1 1-2 2-3 3-4 4-5 5-6 6-7 7-8 8-9 9-10 10-11 11-12 12-13 13-14 14-15 15-16 16-17 17-18 18-19 19-20 20-21 21-22 22-23 23-24 24-25 25-26 26-27 27-28 28-29 29-30 30-31 31-32 32-33 33-34
0.0									
7.0	SILT: Lt Br, mic. Sandy, Some qtz pbls, moist, med.	1	5/7'	42-5-6-7			2.0		
		2	10/12	4-6-7-8			2.0		
	stiff(ML)								
7.0	SILT: LtBr/Gr,	3	15/16.5	24-27-37			1.5	Fuel odor @ 14'	
14.0	mic., f. sandy,	4	20/21	36-50/.5			1.0		
	sl. moist, med. Stiff(ML)	5	25/26.5	25-27-50/.5			1.5		
14.0	SAND: Multi-col								
18.0	f-m. silty, mic., v-dense (SM)							Set 4" well @ 35' w/ 20' screen 15-35' Riser 42-15 Gravel 13-35 Bentonite 11-13' Grout 0-11	
18.0	WEATHERED Rock:								
35.0	Multi-col., Sandy decomposed Gneiss, Soft rock								

Q 3/86

CONNELLY AND ASSOCIATES, INC.
TEST BORING FIELD LOG

PROJECT: WALTER REED ARMY MED. CTR. PROJECT NO: TR I-8

DATE: 12/14/92 BLDG 500 DRILLER: T. CONNELLY SURFACE ELEV. _____

STRATA DEPTH FROM	TO	SOIL DESCRIPTION AND REMARKS	SAMPLE TYPE	NO	DEPTH FROM	TO	1rst 6"	2nd 6"	3rd 6"	4th 6"
0.0	0.5	TOPSOIL: DK Br silty, very moist soft (OL).								
0.5	3.0	GRAVEL: Yl, Br, Silty, dry, loose (GM) FILL	SS	1	5.0	7.0	4	4	4	4
3.0	10.0	SILT: Br, Gry, mic. Sandy, moist, med. stiff (ML)	SS	2	10.0	12.0	4	6	6	7
10.0	20.5	SAND: Multi-col. f-m, silty, mic, moist, mod. dense to dense (SM) w/ petroleum odor @ 10' / oil on rods @ 19	SS	3	14.0	16.0	11	14	16	23
20.5	25.0	WEATHERED ROCK: Multi-col, decomposed gneiss, moist, soft rock	SS	4	20.0	21.0	35	50/.5		
NOTE:		Set 4" WELL @25'								
		.020 Screen f. 5'-25'								
		4" Riser +2 to 5'								
		GRAVEL 3'-25'								
		BENTONITE 2'-3' CM Grout 0-2'								

METHOD OF DRILLING (CHECK ONE)
a. AUGER HSA SIZE 6¼ ID
b. WASH _____ WATER _____ MUD _____
BORING SIZE 10¼ BIT USED HSA
CASING S E E LENGTH _____
UNDISTURBED SAMPLES: NO. _____ SIZE _____
BAG SAMPLES: NO.
SPECIAL TESTS (hrs & explain) _____

WEATHER Cloudy
NON-DRILLING TIME (HRS)
STANDBY TIME 2.0 DECON + DEV
HAULING WATER 0.5 mi
WATER LEVEL: Encountered @ 15'
CAVE-IN DEPTH: _____
REMARKS: All remarks should be explained on the back of this form

APPENDIX E

GROUND-WATER SAMPLING FIELD DATA LOGSHEETS

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 1 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 2 FEB 1993 Time: 1 6 3 7
a. Depth to water from top of casing: 18.35 fee:
b. Height of PVC casing above ground surface: 2.40 feet
c. Depth to water from ground surface: (a-b) 15.95 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1993 Time: 1 6 0 4

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well-0.5, 4-inch well=2.0

3-well volumes = (25.0 feet) - 15.95 feet) X 0.5
(total well depth) (depth to water} (CF)

= g4.8 l l o n s

Amount actually purged: 4 . 0

Well pumped/bailed dry? X yes ___no

SAMPLING

Date: 8 FEB 1993 Time: 1718

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: _____ °C

pH: 5.1

Conductivity: 0.227 mmhos/cm x 1000 = 227 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 2 INSTALLATION: ~~WRAMC-FOREST GLEN SECTION~~

