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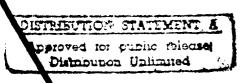
AD-A238 453

Monitoring Well Construction and Groundwater Quality Analysis at the U.S. Army Reserve Center Complex and Training Area-84th Division

Milwaukee, Wisconsin

Contract No. DACA45-87-D-0075 Project No. HA01005-8P

March 1989





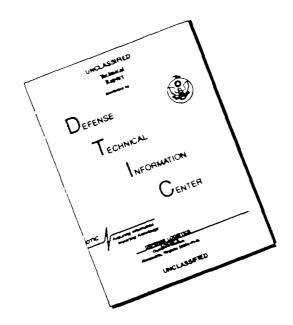


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Commander Fort McCoy AFZR-DE-E Sparta, WI 54656

Colonel Westenburg

Director of Directorate of Engineering

Re: Monitoring Well Construction and Groundwater Quality Analysis US Army Reserve Center (U.S.A.R.C.) Complex and Training Area

Milwaukee, Wisconsin

Donohue Project No. 15977.007

Dear Colonel Westenburg:

Donohue & Associates is pleased to submit to your attention ten (10) copies of our final report entitled "Monitoring Well Construction and Groundwater Quality Analysis at the U.S. Army Training Area-84th Division, Reserve Center Complex and Milwaukee, Wisconsin" (March, 1989). This work was performed under Contract No. DACA45-87-D-0075, Project No. HA01005-8P.

The attached report discusses geologic, hydrogeologic and water quality information obtained during this (and other) investigations conducted at the U.S.A.R.C. Compley. Results of this study indicate that droundwater quality : been impacted at several monitoring locations across the U.S.A.R.C. site by selected indicator, public health and public welfare parameters, including volatile organic compounds. However, the hydrogeologic information obtained during this investigation indicates that the observed impact has resulted from off-site sources located northeast (upgradient) of the U.S.A.R.C. site.

Please feel free to contact Donohue should you have any questions or comments regarding this report.

Very truly yours,

DONOHUE & ASSOCIATES, INC.

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MONITORING WELL CONSTRUCTION AND GROUNDWATER QUALITY ANALYSIS

AT THE

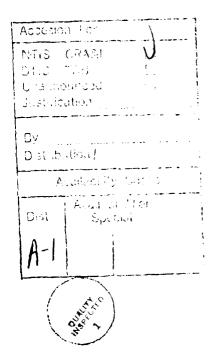
U.S. ARMY RESERVE CENTER COMPLEX AND TRAINING AREA 84TH DIVISION MILWAUKEE, WISCONSIN

Contract No. DACA45-87-D-0075 Project No. HA01005-8P

March, 1989

Donohue & Associates, Inc. 4538 North 40th Street Sheboygan, WI 53083

Project No. 15977.007



I Sund S Sout certify that I am a hydrogeologist and meet or exceed the requirements of NR.500.03(64) of the Wisconsin Administrative Code.

I See R. Grand certify that I am a hydrogeologist and meet or exceed the requirements of NR.500.03(64) of the Wisconsin Administrative Code.

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1.0 INTRODUCTION

During September, 1988, Donohue & Associates, Inc., received by authorization from the U.S. Department of the Army to proceed on Open-End Contract No. DACA45-87-D-0075 for Monitoring Well Construction and Groundwater Analysis, Milwaukee, Wisconsin (Project No. HA01005-8P). This project was completed in accordance with the Scope of Services presented in the August (1988) U.S. Army Request for Proposal (RFP), except for those deviations noted elsewhere in this report. For reference, a copy of the RFP has been included in this report (Attachment 1). All work activities associated with this project were conducted under the jurisdiction of the Commander, Fort McCoy, Wisconsin.

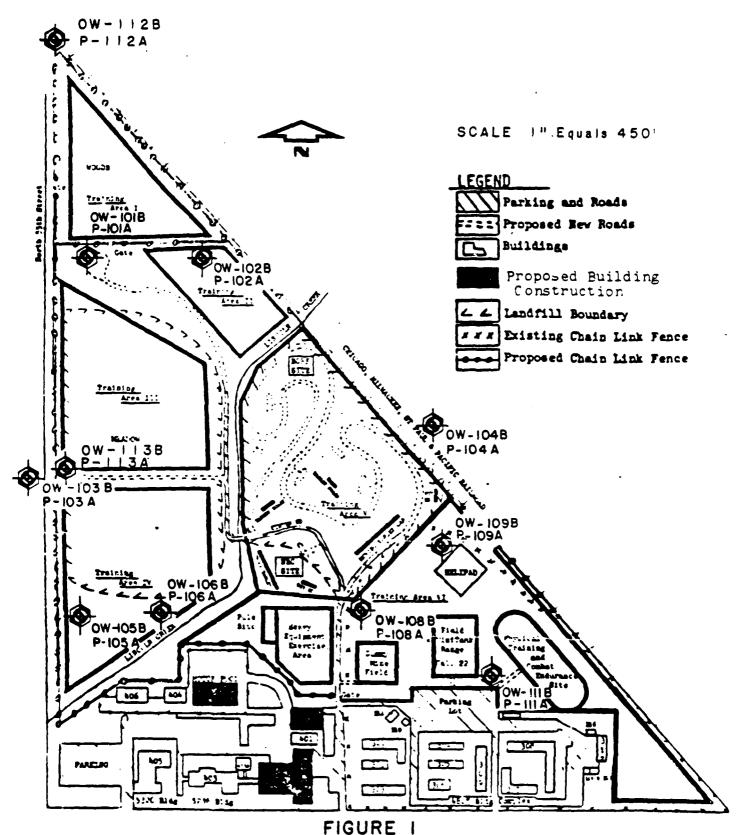
The purpose of this field investigation was to determine the geologic and hydrogeologic characteristics at the U.S. Army Reserve Center Complex and Training Center (U.S.A.R.C.) in Milwaukee, and to assess current groundwater quality at this site. These objectives were accomplished by (1) reviewing existing monitoring data compiled from previous investigations conducted at the U.S.A.R.C.; (2) installing additional groundwater monitoring wells; (3) collecting bimonthly water elevation data; and (4) performing two monthly groundwater sampling events.

This report presents our project appreach, regional and site-specific information obtained during this and earlier investigations, and provides the Department of the Army with information pertaining to groundwater quality. This includes documentation of well construction methods and groundwater sampling protocols employed during this investigation. In addition, historic hydrogeologic and water chemistry data has been compiled to determine whether groundwater contamination currently exists at this site, and to assess the extent of any observed contamination.

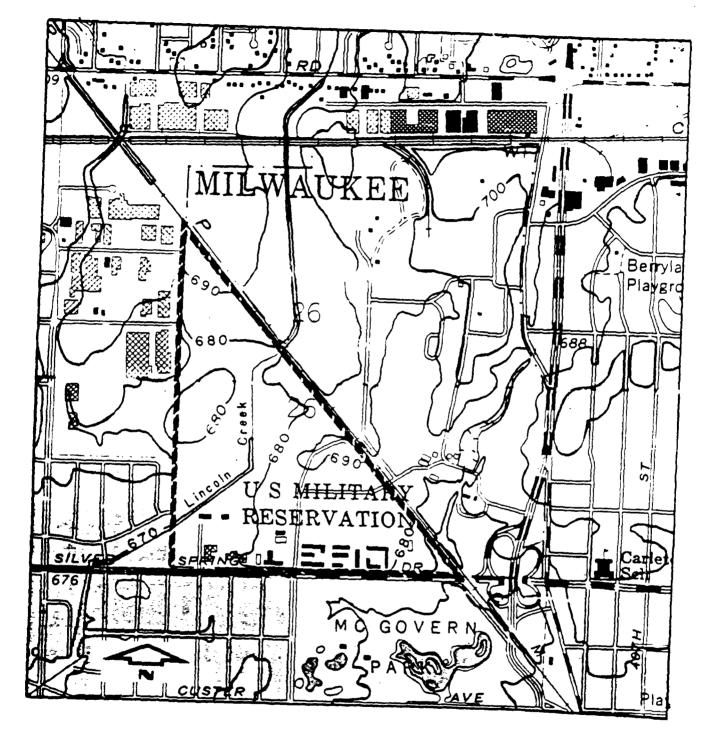
1.1 General Location and Topography

The U.S.A.R.C. study area is located between North 48th and North 55th Streets in the City of Milwaukee (Figure 1). This property lies adjacent to, and directly north of, West Silver Spring Drive. The U.S.A.R.C. is bounded on the northeast by the Chicago, Milwaukee, St. Paul, and Pacific Railroad right-of-way.

Surface topography at the site is represented by nearly level, to very gently rolling terrain with a maximum 25-foot difference in relief (Figure 2). The lowest elevation (approximately 670 feet above mean sea level) occurs at Lincoln Creek in the southwestern portion of the study area. The highest elevations (approximately 695 feet above mean sea level) are in the northernmost part of the U.S.A.R.C, and along the northeast boundary of the study area. Surface slope is directed towards the southwest.



LOCATION OF WELLS
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989



Scale
)" Equals (COO)

Legend

Surface Contour Elev. (Ft.)
Datum (M.S.L.)

FIGURE 2
TOPOGRAPHIC MAP
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989

Lincoln Creek bisects the western portion of the U.S.A.R.C., flowing southward across the study area. Surface water drainage across the site is directed to the south-southwest towards Lincoln Creek. Lincoln Creek originates approximately 2 miles northwest of the U.S.A.R.C. complex, and discharges into the Milwaukee River, approximately 2.5 miles southeast of the study area. The southwest portion of the U.S.A.R.C. complex is located within the Lincoln Creek 100-year floodplain.

1.2 Present and Prior Land Uses

The U.S.A.R.C. is comprised of several administrative/maintenance buildings located on approximately 60 acres (Figure 1). The complex includes military reserve buildings, a motor repair shop, paved roadways, parking areas, and sidewalks. The entire facility is fenced, and access onto the site is restricted.

Adjacent land use consists of mixed light-commercial and residential areas north of the U.S.A.R.C.; the Chicago, Milwaukee, St. Paul and Pacific Railroad right-of-way and the Havenwoods Nature Center on the east; residential and recreational (McGovern Park) areas to the south; and residential and light-commercial use along 55th Street, and areas further west (Figure 2).

Prior land use information presented within the "Environmental Assessment and Finding of No Significant Impact Report" prepared in 1984 indicates that landfilling operations occurred at the U.S.A.R.C. between 1957 through 1966. Reportedly, the Milwaukee Sanitation Department disposed of approximately 500,000 cubic yards of solid waste at this site. This included furniture, appliances, street sweepings, leaves, tin cans, bottles, ashes, cinder and sewer pipe. No newspaper, garbage, industrial or hazardous waste was accepted. During landfilling operations, earth berms were constructed to minimize the flow of potential contaminants to Lincoln Creek.

Samples of seepage discharge collected by the Wisconsin DNR in 1983 indicated that the discharge did not contain pollution concentrations that would be detrimental to public health, wildlife, fish, or aquatic life. Samples of Lincoln Creek collected by the DNR in 1983 at stations located upstream and downstream of the landfill cells also indicated no contamination (Department of the Army, 1984).

1.3 Background Information

Geologic, hydrogeologic and water quality information obtained during previous studies conducted by Donohue and Foth & Van Dyke at the U.S.A.R.C. has been reviewed and is summarized in the following section of this report.

Donohue, 1985

In 1984, Donohue was retained by the U.S. Army Corps of Engineers (Omaha) to define site geology and hydrogeology, and to determine the potential impact the landfill exerted on soil and groundwater quality. This was accomplished by installing eighteen nested groundwater monitoring wells at nine locations across the site, and initiating a groundwater sampling program. The results of this investigation are summarized in a report entitled, "Landfill Impact Evaluation, USAR Center Complex and Training Area" (April, 1985).

Boring information obtained by Donohue in 1985, demonstrated that a bedrock "high" occurs in the southeast portion of the site (27-foot depth). Bedrock is overlain by unconsolidated glacial drift. Lithologically, the drift is comprised of clayey-silt, silty-sand, and sand and gravel layers.

Water level information obtained in the 1985 Donohue study suggested that a water table "high" was located in the south-central portion of the site at that time. Local groundwater flow in the area of the mound was expected to be directed laterally (and downward) towards the east, west, and north. Groundwater movement in other areas of the study area were anticipated to be directed primarily towards the south and southwest. Groundwater gradients obtained during this study indicate that groundwater recharge occurring across the site moves within the shallow water table system, discharging into Lincoln Creek.

Groundwater and surface water chemistry data obtained during this earlier study indicated that higher than expected concentrations of chloride, sulfate, Total Dissolved Solids, and hardness occurred in selected wells. Although the concentration of compounds observed indicated that potential impact from the landfill may have occurred, it was also possible that the contaminants observed were derived from off-site, (upgradient) sources. These possibilities could not be fully-addressed due to the design of the monitoring program in place at that time.

Foth & Van Dyke, 1988

A second study discussing landfill cap design, site hydrogeology, and groundwater quality data was conducted at the U.S.A.R.C. by Foth & Van Dyke and Associates. The results of this investigation have been summarized in a report entitled, "Landfill Sampling and Analyses, U.S.A.R.C., West Silver Spring Drive, Milwaukee, Wisconsin (February, 1988)". During February 1987, eighty-seven auger borings were drilled at 200-foot intervals through the landfill cap to document clay content and cap thickness. This study revealed that approximately 75 percent of the

landfill site had been capped by less than 2 feet of clay. This indicates that a large portion of the site does not satisfy landfill closure requirements as stipulated in the Wisconsin Administrative Code.

A water table map for this site was prepared by Foth & Van Dyke using water elevation data obtained September 28, 1987. This ir Tormation indicated that a water table "high" was located in the south-central portion of the study area. Local groundwater flow near the water table mound was shown as being directed towards the northeast and west, while groundwater movement in other areas of the site is to the west and southwest. These results are comparable with those presented in the 1985 Donohue report.

Water quality data obtained by Foth & Van Dyke indicate that surface water and groundwater at the site were impacted at that time. Five wells exceeded the Wisconsin DNR Preventative Action Limit (PAL) for vinyl chloride. Four wells containing this contaminant were located upgradient (north) of the site. Other organic constituents detected, but which did not exceed the PAL, were 1,1 dichloroethane (upgradient), 1,2 dichloroethylene (upgradient), trichloroethylene (upgradient), tetrachloroethylene (downgradient), and toluene (downgradient). Chloroform and dichlorobromomethane were observed in surface water samples collected from Lincoln Creek (upstream, downstream).

Inorganic analytes detected in groundwater samples collected by Foth & Van Dyke, which exceeded the established PAL, included chloride, arsenic, cadmium, iron, and sulfate. High chloride and iron concentrations were observed in upgradient wells suggesting an off-site source. Sulfate exceedances were observed in many locations across the study area.

The water quality information given in the Foth & Van Dyke study indicated that the groundwater at the site had been impacted. Foth & Van Dyke staff also concluded that a source other than the landfill may be responsible for the vinyl chloride observed in the groundwater. It was recommended that additional wells be installed to further define hydrogeologic characteristics of this site, and to obtain additional information necessary to assess whether the observed groundwater contamination was due to off-site sources.

RP/USARMYM/AA8

2.0 PROJECT APPROACH

The previous groundwater investigation conducted by Foth & Van Dyke has demonstrated that volatile organics and other indicator parameters (including vinyl chloride) were present in some of the monitoring wells located upgradient of the landfill area. The current expanded monitoring well installation and groundwater sampling program conducted at the USARC by Donohue was performed to obtain additional hydrogeologic and water chemistry information. This information has been used to define the aerial extent of any observed contamination, and to determine whether the contaminates are derived from on-site or off-site sources.

2.1 Scope of Services

Donohue satisfied the above objectives by completing the following Scope of Services:

- Background information obtained by Donohue (1985) and Foth & Van Dyke (1988) was reviewed to determine prior site history, and to provide information useful for the completion of this project.
- 2. Donohue prepared a site-specific workplan (November 1988) specifying well construction and groundwater sampling procedures, data quality objectives, and health and safety procedures.
- Donohue prepared technical specifications for soil boring, well construction and other related activities, and entered into an agreement with Twin City Testing Corporation (Wausau, Wisconsin).
- 4. Two well nests, each consisting of a water table observation well and an adjacent piczometer, were constructed of 2-inch, flush-joint stainless steel riser and screen at locations determined by the Department of the Army.
- 5. Two rounds of water quality sampling for volatile organics were performed (GC/MS) for each new well, as well as selected pre-existing wells. The wells sampled during December, 1988, and January, 1989, included:

P-101A/OW-101B P-106A/OW-106B P-102A/OW-102B P-112A/OW-112B (new wells) P-105A/OW-105B P-113A/OW-113B (new wells)

6. Groundwater samples collected from each newly-installed well during December, 1988, and January, 1989, were also analyzed for the following:

- a. Field parameters including temperature, pH, color, odor, turbidity, and specific conductance.
- b. Dissolved metals including iron, barium, chromium, mercury, lead, cadmium, and arsenic.
- c. Indicator parameters including COD, BOD, hardness, odor alkalinity, nitrogen (plus nitrate), chloride, sulfate, and boron.
- 7. Water level measurements were collected bimonthly from each of the above wells during December, 1988, and January, 1989.
- 8. All wells were surveyed, referencing their vertical and horizontal locations to a USGS bench mark (or the Wisconsin State Plane Coordinate System).
- 9. Donohue completed Wisconsin DNR Well Installation Forms documenting well construction details.

RP/USARMYM/AA9

3.0 REGIONAL GEOLOGY AND HYDROGEOLOGY

3.1 Stratigraphy

The U.S. Army Reserve Center Complex and Training Area is underlain by soils which have been disturbed in many areas due to landfilling and other site development activities. On-soils have been assigned to the Loamy Land, Ashkum, Clayey Land, Mequon, and Ozaukee Soil Series.

Variable thickness of Wisconsinan-Age glacial drift underlie the surficial soil. Two till units have been mapped by the Wisconsin Geologic and Natural History Survey across the region. The uppermost sequence of fine-grained till, lacustrine clay, silt and sand, and glaciofluvial sand and gravel deposits have been assigned to the Oak Creek Till. This unit is underlain by noticeably coarser till deposits, comprised predominantly of silty and clayey sands and gravels (New Berlin Till). The glacial drift is unconformably underlain by the Niagara Dolomite of Silurian age.

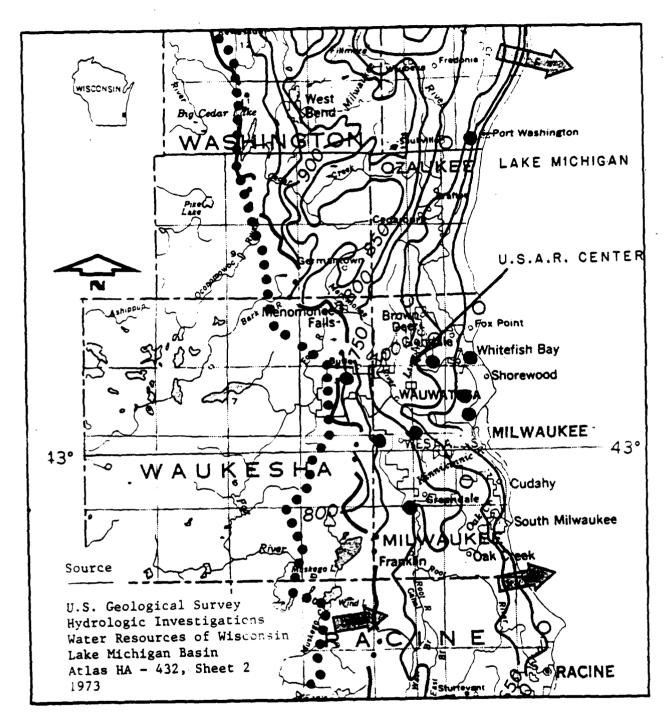
3.2 Hydrogeology

Published hydrogeologic information has documented the existence of two main aquifers units in Milwaukee County. Throughout much of the region, the shallow water table (unconfined) aquifer is comprised of the unconsolidated glacial drift unit, which is hydraulically connected with the underlying Niagara Dolomite. Lithologic differences in the drift unit may locally inhibit hydraulic connection between these two hydrologic units. Generally, small to moderate groundwater supplies are obtained from the water table aquifer. Well yields are dependant on grain size, sorting, and the saturated thickness of sediment comprising the glacial unit, and the presence of fractures, joints, solution channels in the Niagara.

Recharge to the unconfined drift and Niagara aquifer system results primarily from downward seepage of precipitation. Locally, the groundwater discharges to wells, streams, lakes, wetlands, and Lake Michigan.

The deep, confined Cambro-Ordovician sandstone aquifer is the dominant source of groundwater for Milwaukee County. Moderate to large quantities of good quality water are obtained from this aquifer. Wells fully-penetrating this aquifer are capable of producing from 1000-2000 gallons per minute. Well yields are affected by the thickness of aquifer penetrated, and the amount of permeability and porosity development.