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time: 1635
a. Depth to water from top of casing: .8 feet
b. Height of PVC casing above ground surface: 2.34 feet.
c. Depth to water from ground surface: (a-b) 17.46 feet

Measuring method: ~~electric meter~~

PURGING

Date: 8 FEB 1993 Time: 1645

Equipment (bailer or pump): ~~STAINLESS STEEL BAILER~~

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (27.5 feet') - 17.446 feet) X 0.5
(total well depth) (depth to water} (CF)

= . gallons

Amount actually purged: 5

Well pumped/bailed dry? yes X no

SAMPLING

Date: 8 FEB 1993 Time: 1704

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 16.3 °C

pH: 5.0

Conductivity: 1.09 mmhos/cm X 1000 = 1090 µmhos/cm

Dissolved Oxygen: ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 3 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time:
a. Depth to water from top of casing: 21.23 feet
b. Height of PVC casing above ground surface: 2.21 feet
c. Depth to water from ground surface: (a-b) 9.2 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1993 Time: 1550

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well-2.0

3-well volumes = (26.0 feet) - 19.02 feet) X 0.5
{total well depth) (depth to water) (CF)

= 3.49 gallons

Amount actually purged: 2

Well pumped/bailed dry? X yes ___no

SAMPLING

Date: 8 FEB 1993 Time: 1626

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 18 °C

pH: 5.8

Conductivity: 1.49 mmhos/cm x 1000 = 1490 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS :

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 4 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time: 1600
a. Depth to water from top of casing: 32.84 feet
b. Height of PVC casing above ground surface: 2.32 feet
c. Depth to water from ground surface: (a-b) 30.52 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1993 Time: 1618

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 12 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (39.0 feet) - 30.52 feet) X 0.5
(total well depth} {depth to water} (CF}

= 4.24 gallons

Amount actually purged: 5

Well pumped/bailed dry? yes X no

SAMPLING

Date: 8 FEB 1993 Time: 1620

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 21.6 °C

pH: 5 . 1

Conductivity: 0.610 mmhos/cm X 1000 = µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

JELL ID: WELL No. 5 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 9 FEB 1993 Time: 0945
a. Depth to water from top of casing: f 19e80 e t
b. Height of PVC casing above ground surface: 3.01 feet
c. Depth to water from ground surface: (a-b) 16.79 feet

Measuring method: electric meter

PURGING

Date: 9 FEB 1993 Time: 0 9 5 0

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: i2n c h e s

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (27.0 feet) - 16.79 feet) X 0.5
(total well depth) (depth to water) (CF)

= 5.1 gallons

Amount actually purged: 5

Well pumped/bailed dry? yes X no

SAMPLING

Date: 9 FEB 1993 Time: 0955

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 17.5 °C

pH: 5.6

Conductivity: 69 mmhos/cm X 1000 = 469 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 6 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)

Date: 10 FEB 1993 Time: _____

a. Depth to water from top of casing: f10.00 e t

b. Height of PVC casing above ground surface: 2.92 feet

c. Depth to water from ground surface: (a-b) 7.18 f e e t

Measuring method: electric meter

I'URGING

Date: 10 FEB 1993 Time: 1 0 1 8

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes' = (27.0 feet) - f 7e18e t) X 0.5
(total well depth) (depth to water) (CF)

= 9.91 gallons

Amount actually purged: 1 0

Well pumped/bailed dry? yes X no

SAMPLING

Date: 10 FEB 1993 Time: 1023

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 15.0 • ◊

pH: 'Too: o i l y)

Conductivity: 0.639 mmhos/cm X 1000 = 639 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

Oil odor and sheen present.