Figure 3 is a regional water table map which shows water table elevation data, and general groundwater flow direction in the unconfined drift and Niagara aquifer system in the vicinity of



Scale 1" Equals 8 Miles Legend

•••• Groundwater Divide

Groundwater Flow Direction
Observation Wells

FIGURE 3 REGIONAL WATER TABLE MAP MILWAUKEE U.S.A.R. CENTER COMPLEX AND TRAINING AREA MILWAUKEE, WISCONSIN DONOHUE & ASSOCIATES 1989

the U.S.A.R.C. Since groundwater flow in the water table system (indicated by arrows) is from areas of high hydraulic head to areas of lower head, groundwater movement appears to be directed primarily towards the east and southeast. Local groundwater flow within the water table system is anticipated to be interconnected with Lincoln Creek which flows south of the site. Groundwater movement within the deep, confined aquifer system is directed eastward, towards Lake Michigan.

RP/USARMYM/AB0

4.0 SUBSURFACE FIELD INVESTIGATION

The various work tasks comprising this program were generally completed in accordance with the site-specific workplan prepared by Donohue entitled, "Monitoring Well Installation and Ground-water Sampling and Analysis Plan (November 1988)". Health and Safety procedures and technical specifications used during this project have been included in the project workplan.

4.1 Well Locations

Two well nests, each comprised of an observation well and an adjacent piezometer, were installed from November 14-28, 1988, at the U.S.A.R.C. to obtain additional hydrogeologic and water quality data. The general locations of wells OW-112B/P-112A, and OW-113B/P-113A were determined by the Department of the Army prior to initiation of the well installation program.

As shown in Figure 1, well nest OW-112B/P-112A was installed approximately 5 feet outside the extreme northern limit of the U.S.A.R.C. complex. Installation of wells within the fenced area was not possible because the area was heavily wooded, and would have required the removal of several trees, brush, or a portion of the fence. To preclude such activities, the Department of the Army located the well nest just north of the fenced area. reduce the potential for vandalism, each well at this location protective casings and flushedwas constructed with locked, Well nest OW-113B/P-113A was mounted covers. installed on U.S.A.R.C. property, approximately 30 feet east of the Reserve Center fence, and east of the driveway (trail) located immediately along the fence.

4.2 Well Installation Procedures

Borings were drilled in the unconsolidated surficial deposits using a 4 1/4-inch I.D. hollow stem auger. Standard split spoon samples were taken at 5-foot depth intervals. Soil boring, soil sampling and well construction activities were continuously monitored by a Donohue geologist or hydrogeologist. Continuous monitoring of air quality in the vicinity of each borehole was performed as drilling proceeded. Boring logs prepared by Donohue and Twin City Testing are included in Appendices A and B respectively. Well construction diagrams appear in Appendices C and D.

Historic well construction information pertaining to all wells installed at this site has been summarized in Table 1. Well construction information for each newly-installed well is summarized on a Wisconsin DNR Groundwater Monitoring Well Installation Form, Form 4400-89 (Appendix G).

TABLE 1
WELL CONSTRUCTION INFORMATION
U.S.A.R.C., Milwaukee

	We I	Well	Well Status	Install. Date	Ground Elev (ft)	Top/PVC Elev (ft)	Well Depth (ft)	Screened ^l Interval (ft)	Lithology At Screen
=	OW-101B	Observ. Well	Activa	11/84		686.89	30	10-20	CL-ML. GW
5)	P-101A	Plezometer	Active	10/84	1	686.86	46	41-46	NS.
3)	0W-1028	Observ. Well	Active	11/84	ı	686.04	20	10-20	Q.W.
4	P-102A	Piezometer	Active	10/84	•	685.99	45	40-45	CL-ML, SM
2)	OW-103B	Observ. Well	Abandoned	10/84	t	681.18	20	10-20	GW, ML-CL
9	P-103A	Piezometer	Abandoned	11/84	1	681.98	45	40-45	ML-CL, SM
7	OW - 104B	Observ. Well	Active	10/84	1	691.98	20	10-20	SM, CL-ML
8	P-104A	Piezometer	Active	11/84	•	692.11	38.3	33.3-38.3	ML-CL
6	OW - 1058	Observ. Well	Active	11/84	,	677.28	20	10-20	CL-ML
<u>0</u>	P-105A	Plezometer	Active	11/84	1	677.43	45	40-45	ML-CL, GW
=	OW: 106B	Observ. Well	Active	11/84	1	677.07	20	10-20	CL-ML, SM
12)	P-106A	Piezometer	Active	10/84	1	677.02	45	40-45	ML-CL
13)	OW-107B	Observ. Well	Inactive	11/84		,	,	1	ι.
14)	P-107A	Piezometer	Inactive	11/84	1		15	1	1
15)	OW-108B	Observ. Well	Active	11/84	ı	696.58	20	10-20	ML SM
16)	P-108A	Piezometer	Active	11/84	1	696.48	42	37-42	Limestone
17)	OW-109B	Observ. Well	Active	10/84	ı	694.99	20	10-20	ML, ML-CL
18)	P-109A	Piezometer	Active	11/84	1	694.88	36	31-36	Limestone
19)	OW-111B	Observ. Well	Active	10/84	1	690.93	20	10-20	SM-ML, SM
20)	P-111A	Piezometer	Active	10/84	ı	690.97	38.5	33.5-38.5	ML-CL
21)	OW-1128	Observ. Well	Active	11/88	691.54	691.36	25.1	15.1-25.1	CL, SM
22)	P-112A	Piezometer	Active	11/88	691.76	691.22	44.4	39,4-44,4	GM, CL
23)	OW-113B	Observ. Well	Active	11/88	679.94	682.94	18.0	7.8-18.0	CL. SM
24)	P-113A	Piezometer	Active	11/88	679.98	682.98	44.0	39,0-44,0	CL, SP

 $^{
m l}$ Depth measured from ground surface during well installation.

RP/USARMYM/AB6

Wisconsin State Plane Coordinates for all wells installed at the U.S. Army Reserve Complex are presented in Table la. This table includes top of riser pipe elevations.

4.2.1 Well Nest OW-112B/P-112A

Observation Well (OW-112B)

On November 16, 1988, a boring was drilled for observation well OW-112B. Split-spoon samples were obtained from the boring at depths of 10, 15, and 20 feet during drilling operations. boring depth was 25 feet. Installation of this well was initiated by placing a 10-foot stainless steel screen and riser in the borehole. This activity was followed by the placement of filter pack sand in the well annulus. However, during measurement of the filter pack, a foot-long metal rod attached to the end of the measuring tape became stuck. Subsequent activities resulted in breaking off the tape in the well at a depth of approximately 16 to 17 feet below the ground surface necessitat-Following removal of the well screen and ing abandonment. casing, the boring was backfilled with a cement/bentonite grout as specified in the Wisconsin Administrative Code.

On November 17, 1988, another boring was drilled for OW-112B at a location approximately 4.5 feet northwest of the abandoned torehole. This boring was drilled to a depth of 25.3 feet. The geologic strata encountered consisted of a sequence of clay, silt, sand, and gravel layers, and mixtures of the same.

A 2-inch (I.D.) stainless steel screen, with 0.010-inch openings was placed from a depth of 15 to 25 feet. A 2-inch (I.D.) stainless steel casing was placed from 6 inches below the ground surface to a depth of 15 feet in the well annulus.

Red flint filter pack sand (No. 30) was placed in the annular space between the well screen, casing, and native formation from a depth of 9.5 feet to 25.3 feet. The native formation in the screened interval was comprised of clay, silty, gravelly sand, and sandy to gravelly clay.

A 3-foot thick bentonite seal was placed above the filter pack and 0.5 feet of sand was placed above the bentonite seal. A 4-inch diameter, 5-foot long protective steel casing was placed over the observation well riser. The top of the protective 2 inches below the ground casing was placed approximately surface. A 5.8-foot thick concrete collar was placed in the annulus above the filter pack, to a depth of approximately 9 inches below the surface. Approximately 3 inches of sand was placed above the concrete collar. A flush-mount cover was placed over the protective casing and set into the concrete collar. Well construction was completed by sloping the concrete gently away from the flush mount cover to direct surface water drainage away from the well.

TABLE 1a

MONITORING WELL LOCATIONS AND ELEVATIONS
WISCONSIN STATE PLANE COORDINATE SYSTEM
SOUTH ZONE

		•	
Well No.	Y Value	x Value	Elevation* (NVD 1929)
OW101	417,120.9	2,539,200.1	686.89
P101	417,122.9	2,539,195.3	686.86
OW102	417,114.4	2,539,732.2	686.04
P102	417,113.1	2,539,738.2	685.99
OW103	415,878.8	2,538,943.5	681.18
P103	415,879.8	2,538,946.4	681.98
OW104	416,344.7	2,540,766.0	691.98
P104	416,341.5	2,540,761.6	692.11
OW105	415,395.9	2,539,101.0	677.28
P105	415,392.3	2,539,100.6	677.43
OW106	415,405.4	2,539,464.0	677.07
P106	415,408.5	2,539,462.7	677.02
OW108	415,740.9	2,540,544.3	696.58
P108	415,733.8	2,540,540.4	696.48
OW 109	415,810.7	2,540,797.2	694.99
P109	415,814.4	2,540,793.9	694.88
OW111	415,375.6	2,541,016.9	690.93
P111	415,372.3	2,541,016.7	690.97
P112A	418,021.4	2,539,211.5	691.76
OW112B	418,017.3	2,539,210.0	691.54
P113A	415,872.9	2,539,072.3	679.98
OW113B	415,877.9	2,539,068.3	679.94

^{*}Elevation of top of PVC riser, referencing the 1929 National Vertical Datum.

RP/USARMYM/AB8

Piezometer (P-112A)

Soil boring and soil sampling activities for boring B-112A were completed on November 22, 1988. Construction of piezometer P-112A was completed on November 23.

This boring was drilled to a depth of 45.5 feet before encountering refusal (bedrock?). An attempt was made to obtain a sample at the total boring depth with a split-spoon sampler. No sample was retrieved, however. The geologic strata encountered in this boring consisted of interbedded layers of clay, silt, sand, gravel, and mixtures of the same.

Two-inch (I.D.) stainless steel screen with 0.010-inch openings was placed from a depth of 39.4 feet to 44.4 feet.

Red flint filter pack sand (No. 30) was placed in the annular space between the well screen, casing, and native formation from a depth of 33.8 feet to 44.4 feet. The native formation in the screened interval was comprised of sandy gravel, gravelly sand, and silty clay.

An attempt was made to place a bentonite pellet seal above the filter pack. However, when the augers were pulled up slightly above the filter pack to allow space for placing bentonite pellets, formation material upwelled in the auger. Approximately 50 gallons of water obtained from U.S.A.R.C. Building 312 was used to remove the material. Over time, unconsolidated soil materials again slowly upwelled inside the auger. After reflushing the auger with an additional 50 gallons of water, a bentonite-sand slurry was tremied inside the auger from a depth of 33.8 feet, to a depth of 8 feet.

A 3-foot thick bentonite seal was placed above the bentonite-sand grout backfill. A 4-inch diameter steel protective casing was placed over the observation well casing. The top of the protective casing was set approximately 2 inches below the ground surface. A flush-mount cover was placed over the protective casing, and a 6-foot thick concrete collar was placed in the annular space between the protective casing flush mount cover and native formation. The concrete collar was sloped gently away from the cover to facilitate surface water drainage.

4.2.2 Well Nest OW-113B/P-113A

Observation Well (OW-113B)

Soil boring and sampling activities were completed at boring B-113B on November 14, 1988. Observation well OW-113B was constructed in this boring on November 15.

This boring was drilled to a depth of 20 feet. The geologic strata encountered consisted of interbedded layers of clay, silty sand and gravel, and mixtures of the same.

Split-spoon soil samples were taken at depths of 10 feet and 15 feet. At a depth of 15 feet, sandy clay material upwelled inside the auger when the plug was removed to allow for split-spoon soil sampling. The auger was flushed with clean water to remove the upwelled material. Approximately 100 gallons of water obtained from U.S.A.R.C. Building 312 were used to remove the material.

Two-inch (I.D.) stainless steel screen, with 0.010-inch openings was placed over the 8-foot to 18-foot depth interval. Two-inch (I.D.) stainless steel casing was placed from 3.1 feet above the ground surface to a depth of 8 feet.

Red flint filter pack sand (No. 30) was placed in annular space between the well screen, casing, and native formation over the 7-to 18.5-foot depth. The geologic strata present in the screened interval consisted of clayey silt, silty clay, silty gravell; sand, and silty sand.

A 2-foot thick bentonite seal was placed above the filter pack. A 4-inch diameter, steel protective casing was placed over the observation well casing. A 5-foot thick concrete collar was placed above the bentonite seal and extended upward to the ground surface. The concrete was sloped away from the protective casing to facilitate surface water drainage away from the well.

Piezometer (P-113A)

Boring B-113A was drilled and sampled on November 15 and 16, 1988. Construction of piezometer P-113A was completed on November 16.

This boring was drilled to a depth of 44.5 feet, at which depth bedrock was apparently encountered. No samples of bedrock were obtained, however. The geologic strata penetrated by this boring consisted of interbedded layers of clay, silt, sand, and mixtures of the same.

Two-inch (I.D.) stainless steel screen with 0.010-inch openings was placed from a depth of 38.8 feet to 44 feet. Two-inch (I.D.) stainless steel casing was placed from 3 feet above the ground surface to a depth of 38.8 feet.

Red flint filter pack sand (No. 30) was placed in the annular space between the well screen, casing, and native formation from a depth of 33.5 feet to 44.5 feet. The native formation in the screened interval consists of clay and well-sorted sand.

A 7-foot thick bentonite seal was placed above the filter pack. Approximately 19.5 feet of bentonite-sand-grout backfill was placed above the bentonite seal. A 2-foot thick, bentonite pellet seal was placed above the bentonite-sand slurry. A 4-inch diameter, steel protective casing was placed over the piezometer casing pipe and a 5-foot thick concrete collar was placed to the surface. The concrete was sloped away from the protective casing to facilitate surface water drainage away from the well.

4.2.3 Borehole Monitoring

Atmospheric monitoring was conducted during the soil boring and soil sampling operations with an HNu photoionization detector. This instrument is useful in the detection of selected volatile organics.

Borehole monitoring was accomplished by inserting the tip of the HNu into the borehole annulus. Formation samples were placed in zip-lock bags and the HNu probe was inserted through a small opening in the zip-lock to monitor air quality. No detects were observed in either the formation samples or the borehole.

The borehole was also periodically monitored for oxygen concentration and lower explosive limit with a combustible gas/oxygen indicator. No air quality anomaly was observed with this instrument.

An oily film was briefly observed on water seeping from drill cuttings collected during the drilling of boring B-113A. However, no volatile organics were detected with the HNu.

4.2.4 Well Development

Twin City Testing Corporation initiated well development after a minimum of 48 hours had elapsed following well construction. Well development is performed to remove fine-grained material from the well annulus, enabling a representative sampling of the groundwater. Each well was developed by pumping and/or surging the well with a hand pump, without the use of acids, dispersing agents or explosives.

Before, during, and after completion of purging, the chemical and physical characteristics of the water removed from each well were measured and documented. Measurements obtained included turbidity, color, odor, conductivity, pH and temperature. Wells OW-112B and P-112A were developed until a volume equaling five times the standing water volume in each well had been removed, or until the water was clear and the physical parameters were constant (+10 percent). Approximately four well volumes were removed from Well OW-113B. Piezometer P-113A was purged dry, and then one well casing volume of distilled water was added to the well.

After the water was added, the well was surged and purged dry again. All well development information was recorded on a well purging and sample collection log (Appendix E).

Water levels were measured and recorded prior to purging each well. Well OW-112B was developed until 160 gallons were removed and the pH and conductivity had stabilized at 7.20 ± 0.1 and $1000\pm$ umhos/cm, respectively. Similarly, piezometer P-112A was developed until the water was clear, and the conductance had stabilized at 800 umhos/cm. A stabilized pH value of 6.80 ± 0.1 was recorded for piezometer P-113A after 75 gallons had been removed. Some fluctuations were noted in the pH and conductance for Well OW-113B even after 100 gallons had been removed from the well.

4.3 Site Stratigraphy

The stratigraphic information obtained from borings B-112A/B-112B differs markedly from that observed in borings B-113A/B-113B. Soils encountered in borings B-112A/B-112B were much coarser in the basal portion compared to those penetrated in borings B-113A/B-113B, which were predominantly fine-grained.

The surface soils in the vicinity of well nests OW-112B/P-112A and OW-113B/P-113A appear to be silt-clay loams developed within a silty-clay drift. The soils appear to be poorly aerated and drained as evidenced by the abundant clay content and faint mottling. The permeability of the surface soil appears to be low (estimated at .1 to .5 inches per hour).

Well Nest OW-112B/P-112A

The soils at borings B-112A/B-112B generally consist of gray to brown-gray, gravelly sand and sandy gravel below a depth of 21 feet (to bedrock). Gravelly sands encountered contain a high percentage of angular limestone (dolomite) rock fragments, and a trace of subround gravel of igneous origin.

Gray-brown, silty clay with migrite clasts occurs over the 20-21 foot depth increment. Tan-gray, gravelly sand is present over the 15 to 20-foot depth. This sand unit is overlain by gray, gray-brown, buff and brown clayey silt and silty clay. The clayey silt at a depth of approximately 5 feet was faintly laminated. The laminites consisted of alternating silt and clay. Faint green mottling was apparent at a depth of 6 feet.

Well Nest OW-113B/P-113A

Bedrock was presumably encountered at a depth of 44.5 feet in borings B-113A/B-113B as the split-spoon sampler could not be advanced any further (no bedrock sample obtained). The strata encountered at this location consist primarily of silty-clay and clay, with occasional intercalated sand layers.

The color of the formation is predominantly gray in the basal 35 feet of the section, changing to light-gray to brown in the upper 10 feet. A trace of angular to round gravel (limestone/dolomite) was observed. Faint laminations were noted in a silty clay occurring at a depth of 26 to 27 feet.

4.4 Bedrock Configuration

Past and present boring programs conducted at the U.S.A.R.C. site has provided useful information regarding the configuration of the bedrock in the study area. In general, the attitude of the bedrock surface appears to mimic surface topography.

Based on available data, bedrock relief across the study area is approximately 30 feet. Lowest bedrock elevations occur in the vicinity of borings B-105A/B-105B and B-106A/B-106B. The maximum bedrock elevation (660 feet above mean sea level) occurs as a localized knob (bedrock "high") near borings B-108A/B-108B and B-109A/B-109B. It is also possible that the bedrock "high" is part of a northeast-southwest trending ridge. General slope of the bedrock surface across the study area is toward the south-southwest.

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5.0 HYDROGEOLOGY

Several lakes are present in the vicinity of the U.S.A.R.C. complex. Many are groundwater-dominated seepage lakes, hydraulically connected to the local groundwater system. Figure 4 shows water table contours derived from surface elevations recorded at nine lakes located in the vicinity of the U.S.A.R.C. The base map is a U.S.G.S. quadrangle, photo-revised in 1976. Water elevations recorded for each lake, suggest that regional groundwater flow is directed towards the southeast, with an average horizontal hydraulic gradient of approximately .006 ft/ft. The hydraulic gradient observed between higher and lower elevation lakes is not necessarily constant and may be influenced by local recharge mounds.

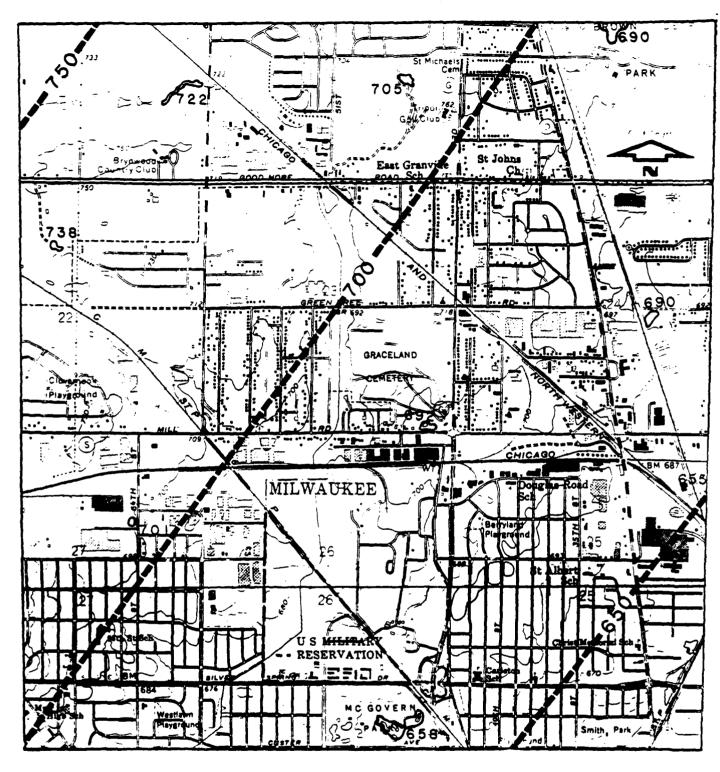
5.1 Site Hydrogeology

The hydrogeologic characteristics of the glacial drift unit have been studied more extensively than the hydrogeology of the underlying Niagara Dolomite at the U.S.A.R.C. site. Twenty wells installed at this site are screened in drift unit. The remaining two wells (P-108A, P-109) are screened 10 and 9 feet into the underlying limestone (dolomite).