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 7 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 10 FEB 1993 Time: 1240
a. Depth to water from top of casing: 10.25 feet
b. Height of PVC casing above ground surface: 2.89 feet
c. Depth to water from ground surface: (a-b) 7.36 feet

Measuring method: electric meter

PURGING

Date: 10 FEB 1993 Time: 1245

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well-2.0

3-well volumes = (22.0 feet - 7.36 feet) X 0.5
(total well depth) (depth to water) (CF)

= 7.3 gallons

Amount actually purged: 7

Well pumped/bailed dry? yes X no

SAMPLING

Date: 10 FEB 1993 Time: 1315

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 15.7 °C

pH: 5.8

Conductivity: 0.336 mmhos/cm X 1000 = 336 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 8 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 9 FEB 1993 Time: 0940
a. Depth to water from top of casing: 15.84 feet
b. Height of PVC casing above ground surface: 2.90 feet
c. Depth to water from ground surface: (a-b) 12.94 feet

Measuring method: electric meter

PURGING

Date: 9 FEB 1993 Time: 0945

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): Z-inch well=0.5, 4-inch well=2.0

3-well volumes = (25.0 feet) - 22.94 feet) X 0.5
(total well depth) (depth to water) (CF)

= 6.03 gallons

Amount actually purged: 6

Well pumped/bailed dry? X yes ___ no

SAMPLING

Date: 9 FEB 1993 Time: _____

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 19.7 °C

pH: 5.9

Conductivity: 1.00 mmhos/cm X 1000 = µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 9 INSTALLATION: WC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 9 FEB 1993 Time: 0915
a. Depth to water from top of casing: 14.79 feet
b. Height of PVC casing above ground surface: 2.89 feet
c. Depth to water from ground surface: (a-b) 1.90 feet

Measuring method: electric meter

PURGING

Date: 9 FEB 1993 Time: 0927

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (22.0 feet) - 11.9 feet) X 0.5
(total well depth) (depth to water) (CF)

= 5.05 gallons

Amount actually purged: 5

Well pumped/bailed dry? yes X no

SAMPLING

Date: 9 FEB 1933 Time: 0930

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 13.8 °C

pH: 5 . 5

Conductivity: 0.267 mmhos/cm X 1000 = . 267 - µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 10 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time: 1 1 0 0
a. Depth to water from top of casing: 15.65 feet
b. Height of PVC casing above ground surface: + 0.2 feet
c. Depth to water from ground surface: (a-b) 15.85 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1993 Time: 1105

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 2 inches

Conversion factors (CF): 2-inch well=0.5, s-inch well=2.0

3-well volumes = (25.0 feet) - 15.85 feet) X 0.5 (CF)
(total well depth) (depth to water)

= 4.58 gallons

Amount actually purged: 7

Well pumped/bailed dry? yes X no

SAMPLING

Date: 8 FEB 1993 Time: 1130

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: None °C

pH: 5.6

Conductivity: 0.940 mmhos/cm x 1000 = 940 µmnos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

NO odor or sheen visible on acrylic bailer.

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 11 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time: 1135
a. Depth to water from top of casing: 17.73 feet
b. Height of PVC casing above ground surface: + 0.2 feet
c. Depth to water from ground surface: (a-b) 17.93 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1 9 9 3 Time: 1 1 4 0

Equipment (bailer *or* pump): STAINLESS STEEL BAILER

Inside diameter of well: i4n c h e s

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (f 3e.1e t) 17.93 feet) X 2.0
(total well depth} (depth to water} (CF)

= 24.34 gallons

Amount actually purged: 2 4

Well pumped/bailed dry? yes X no

SAMPLING

Date: 8 FEB 1993 Time: 1223

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 18.3 'C

pH: 5.3

Conductivity: 0.177 mmhos/cm X 1000 = 177 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS: No sheen visible on acrylic bailer; however, there is an odor of possible gasoline..

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 12 INSTALLATION: ~~WRAMC-FOREST GLEN SECTION~~

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time: 1450
a. Depth to water from top of casing: 13.91 feet
b. Height of PVC casing above ground surface: 2+ .9 feet
c. Depth to water from ground surface: (a-b) 16.81 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1993 Time: 1455

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (32.5 feet) - (16.81 feet) X 2.0
(total well depth) (depth to water) (CF)

= 31.4 gallons

Amount actually purged: 3 1

Well pumped/bailed dry? yes X no

SAMPLING

Date: 8 FEB 1993 Time: 1522

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 16.7 °C

pH: 6.0

Conductivity: 0.297 mmhos/cm X 1000 =µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 13 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 8 FEB 1993 Time: _____
a. Depth to water from top of casing: 13.90 feet
b. Height of PVC casing above ground surface: + 0.3 feet
c. Depth to water from ground surface: (a-b) 14.20 feet

Measuring method: electric meter

PURGING

Date: 8 FEB 1993 Time: 1145

Equipment (bailer or pump): - STEEL

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well-0.5, 4-inch well-2.0

3-well volumes = (30.6 feet) - 14.20 feet) X 2.0
(total well depth) (depth to water) (CF)

= 32.8 gallons

Amount actually purged: 26

Well pumped/bailed dry? X yes ___ no

SAMPLING

Date: 8 FEB 1993 Time: 1445

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 17.3 °C

pH: 5.8

Conductivity: 0.322 mmhos/cm X 1000 = 322 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 14 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 9 FEB 1993 Time: 1107
a. Depth to water from top of casing: 13.43 feet
b. Height of PVC casing above ground surface: 2.88 feet
c. Depth to water from ground surface: (a-b) 10.55 feet

Measuring method: electric meter

PURGING

Date: 10 FEB 1933 Time: 0910

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (23.1 feet) - 10.55 feet) X 2.0
(total well depth) {depth to water) {CF)

= 25.1 gallons

Amount actually purged: 2 7

Well pumped/bailed dry? yes X no

SAMPLING

Date: 10 FEB 1993 Time: 0950

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 16.4 °C

pH: - 6 . 3

Conductivity: 0.964 mmhos/cm X 1000 = 964 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 15 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS '(before developing)
Date: 9 FEB 1993 Time: 1012

a. Depth to water from top of casing: 16.70 feet
b. Height of PVC casing above ground surface: 2.17 feet
c. Depth to water from ground surface: (a-b) 14.53 feet

Measuring method: electric meter

PURGING

Date: 9 FEB 1993 (15A) Time: 1019

Equipment (bailer or pump): STAINLESS STEEL BAILER (15A)

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well=2.0

3-well volumes = (44.9 feet (total well depth) - 14.53 feet (depth to water)) X 2.0 (CF)

= 60.8 gallons

Amount actually purged: 65

Well pumped/bailed dry? yes X no

SAMPLING

Date: 9 FEB 1993 (15A) Time: 1700
10 FEB 1993 (15B) 0920

Equipment (bailer or pump): STAINLESS STEEL BAILER (15A)
SINGLESAMPLE BAILER 15B)

FIELD MEASUREMENTS

Temperature: 36.9 °C

pH: 6.3

Conductivity: 1.08 mmhos/cm X 1000 = 1080 µmhos/cm

Dissolved Oxygen: ppm

COMMENTS: Odor of fuel oil but no sheen on acrylic bailer: however, sheen and a lot of weathered oil is coming in later from the well screen with sand during purging.

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 16 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 10 FEB 1993 Time: 1 0 0 0
a. Depth to water from top of casing: 12.91 feet
b. Height of PVC casing above ground surface: 2.46 feet
c. Depth to water from ground surface: (a-b) 10.45 feet

Measuring method: electric meter

PURGING

Date: 10 FEB 1993 Time: 1008

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well-2.0

3-well volumes = (20.5 feet) - 10.45 feet) X 2.0
{total well depth} {depth to water) (CF)

= 20.2 gallons

Amount actually purged: 2 5

Well pumped/bailed dry? yes X no

SAMPLING

Date: 10 FEB 1993 Time: 1030

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 15.0 °C

pH: None

Conductivity: 0.250 mmhos/cm X 1000 = 2 5 0 µmhos/cm

Dissolved Oxygen: . ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 101 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 10 FEB 1993 Time: _____
a. Depth to water from top of casing: 9.5% feet
b. Height of PVC casing above ground surface: 1.98 feet
c. Depth to water from ground surface: (a-b) 7.60 feet

Measuring method: electric meter

PURGING

Date: 10 FEB 1993 Time: _____

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well-0.5, 4-inch well=2.0

3-well volumes = (f 24.0 e t) - 3.6 feet) X 2.0
(total well depth} (depth to water} (CF)