Groundwater elevation data was obtained from all observation wells and piezometers during the course of this project (March, 1989). This information and historic water level data is summarized in Table 2.

Water level measurements taken on March 1, 1989 have been used to show the present configuration of the water table at the U.S. Army Reserve site (Figure 5). The water table map which has been prepared illustrates the general magnitude of observed horizontal gradients and direction of groundwater flow. The horizontal hydraulic gradient in the vicinity of wells P-101A/OW-101B and P-102A/OW-102B, southward to wells P-105A/OW-105B is approximately .002 ft/ft. The horizontal hydraulic gradient between well nests P-108A/OW-108B and P-106A/OW-106B is approximately .02 ft/ft.

Groundwater flow is directed towards areas of decreasing hydraulic head, as indicated by the arrows on Figure 5. Th contoured water table elevation data suggests that groundwater is directed radially away from the bedrock "high" located near well nest OW-108B/P-108A. The predominent direction of groundwater flow away from this location, across other areas of the site, varies from southwesterly in the northern part of the study area, to southeasterly in the vicinity of well nests P-105A/OW-105B and P-106A/OW-106B.



SCALE
I" Equals 2000'
LEGEND

690 C Lake Surface Elevation

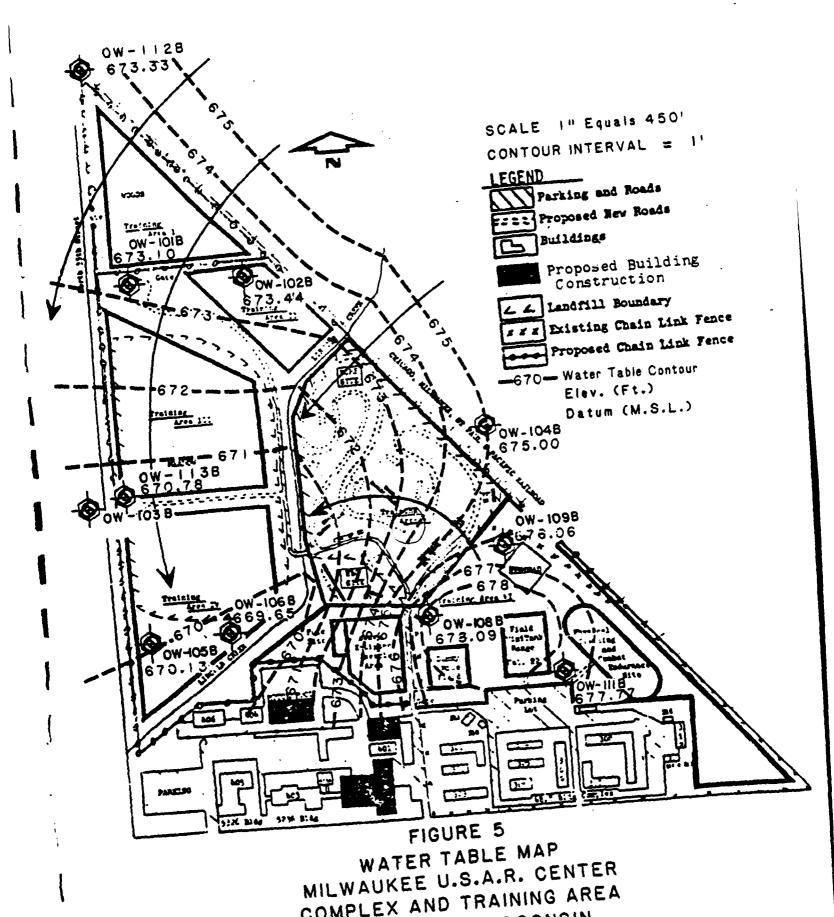
Water Table Contour Elev. (Ft.) Datum (M.S.L.) FIGURE 4
WATER TABLE MAP
BASED ON LAKE ELEVATIONS
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989

TABLE 2
GROUNDWATER ELEVATION DATA

US Army Reserve B4th Division

Monitoring Well Elevation

Well No.	T.O.P.(MSL)	1/87	3/87	5/87	7/87	9/87	12/88	1/89	2/89	3/1
P-101A	686.76	676.05	676.28	677.16	675.69	676.67	673.39	674.35	674.36	674.34
DW-1019	686.89	675.58	675.89	676.64	675.35	676.21	673.14	673.14	673.15	673.10
P-102A	685.99	675.95	676.20	676.95	675.59	676.56	673.14	673.37	673.37	673.21
OW-102B	686.04	676.04	676.35	677.09	675.71	676.64	673.47	673.47	673.48	673.44
P-104A	692.11									Frozen
OW-104B	691.98	680.67	677.32	678.22	676.13	677.24				67 5. 00
P-105A	677.43	671.74	672.25	672.76	671.75	672.44	669.33	669.38	669.36	669.34
OW-105B	677.28	670.84	670.84	671.58	670.80	671.39	469.99	670.12	670.15	670.13
P-106A	677.02	670.06	670.65	670.73	669.97	<i>6</i> 70.78	669.56	669.01	669.02	668.98
DW-106B	677.07	669.88	670.95	670.74	669.33	670.54	669.38	669.67	669.68	669.65
P-108A	696.48	680.31	681.65	682.45	679.88	682.18				676.11
OW-1088	696.58	686.25	687.61	688.09	685.52	687.63				678.09
P-109A	674.88	679.59	681.08	581.Sú	679.13	681.36				675.12
0₩-109B	694.99	679.99	681.62	682.48	679.57	681.92				676.06
P-111A	690.97	677.80	679.31	480.58	677.76	679.87				673.20
OW-111B	690.93	681.26	683.31	684.15	681.26	683.66		,		677.77
P-112A	691.22						673.28	673.32	673.33	673.30
OW-1128	691.36						673.35	673.33	673.34	673.33
P-113A	682.98						670.76	670.74	670.75	670.73
OW-113B	682.94						670.73	670.76	670.80	670.78



WATER TABLE MAP
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989

Vertical gradients vary from strongly downward in well nests P-108A/OW-108B, P-109A/OW-109B, P-104A/OW-104B, and P-111A/OW-111B, to strongly upward at well nest P-101A/OW-101B. Strong downward gradients are indicated for wells located in the vicinity of the bedrock "high". Groundwater appears to move downward and radially away from this area.

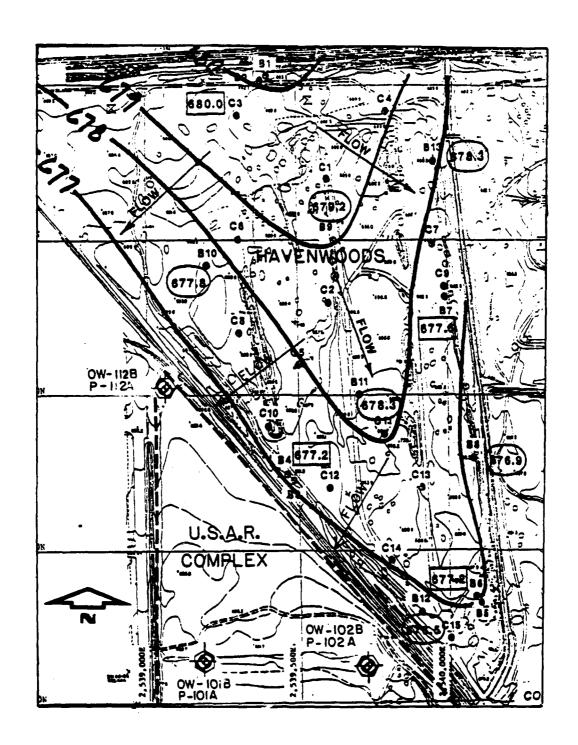
The observed groundwater mound located near well nest OW-108B/P-108A is recharged by local precipitation. Recharge to the aquifer in other areas of the site is obtained from local precipitation and infiltration flow.

In 1986-1987 Miller Engineers conducted a groundwater investigation at the Havenwoods Nature Preserve located northeast of the U.S.A.R. Center complex and training area. Staff with Miller Engineers concluded that "horizontal flow directions are to the southeast south-southwest toward both Lincoln Creek and the U.S. Army Reserve Complex". Figure 6 shows the configuration of water table at the Havenwoods study area developed from water level measurements taken in 1986 and 1987.

The water table map presented by Miller Engineers for the Haven-woods study area generally coincides with the water table map developed from this study. Groundwater is migrating from the vicinity of the Havenwoods study area toward the U.S.A.R. Center complex and training center.

The relationship between Lincoln Creek and the aquifer system is not known with certainty. It appears that water levels measured in observation wells OW-102B and OW-106B are at approximately the same elevation as water levels in Lincoln Creek. It is believed that Lincoln Creek is hydraulically connected to the drift aquifer and that flow in the creek is primarily sustained by groundwater discharge.

RP/USARMYM/AB2



SCALE

I" Equals 350'

LEGEND

— 678 — Water Table Contour Elev. (Ft.)
Datum (M.S.L.)

FIGURE 6
WATER TABLE MAP
HAVENWOODS STUDY AREA
MILWAUKEE U.S.A.R. CENTER
COMPLEX AND TRAINING AREA
MILWAUKEE, WISCONSIN
DONOHUE & ASSOCIATES
1989

6.0 GROUNDWATER SAMPLING AND ANALYSIS

6.1 Groundwater Sampling

Groundwater samples were obtained from selected wells on December 21 and 22, 1988, and January 23 and 24, 1989, following proper well construction and development. Wells sampled for volatile organics included:

P-101A/OW-101B P-106A/OW-106B P-102A/OW-102B P-112A/OW-112B (new wells) P-105A/OW-105B P-113A/OW-113B (new wells)

Table 3 provides a listing of the organic analytes determined by Donohue Analytical, and their associated analytical detection limits.

In addition, groundwater samples collected from each newly-installed well were analyzed for selected Public Health and Welfare Standards, and Indicator Parameters as shown in Table 4. These include:

- 1. Field parameters including temperature, pH, color, odor, turbidity and specific conductance.
- Dissolved metals including iron, barium, chromium, mercury, lead, cadmium and arsenic.
- 3. Indicator parameters including COD, BOD, hardness, odor, alkalinity, nitrate + nitrite, ammonia-nitrogen, chloride, sulfate and boron.

Purging was conducted prior to sampling activities to ensure the collection of a representative groundwater sample. Samples were obtained by using a teflon bailer attached to a nylon rope. The first several bailer volumes retrieved from each well were discarded prior to sample collection. Sampling equipment was decontaminated between successive locations with liquinox and distilled water.

The physical characteristics of the groundwater obtained before, during and after the purging were recorded. Parameters noted included turbidity, color, odor, conductivity, pH and temperature. Each well was purged until stabilization of these parameters had occurred $(\pm 10\%)$.

Analytical methods and groundwater sampling requirements are presented in Table 5. This table also indicates bottle and preservative requirements employed during groundwater sampling. Groundwater samples to undergo analysis for dissolved metals were field filtered using a 0.45 micron filter and a positive pressure filtering apparatus. Samples collected for volatile organics were not field filtered.

TABLE 3

ORGANIC ANALYTES
84th U.S. Army Reserve Complex and Training Center

CAS Number	Donohue Analytical Detection Limit (ug/l)	<u>Volatiles</u>
74-87-3	<2	Chloromethane
74-83-9	<2	Bromomethane
75-01-4	<2	Vinyl Chloride
75-00-3	<2	Chloroethane
75-09-2	<1	Methylene Chloride
67-64-1	<5	Acetone
75-15-0	<10	Carbon Disulfide
75-35-4	<1	1,1-Dichloroethene
75-34-3	<1	1,1-Dichloroethane
156-60-5	<1	Trans-1,2-dichloroethene
67-66-3	<1	Chloroform
107-06-2	<1	1,2-Dichloroethane
78-93-3	<10	2-Butanone
71-55-6	<1	1,1,1-Trichloroethane
56-23-5	<1	Carbon Tetrachloride
106-05-4		Vinyl Acetate
75-27-4	<1	Bromodichloromethane
78-87-5	<1	1,2-Dichloropropane
10061-02-6-	<1	Trans-1,3-Dichloropropene
79-01-6	<1	Trichloroethene
124-48-1	<1	Dibromochloromethane
79-00-5	<1	1,1,2-Trichloroethane
71-43-2	<1	Benzene
10061-01-5	<1	Cis-1,3-Dichloropropene
110-75-8	<1	2-Chloroethylvinylether
75-25-2	<1	Bromoform
591-78-6	<10	4-Methyl-2-Pentanone
108-10-1	<25	2-Hexanone
127-18-4	<1	Tetrachloroethene
79-34-5	<1	1,1,2,2-Tetrachloroethane
108-88-3	<1	Toluene
108-90-7	<1	Chlorobenzene
100-41-4	<1	Ethylbenzene
100-42-5	<1	Styrene
	<2	Total Xylenes

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TABLE 4

FIELD PARAMETERS AND INORGANIC ANALYTES 84th U.S. Army Reserve Complex and Training Center

Indicator Parameters:

Field Parameters:

BOD Alkalinity COD Hardness Ammonia/Nitrogen

Temperature Conductivity pH Turbidity Color Odor

Public Welfare Standards:

Chloride Dissolved Iron Sulfates

Public Health Standards:

Nitrate and Nitrite - Nitrogen

Other Dissolved Metals to Include:

Arsenic Barium Boron Cadmium Chromium Lead Mercury

RP/USARMYM/AA3

TABLE 5

ANALYTICAL METHODS AND GROUNDWATER SAMPLING REQUIREMENTS B4th U.S. Army Reserve Complex and Training Center

Color P	1 V P 9 . E P . E	Type Limit P.E -	Number/Reference Field Observation Field Observation	Glass Jar Glass Jar Glass Jar	Preservative(s) None None	Analyze Immediately Analyze Immediately Analyze Immediately
i t y	, c c	1 1 1	Field Observation	Glass Jar Glass Jar	None None	Analyze Immediately Analyze Immediately
DISSOLVED METALS	۵	. 1/bn [206.3/1	250 ml HDPE Bottle	1:1 HNO ₃ to pH <2	6 Wonths
	. a	200 09/1	208.1/1	250 ml HOPE Bottle	1:1 HNO3 to pH <2	6 Months
4	۵	0.1 mg/1	212.3/1	250 ml HDPE Bottle	None	6 months
4	a	1/60 1	213.2/1	250 ml HDPE Bottle	1:1 HNO ₃ to pH <2	6 Months
"	۵	2 ug/1	218.2/1	250 ml HDPE Bottle	1:1 HNO ₃ to pH <2	6 Months
4	a	2 ug/1	239.2/1	250 ml HDPE Bottle	1:1 HNO3 to pH <2	6 Months
4	۵	0.2 ug/1	245.2/1	250 ml HDPE Bottle	1:1 HNO ₃ to pH <2	28 days
•	۵	50 ug/1	236.1/1	250 ml HDPE Bottle	1:1 HNO ₃ to pH <2	6 Months
			·			
Nitrate+Nitrite- Nitrogen	Q .	0.05 mg/ł	353.271	250 ml Glass Bottle	1:1 H ₂ SO ₄ to pH <2, 4°C	28 Days
Ammonia- Nitrogen	٩	0.10 mg/1	350,1/1	250 ml Glass Bottle	1:1 H ₂ SO ₄ to pH <2, 4 ⁰ C	28 Days
-	Q.	2 mg/l	375.2/1	1000 ml HDPE Bottle	J ₀ ¢	28 Days
Chloride	۵	0.5 mg/l	325.2/1.	1000 ml HDPE Bottle	None	28 Days

** P Denotes newly-installed well; E denotes pre-existing well

TABLE 5

ANALYTICAL METHODS AND GROUNDWATER SAMPLING REQUIREMENTS 84TH U.S. Army Reserve Complex and Training Center (Continued)

9	Well.	Weller Detection	EPA Method Number/Reference	Sample Container	Preservative(s)	Holding Time
		1/0# %	310,2/1	1000 ml HDPE Bottle	4°C	14 Days
Tardossa P	. a	2 mg/1	130.1/1	250 ml HDPE Bottle	1:1 HNO ₃ to pH <2	6 Months
000	۵	5 mg/1	410.4/1	250 ml Glass Bottle	1:1 H ₂ SO ₄ to ph <2, 4 ⁰ C	28 Days
008	۵	2 mg/1	405.1/1	1 liter HDPE Bottle	None	48 Hours
ORGANICS						
Volatile Organics	P, E	1-5 ug/1*	624 Vials, Teflon Coots No Headsnade	(2) 40 ml glass	4°C	14 Days

References:

EPA-600/4-79-020 revised 1983, "Methods for Chemical Analysis of Water and Wastes"

2. 40 CFR Part 136, Federal Register, October 26, 1984.

varies by compound, refer to method.
 P Denotes proposed well; E denotes existing well

RP/USARMYM/AA4

Table 6 summarizes Donohue quality assurance/quality control requirements. Quality assurance standards for volatile organics were satisfied by collecting one duplicate, trip blank and field blank during each sampling event. Field blanks consisted of rinsates.

Specific sampling techniques and protocols utilized during this investigation are discussed further in the project workplan prepared by Donohue, entitled "Monitoring Well Installation and Groundwater Sampling and Analysis Plan" (November, 1988). This workplan also describes sample documentation, and sample handling procedures.

6.2 Groundwater Analysis and Results

Groundwater sampling results obtained during December, 1988, and January, 1989, are presented in Appendix F of this report. This appendix also includes historic groundwater quality data from 1987. A summary memorandum prepared by the Donohue Laboratory Quality Control Coordinator discussing data quality is also included in this appendix. Sampling events are summarized by well for indicator parameters, and volatile organic compounds.

6.2.1 Indicator Parameters

Concentrations of COD ranging from 15 to 30 milligrams per liter (mg/l) were observed in wells OW-101B/P-101A, OW-102B/P-102A, and P-105A. The remaining wells monitored at the site contained COD concentrations below the analytical detection limit of 5 mg/l. Analytical data obtained during this investigation, and historic water quality information indicates that BOD concentrations are near or below the analytical detection limit.

Boron concentrations in groundwater samples obtained from the site are less than 1 mg/1.

Generally, above normal conductivity values were observed at all well locations. Conductivity values observed in the groundwater samples obtained from this site ranged from 800 to 1400 micromhos. High specific conductives was also observed in well OW-112B.

Near neutral pH values were observed at all locations across the site except near well locations 112 and 113 where pH values ranged from 7.6 to 9.2 units. Total hardness concentrations at all wells were generally in the 500 to 900 mg/l range. Alkalinity values ranged from 300 to 500 mg/l.

TABLE 6

QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS
84th U.S. Army Reserve Complex and Training Center

Well Type	# Field Samples	# Field Blanks	# Trip Blanks	#Field Duplicates
Existing	8	1	0	0 *
New	4	1	1	1 *

* One field duplicate taken during each event. Second event field duplicate will be from well exhibiting detectable volatile organics in first event.

Sample Containers for Each Field Sample, Blank, Duplicate

Ana	<pre>lyte(S)</pre>	Container
1.	Metals, Hardness	<pre>l-liter HDPE bottle with 1:1 HNO₃ to pH <2</pre>
2.	Sulfate, chloride, BOD, alkalinity	1-liter HDPE bottle cool to 4°C
3.	Ammonia, COD Nitrate + nitrite	1-250 ml glass bottle, l:1 H_2SO_4 to pH <2
4.	Volatile Organics	(2) 40 ml glass vials with Teflon septa, no headspace, 4°C

RP/USARMYM/AA3

6.2.2 Public Welfare Parameters

Elevated chloride concentrations were observed at all monitoring well locations at the USARC site. The only noted exception occurred at well OW-106B, which contained approximately 20 mg/l chloride. Intermediate chloride concentrations, reaching a maximum of 100 mg/l, were observed at well locations 101, 102, 105, and 113. This concentration range is below the established Wisconsin DNR Preventative Action Limit (PAL). Highest chloride concentrations approached 200 mg/l for wells P-112A/OW-112B (upgradient). While the chloride concentration observed at well location 112 exceeds the PAL, the Enforcement Standard (ES) was not attained.

Observed sulfate concentrations generally fall in the range from 200 to 300 mg/l. The PAL established for sulfate was exceeded in all wells, and several wells exceeded the ES.

Dissolved iron concentrations are extremely variable across the USARC site. Analytical results range from the analytical detection limit of 0.05 mg/l to values exceeding 3 mg/l. In general, the concentration Enforcement Standard. Consistently high iron concentrations have been observed in wells P-101A, P-105A, P-112A, and OW-112B.

6.2.3 Public Health Parameters

The concentration of toxic metals in the groundwater at this site was generally below the analytical detection limit. Nitrate + nitrate-nitrogen concentrations were also near or below the analytical detection limit (all locations).

Volatile organic compounds (VOCs) have been detected at all well locations monitored during this program. Vinyl chloride presence was not confirmed in wells OW-101B, P-101A, OW-102B, P-102A, and P-105A. Elevated vinyl chloride concentrations were observed in these wells during the February 1987, and July 1987, sampling events. The compound cis-1, 2-dichloroethylene was confirmed in wells OW-101B, OW-102B, and P-102A. Concentrations observed are similar to those detected during 1987 sampling events.

Dichlorobenzene isomers were detected in wells P-102A, P-105A, OW-105B, OW-106B, P-106A, and P-113A. Only well P-102A showed comparable isomer concentrations during the most recent (December, 1988; and January, 1989) sampling events.

The highest concentrations of volatile organic compounds were detected in groundwater samples obtained from well nest OW-112B/P-112A (upgradient). Maximum concentrations deleted were: cis-1, 2-dichloroethylene, 762 mg/l; trichloroethylene, 209 mg/l; 1-dichloroethane, 104 mg/l. Elevated concentrations were confirmed during both the December, 1988, and January, 1989 events. The majority of volatile organics detected at well nest OW-112B/P-112A are ES exceedances.

7.0 SUMMARY AND CONCLUSIONS

Previous studies by Donohue (1985) and Foth and Van Dyke (1988) have shown that groundwater at the U.S.A.R.C. complex has been impacted by chloride, arsenic, cadmium, iron, and volatile organic compounds. Analytical data obtained during this investigation has also documented groundwater impact at several monitoring well locations across the site. Enforcement standards have been exceeded for sulfate, dissolved iron, and volatile organic compounds. The most significant impacts in groundwater quality were observed near the northern portion of the U.S.A.R.C. site. Well nest OW-112B/P-112A have shown PAL and ES exceedances for selected indicator, public welfare, and public health parameters, including volatile organic compounds.

Groundwater elevation data obtained during this study has indicated that generally groundwater flow within the shallow unconfined water table system is directed towards the south and southwest. A subsurface study conducted at the Havenwoods Nature Preserve located just northeast of the U.S.A.R.C. complex also indicated that groundwater flow is directed southeast-southsouthwest from the Havenwoods Nature Preserve, towards Lincoln Creek and the U.S.A.R.C. site. This information indicates that the most impacted well nest (P-112A/OW112B) is located upgradient from the U.S.A.R.C. site, and downgradient from the Havenwoods Nature Preserve. Based on the information obtained during this investigation and summarized in this report it appears that the groundwater impacts presently observed at the U.S.A.R.C. site have resulted from an off-site source located northeast of the U.S.A.R.C. site.

RP/USARMYM/AB4

BIBLIOGRAPHY

- Donohue & Associates, 1985, Landfill Impact Evaluation, USAR

 Center Complex and Training Area, Milwaukee, Wisconsin;

 prepared for U.S. Army Corps of Engineers (Omaha).
- Donohue & Associates, 1988, Monitoring Well Installation and Groundwater Sampling and Analysis Plan for the U.S. Army Training Reserve 84th Division, Milwaukee, Wisconsin (project work plan).
- Foth & VanDyke, 1988, Landfill Sampling and Analysis, USARC, West Silver Spring Drive, Milwaukee, Wisconsin; prepared for U.S. Army Corps of Engineers (Fort McCoy).
- Giles Engineering, 1985, Boring Logs, Soil Classification, and Well Diagrams, U.S. Army Reserve Training Center, Milwaukee, Wisconsin.
- Miller Engineers, 1988, <u>Hydrogeologic Investigation and</u>
 <u>Groundwater Quality Assessment Report, Haven Woods State</u>
 <u>Forest, Milwaukee, Wisconsin;</u> prepared for Wisconsin
 <u>Department of Administration.</u>
- Twin City Testing, 1988, Report of Subsurface Exploration and Monitoring Well Installation Program, United States Army Reserve Center, Milwaukee, Wisconsin.

RP/USARMYM/AB5

ATTACHMENT 1

DEPARTMENT OF ARMY REQUEST FOR PROPOSAL SCOPE OF SERVICES



DEPARTMENT OF THE ARMY

HEADQUARTERS, FORT NCCOY SPARTA, WISCONSIN 84686-8000

August 10, 1988

REPLY TO

Acting Chief, Engineering Plans and Services

Donohue & Associates, Inc. 1705 Wilson Avenue Plover, Wisconsin 54467

Gentlmen:

You are requested to submit your proposal for Open-End Contract No. DACA45-87-D-8075 for Monitoring Well Construction and Groundwater Analysis Milwaukee, WI., project number HA01005-8P.

Description of work is outlined in the enclosed scope of work.

Required completion date is presently set at Harch 1, 1989.

Fee negotiation for this work order proposal is to be conducted with your firm's representative at Building 2111, Directorate of Engineering, Engineering Plans and Services Division, Fort McCoy, Wisconsin, on August 31, 1988, at 1:00 PM.

Fee shall include all costs for accomplishing the work stated in the scope of work to include any fees for state plan reviews and approvals.

Sincerely,

John O. Calvert

Acting Chief, Engineering Plans and

Services Division

Contracting Officer's Representative

Enclosures

SCOPE OF WORK

1. TITLE AND IDENTIFICATION OF PROJECTS:

a. Projects shall be identified by the following Fort McCoy names and related numbers:

1) Project Name: Monitoring Well Construction and Groundwater Analysis; 84th Division, Milwaukee, WI Project Number: HA01005-8P Drawing Number: 47-018-2041

b. Purpose:

Install two well nests.

- Determine source direction for elevated levels of vinyl chloride.
- Monitor and evaluate other groundwater quality parameters.

2. PROJECT COORDINATION:

a. The project shall be coordinated through Mr. John Esson at Fort McCoy, phone (608) 388-2408.

3. PROJECT REVIEW:

- a. The project shall be reviewed by Fort McCoy at 50% and 98% completion. The 50% completion represents completion of all well construction and first round water sampling and analysis.
- b. The reviews shall be conducted in Building 2171 at Fort McCoy. Attendees will include your firm's representative(s), contracting officer representative, project manager and other representatives within the Directorate of Engineering (DE) and 84th Division.
- c. Provide six (6) copies of well construction and lab analysis reports for the first round groundwater analysis.
- d. Provide eight (8) copies of the final evaluation report one week prior to the 98% meeting.
- e. A complete report of project findings and evaluation of the source, extent and degree of any contamination shall be submitted. The report shall include complete tell construction documentation and diagrams.

The draft report shall be submitted to Fort McCoy 90 calendar days after the notice to proceed. The final report shall be submitted 150 days after the notice to proceed.

f. A qualified hydrogeologist shall interpret all geologic and hydrogeologic data and sign the final report. The report must also include the following statement:

"I, (hydrogeologist's signature) certify that I am a hydrogeologist and meet or exceed the requirements of NR.500.03(64), Wisc. Admin. Code."

- g. All documents shall be submitted in accordance with NR 500.05.
- h. Fort McCoy reserves the right to schedule additional intermediate reviews if necessary. Your firm shal provide copies of review comments as indicated above. All reviews shall be scheduled a minimum of one week in advance.

4. BACKGROUND INFORMATION:

- Two (2) groundwater investigations have been completed to date. Elevated levels of vinyl chloride were detected in some north and west monitoring wells, but additional monitoring wells are required to determine if the contamination source is on US Army Reserve property. The following reports and data will be available for review and guidance:
- a. Donohue & Associates, Inc. 1985. Landfill Impact Evaluation, USAR Center Complex & Training Area, Milwaukee, Wisconsin. Included well construction documentation and groundwater analysis.
- b. Foth & Van Dyke & Associates, Inc. 1988. Landfill Sampling and Analysis, USARC, West Silver Spring Drive, Milwaukee, Wisconsin. Includes VOC and inorganics groundwater analysis and landfill cap analysis.

5. GENERAL TASKS:

Work shall include constructing two (2) well nests, collecting water samples and analyzing for inorganics and volatile organic compounds (VOC). Contractor shall coordinate with the Wisconsin Department of Natural Resources (WDNR) for required detection limits. Contractor shall also interpret test results and prepare a detailed technical report of the project findings.

6. SPECIFIC REQUIREMENTS:

- a. Well Construction/Development
 - 1) Install two (2) groundwater monitoring well nests, consisting of two wells each, as shown on the Milwaukee Site Plan (Encl 1). Wells will be constructed of 2-inch casings made of a material which will not react with or contaminate the groundwater. PWC is not acceptable. Boring samples shall be taken every 5 feet and as new geologic formations are encountered. Boring logs and well construction diagrams shall be prepared for each well. Well construction and development shall comply with WDNR requirements including NR 508.05, NR 508.06 and NR 1411 (proposed) or other DNR-approved methods.
 - 2) Fort McCoy will provide the exact location of new monitoring wells at the time of construction.
- b. Water sampling and laboratory analysis

1) Collect two (2) rounds of water samples from the following wells:

105A/105B 113A/113B (new wells)

Sampling periods shall be as least 60 days apart.

- 2) Conduct gas chromatography (GC) scan for volatile organic chemical compounds on water samples taken above. All compounds detected in the GC scan shall also be quantified with a GC/MS scan.
- 3) Take water level measurements at each of the above wells on four (4) occasions.
 - During each sampling round.
 - 30 days following the 1st sampling round.
 - 30 days following the 2nd sampling round.
- 4) For new monitoring wells #112A/112B and 113A/113B, conduct laboratory analysis on each sample collected for:

Field H₂O temp.
Field pH
Field conductivity (corrected to 25° C)
COD

BOD₅

Dissolved Iron

Hardness

Total Alkalinity

Nitrogen as $NO_2 - NO_3$ Ammonia as NH_2

Barium

Chloride

Sulfate

Chromium

Mercury

Lead

Cadmium

Arsenic

Boron

Color/odor/turbidity

- 5) Samples shall be tested in a laboratory certified for WOC's by the WDNR, in accordance with NR149.
- 6) All parameters shall be tested at or below detection levels acceptable to the WDNR.
- 7) Sampling and testing shall be performed by WDNR and EPAapproved methods and in accordance with the attached Sampling Standards guideline (Encl 2).
- c. Contractor shall evaluate the source of any contaminants and determine the source direction for the elevated levels of vinyl chloride.

7. BID PROPOSAL:

Bid proposal shall include the proposed well construction details including drilling techniques, construction materials, casing material, well depth, screen length, well seal type and depth, vandalism protective measures and quality control measures, etc.

8. OBLIGATIONS:

This project is subject to approval by the Wisconsin DNR. The project must be in compliance with, and must include all information required in, NR 508.05 and NR 149 or the Wisconsin Administrative Code, for submission to the DNR.

SUBJECT: Ground-Water Consultation No. 38-26-0876-88, th Division Graining) CURRENT UTÍLÍZATÍON UNITED STATES ARMY RESERVE COMPLEX & TRAINING AREA TRAINING WEST SILVER SPRING DRIVE (WOODS MILWAUKEE, WISCONSIN LEGEND LANDFILL BOUNDARY TRAINING BA (MEADOW) ROPOSED MONITORING IBB **IRAMING** PARKING LOT ELL SILVER ZENNO TUNE

MILWAUKEE SITE PLAN MONITORING WELL LOCATIONS

SAMPLING STANDARDS

Water sumpling on this project shall be conducted in accordance with the following paragraphs:

- I. All procedures for sampling and analysis shall be recorded each sampling period. Any deviations from standard procedures shall be noted and reason given for the change.
 - A. Sampling Procedures. The methods used or proposed to be used to obtain, preserve and analyze groundwater samples shall be described. The following elements shall be included:
 - 1. Filtering of the samples, especially for metals, shall be conducted in the field. Standard preservation techniques shall be followed
 - 2. Field blanks shall be obtained during the sampling program. One field blank at the start, at midpoint, and at the end.
 - Device(s) used to retrieve samples.
 - 4. Procedures used to flush wells prior to collecting samples, with approximate water volumes removed and approximate time elapsed between flushing and sampling.
 - 5. Procedures for cleaning samplers (such as bailers) between wells.
 - 6. The order of well sampling from least to most contaminated, if known, or up-gradient to down gradient.
 - 7. Equipment used to measure conductivity and pli in the field.
 - 8. Volume of samples collected; procedures for filtering samples prior to analysis; procedures for chemical preservation of samples; and time at which filtration and preservation are carried out.
 - 9. Hethods for transporting samples to the lab, the time spent transporting the samples to the lab, and the time passed before the samples are analyzed in the lab.
 - Analytical procedures used in the lab for each required chemical parameter, including make and model of any automated analytical equipment used. If procedures are exactly as described in published sources, references may be listed to fulfill this equipment.
 - B. Because of the volatile nature of organics, special equipment shall be used and field sampling techniques followed for obtaining water for organic analysis:
 - 1. Teflon bailers shall be used. Stainless steel bailers are less desirable because some organics may be absorbed by metal.
 - 2. Monofilament or mylon line shall be used for lowering the bailer. Cut off the end of line each time and retie.
 - 3. Triple rinsing of the builer and line, using deionized distilled laboratory grade water, shall be conducted in the field between each sample location.

4. Glass vials with Teflon-lined screw-on caps shall be over filled so air bubbles are excluded and a positive meniscus is achieved. Vials should be capped immediately after being filled.

5. Emptying the bailer and filling the sample vials shall be conducted with a minimum of turbulence to avoid degassing. The use of a bottom emptying device with the bailer is recommended.

6. All samples shall be immediately stored in freezer packs and kept

on ice during shipment to the laboratory.

7. One bailer blank shall be collected and analyzed during each sampling period. After the triple rinse decontamination procedure and before sampling the hext well, a sample consisting of deionized, distilled water shall be passed through the bailer and collected. A travel blank shall also be analyzed.

APPENDIX A DONOHUE BORING LOGS

Sheet of	
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BORING LOG

SOIL BORING NO.

Engineers & Architects
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SITE: 4.5. A. R.C. PROJECT NO. 15977.007

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DRILLING DATA

SOIL BORING NUMBER

Engineers & Architects

Other Equip.

ADDITIONAL DRILLING DATA

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Thin Wall Tube Size_	OD	
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Casing Hammer	1b	in drop
Drill Rod Size		
Drill Bit Type		(b)
Drill Bit Size	(a)	(b)
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Hollow Stem Auger_	141D	
Core Barrel Size	ID	
Core Bit Serial		
Core Bit Serial		
Drill Mud Type		
Drill Mud Formula_		
Depth Drill Mud Use	d	
Back Filled Date		
Method		
Drill Rig Mfg. Mod		
Other Equip		

DRILLING INFORMATION

- Record measurements in tenths or feet. For samples, record sample type (spilt spoon, shelby, core) depths, sample interval, length of For samples, record sample type (split spices, shelby, core) dettil, sample interval, tangum sample recovered.
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 Record all problems encountered during drilling.
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 Report general drilling conditions, (temperature, raining, etc.)

Soli/Rock Description Requirements

- Written classification
 USCS symbol
 Estimated % of secondary components *% and size graves, cobbles
 Color, mostling Plasticity (general)
 - Consistency (cohesive) or density (non-cohesive)
- Moisture Teature/fearle/leading Depositional environment
- - Classification Lithologic characteristics
 - Bedding/banding

 - Structure

 - Structure
 Degree of weathering
 Solution or void conditions
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 Nate nauval and coring induced rock breaks, and lost core including probable reason
 for include number of fractures per foot, number of fractures per total length of
 recovery.

Texture	Abbreviation	Size	<u>Abbreviation</u>	Soil Particle Size
Boulder	Во			Over 3.0"
		Large	L	1.0" to 3.0"
Gravel	Gr	Medium	M	.38" to .99"
		Small	Sm	2.0mm to .38"
		Coarse	Co	.75mm to 1.99mm
Sand	S	Medium	M	.25mm to .74mm
		Fine	F	.05mm to .24mm
Silt	Si			.002mm to .049mm
Clay	С			Smaller than .022mm

Consistency	Abbreviation	N	Density	Abbreviation	N
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Medium	M	5-8	Medium Dense	MD	10-29
Stiff	St	9-16	Dense	٥	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
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CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualfied soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

BORING LOG

SOIL BORING NO.

Engineers & Architects

SITE: U.S.A.R.C. PROJECT NO. 15777.007

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. •	16-		العابا			1/4				Hymporn, gilly elay with mining fragments. Migra frage-chagaler fresh breaks a 57. Conse fraction. Clay - DAGEST exet	Somate Somate Connectory to 24'

SHE	ET_	JOF	

DRILLING DATA

SOIL BORING NUMBER

Engineers & Architects

Split Tube Size____

Casing Used___

Drill Rod Size ____

Drill Bit Size___

Core Bit Serial _ Core Bit Serial Drill Mud Type__

Drill Mud Formula Depth Drill Mud Used_ Back Filled Date____

Drill Rig Mfg. Mod.____ Other Equip _____ Other Equip.

Method_

Thin Wall Tube Size___OD

Drill Bit Type____(a)

Auger Type 67 OD

Hollow Stem Auger451D

Core Barrel Size____ID_

ADDITIONAL DRILLING DATA

Hammer Wt. 15/C lb 30 in drop

Casing Hammer_____Ib ____in drop

____LF_

__ID_

(a)

____by ___

(b)

(b)

_Length

DRILLING INFORMATION

- Record measurements in tenths of feet.
 For samples, record sample type (split spoon, shelby, core) depths, sample interval, length of
- For samples, record sample type (split toben, sheap), cere rooms, sample recovered.
 Record first encoursared water and any other distinct water producing zones.
 Record blow counts (density), hammer weight, length of fall for driven samples.
 Record use of drilling fluids, fluid type, source of water, fluid losses, interest (and son type) where fluid loss escurred. If determinable, quantitive estimate of volume of fluid loss.
 Record drilling equipment used and general drilling procedures.
 Record all problems encountered during drilling.
 Collect samples of back fill, grout, and concrete.
 Report general drilling conditions, (temperature, reining, etc.)

Soul/Rock Description Requirements

- - USCS symbol
 Estimated % of secondary components "% and size gravel, cobbles

 - Estimated % of paconsery compenents % and six Color, merting Planticity (general) Consistency (consistency) or density (non-conserve) Moisture Texture/lastic/satisfing Depositional environment
- - Classification
 - Listings characteristics
 Bedding/banding

 - - Degree of comentation Texture
- Texture
 Structure
 Degree of wasthering
 Senution or vaid conditions
 Primary and secondary estimated hydraulic conductivity, retionate
 Note natural and coring induced rock breaks, and lost care including probable reason
 for include number of fractures per foot, number of fractures per total length of

Texture	Abbreviation	Size	<u>Abbreviation</u>	Soil Particle Size
Boulder	Во			Over 3.0"
C		Large	L	1.0" to 3.0"
Gravel	Gr	Medium Small	M Sm	.38" to .99" 2.0mm to .38"
		Coarse	Со	.75mm to 1.99mm
Sand	S	Medium	M	.25mm to .74mm
		Fine	F	.05mm to .24mm
Silt	Si			.002mm to .049mm
Clay	С			Smaller than .022mm

Consistency	Abbreviation	N	Density	Abbreviation	N
Very Soft	VS	0-2	Very Loose	VL	0-4
Soft	S	3-4	Loose	L	5-9
Medium	M	5-8	Medium Dense	MD	10-29
Stiff	St	9-16	Dense	Ø	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
Hard	H	Over 30	•		

% of Dry Weight	<u>Term</u>	Abbreviation
0-10	Trace or Occassional	TR or OC
11.20	Little	LI
21-35	Some	SO
36-50	And or With	& or W/

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualfied soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or wash cuttings. The changes between the soil strata may be transitional rather than abrupt, particularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water levels may not be entered on this field log.

Sheet	of	

BORING LOG

SOIL BORING NO.

Foring and B. Asmbita air.	SIIEI U.S.A.R.C.	_ PROJECT	NU.	(112-
Engineers & Architects				
CHIPMEN ALBER CERCON/CHIPTING				Pieson

DRILLING METHOD: Hollow Stem doze WATER LEVEL READINGS GROUND SURFACE ELEV.

FOREMAN: John DATE TIME DEPTH PHYSICAL SETTING Start FOREX SURFACE ELEV.

ASSISTANT: 806 S.C.R. DATE START: //-22-88

GEOL./ENG'R. J. Girand SAPLING DATA
LOG BY: J. Girand SAPLING DATA
COMMENTS

M STRATA B. E. MO. T. A. R. 181 ENGSrd N.

WATER LEVEL READINGS

GROUND SURFACE ELEV.

PHYSICAL SETTING STATE (1/-23-88)

ACR. DATE COMPLETE: //-23-88

SOIL DESCRIPTION COMMENTS

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DRILLING DATA

SOIL BORING NUMBER

Engineers & Architects

Split Tube Size_

Drill Rod Size __ Drill Bit Type___

Drill Bit Size_

Auger Type___

Core Bit Serial Core Bit Serial Drill Mud Type

Method_

Drill Mud Formula Depth Drill Mud Used_ Back Filled Date_

Drill Rig Mfg. Mod. Other Equip_ Other Equip. _

Casing Used_

ADDITIONAL DRILLING DATA

Hammer Wt. 140 lb 30

Thin Wall Tube Size___OD

Casing Hammer_____Ib_

Hollow Stem Auger 441D Core Barrel Size__

ID

(a)

(a)

TOD

__ID

___LF.

in drop

_in drop

Length

(b)

DRILLING INFORMATION

- speak, shally, care) depths, sample interval, length of
- sample recovered. Recovered water and any other distinct water producing sones. Recover third encountered water and any other distinct water producing sones. Recover these counts (denaity), hammer weight, longth of fall for driven samples. Recover use of eveter, fluid leases, interval (and soli where fluid lease experied, if denainable, exemptive extenses of volume of fluid leas. Recover or little southerness water fluid lease. Recover or little southerness developed the recovery of the solid procedures. Recover or produce or executive southerness, and evenerate, raining, etc.)