= 32.8 gallons

Amount actually purged: 3 7

Well pumped/bailed dry? __yes _X_no

SAMPLING

Date: 10 FEB 93 Time: _____

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 15.6 °C

pH: 5.9

Conductivity: 0.397 mmhos/cm x 1000 = 387 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 102 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 9 FEB 1993 Time: 1115
a. Depth to water from top of casing: 15.15 feet
b. Height of PVC casing above ground surface: 2.0 feet
c. Depth to water from ground surface: (a-b) 13.15 feet

Measuring method: electric meter

PURGING

Date: 9 FEB 1993 Time: 1120

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well=0.5, 4-inch well-2.0

3-well volumes = (34.8 feet) - 13.15 feet) X 2.0
(total well depth) (depth to water) (CF)

= 43.3 gallons

Amount actually purged: 47

Well pumped/bailed dry? yes X no

SAMPLING

Date: 3 FEB 1993 Time: _____

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 18.3 °C

pH: 6 ,

Conductivity: 0.795 mmhos/cm X 1000 = 795 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 103 INSTALLATION: WRAMC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 9 FEB 1993 Time: 1126
a. Depth to water from top of casing: 17.97 feet
b. Height of PVC casing above ground surface: 2.72 feet
c. Depth to water from ground surface: (a-b) 5 feet

Measuring method: electric meter

PURGING

Date: 9 FEB 1993 Time: 1130

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well-0.5, I-inch well=2.0

3-well volumes = (feet) 1 - 15.25 feet) X 2.0
(total well depth) (depth to water) (CF)

= 37.7 gallons

Amount actually purged: 43

Well pumped/bailed dry? yes X no

SAMPLING

Date: 9 FEB 1993 Time:

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: 20.8 °C

pH: 5 . 8

Conductivity: 1.20 mmhos/cm x 1000 = 1200 µmhos/cm

Dissolved Oxygen: ppm

COMMENTS:

GROUND-WATER DATA FIELD DATA LOGSHEET

WELL ID: WELL No. 104 INSTALLATION: WC-FOREST GLEN SECTION

WATER LEVEL MEASUREMENTS (before developing)
Date: 10 FEB 1993 Time: 1245
a. Depth to water from top of casing: 12.90 feet
b. Height of PVC casing above ground surface: 2.40 feet
c. Depth to water from ground surface: (a-b) 10.50 feet

Measuring method: electric meter

PURGING

Date: 10 FEB 1993 Time: 1250

Equipment (bailer or pump): STAINLESS STEEL BAILER

Inside diameter of well: 4 inches

Conversion factors (CF): 2-inch well-0.5, 4-inch well-2.0

3-well volumes = (24.2 feet) - 10.50 feet) X 2.0
{total well depth} {depth to water) (CF)

= 27.4 gallons

Amount actually purged: 32

Well pumped/bailed dry? yes X no

SAMPLING

Date: 10 FEB 1993 Time: 1327

Equipment (bailer or pump): SINGLE SAMPLE BAILER

FIELD MEASUREMENTS

Temperature: _____ °C

pH: None

Conductivity: 0.163 mmhos/cm X 1000 = 163 µmhos/cm

Dissolved Oxygen: _____ ppm

COMMENTS: Oil sheen and fuel oil odor present in bailer.

APPENDIX F

VOLATILE ORGANIC COMPOUNDS ANALYZED AND THEIR DETECTION LIMITS IN MICROGRAMS PER LITER (µg/L)

Purgeable Organic Compounds	Detection Limit in micrograms per liter (µg/L)
Benzene	2.0
Bromobcnzcnc	2.0
Bromochloromethane	2.0
Bromodichtoromethane	2.0
Bromoform	2.0
Bromomcthanc	2.0
n-Butylbenzene	2.0
sec-Butylbenzene	2.0
tert-Butylbenzene	2.0
Carbon Tctrachtoridc	2.0
Chlorobenzene	2.0
Chloroethane	2.0
Chloroform	2.0
Chloromethane	2.0
2-Chlorotoluene	2.0
4-Chlorotoluene	2.0
Dibromochloromethane	2.0
t,2-Dibromo-3-chloropropane	2.0
I,2-Dibromoethane	2.0
Dibromomethane	2.0
1,2-Dichlorobenzene	2.0
1,3-Dichlorobenzene	2.0
1,4-Dichlorobenzene	2.0 .
Dichtorodif'luromethane	2.0
1,1-Dichloroethane	2.0
1,2-Dichloroethane	2.0
1,1-Dichloroethene	2.0
cis-1,2-Dichloroethene	2.0
trans-1,2-Dichloroethene	2.0
1,2-Dichloropropane	2.0
1,3-Dichloropropane	2.0