 Report general drilling condicions; (temperature, raining, etc.)

- - Written steadleath
 USCS symbol
 Estimated % of secColor, mottling
 Plasticity (poneral)
 Consideration (section

 - - Classification
 Lithelegis characteristics
 Bedding/banding

Texture	<u>Abbreviation</u>	Size	<u>Abbreviation</u>	Soil Particle Size
Boulder	Bo		<u></u>	Over 3.0"
		Large	Ļ	1.0" to 3.0"
Gravel	Gr	Medium	М	.38" to .99"
		Small	S m	2.0mm to .38"
		Coarse	Co	.75mm to 1.99mm
Send	S	Medium	M	.25mm to .74mm
		Fine	F.	.05mm to .24mm
Silt	Si			.002mm to .049mm
Clay	С			Smaller than .022mm

Consistency	Abbreviation	N	Density	Abbreviation	N
Very Soft	VS	0-2	Very Loose	VL	0-4
Soft	S	3-4	Loose	L	5-9
Medium	M	5-8	Medium Dense	MD	10-2 9
Stiff	St	9-16	Dense	D	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
Herd	Н	Over 30	•		

% of Dry Weight	<u> 1erm</u>	Abbrevistio
0-10	Trace or Occassional	TR or OC
11-20	Little	LI
21-35	Some	SO
36-50	And or With	& or W/

CONDITIONS FOR USE OF SOIL BORING LOG

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BORING LOG

SOIL BORING NO.

Engineers & Architects

SITE: U.S.A. R.C.

November 14, 1988

PROJECT NO. 15177.007



DRILLING METHOD: Augus - Hollow Stem

FOREMAN: Gary Wellner

ASSISTANT: Meil

GEOL./ENG'R. Jel Girand

LOG BY: J. Girand

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GROUND SURFACE ELEV.

PHYSICAL SETTING: flat / Irm L

DATE START: 11-14-88

DATE COMPLETE: 11-14-88

	EPTH TO THE SAMPLING DATA MANGES STRATA SE MO. T A PENETRATION ISTRATA												
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DRILLING DATA

SOIL BORING NUMBER

Engineers & Architects

Casing Used___

Drill Rod Size_ Drill Bit Type_

Drill Bit Size____

Core Barrel Size___

Drill Mud Formula_

Depth Drill Mud Used__ Back Filled Date___

Drill Rig Mfg. Mod.___

Other Equip___ Other Equip.

Core Bit Serial Core Bit Serial Drill Mud Type_

Method_

ADDITIONAL DRILLING DATA

Thin Well Tube Size___OD

Casing Used_____LF_

Auger Type 43 OD

Hollow Stem Auger 441D

Split Tube Size ____ID___OD Hammer Wt. _/^/O Ib _30 in drop

<u>(a)</u>

___by__

Dia. _in drop

(b)

(b)

Length

DRILLING INFORMATION

- Record measurements in tenths of feet.
 For sumples, resord semple type (solit s

- Written electrication USCS symbol Serim sted % of mer
- Color, mottling Plasticity (general)

- - Classification
 - Cimarisation
 Lithology characteristics
 Bodding/bonding
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 - Structure Degree of magnificating Setution or void conditions
- Primary and secondary vetimated hydraulic conductivity, rectorate flots natural and sering induced real breaks, and lest core including probable rea flot, include number of requires port flots, number of freatway per total longer of

Texture	Abbreviation	Size	<u>Abbreviation</u>	Soil Particle Size
Boulder	Во			Over 3.0"
Gravel	Gr	Large Medium Small	L M Sm	1.0" to 3.0" .38" to .99" 2.0mm to .38"
Send	S	Coerse Medium Fine	Co M F	.75mm to 1.99mm .25mm to .74mm .05mm to .24mm
Silt	Si			.002mm to .049mm
Clay	С			Smaller than .022mm

Consistency	Abbreviation	N	Density	Abbreviation	N
Very Soft	VS	0-2	Very Loose	٧L	0-4
Soft	S	3-4	Loose	Ĺ	5-9
Medium	M	5-8	Medium Dense	MD	10-29
Stiff	St	9-16	Dense	D	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
Hard	H	Over 30	,	•	50,

% of Dry Weight	Term	Abbreviation
0-10	Trace or Occassional	TR or OC
11-20	Little	LI
21-35	Some	so
36-50	· And or With	& or W/

CONDITIONS FOR USE OF SOIL BORING LOG

This field soil boring log records the soil descriptions and other data observed or measured in the field by qualfied soil technicians. The soils between the samples may have been determined by the "feel" of the drill bit or week cuttings. The changes between the soil strats may be transitional rather than abrupt, perticularly with respect to color, weathering, and consistency changes. The amount of large sized gravel or boulders is generally estimated because the sampling tubes seldom retain these larger sized soil particles. Delayed readings of ground water wels may not be entered on this field los.

BORING LOG

SOIL BORING NO.

Engineers & Architects

SITE: U.S.A.R.C PROJECT NO. 15977. 007

P113 A

ILLING ME											EADINGS		GROUND SURF		
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DRILLING DATA

SOIL			

Engineers & Architects

Drill Bit Size___

Core Bit Serial __ Core Bit Serial

Drill Mud Type

Drill Mud Formula Depth Drill Mud Used_

Back Filled Date_

Method_

Other Equip_ Other Equip.

Auger Type _____OD Hollow Stern Auger 441D Core Barrel Size____ID_

(a)

(b)

Length

ADDITIONAL DRILLING DATA **DRILLING INFORMATION**

- Split Tube Size__ LID_
- Resterd measurements in tenths of feet.
 For temples, record temple type (abit speen, shotby, ears) depths, temple interval, length of sample restricted temple type (abit speen, shotby, ears) depths, temple interval, length of semple temples are semple restricted material and any other distinct water producing zones.
 Recent jute act artilling fluids, field type, source of wither, fluid lease, lettered (and soit type) where fluid lease occurred, if desprishences, course of wither, fluid lease, lettered (and soit type) where fluid lease occurred, if desprishences, course of volume of fluid lease.
 Recent sit problems executative defining procedures.
 Recent sit problems executatived during drilling.
 College cannot got blankfills, same, and cannot me. Hammer Wt. 140 lb 30 in drop
- Thin Wall Tube Size___OD
- Casing Used_
- Casing Hammer_ lb_ in drop ampies of blackfill, grave, and concrete.

 general deliting conditions: (temperature, raining, etc.)
- Drill Rod Size _ Drill Bit Type____ (a)

- - Written classification
 USCS symbol
 Estimates is of secondary components *5 and size gravel, consider
 Color, mettling
 Plastality (general pages) or despite (general)
- Rock

 - Glassification Lithologic characteristics Bodding/bending Color

 - Color Hardness Degree of comentation Texture Structure Degree of weekering

 - Degree of Imponenting
 Solution or void conditions
 Primary and accordany estimated hydraulic conductivity, retionals
 Rote netwrat and accing induced right breaks, and lost core inputing probable real
 flar. Include number of frattures per foot, number of fractures per total longer of

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Boulder	Во			Over 3.0"
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Stiff	St	9 -16	Dense	D	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
Hard	H	Over 30	•		

% of Dry Weight	Term	Abbreviation
0-10	Trace or Occassional	TR or OC
11-20	Little	LI
21-35	Some	SO
36-50	And or With	& or W/

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BORING LOG

SOIL BORING NO.

Engineers & Architects

CONTROL AND CONTROL

SITE: U.S. 4. R.C PROJECT NO. 15977.007

P-113 A

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DRILLING DATA

SOIL BORING NUMBER

Engineers & Architects

Solit Tube Size_

Thin Wall Tube Size___

Hollow Stem Auger 21D

Core Barrel Size_44 ID

Hammer Wt._

Casing Used_

Casing Hammer_

Drill Rod Size . Drill Bit Type.

Drill Bit Size

Auger Type_

Core Bit Serial **Core Bit Serial** Drill Mud Type

Method_

Other Equip_ Other Equip.

Drill Mud Formula Depth Drill Mud Used Back Filled Date_

Drill Rig Mfg. Mod.

ADDITIONAL DRILLING DATA

JD.

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DRILLING INFORMATION

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 - - Plasticity (general)
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 - Lithologic characteristics Bodding/banding

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 for. Include number (, or vary generatory sectinesed by drautic equiduativity, rationals and sepandary sectinesed took breaks, and lest ware including probable room bude number of fractures per foot, humber of fractures per total length of

Texture	Abbreviation	Size	<u>Abbreviation</u>	Soil Particle Size
Boulder	Во			Over 3.0"
Gravel	Gr	Large Medium Small	L M Sm	1.0" to 3.0" .38" to .99" 2.0mm to .38"
Send	S	Coerse Medium Fine	Co M F	.75mm to 1.99mm .25mm to .74mm .05mm to .24mm
Silt	Si			.002mm to .049mm
Clay	С			Smaller than .022mm

Consistency	Abbreviation	N	Density	Abbreviation	N
Very Soft	vs	0-2	Very Loose	VL	0-4
Soft	S	3-4	Loose	L	5-9
Medium	M	5-8	Medium Dense	MD	10-29
Stiff	St	9-16	Dense	D	30-49
Very Stiff	VST	17-30	Very Dense	VD	50+
Hard	H	One 30		, _	

% of Dry Weight	Term	Abbreviation
0-10	Trace or Occassional	TR or OC
11-20	Little	LI
21-35 ·	Some	SO
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APPENDIX B
TWIN CITY TESTING BORING LOGS

				L	OG OF T										
		0-89-018			VERTIC DEPARTMEN	AL SCA	LE1"	= 6'	TT UA	. B	ORING	NO.		112B	
PROJEC1					JEFARIME	VI OF	THE ARC	T	LLWA	- =		=			===
DEPTH			PTION OF M			GEC	LOGIC			SA	MPLE	 	ABORA	TORY TI	ESTS T
FEET		E ELEVATIO					RIGIN	N	WL	NO.	TYPE	W	D	P.L.	Qu
1 +		C SILTY					OPSOIL	+				İ			
4	SILTY	CLAY, b	rown	(CI	L-ML)		FINE LUVIUM	-							
5-	SANDY	SILT, w	ith grav	el, brov (M				-							
9		CLAY, w to gray	_		oles, L-ML)										
15		with gr	avel, co	obbles, (S			COARSE LUVIUM	-							
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tillin city testing

	LOG OF TEST BORI	NG								
JOB NO			= 6'		В	ORING	NO _	P11	.2A	
PROJEC		ARM	(, M)	LLWA		==	==			
DEPTH	DESCRIPTION OF MATERIAL GEOLOGIC GEOLOGIC				SA	MPLE	LA	BORA	LL.	STS
FEET	SURFACE ELEVATION 691.76 ORIGIN		N	WL	ــــــــــــــــــــــــــــــــــــــ	TYPE	W	D	P.L.	Qu
12"	ORGANIC SILT, black (OL) TOPSOI LEAN CLAY, yellowish brown, stiff FINE		-		1	A				Ì
4	LEAN CLAY, yellowish brown, stiff (CL) FINE (CL)		-		2					
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4			_		ļ				i	
+			25		3	SB				
1		ı		•					l	
8 ¹ 2	LEAN CLAY, with (See #1)		Ļ							ĺ
1-1	SILTY CLAY, with gravel, cobbles,		-							1
1	brown to gray, stiff (CL-ML)		- 21		4	SB				
1			[
4			}					<u> </u>		
15	SAND, with gravel, medium grained, COARS		-							
]	gray, moist, very dense (SM) ALLUVI		43		5	SB				
4			-	V				1		
20 -			Ĺ					j [
7	SAND, with gravel, cobbles, gray,		- 44		5	SB				
4	waterbearing, very dense, layers		}	}						}
]	of sandy lean clay (SP)		Ĺ		ļ					
25			[1 1				
4	SAND, with gravel, medium to coarse		27		7	SB				
1	grained, gray, dense to very dense, layers of silty sand (SP)			}						
	rayers or sirey saint (Sr)									
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43	SILTY SAND, with gravel, gray,									
453	waterbearing, very dense (SM)		30						ı	
4275	END OF BORING		$-\frac{30}{0.5}$]	11	SB			I	
1	#1 gravel, cobbles, brown, stiff		Ţ						!	
	(CL) WATER LEVEL MEASUREMENTS		START	L	11-	22 - 88	COM	PI ETE	11-	23-88
		TER	3,201		11-22-88 COMPLET					9:30
11-2	TIME DEPTH DEPTH BAILED DEPTHS LE	VEL	METHOD	4½" HSA 0' to 45'						
11-2	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	181/2'	 	4%	Н.	SA U	Ľ0	45		· · ·
	to		<u> </u>							
<u> </u>	to		CREW C	HIEF	!	WELLI	IER			
		_								

LOG OF TEST BORING 1" = 6' 81GG-89-0181 VERTICAL SCALE 1" = 6' BORING NO OW:

MW INSTALLATION PROJECT, DEPARTMENT OF THE ARMY, MILWAUKEE, WISCONSIN OW113B JOB NO. DEPTH DESCRIPTION OF MATERIAL SAMPLE LABORATORY TESTS GEOLOGIC SURFACE ELEVATION _____679.94 FEET **ORIGIN** N WL NO. TYPE Qu P.L. ORGANIC SILTY CLAY, dark brown (OL) TOPSOIL SILTY SAND, light brown, moist **COARSE ALLUVIUM** 6 (CL-ML) SILTY CLAY, brown FINE ALLUVIUM 10 SILTY SAND, with gravel, gray, wet, COARSE 12 SB ALLUVIUM meidum dense SB15 SAND, medium grained, gray, water-7 3 SB bearing, loose 17 SILTY CLAY, with gravel, gray FINE (CL-ML) **ALLUVIUM** 20 END OF BORING 11-14-88 COMPLETE 11-15-88 WATER LEVEL MEASUREMENTS SAMPLED DEPTH CASING CAVE IN WATER 08:30 DATE TIME BAILED DEPTHS LEVEL 17' 19 191 12' 11-14 16:35 4년" HSA 0' to 20' 10 11-15 07:00 20' 20' 20' 91/21 to

WELLNER

CREW CHIEF

LOG OF TEST BORING

JOB NO		0-89-018 Installa		OJECT. E	VERTIC EPARTMEN	AL SCALE1" T OF THE ARM	= 6' Y, MI	LWAI	. B OKEI	ORING	NO	P11	13A	
DEPTH		DESCRI					MPLE							
IN FEET		CE ELEVATIO	ON67	9.98		GEOLOGIC ORIGIN	N	WL		TYPE		D	L.L. P.L	Qu
9'' - 2	ORGANI	C LEAN C	CLAY, da CLAY, da	rk brown	(OL)	TOPSOIL FINE ALLUVIUM	- 8		1 2	SB SB				
2		SAND, wi wn, mois	_	_		COARSE ALLUVIUM	T - -							
7	SILTY	CLAY, wi	ith sand		medium L-ML)	FINE ALLUVIUM	6	▼.	3	SB				
	SAND CLAYEY	with gra	vel,	vel (Se	e #[]	COARSE ALLUVIUM	√ 18		4	SB				}
12	SILTY		ith grav	el, gray	, stiff,	FINE ALLUVIUM	<u></u>							
4 4-4-4							} }							
20	graine GRAVEL	with gra d. gray, LY LEAN CLAY, wi	<u>wet</u> d CLAY, gr	ense (SI ay, ver) , gray,	stiff(C	COARSE ALLUVIUM L) FINE ALLUVIUM	38		5	SB SB				
25		LAY.•a l		ravel, {			- 31		7	SB				
							- 26		8	SB				
40		SILTY CI			ravel, L-ML)				9	SB SB				
45		erse gra		ay, wet	P)		50 -0.5'		11	SB				ii
	#2 gr	ay, wet		(S)			<u> </u>	1,	-15	- 00	L		1111	E 0
		SAMPLED	CASING	MEASUREME CAVE IN		WATER	START	_==	-15	- 88	COM	PLETE	7	5-88 4:15
DATE 11-18	9:30	DEPTH	DEPTH	DEPTH	BAILED 7	EPTHS LEVEL	METHOD		A 0	' to	451	-	1 6-	
		<u> </u>			to		4							

APPENDIX C DONOHUE WELL CONSTRUCTION DIAGRAMS

Sheet___ of. OBSERVATION WELL INSTALLATION DIAGRAM Well No. 0N-112A Site: USARC Training Area Aset Sugar By: Jeff Awarson Project No. <u>15977.00</u>7 Protective Casing Flush month older Guard Posts flush mount Type Steet Diameter M.O" Locked Length 5.0' well ky \$ 2016 ordered (now pre temporary) Type Stainless steel Vented_ **Concrete Collar** 9.5 Quant, Cement 400 | lbs. + Quant, Water 25 gal. Total Quant._ Manufacturer quikrete Powder/Granular/Pellety Quant_/ Dan gal. 29 als und Pel Plug Manufacturer_ gal., Time 40 min. 14.55 Hydrated 12 by. 2:23 Pipe Type Stum/so Steel 24.55 5.05 O.D. 24 _ Manufacturer_Trilisc Schedule 40 I.D. 2 Length/per sec. 1-10 __No, of sec. Joints Threaded Flush Joint Inflor Taped Tay No. Threaded thesh OATEY (tare Manufacturer_ Backfill Type(s) Red Flint Sand Source Silica =30 Volume 7 - 10014 mec (40016) Screen Type Shinker Shell Stot Size 10.0' No. Stots/ft. _/0 _Schedule _ Menutacturer Triboc Length/per sec. 5' No. of sec. 2 Cap 0.25 8.0 Meterial Notes: Water Source Original OW112A was abandoned Offset 4.5' NW upgradiet from abandard hole since drillers need measuring device was last in The bore hole.

j

Donohue PIEZOMETER INSTALLATION DIAGRAM Well No. 2-//24 Site: P-1124 U.S.A.R.C. Date: 11-23-88 By: T Giraud Project No. 15727.007 Clush mount 1.0 **Protective Casing Guard Posts** Type <u>stul</u> No. __berned__ Locked Yes nd Sufac Diameter__ Key # 2016 Length.... Plug Type_ Vented. Macta ASTM C387 Strongth Concrete Coller Manufacturer PAKMIX Inc. 5.0 Comert 200 lbs. + Water __/3_ 8.0 Total Quantity, Seal Manufacturer Bomis Co. Inc. VonCouver, W 33.8 Powder/Granula/Pellets Quant 65 165 gal. ____gal., Time _/:/5 p ---Hydrated ___ " Schedule 4-3/2 Sw-4 33.8 Type Sealuless "Manufacturer Branco Ital 38-0' 0.D. _ Cement - Bentonite Grout 43.0' 25.81 Mix 2016 Sad Gemens 75165 Bentonite 444 __lbs. + Bentonite__ vector gals. gals. 39095 Manufacturers Aqua Gel Benton to IV. C. Banoid, Houston. Joints Chreaded Flush Tefion Taped Yes/No Manufacturer___ See 1000 - Sand blow-upin auger.
Comit Place sea (Powder/Pellets Quant. _ _ gai., Tîme . Hydrated ___ Screen Sot Size 0.000 _ No. Slots/ft. 5.01 Beckfill Type Red Flint
Source 4x Boss - Appleton 100165-Valume_ poor placement - dur to sand blow-up. Type Stainlyss Steel Threaded Volumes, **Material** Notes: Water Source Notice material - comes sand gran

U.S.A.R.C- cham potable water

Sheet_L of_L Donohue OBSERVATION WELL INSTALLATION DIAGRAM Well No. 074-1/3 B Site: USARC (M:/wauker) Date: //- 45 -88 By: Jul Girent Project No. 15977.007 Protective Casing **Guard Posts** Length 5.35 Key# Plug Tomporary DVC Cap -Vented 5.0 Congrete Collar Quant, Cement 200 lbs, + Quant, Water___ Total Quant,__ gal. 2 1/2 6095 (8016) Manufacturer Buierete Seal Powder/Granular/Reliate Quant. 1.5-22 gal. Manufacturer American Colloid Co. i0.85 Hydrated 21 gal., Time 24 + 473. Pipe 21,1 1.0 Type Steinless ASTM 4-312 Manufacturer Brainand Kilmon 18.5' 1.D. 2.0 _Schedule _055 Length/per sec. /O No. of sec. / Joints Threaded Flush Joint Teflon Taped Yes No Cleveland 04:0 Tape Outey. Manufacturer Backfüll Type(s) Red Fligh # 30 Source Bag (100 ch) 4x-Apple ton 350 163 - 742 bags Volume ___ Screen Type 5+4/46/45 Slot Size 0 . 0/0
0.D. ______ No. Slots/ft. ____ 10.25 O.D. ____ _Schedule . Manufacturer Brainard Kilman (Tribe) Length/per sec. 5.6 No. of sec. 2 Cap 0.5 Type stainless Threaded

Notes: Weter Source Bidg. 312 USARC

Native soil and tilke fack (alone)

Material

Retable water

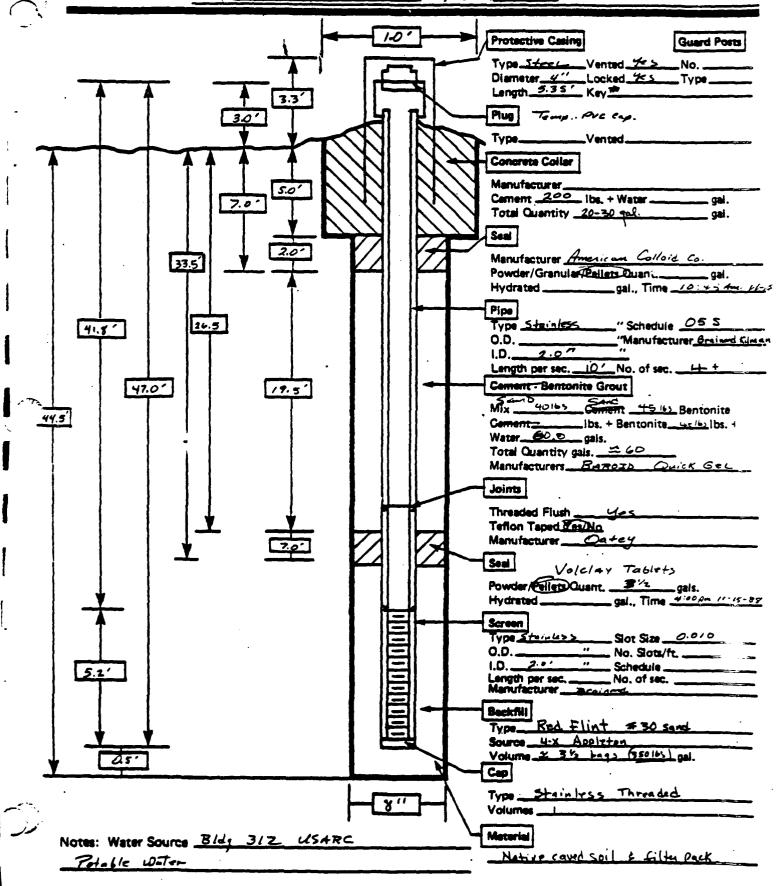
Donohue⁻

PIEZOMETER INSTALLATION DIAGRAM

Site: USARC Training Anna Date: 11- 15/16 - 88 By: J. Girand

Project No. 15927.007

Well No. P-113 4



APPENDIX D

TWIN CITY TESTING WELL CONSTRUCTION DIAGRAMS

INSTALLATION OF FLUSH MOUNT MONITORING WELL

JOB NO. 8100-89-0181
GROUND SURFACE ELEVATION 691.54

MONITORING WELL NO. OW 112B

TOP OF RISER PIPR ELEVATION 691.36
(With cap removed)

	SCREW TYPE CAP CONCRETE COLLAR PROTECTIVE FLUSH- MOUNT CASING Diameter and Type Total Length Length Below Ground THICKNESS AND TYPE OF SEAL	4" STEEL W/LOC 5.0' 5.0' 6.5' CONCRETE
L ₉ L ₈ L ₃	DIAMETER AND TYPE OF RISER PIPE	2" STAINLESS _STEEL
SUMMARY L1 - L9	TYPE OF BACKFILL AROUND RISER	<u>#30 SILICA SA</u> N
$L_1 = \underbrace{NONEft}_{L_2} = \underbrace{6.5 ft}_{4}$	THICKNESS AND TYPE OF SEAL	3.0' BENTONITE PELLETS
$L_3 = \underbrace{0.5 \text{ ft}}_{5}$ $L_4 = \underbrace{3.0 \text{ ft}}_{5}$	DEPTH TO TOP OF FILTER SAND	10_0'
L ₅ =4.5 ft	TYPE OF FILTER AROUND SCREEN TYPE OF MONITORING WELL	#30 SILICA SAN
$L_7 = \frac{10.3 \text{ ft}}{\text{NONEft}}$	SCREEN GAUGE OR SIZE OF OPENINGS (Blot no.)	.010
$L_8 = \frac{24.8 \text{ ft}}{24.8 \text{ ft}}$ $L_9 = \frac{24.8 \text{ ft}}{24.8 \text{ ft}}$	DIAMETER AND LENGTH OF SCREEN	2" x 10.0'
L ₉ = 24.8 ft	MONITORING WELL DEPTH TO BOTTOM OF	24.8'
	DEPTH TO BOTTOM OF FILTER SAND DIAMETER OF BOREHOLE	24.8'

Installation Completed

Date 11-17-88 Time 15:55

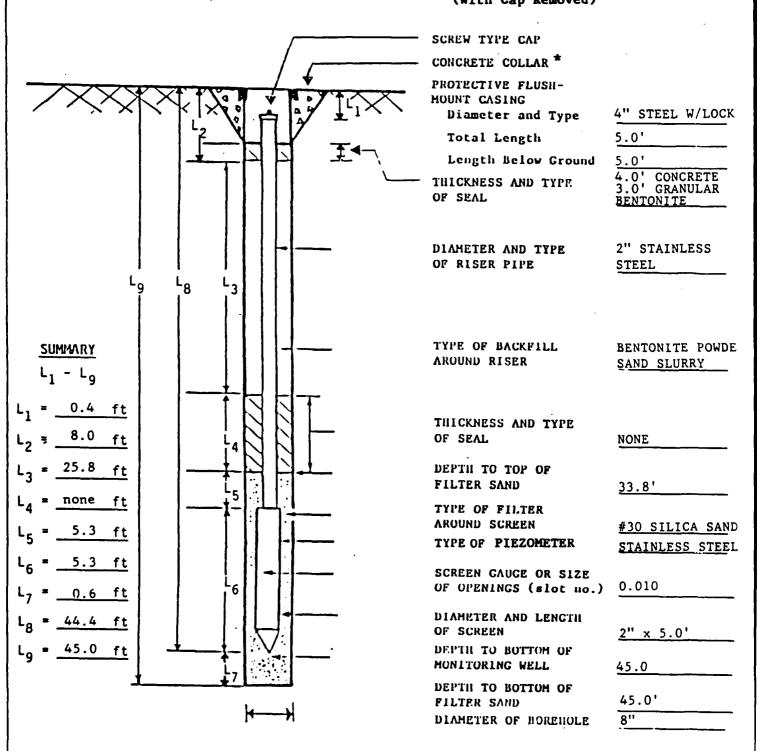
INSTALLATION OF FLUSH MOUNT PIEZOMETER

JOB NUMBER 8100-89-0181

GROUND SURFACE ELEVATION 691.76 PIEZOMETER NO.

112A

TOP OF RISER PIPE ELEVATION (With Cap Removed) 691.22

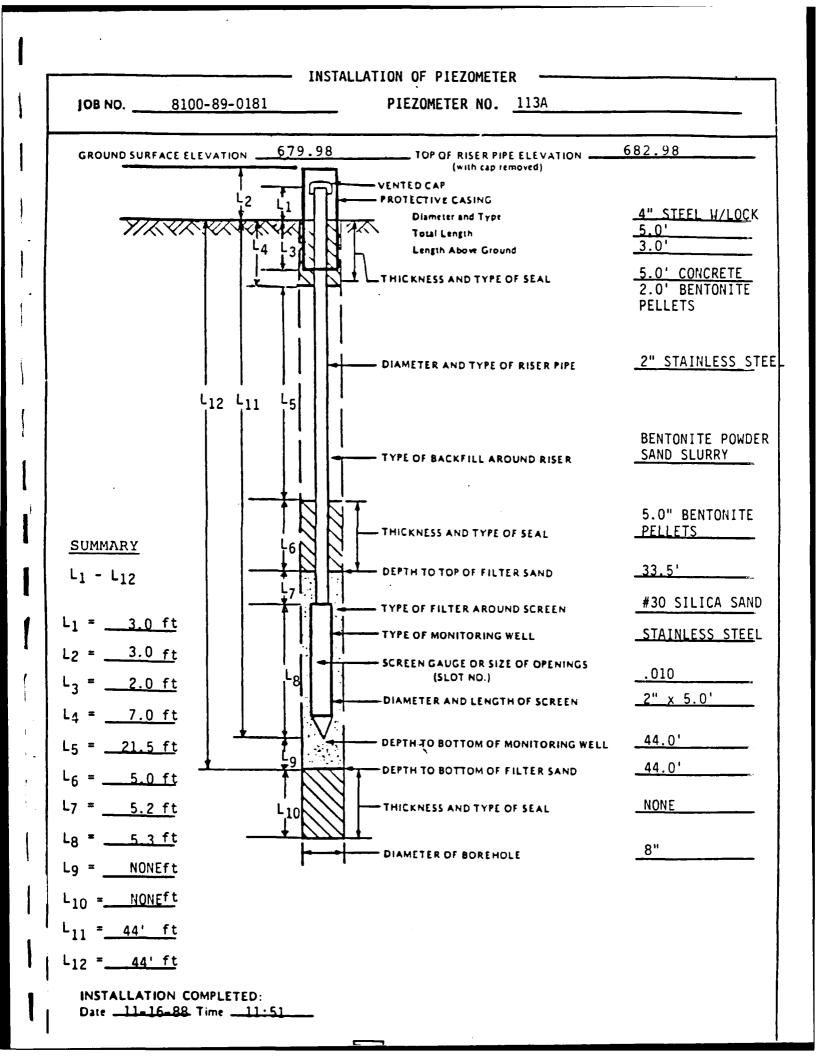


* WELL INSTALLED IN MANHOLE

Installation Completed Date 11-23-88 Time 12:00

SF-1988A

---- INSTALLATION OF MONITORING WELL ---10B NO. ____8100-89-0181 MONITORING WELL NO. ____ON_113B_ 682.94 679.94 GROUND SURFACE ELEVATION . TOP OF RISER PIPE ELEVATION (with cap removed) - VENTED CAP - PROTECTIVE CASING 4" STEEL W/LOCK Diameter and Type N74 XXXXXXXXXXXX Total Length Length Above Ground 4.5' CONCRETE 2.0' BENTONITE THICKNESS AND TYPE OF SEAL **PELLETS** 2" STAINLESS STEE - DIAMETER AND TYPE OF RISER PIPE 1 L12 L11 NONE - TYPE OF BACKFILL AROUND RISER NONE - THICKNESS AND TYPE OF SEAL SUMMARY 6.5' - DEPTH TO TOP OF FILTER SAND L1 - L12 #3 SILICA SAND - TYPE OF FILTER AROUND SCREEN $L_1 = 3.1 ft$ STAINLESS STEEL TYPE OF MONITORING WELL $L_2 = 3.0 \, ft$ - SCREEN GAUGE OR SIZE OF OPENINGS _.010 (SLOT NO.) $L_3 = 2.0 \text{ ft}$ 2" x 10.0 -DIAMETER AND LENGTH OF SCREEN $L_4 = 6.5 ft$ 18' - DEPTH TO BOTTOM OF MONITORING WELL L5 = NONEft 20' -DEPTH TO BOTTOM OF FILTER SAND $L_6 = NONEft$ NONE $L7 = _{1.2} ft$ THICKNESS AND TYPE OF SEAL $L_{8} = 10.3 \text{ ft}$ _8' - DIAMETER OF BOREHOLE $L_9 = 2.0 ft$ L10 = NONEft $L_{11} = 18' \text{ ft}$ L₁₂ = 20' ft INSTALLATION COMPLETED:
Date 11-5-88 Time 10:00



APPENDIX E WELL DEVELOPMENT FORMS

P	89 09:00 FF	ROM TCT WAUSA	U•MI	TO	DONCHUE-SHEBOY	P.02
		SAMI	PLING INFORM	ATION		
ampling Po	int Piezomet	er 113A	Pro	ject U.S. A	rmy Reserve Center	r
cation	Milwaukee, P	ITSCONSTN		w.o.	# 8100-89-0181	
ample ID # scribe Sai	N/A mpling Point	N/A	Date Sampled	11	Time N/A	AM/PM
ell Depth .	44	ft. below	MP C	sing Diamete	r 2 Time 09:30	inches
						AM/#W
		<u> </u>				
least		_ bore volumes h	ave been evacua	ted before sai	npling.	
					Dther	
bing (type		(yes, no). Tubing	ew or previously	eu a sw (beau	ed to collect all sample	s (yes, no)
		, , , , , ,				
te any Cle	eaning performe lected:	M 44 1-	•		DATA	
ote any Cle	eaning performe lected:	ACUATION/S	•	ON TEST	DATA	
te any Cle	eaning performe lected:	od in field:	•			Pumping
te any Cle mples Col	eaning performe lected:EV	ACUATION/S Temperature Corrected Conductance	STABILIZATI Temperature	ON TEST Water Level (Neares:	Cumulative Volume of Water Removed From Well	Pumping
Time 19:30 0:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time	pH (Units)	Temperature Corrected Conductance (umhos/cm)	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35	Pumping
Time 09:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time 19:30 0:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time 09:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time 09:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	
Time 09:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time 09:30	pH (Units) 6.80 6.85	Temperature Corrected Conductance (umhos/cm) 1300 1200	Temperature (°C)	ON TEST Water Level (Nearest 0.01 ft)	Cumulative Volume of Water Removed From Well (gallons) 35 60	Pumping
Time 09:30 10:50	pH (Units) 6.80 6.85 6.80	Temperature Corrected Conductance (umhos/cm) 1300 1200 1300	Temperature (°C)	Water Level (Nearest 0.01 ft) 8.20	Cumulative Volume of Water Removed From Well (gallons) 35 60 75	Pumping
Time 09:30 10:30 12:50	pH (Units) 6.80 6.85 6.80	Temperature Corrected Conductance (umhos/cm) 1300 1200 1300	Temperature (°C)	Water Level (Nearest 0.01 ft) 8.20	Cumulative Volume of Water Removed From Well (gallons) 35 60 75	Pumping
Time 09:30 10:30 12:50	pH (Units) 6.80 6.85 6.80	Temperature Corrected Conductance (umhos/cm) 1300 1200 1300	Temperature (°C)	Water Level (Nearest 0.01 ft) 8.20	Cumulative Volume of Water Removed From Well (gallons) 35 60 75	Pumping

Reviewed by: R Levra

Form completed by: G Wellner

MAR-03-19	89 09:01 FF	ROM TCT WAUSA	u,wI	TO	DONOHUE-SHEBOY	P.05
	,	_	LING INFORM			
Sampling Poi	nt OW	1128	Proj	ect U.S. A	rmy Reserve Cente	r
ocation	Milwaukee,	Wisconsin		w.o.	# 8100-89-0181	
	N/A npling Point	N/A		- / /	Time N/A	AM/PM
Vell Depth	24.8	ft, below	MP C	sing Diamete	or2	inches
epth to Wat	er (below MP)	17.90	ft. Date 11	1 24 189	Time 13:01	_ XXX/PM
rischarge Ra	ite =	gpm	x 0.00223 =		cfs.	
t least		_ bore volumes ha	ave been evacuat	ed before sar	npling.	
ampling Me	thad · D T	an 🗆 Suhma	rsible Pump	Ø Bailer	Dther	
umo intaka	or bailer set at		ft. below MP			
					ed to collect all sample	s (ves. n o)
nd all field r	nessurements ((yes, no). Tubing (used only for			
tote any Sar	mpling Problem	s: None			one	
lote any Sar lote any Cle	mpling Problem aning performe lected:	Clear s: None d in field: Nor	ne			
lote any Sar lote any Cle	mpling Problem aning performe lected:	s: <u>None</u> d in field: <u>Nor</u>	ne			Pumping
lote any Sar lote any Cle lamples Coli	mpling Problem aning performe lected:	s: None Indicate the second of the second o	Temperature	ON TEST Water Level (Neares:	Cumulative Volume of Water Removed From Well	Pumping
lote any Sar lote any Cle iamples Coli	pH (Units)	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm)	Temperature (°C)	Water Level (Nearest 0.01 ft) 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100	Pumping
lote any Sar lote any Cle kamples Coli Time 13:01	pH (Units)	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9	Cumulative Volume of Water Removed From Well (gallons)	Pumping
Time 13:01 13:50	pH (Units) 7.20 7.10	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100	Temperature (°C)	Water Level (Nearest 0.01 ft) 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100	Pumping Rate (gpm
Time 13:50 14:10	pH (Units) 7.20 7.10 7.20	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100 1100	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100 120	Pumping Rate (gpm
Time 13:50 14:10	pH (Units) 7.20 7.10 7.20	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100 1100	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100 120	Pumping Rate (gpm
Time 13:01 13:50 14:10	pH (Units) 7.20 7.10 7.20	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100 1100	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100 120	Pumping Rate (gpm
Time 13:01 13:50 14:10	pH (Units) 7.20 7.10 7.20	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100 1100	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100 120	Pumping Rate (gen
Time 13:01 13:50 14:10	pH (Units) 7.20 7.10 7.20	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100 1100	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100 120	Pumping Rate (gar
Time 13:50 14:10	pH (Units) 7.20 7.10 7.20	s: None d in field: Nor ACUATION/S Temperature Corrected Conductance (umhos/cm) 1200 1100 1100	Temperature (°C)	ON TEST Water Level (Neares: 0.01 ft) 17.9 17.9 17.9	Cumulative Volume of Water Removed From Well (gallons) 0 100 120	Pumping Rate (gpn

Pumping start time 13:01 Pumping stop time 14:30	WL 17.9 WL 18.0
Comments:	
Form completed by: G Wellner	Reviewed by: R Levra

epth to Wate		N/A				
					r2	
					Time 13:07	XXX/PV
		gpn				
					Dther	·
•		ıt		•		
					ed to collect all sample	es (yes, no
ina ali nela m	easuraments	(yes, no). Tubing (used only for			
		_				
				Odor:N	one	
Note any Sam	pling Probler	ns: None				
		ed in field: None				
Samples Colle	cted:		·			
	£ 1	/ A C ! / A T ! C ! / A			0.474	
	E /	ACUATION/S	STABILIZATI	ON TEST	DATA .	
		Temperature		Water	Cumulative	1
	_	Corrected		Level	Volume of Water	
Time	್ಲು (Units)	Conductance (umhos/cm)	Temperature (°C)	(Nearest 0.01 ft)	Removed From Well (gallons)	Pumping Rate (ppr
13:07	6.20	1000	13	17.70	0	
14:00	6.30	860	11	17.70	100	
15:30	6.1	800	11	17.70	200	
		333			-	
				}		
		 	1			<u> </u>
				<u> </u>		1
				1	1	
Pi	umping start	time13:07		V	VL17.70	
	umping start	time 13:07 time 15:30			VL 17.70 VL 17.70	
	_	4 - 4 -				
P	umping stop	4 - 4 -			VL <u>17.70</u>	

.			PLING INFORM			
Sampling Po	int <u>UW-113</u> Milwaukee.	B / Wisconsin	Proj	ect U.S. A	rmy Reserve Cente # 8100-89-0181	r
iampie ID # Describe Sar	mpling Point _	N/A	Date Sampled _	//	Time N/A	AM/PM
Well Depth .	18.0	ft. below	MP Ca	sing Diamete	2	inches
Depth to Wa	ter (below MP)	9.15	_ft. Date _11_	124 188	Time09:30	AM/
Discharge Hi Mileset	ate =	gpn	n x 0.00223 =		cfs.	
		_ bore volumes hi				
sampling Me	thod:	Tap 🗆 Subme	rsible Pump	🖾 Bailer	Cther	
rump intake Tubipa (bioc	or bailer set a		ft. below MP			
ind all field	measurements	(yes, no). Tubing i	ew or previously t	used) was use	d to collect all sample	s (yes, no)
		Goot hoj. Tuonig i	2390 Oily 101			
Samola Ano		Clear		Oden Non	e	
	mpling Problem					
			e			
Samples Col	lected: N/A				-	
•						
	EV	ACUATION/S	STABILIZATI	ON TEST	DATA	
		Temperature		Water	Cumulative	
		Соптестеб		Level	Volume of Water	
Time	pH (Units)	Conductance (umhos/cm)	Temperature (°C)	(Nearest 0.01 ft)	Removed From Well (gallons)	Pumping Rate (gom
09:30	7.10	1200	12	9.15	0	
10:30	7.20	1300	11	9.15	40	1
11:00	7.00	1200	11	9.15	75	
12:50	7.20	1100	11		100	
	ļ					
				1		
		Rime			/L9.15	
		time			/L9.15 /L9.15	
	Pumping stop	ime <u>12:50</u>				
	Pumping stop					
	Pumping stop	ime <u>12:50</u>				
	Pumping stop	ime <u>12:50</u>				