Purgeable Organic Compounds	Detection Limit in micrograms per liter (µg/L)
2,2-Dichloropropane	2.0
1,1-Dichloropropene	2.0
cis-1,3-Dichloropropene	2.0
trans-1,3-Dichloropropene	2.0
Ethylbenzene	2.0
Hexachlorobutadiene	2.0
Isopropylbenzene	2.0
p-Isopropyltoluene	2.0
Methylene Chloride	2.0
Naphthalene	2.0
n-Propylbenzene	2.0
Styrene	2.0
1,1,1,2-Tetrachloroethane	2.0
1,1,2,2-Tetrachloroethane	2.0
Tetrachloroethene	2.0
Toluene	2.0
1,2,3-Trichlorobenzene	2.0
1,2,4-Trichlorobenzene	2.0
1,1,1-Trichloroethane	2.0
1,1,2-Trichloroethane	2.0
Trichloroethene	2.0
Trichlorofluromethane	2.0
1,2,3-Trichloropropane	2.0
1.2,4-Trimethylbenzene	2.0
1,3,5-Trimethylbenzene	2.0
Vinyl Chloride	2.0
o-Xylene	2.0
m & p-Xylene	2.0

APPENDIX G

TECHNICAL ASSISTANCE

1. Requests for services should be directed through appropriate command channels of the requesting activity to Commander, U.S. Army Environmental Hygiene Agency, ATTN: HSHB-ME-SG, Aberdeen Proving Ground, MD 21010-5422, with an information copy furnished the Commander, U.S. Army Health Services Command, AT-I??: HSCL-P, Fort Sam Houston, TX 78234-6000.

2. The numbered programs, and the program managers and their telephone numbers [DSN 584-XXXX or Commercial (410) 671-XXXX] are listed below for general support.

Program Number	Program Title	Program Manager	Telephone Number
11	Occupational Medicine Residency	LTC Deeter	4312
16	Pest Management	Mr. Wells	3613
17	Pesticide Risk Management	Dr. Evans	4131
24	Radio Frequency Radiation/Ultrasound	Mr. Hicks	4834
25	Laser/Optical Radiation	Dr. Sliney	3932
27	Industrial Health Physics	Mr. Edge	3526
28	Medical Health Physics	CPT Rower	3546
31	Water Supply Management	MAJ Moxley	3919
32	Wastewater Management	Mr. Fifty	3816
37	Hazardous and Medical Waste	Mr. Resta	3651
38	Ground Water and Solid Waste	Mr. Bauer	2025
39	Health Risk Assessment	MAJ Legg	2953
42	Air Pollution Source Management	Mr. Daughdrill	3500
43	Ambient Air Quality Management	Mr. Guinivan	3500
51	Hearing Conservation	Dr. Ohlin	3797
52	Environmental Noise	Dr. Luz	3029
54	Special Industrial Hygiene Services	Ms. Doganiero	3928
55	Industrial Hygiene	MAJ Sheaffer	2559
56	Healthcare Hazards	CPT McKee	3040
57	Sanitation and Hygiene	MAJ McDevitt	2489
59	Industrial Hygiene Management	Mr. Monk	2439
63	Vision Conservation	LTC Thompson	2714
64	Occupational and Environmental Medicine	MAJ Gum	2714
65	Occupational Health Nursing	Dr. Dash	2714
66	Special Document Development	Ms. Weyandt	3254
69	Health Hazard Assessment	LTC Murnyak	2925
74	Analytical Quality Assurance	CPT Lukey	3269
75	Toxicology Assessment	Mr. Weeks	3627
76	organic Environmental Chemistry	Mr. Belkin	3739
70	Radiological/Inorganic Chemistry	Dr. Boldt	2619

3. Direct support is provided by:

USAEHA Activity - North, Fort George G. Meade, MD LTC Stone, DSN 923-7403
USAEHA Activity - South, Fort McPherson, GA LTC Jakubowski, DSN 572-3332
USAEHA Activity - West, Fitzsimons AMC, CO LTC Aiken, DSN 943-3737