APPENDIX F GROUNDWATER SAMPLING RESULTS

Well Number OW-101B

	6roun	dwater						
	Standa	rds, a g/	1	•	Analyti	ical Result	ts, mg/l	
eter :	PAL	ES	ł	1/87	3/87	5/87	7/87	9/87
1			1					
:	25	-	1	0.13	24	10	25	25
;	25	-	;	<6	₹6	₹6	6	₹6
1	2	-	;	0.23	0.48	0.34	0.42	0.6
e 25° ;	200	-	-	1410	1397	1291	1381	1231
;	+/-1	-	;	6.48	6.97	6.73	6.87	7
ess :	100	_	ŧ	660	710	670	740	760
inity	100	-	ł	5 20	540	560	540	520
1	2	-	;	0.55	0.1	i	0.7	Ů.6
ide	125	250	i	80	65	54	57	6 0
tes	125	2 5 0	1	240	260	240	28ú	280
ium	0.005	0.05	1	(0.005	(0.005	<0.005	<0.005	<0.005
ry :	0.0002	0.002	ţ	<0.0005	<0.0005	(0.000 5	<0.0005	(0.0005
1	0.005	0.05	ļ	<0.005	<0.005	<0.005	<0.005	<0.005
us :	0.001	0.01	1	<0.001	<0.001	<0.001	<0.001	(0.001
ic :	0.005	0.05	!	⟨0.005	<0.005	<0.005	<0.005	<0.005
ron !	0.15	0.3	}	<0.1	0.16	0.11	⟨0.1	0.86
03-N :	2	10	1	0.06	₹0.05	0.1	₹0.05	Ů.1Ž
• :	0.2	1	3	(1)	<1	α	₹1	(1
	ess inity ide tes ium ry ic ron 03-N	Standa eter PAL	eter PAL ES 25 - 25 - 2 -	Standards, mg/l eter PAL ES 25 - 25 - 2 - 25 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 3 - 4 - 1 - 5 - 6 - 7 - 7 - 8 - 9 - 100 -	Standards, mg/l eter PAL ES 1/87 25 - 0.13 25 - 0.23 25 - 0.23 25 - 0.23 27 0.23 27 0.23 28 25 200 - 1410 14 100 - 6.48 100 - 660 101 100 - 520 2 - 0.55 240 101 0.005 0.05 0.005	Standards, mg/l Analytic eter PAL ES 1/87 3/87	Standards, mg/l	Standards, mg/l eter PAL ES 1/87 3/87 5/87 7/87

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)

ES - Denotes Enforcement Standard

Well Number OW-101B

	Groundwa Standards,		A	Analytical Results, ug/l			
Volatile Organic							
Parameter	PAL	ES ;	2/87	7/87	12/88	1/89	
Methylene chloride	15	150	NA	NA	X	2	
1,1 - Dichloroethylene	0.024	0.24	X	NA	X	X	
1,1 - Dichloroethane	85	850 :	0.5	NA	1	3	
Chlorofore	-	- 1	X	NA	X	X	
Carbon tetrachloride	-	- 1	X	NA	X	X	
1.2 - Dickloropropane	-	- ;	X	NA	X	Ä	
Trichloroethylene (TCE)	Ú.18	1.8	X	NA	X	X	
1.1,2 - Trichloroethane	0.06	0.6	X	NA	X	X	
Dibromochloromethane	-	- 1	X	NA	X	χ	
Tetrachioroethylene :	Ů.1	1 1	X	NA	X	Ä	
Chlorobenzene :	-	- :	X	NA	X	χ	
Trans-1,2-Dichloroethylene	20	100	NA	NA	X	X	
1,2 - Dichloroethane	0.05	0.5	X	NA	X	X	
1,1,1 - Trichloroethane	40	200 :	X	NA	Ï	X	
Bromodichloromethane	-	- ;	X	NA	, X	X	
Benzene	0.067	0.67	X	NA	X	X.	
Bromoform :	-	- ;	X	NÀ	*	X	
1,1,2,2-Tetrachloroethane	-	- ;	· X	NA	X	X	
Toluene	68.6	343 (X	NA 1	X	X	
Ethylbenzene :	272	1360	X	NA	X	Ä	
Vinyl chloride	0.0015	0.015	12.5	18.6	X	X	
Total xylene	124	620 :	NA	NA	X	X	
1.2-Dichlorobenzene	125	1250	X	NA	X	X	
1,3-Dichlorobenzene	125	1250 ;	X	NA	X	X	
1,4-Dichlorobenzene	150	750 ¦	X	NA	X	X	
2-Chloroethylvinyl Ether	-	- :	X	NA	χ	X	
Cis-1,2-Dichloroethylene	10	100 ;	NA	NA	49	86	
trans-1,3-dichloropropene	-	- {	X	NA	X	Ï	
cis-1,3-dichloropropene	-	- 1	X	NA	X	Ĺ	
Total 1,2-Dichloroethylene	-	- :	23.8	18.9	NA	NA	
Bromomethane	-	- ;	X	NA	NA	NA	
Chloroethane	-	- ;	X	NA	NA	NA	
Chloromethane	-	- }	X	NA	NA	NA	
Dichloromethane	-	- }	X	NA	NA	NA	
Trichlorofluoromethane	698	3490 ;	X	NA	NA	NA	
Dichlorodiflouromethane	-	- ;	X	NA	NA	NA	

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number P-101A

		dwater rds, mg/	1		Analyti	cal Result	s, æg/l	
Parameter	: PAL	ES	ì	1/87	3/87	5/87	7/87	9/87
Indicators:	;		i					
COD	1 25	-	ł	29	23	26	20	35
80D	1 25	•	ł	⟨6	₹6	₹6	₹6	(6
Baran	; 2	-	i	0.16	0.18	0.13	0.22	û.29
Cond € 25°	: 200	-	į	1362	1334	1064	1258	1165
pH	+/-1	-	1	6.67	6.9	7.3	6.64	6.87
Hardness	1 100	-	i	620	680	540	670	1300
Alkalinity	1 100	-	1.	410	420	32ú	410	400
NH3-N	; 2	-	i	0.42	0.1	0.9	0.4	0.3
Public Health								
and Welfare:							•	
Chloride	125	250	í	130	84	86	80	ΒÜ
Sulfates	1 125	250	1	260	260	250	250	220
Chromium	0.005	0.05	ì	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	10.0002	0.002	1	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Lead	: 0.005	0.05	1	<0.005	(0.005	<0.005	₹0.005	(0.005
Cadmium	: 0.001	0.01	ł	(0.001	(0.001	(0.001	<0.001	(0.001
Arsenic	: 0.005	0.05	1	(0.005	(0.005	<0.005	₹0.005	<0.005
Dis Iron	: 0.15	0.3	ļ	3.4	3.4	0.22	0.67	3.4 .
NB2+NB3-N	1 2	10	ł	<0.05	<0.05	<0.05	<0.05	0.08
Barium	0.2	1	i	₹1	<1	₹1	<1	41

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)

ES - Denotes Enforcement Standard

Hell Number P-101A

	Groundwat Standards,		Anal	Analytical Results, ug/l			
Volatile Organic							
Parameter	FAL	ES :	2/87	7/87	12/88	1/89	
Hethylene chloride	15	150	NA	NA	X	6	
1.1 - Dichloroethylene	0.024	0.24	X	NA	X	Χ.	
1,1 - Dichloroethane	85	850 ;	χ	NA	X	X	
Chlorofore	-	- }	X	NA	X	Ï	
Carbon tetractionide	-	- ;	X	NA	X	X	
1.2 - Dichloropropane	-	- ;	X	NA	X	X	
Trichloroethylene (TCE)	0.18	1.8	X	NA	X	X	
1.1.2 - Trichloroethane	0.06	0.6	X	NA	X	X	
Dibrosochlorosethane	-	- }	X	NA	X	X	
Tetrachloroethylene :	0.1	1 }	X	NA	Ĭ	İ	
Chlorobenzene	-	- ;	X	NA	X	X	
Trans-1,2-Dichloroethylene	20	100	NA	NA	X	X	
1.2 - Dichloroethane	0.05	0.5	X	NA	X	2	
1.1.1 - Trichloroethane	40	200	X	NA	X	X	
Bromodichloromethane	-	- ;	X	NA	X	X	
Benzene	0.067	0.67	X	NA	X	Ä	
Brosofors	• -	- ;	X	NA	X	Í.	
1,1,2,2-Tetrachloroethane	-	- ;	Ä	NA	ķ	X	
Toluene	68.6	343	X	NA	X	X	
Ethylbenzene	272	1360	Ï	NA	X	X	
Vinyl chloride	0.0015	0.015	33%	304	X	X	
Total xylene	124	620	NA	NA	X	X	
1,2-Dichlorobenzene	125	1250	X	NA	X	X	
1,3-Dichlorobenzene	125	1250	X	NA	X	X	
1,4-Dichlorobenzene	150	750 J	X	NA	X	3	
C-Chloroethylvinyl Ether	: -	- ;	X	NA	X	X	
Cis-1,2-Dichloroethylene	: 10	100	NA	MA	X	X	
trans-1,3-dichloropropene	: -	- :	X	NA	X	X	
cis-1,3-dichloropropene	-	- ;	X	NA		X	
Total 1,2-Dichloroethylene	-	- ;	X	NA	NA 	NA	
Bromomethane	-	- }	X	NA	NA 	NA NA	
Chloroethane	; -	- ;	, X	NA	NA NA	NA NA	
Chlorosethane	-	- ;	X	NA.	NA NA	NA NA	
Dichloromethane	-	- ;	X	NA 	NA NA	NA NA	
Trichlorofluoromethane	1 698	3490	X	NA 	NA NA	NA NA	
Dichlorodiflouromethane	-	- ;	X X	NA	MA	net	

X - Analyzed for but not detected

MA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number DW-102B

	Groundwater Standards, mg/l A						Anal	alytical Results, #g/l		
f	³ ara s eter	ŀ	PAL	£ŝ	ł	1/87	3/87	5/87	7/87	9/87
Indicators:		ì			Í					
(QOC	1	25	-	1	0.28	34	14	53	20
I	BOD	;	25	-	1	7	⟨6	₹6	₹6	46
{	Boron	ì	2	-	1	0.16	0.44	0.3	0.31	0.45
(Cond € 25°	;	200	-	1	1305	1256	1045	1180	1045
	pH .	1	+/-1	-	1	6.79	6.75	6.99	6.77	6.93
	Hardness	1	100	-	1	540	37û	690	630	900
	Alkalinity	;	100	-	;	4 70	500	510	480	44ů
	NH3-N	;	2	-	i	1	0.1	0.9 •	1.4	1.2
Public Heal	th									
and Welfare	_									
	Chloride	;	125	250	į	54	24	31	63	45
	Sulfates	1	125	250	i	210	24ú	270	18û	180
	Chromium	;	0.005	0.05	ļ	<0.005	(0.005	(0.005	<0.005	₹0.005
	Mercury	1	0.0002	0,002	1	<0.0005	(0.0005	(0.0005	<0.0005	<0.0005
	Lead	;	0.005	0.05	1	<0.005	<0.005	(0.005	<0.005	<0.005
	Cadmium	1	0.001	0.01	1	<0.001	<0.001	(0,001	<0.001	(0.001
	Arsenic	į	0.005	0.05	1	<0.005	(0.005	<0.005	(0.005	<0.J05
	Dis Iron	i	0.15	0.3		(0.1	(9.1	0.11	(0.1	2.3
	ND2+NO3-N		2	10	1	(0.05	0.08	<0.0 5	⟨0.05	0.12
	Barium	1	0.2	1	}	⟨1	<1	α	α	12

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

Well Number GW-102B

	Groundwa Standards,		Ana	Analytical Results, ug/l			
Volatile Organic							
Parameter	PAL	ES :	2/87	7/88	12/88	1/89	
Methylene chloride	15	150	NA	NA	X	3	
1,1 - Dichloroethylene	0.024	0.24	X	NA	X	X	
1.1 - Dichloroethane	85	850	1.2	NA	1	3	
Chlorofore	-	- 1	X	NA	X	X	
Carbon tetrachloride		- ;	X	NA	X	X	
1,2 - Dichloropropane	•	-	X	NA	X	X	
Trichloroethylene (TCE)	0.18	1.8 ;	1	NA	0.6	X	
1,1,2 - Trichloroethane	0.06	0.6	X	NA	Ï	X	
Dibromochloromethane :	-	- ;	X	NA	X	X	
Tetrachloroethylene :	0.1	1 1	X.	NA	X	1	
Chlorobenzene	-	- :	X	NA	X	X	
Trans-1,2-Dichloroethylene	20	100 \$	NA	NA	X	X	
1.2 - Dichloroethane	0.05	0.5	X	NA	X	X	
1,1,1 - Trichloroethane	40	200 1	X	NA	X	X	
Bromodichloromethane	-	- ;	X	NA	X	X	
Benzene (0.067	0.67	Χ	NA	1	Ŕ	
Broadiora	-	- i	X	NA	X	Ä	
1,1,2,2-Tetrachloroethane	-	- ;	X	NA	X	Ĭ.	
Toluene	68.0	343 :	Á	NA	Χ.	X	
Ethylbenzene	272	1360	X	NA	X	X	
Vinyl chloride	0.0015	0.015	23.1	42.5	X	Ä	
Total xylene	124	620	NA	NA	2	X	
1,2-Dichlorobenzene	125	1250	X	NA	X	X	
1.3-Dichlorobenzene	125	1250	X	NA	X	X	
1,4-Dichlorobenzene	150	750 1	X	NA	X	X.	
2-Chloroethylvinyl Ether	-	- ;	X	NA	X	χ	
Cis-1,2-Dichloroethylene	10	100	NA	NA	11	16	
trans-1,3-dichloropropene	-	- ;	X	NA	X	1	
cis-1,3-dichloropropene	! -	- }	X	NA	· X	X	
Total 1,2-Dichloroethylene	-	- 1	13.9	14.6	NÁ	NÁ	
Brosomethane	-	- ;	X	NA	NA	NA	
Chloroethane	-	- :	X	NA	NA	NA	
Chloromethane	-	- :	X	NA	NA	NA	
Dichloromethane	; -	- ;	0.3	NA	NA	NA	
Trichlorofluoromethane	698	3490	; х	NA	NA	NA	
Dichlorodiflouromethane	; -	- 1	t X	NA	NA	NA	

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number P-102A

		•	dwater rds, m g/	/1		Analyti	ical Result	ts, mg/i	
Para	ameter i	PAL	ES	;	1/87	3/87	5/87	7/87	9/87
Indicators:	t			ļ					
COD	1	25	~	1	49	₹5	14	20	25
BOD	1	25	-	i	⟨6	7	∖ 6	7	₹6
Boro	on i	2	-	;	0.23	0.33	0.25	0.34	0.42
Cone	1 € 25* 1	200	-	ŧ	1156	1175	814	1105	993
рH	:	+/-1	-	i	7	7.11	7.22	7.06	7.1
Har	iness :	100	-	;	460	600	55û	59ú	683
Alk	alinity (100	-	1	340	430	440	460	420
NH3-	-N ;	2	-	;	0.57	0.1	9.7	1.1	1.2
Public Health									
and Welfare:									
Chli	oride ;	125	250	i	75	38	42	47	200
Sul	fates i	125	250	1	230	220	200	160	200
Chri	paius :	0.005	0.05	;	<0.005	<0.005	<0.005	<0.005	⟨0.005
Here	cury !	0.0002	0.002	ł	⟨0.0005	<0.0005	<0.0005	(0.0005	<0.0005
Lea	d l	Ú.005	0.05	-	<0.005	<0.005	(0.005	<0.005	<0.005
Cade	Blus ;	0.001	0.01	ł	<0.001	<0.001	(0.001	<0.001	(0.001
Ars	enic :	0.005	0.05	i	⟨0.005	<0.005	<0.005	<0.005	<0.005
Dis	Iron ;	0.15	0.3	;	<0.1	<0.1	Ú.22	0.51	1.1
NO2	+N03-N	2	10	1	0.19	0.25	0.11	₹0.05	0.17
Bar	ius i	0.2	i	i	₹1	<1	⟨1	VI.	(1)

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)

ES - Denotes Enforcement Standard

US Army Reserve 84th Division Groundwater Sampling and Analysis

Well Number P-102A

	Ana	Analytical Results, ug/l				
Volatile Organic						
Parameter	PAL	ES ;	2/87	7/87	12/88	1/89
1		¦				
Methylene chloride	15	150	• • • • • • • • • • • • • • • • • • • •	NA	X	10
1,1 - Dichloroethylene	0.024	0.24	X	NA	X	X -
1,1 - Dichloroethane	85	850	0.7	NA	2	7
Chlorofora	-	- ;	X	NA	, i	X
Carbon tetrachloride :	•	-	, x	NA	X	X
1,2 - Dichloropropane	-	-	X	NA	X	X
Trichloroethylene (TCE)	9.18	1.8	; X	NA	X	8
1,1,2 - Trichloroethane	0.06	0.6) X	NA	X	5
Dibrosochlorosethane	-	-	ł X	NA	3	2
Tetrachloroetnylene :	0.1	1	X X	NA	X	X
Chlorobenzene	-	-	ł X	NA	X	3
Trans-1,2-Dichloroethylene	20	100	l NA	NA	X	X
1,2 - Dichloroethane	ŭ.05	0.5	ł X	NA	X	5
1,1,1 - Trichloroethane	4 Ú	200	t X	NA	X	Ĭ
Bromodichloromethane	-	-	; X	NA	X	5
Benzene	0.067	0.57	X :	NA	1	ķ
Bromoform	-	-	i X	NA	5	X
1,1,2,2-Tetrachloroethane	-	-	, A	NA	Å	1
Toluene	68.6	343	; X	NA	X	X
Ethylbenzene	272	1360	1 X	NÁ	X	· ,
Vinyl chloride	0.0015	0.015	1 3	29.4	X	X
Total xylene	124	620	I NA	NA	5	5
1,2-Dichloropenzene	125	1250	; X	NA	10	18
1.3-Dichlorobenzene	125	1250	; X	NA	15	14
1,4-Dichlorobenzene	150	750	; X	NA	8	14
2-Chloroethylvinyl Ether	-	-	į X	NA	X	Ĭ.
Cis-1,2-Dichloroethylene	10	100	i NA	NÀ	8	30
trans-1,3-dichloropropene	-	-	,	NA	1	1
cis-1,3-dichloropropene	-	-	1 X	NA	3	X.
Total 1,2-Dichloroethylene	-	-	4	8.6	NA	NÁ
Brospethane	-	-) X	NA	NA	NA
Chloroethane	.	-	; X	NÁ	NA	NA
Chloromethane	-	-	t X	NA	NA	NA
Dichloromethane	-	-	} X	NA	NA	NA
Trichlorofluoromethane	. 698	3490	; X	NA	NA	NA
Dichlorodiflouromethane	-	-	1 1	NA	NA	NA
Replical Advisaci Americane	•					

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number OW-1058

	Groundwa Standards,		Analytical Results, ug/l		
Volatile Organic					
Parameter	PAL	ES !	12/88	1/89	
Methylene chloride	15	150	X	7	
1,1 - Dichloroethylene	0.024	0.24 :	X	X	
1.1 - Dichloroethane	85	850 i	X	4.8	
Chloroform	-	- 1	X	X	
Carbon tetrachloride	-	- 1	X	3	
1,2 - Dichloropropane	-	- ;	X	X	
Trichloroethylene (TCE)	Ú.19	1.8 ;	X	3.1	
1,1,2 - Trichloroethane	0.06	0.6	X	3	
Dibromochloromethane	-	- ;	X	X	
Tetrachioroethylene	0.1	1 +	X	2	
Chlorobenzene	; -	- ;	X	2	
Trans-1,2-Dichloroethylene	: 20	100 ;	X	2.4	
1,2 - Dichloroethane	0.05	0.5 ;	X	6	
1.1.1 - Trichloroethane	ł 40	1200	X	6	
Broadichloromethane	-	-	X	2	
Benzene	0.067	0.67	X	Ĭ.	
Broanfors	: -	- ;	Á	ì	
1,1,2,2-Tetrachloroethane	<u>-</u>	- 1	į,	X	
Toluene	68.6	343 :	X	X	
Ethylbenzene	272	1360 ;	X	X	
Vinyl chloride	0.0015	0.015 ;	X	X	
Total xylene	124	620	X	3	
1.2-Dichlorobenzene	125	1250	X	6	
1,3-Dichlorobenzene	125	1250	X	5	
1,4-Dichlorobenzene	150	750 ¦	X.	3	
2-Chloroethylvinyl Ether	-	- (X	X	
Cis-1,2-Dichloroethylene	; 10	100	X	6.6	
trans-1,3-dichloropropene	-	- ;	X	X	
cis-1,3-dichloropropene	-	1	X	X	
Total 1,2-Dichloroethylene	-	- ;	NA	NA	
Bronomethane	-	- 1	NA	NA	
Chloroethane	-	- 1	NA	NA	
Chloromethane	-	- 1	NA	NA	
Dichloromethane	-	- 1	NA	NA	
Trichlorofluoromethane	698	3490	NA	NA	
Dichlorodiflouromethane	-	-	NA	NA	
	-	•			

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number P-105A

			Graund	iwater							
			Standar	rds, m	g/1			Analyti	ical Result	ts, mg/l	
	Parameter	{	PÅL	E	S i	í	1/87	3/87	5/87	7/87	9/87
Indicators	:	ļ				l f					
	COD	1	25		- ;	i	18	16	18	₹5	10
	BOD	;	25		- !	i	₹6	₹6	₹6	₹6	<6
	Boron	1	2		- ,	i	0.36	0.25	0.15	0.23	0.27
	Cond € 25~	1	200		- :	•	1536	1463	860	1100	1203
	рH	;	+/-1		-	•	6.75	7.1	7.09	6.95	6.95
	Hardness	f	100		-	1	730	76û	720	720	920
	Alkalinity	;	100		-	j	420	430	430	410	* 420
	NH3-N	;	2		-	ŧ	0.27	0.3	ù.2	0.5	0.2
Public Hea	lth		•								
and Welfar	e:										
	Chloride	ì	125	250		1	150	100	ţùù	100	75
	Sulfates	1	125	25ú		į	200	300	310	290	320
	Chromium	;	0.005	0.05		1	<0.005	<0.005	<0.005	<0.005	₹0.005
	Hercury	ì	0.0002	0.002		t t	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Lead	1	0.005	0.05		1	<0.005	<0.005	<0.005	<0.005	<0.005
	Cadeius	1	0.001	0.01		!	(0.00)	(0.001	⟨0.001	(0.001	(0.001
	Arsenic	1	0.005	0.05		ŀ	<0.005	<0.005	(0.005	<0.005	<0.005
	Dis Iran	1	0.15	0.3		1	2.9	2.8	1.7	(Ú.1	2.1
	NO2+NO3-N	1	2	10		j	<0.05	₹0.05	(0.05	₹0.05	0.06
	Barius	;	0.2	1		ì	<1	<1	<1	<1	<1

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)

ES - Denotes Enforcement Sandard

Well Number P-105A

	Groundwat Standards,		Ana	lytical Re	sults, ug/l	l
Volatile Organic						
Parameter :	PAL	ES ;	2/87	7/87	12/88	1/89
Methylene chloride	15	150	NA	NA	. 1	2
1,1 - Dichloroethylene	0.024	0.24	X	NA	X	X
1,1 - Dichloroethane	85	850 ÷	χ	NA	X	χ
Chloroform	-	- ;	X	NA	Ĭ	X
Carbon tetrachloride	-	- }	X	NA	X	X.
1.2 - Dichloropropane	-	-	1	NA	X	X
Trichioroethylene (TCE)	0.18	1.8	X	NA	X	1.2
1.1.2 - Trichloroethane	0.06	0.6	X	NA	Ĭ	χ
Dibromochloromethane	-	- 1	X	NA	X,	X
Tetrachloroethylene	0.1	1 1	X	NA	X	χ
Chlorobenzene	-	- :	X	NA	X	X
Trans-1,2-Dichloroethylene	20	100	NA	NA	X	0.5
1,2 - Dichloroethane	0.05	0.5	X	NA	X	4
1,1,1 - Trichloroethane	40	200	Ä	NA .	X	X
Bromodichloromethane	-	- ;	X	NÀ	X	χ
Benzene	0.067	0.67	X	NA	Ä	Ä
Brosoform -	-	- ;	X	NA	X	X
1,1,2,2-Tetracnloroethane	-	- }	X	NÀ	Å	X
Toluene	68.6	343	X	NA	X	X
Ethylbenzene	272	1360	X	NA	X	X
Vinyl chloride	0.0015	0.015	39.9	19.1	X	X
Total xylene	124	620	NA	NA	X	X
1,2-Dichlorobenzene	1 125	1250 :	X	NA	X	6
1,3-Dichlorobenzene	125	1250	X	NA	X	X
1,4-Dichlorobenzene	150	750	X	NA	X	4
2-Chloroethylvinyl Ether	-	- ;	X	NA	X	χ
Cis-1,2-Dichloroethylene	10	100	NA	NA	2	20
trans-1,3-dichloropropene	: -	- ;	X	NA	X	X
cis-1,3-dichloropropene	-	- ;	X	NA	X	X
Total 1,2-Dichloroethylene	-	-	X	NA	NA	NA
Bronomethane	<u>-</u>	- ;	. X	NA	NA	NA
Chloroethane	-	- ;	K :	NA	NA	NA
Chloromethane	-	- 1	i X	NA	NA	NA
Dichloromethane	-	- :	i X	NA	NA	NA
Trichlorofluoromethane	; 698	3490	. X	NA	NA	NA
Dichlorodiflouromethane	-	•	; X	NA	NA	NA

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number ON-106B

	Groundwater Standards. mg/l							Analytical Results, mg/l				
	Parameter	1	PAL	ES	;	1/87	3/87	5/87	7/87	9/87		
Indicators:		+			i							
	COD	ì	- 25	-	i	0.21	₹5	, 6	₹5	15		
	BOD	!	25	-	1	₹6	(6	₹6	₹6	₹6		
	Boron	Į I	2	-	;	Ü.49		0.08	0.05	0.19		
	Cond @ 25°	1	200	-	-	982	932	1417	805	856		
	ρH	ļ,	+/-1	-	1	6.8	7.06	7.5	7.05	6.87		
	Hardness	:	100	-	ł	48ú	560	490	55ů	570		
	Alkalinity	1	100	-	!	38û	39û	3 8 0	400	390		
	NH3-N	1	2	-	ł	0.15	⟨0.1	(0.1	<0.1	0.1		
Public Hea	lth											
and Welfar	e:											
	Chloride	1	125	250	i i	150	20	21	18	15		
	Sulfates	1	125	25ù	1	300	180	160	130	170		
	Chronium	ł	0.005	0.05	ł	<0.005	₹0.005	<0.005	<0.005	(0.005		
	Hercury	ł	0.0002	0.002	ì	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005		
	Lead	1	0.005	0.05	1	<0.005	<0.005	₹0.005	₹0.005	<0.005		
	Cadeius	:	0.001	0.01	1	(0.001	(0.001	<0.001	<0.001	0.0029		
	Arsenic	1	0.005	0.05	i	<0.005	(0.005	<0.00 5	(0.005	<0.005		
	Dis Iron	:	0.15	0.3		<0.1	(0.1	0.2	⟨0.1	<0.1		
	NO2+NO3-N	;	2	10	1	(0.05	⟨Û.Û5	<0.05	<0.05	0.08		
	Barius	;	0.2	1	i	⟨1	<1	<1	(1	α		

Notes:

PAL - Denotes Preventive Action Limit (Increase above background)
ES - Denotes Enforcement Standard

Well Number GW-106B

Volatile Organic PAL E5 2/87 12/88 1/8 Methylene chloride 15 150 NA X 3 1,1 - Dichloroethylene 0.024 0.24 X X 1,1 - Dichloroethane 85 850 X X 0.3 Chlorofora				
Parameter PAL E5 2/87 12/88 1/8 Methylene chloride 15 150 NA X 5 1,1 - Dichloroethylene 0.024 0.24 X X X 1,1 - Dichloroethane 85 850 X X 0.4 Chlorofora X X X X X Carbon tetrachloride X X X X X X 1,2 - Dichloropropane X<	Analytical Results, ug/l			
Parameter PAL E5 2/87 12/88 1/8 Methylene chloride 15 150 NA X 5 1,1 - Dichloroethylene 0.024 0.24 X X X 1,1 - Dichloroethane 85 850 X X 0.4 Chlorofora X X X X X Carbon tetrachloride X X X X X X 1,2 - Dichloropropane X<				
1,1 - Dichloroethylene 0.024 0.24 X	89			
1,1 - Dichloroethylene 0.024 0.24 X	_			
1.1 - Dichloroethane 85 850 X X 0.4 Chloroform X X Carbon tetrachloride X X 1.2 - Dichloropropane - X X Trichloroethylene (TCE) 0.18 1.8 X X 1.1,2 - Trichloroethane 0.06 0.6 X X Dibromochloromethane - X X Tetrachloroethylene 0.1 1 X X Chlorobenzene - X X Trans-1,2-Dichloroethylene 20 100 NA X	5			
Chloroform	Ä			
Carbon tetrachloride				
1,2 - Dichloropropane 1,2 - Dichloropropane Trichloroethylene (TCE) 1,1,2 - Trichloroethane 0.06 0.6 X X Dibromochloromethane X Tetrachloroethylene 0.1 1	3			
Trichloroethylene (TCE) 0.18 1.8 X X 0.1 1.1,2 - Trichloroethane 0.06 0.6 X X X Dibromochloromethane X X X X X X X X	X			
1,1,2 - Trichloroethane	Ĭ			
Dibromochlaromethane				
Tetrachloroethylene : 0.1 1	3			
Chlorobenzene	X			
Trans-1,2-Dichloroethylene : 20 100 NA X	X			
Trans-1,2-bichior de chylene	X			
	Å			
	2			
1,1,1 - Trichloroethane : 40 200 : X X	X			
Bromodichloromethane : X X	2			
Benzene : 0.067 0.67 X X	Á			
Bromoform X X	X			
1,1,2,2-Tetrachloroethane : : X	X			
Toluene 68.6 343 X X	X			
Ethylbenzene : 272 1360 ; X X	Ä			
Vinyl chloride : 0.0015 0.015 ; X X	X			
Total xylene : 124 620 : NA X	X			
1,2-Dichlorobenzene i 125 1250 i X X 1	10			
1,3-Dichlorobenzene 1 125 1250 X X	8			
1.4-Dichlorobenzene i 150 750 i X X	8			
2-Chloroethylvinyl Ether : : X	X			
Cis-1,2-Dichloroethylene ; 10 100 ; NA X	4			
trans-1,3-dichloropropene X X	1			
cis-1,3-dichloropropene X	X			
Total 1,2-Dichloroethylene : : X NA	NA			
Bromomethane X NA	NA			
Chloroethane : : X NA	NA			
Chloromethane X NA	NA			
Dichloromethane X NA	NA			
Trichlorofluoromethane : 698 3490 : X NA	NA			
Dichlorodiflouromethane X NA	NA			

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number P-106A

	Groundwat Standards,	_	Analytic Results,	
Volatile Organic				
	; PAL	ES :	12/88	1/89
	:	1		
Methylene chloride	: 15	150	X	9
1.1 - Dichloroethylene	1 0.024	0.24	X	X
1,1 - Dichloroethane	85	850	X	2
Chloroform	-	- 1	X	5
Carbon tetrachloride	-	- 1	X	X
1,2 - Dichloropropane	-	- :	X	X.
Trichloroethylene (TCE)	: 0.18	1.8	X	χ
1,1,2 - Trichloroethane	0.06	0.6	X	6
Dibromochloromethane	; -	- 1	X	3
Tetrachloroethylene	0.1	1 4	X	X
Chlorobenzene	; -	- ;	X	2
Trans-1,2-Dichloroethylene	1 20	100	X	X
1,2 - Dichloroethane	0.05	0.5	X	5
1,1,1 - Trichloroethane	40	200	X	X
Bromodichlorosethane	-	-	X	4
Benzene	0.067	0.67	X	χ
Bromoform		- 1	X	2
1,1,2,2-Tetrachloroethane	-	- :	. Х	X
Toluene	68.6	343 i	X	X
Ethylbenzene	272	1360	X	X
Vinyl chloride	0.0015	0.015	X	X
Total xylene	124	620	X	4
1,2-Dichlorobenzene	125	1250	X	17
1,3-Dichlorobenzene	125	1250	X	12
1,4-Dichlorobenzene	150	750	X	12
2-Chloroethylvinyl Ether	-	- 1	X	X
Cis-1,2-Dichloroethylene	10	100	3	10
trans-1,3-dichloropropene	-	- :	X	X
cis-1,3-dichloropropene	· -	- }	X	X
Total 1,2-Dichloroethylene	· -	- {	NA	NA
Bromomethane	-	- 1	NA	NA
Chloroethane	-	- 1	NA	NA
Chloromethane	-	- 1	NA	NA
Dichloromethane	-	- 1	NA	NA
Trichlorofluoromethane	. 698	3490	NA NA	NA
Dichlorodiflouromethane		- !	NA NA	NA
ATCUTOLOGISTION DESCUSUS		1	1444	1

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number OW-1128

			Ground	iwater	Analytical		
		Standar		ds, a g/	ì	Results	, m g/l
	Parameter	ŧ	PAL	ES	1	12/88	1/89
Indicators	:	ļ			1		
	COD	;	25	-	i i	∢ S	₹5
	BOD	;	25	-	ł	₹3	⟨2
	Boron	į	2	-	i	<0.05	0.16
	€ond € 25°	1	200	-	1	1642	1133
	На	1	+/-1	-	1	7.95	8.12
	Hardness	1	100	-	1.	775	600
	Alkalinity	1	100	-	ļ	524	376
	NH3-N	;	2	-	ł	<0.1	⟨0.1
Public Hea	lth						
and Welfar	e:						
	Chloride	i	125	250	i	226	23.5
	Sulfates	;	125	250	1 2	201	226
	Chromium	1	0.005	0.05	ł	(0.002	<0.002
	Mercury	:(0.0002	0.002	ł	<0.0002	<0.0002
	Lead	1	0.005	0.05	ł	0.04	(0.002
•	Cadmium	;	0.001	0.01	1	<0.001	<0.001
	Arsenic	:	0.005	0.05	!	<0.001	0.002
	Dis Iron	;	0.15	0.3	i	1.87	û .8 7
	NO2+NO3-N	i	2	10	i	<0.05	⟨0.05
	Barium	1	0.2	1	į	0.24	0.18

Notes:

PAL - Denotes Preventive Action Limit (Increase above background ES - Denotes Enforcement Standard

Well Number OW-112B

	Groundwal Standards,		Analytical Results, ug/l		
Volatile Organic					
Parameter :	PAL	ES !	12/88	1/89	
;	_				
Methylene chloride	15	150	X	٪ _ ۲	
1,1 - Dichloroethylene	0.024	0.24	32	5	
1,1 - Dichloroethane :	85	850	50	15	
Chlorofore	-	- 1	X	X	
Carbon tetrachloride	-	- :	X	X	
1,2 - Dichloropropane	-	- 1	X	X	
Trichloroethylene (TCE)	0.18	1.8	26	209	
1,1,2 - Trichloroethane	0.06	0.6	X	X	
Dibromochloromethane	-	- }	X	X	
Tetrachloroethylene :	Ù.1	1 1	χ	X	
Chlorobenzene	-	- ;	X	X	
Trans-1,2-Dichloroethylene	20	1 001	21	2	
1,2 - Dichloroethane	0.05	0.5	X	2	
1,1,1 - Trichloroethane	40	200 (X	X	
Bromodichloromethane	-	- ;	X	X	
Benzene	0.067	0.57	3	Ĭ.	
Brostors	i -	~ i	X	X	
1,1,2,2-Tetrachioroethane	-	- 1	X.	X	
Toluene	68.6	343 (X	X	
Ethvibenzene	272	1360	X	Ï	
Vinyl chloride	0.0015	0.015	22	X	
Total xylene	124	620	X	X	
1,2-Dichlorobenzene	125	1250	X	X	
1,3-Dichlorobenzene	125	1250	X	X	
1,4-Dichlorobenzene	150	750 1	X	X	
2-Chloroethylvinyl Ether	-	-	X	X	
Cis-1,2-Dichloroethylene	10	100 ;	570	118	
trans-1,3-dichloropropene	-	- ;	X	X	
cis-1,3-dichloropropene	; -	- }	X	X	
Total 1,2-Dichloroethylene	-	- !	NA	NA	
Brososethane	; -	- }	NA	NA	
Chloroethane	; -	- }	NÁ	NA	
Chloromethane	-	- ¦	NA	NA	
Dichloromethane	-	- }	NA	NA	
Trichlorofluoromethane	: 698	3490	NA	AM	
Dichlerodiflouromethane	-	- }	NA	NA	

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number P-112A

			6roun	dwater	Analytical		
		Standar		rds, a g	i	Results	s, mg/l
	Parameter	;	PAL	ES	1	12/88	1/89
Indicators	:	1			i		
	COD	i	25	-	1	₹5	⟨5
	800	i	25	-	ł	₹3	₹2
	Boron	į	2	-	;	0.06	0.13
	Cond € 25°	ì	200	-	1	1795	1563
	pH	i	+/-1	-	1	7.63	8.43
	Hardness	ł	100	-	ì	773	670
	Alkalinity	ŧ	100	-	1	524	382
	NH3-N	ļ	2	-	i	₹0.1	<0.1
Public Hea	lth						
and Welfar	e· •						
	Chloride	- (125	250	!	183	195
	Sulfates	1	125	25û	i	192	201
	Chromium	1	0.005	0.05	1	<0.002	<0.002
	Mercury	;(0.0002	0.002	1	<0.0002	<0.0002
	Lead	i	0.005	0.05	ł	0.033	<0.002
	Cadmium	į	0.001	0.01	;	(0.001	(0.001
	Arsenic	ł	0.005	0.05	;	<0.001	0.001
	Dis Iron	1	0.15	0.3	1	1.43	1.81
	NO2+NO3-N	i	2	10	ì	(0.05	(0.05
	Barium	1	0.2	1	1	0.2	0.18

Notes:

PAL - Denotes Preventive Action Limit (Increase above background ES - Denotes Enforcement Standard

Well Number P-112A

	Groundwai Standards,		Analytical Results, ug/l		
Volatile Organic	PAL	ES :	12/88	1/89	
Parameter	THL	;	12700	•,,,,	
Methylene chloride	15	150	X	X	
1,1 - Dichloroethylene	0.024	0.24	3 0	46	
1.1 - Dichloroethane	85	850 ¦	52	104	
Chlorofore	-	- !	X	X	
Carbon tetrachloride	-	- 1	X	X	
1.2 - Dichloropropane	-	- !	X	Ï	
Trichloroethylene (TCE)	Ù.18	1.8	36	56	
1,1,2 - Trichloroethane	0.06	0.6	X	X.	
Dibromochloromethane	-	- :	X	X	
Tetrachloroethylene	0.1	1 +	X	X	
Chlorobenzene	-	- ;	X	X	
Trans-1,2-Dichloroethylene	: 20	100 :	17	27	
1,2 - Dichloroethane	0.05	0.5	X	22	
1,1,1 - Trichloroethane	40	200 :	X	χ	
Bromodichloromethane	-	- 1	X	X	
Benzene	0.067	0.67	3	4	
Bromoform	-	- 1	X	X	
1,1,2,2-Tetrachloroethane	-	- (X	X	
Toluene	1 68.6	343 1	X	X	
Ethylbenzene	272	1360	X	X	
Vinyl chloride	0.0015	0.015	X	χ	
Total xylene	124	620 1	X	X	
1,2-Dichlorobenzene	1 125	1250	X	X	
1,3-Dichlorobenzene	1 125	1250	X	X	
1,4-Dichlorobenzene	150	750 :	X	X	
2-Chloroethylvinyl Ether	-	- }	X	X	
Cis-1,2-Dichloroethylene	10	100	587	762	
trans-1,3-dichloropropene	-	- ;	χ	X	
cis-1,3-dichloropropene	-	- :	X	X	
Total 1,2-Dichloroethylene	-	- :	NA	NA	
Bromomethane	-	- 1	NA	NA	
Chloroethane	-	- 1	NA	NA	
Chloromethane	-	- }	NA	NA	
Dichloromethane	-	- }	NA	NA	
Trichlorofluoromethane	698	3490	NA NA	NA	
Dichlorodiflouromethane	-	- ;	NA	NA	

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number OW-113B

	Groundwater			Analytical	
	Standards, mg/l			Results, mg/l	
Parameter	; PAI	L ES	-	12/88	1/89
Indicators:	i		;		
COD	1 25	-	}	∢5	⟨5
800	1 25	-	i	₹2	<2
Boron	; 2	-	;	<0.05	⟨0.05
Cond € 25°	; 200	-	1	1056	860
Ha ·	+/-	1 -	ł	7.98	8.12
Hardness	; 100	•	ļ	503	478
Alkalinity	1 100	-	1	410	336
NH3-N	; 2	~	i	<0.01	0.12
Public Health					
and Welfare.					
Chloride	; 125		1	66.4	45.5
Sulfates	1 125	250	ì	138	131
Chromium	: 0.005	0.05	ŧ	<0.002	(0.002
Hercury	:0.0002	0.002	;	<0.0002	<0.0002
Lead	: 0.005	0.05	1	0.019	<0.002
Cadelue	: 0.001	0.01	1	<0.001	<0.001
Arsenic	: 0.005	0.05	ł	<0.001	0.002
Dis Iron	1 0.15	ú.3	;	0.08	0.09
NO2+NO3-N	: 2	10	:	<0.05	<0.05
Barius	: 0.2	2 1	i	0.18	ŭ.14

Notes:

PAL - Denotes Preventive Action Limit (Increase above background ES - Denotes Enforcement Standard

Well Number OW-113B

	Groundwat Standards,		Analytical Results, ug/l		
Volatile Organic	•				
Parameter	PAL	ES :	12/88	1/89	
H 16 3 ublooide	: : 15	150	X	3	
Methylene chloride	. 13 ! 0.024	0.24	Ŷ	X	
1,1 - Dichloroethylene	: 0.027	850	Ŷ	Ŷ	
1.1 - Dichloroethane	, 63	- !	, X	ĭ	
Chlorofore			Ŷ	Ŷ	
Carbon tetrachloride	i -	_ ;	χ	x x	
1,2 - Dichloropropane	0.18	1.8	î	Ŷ	
Trichloroethylene (TCE)	. 0.16	i.δ ;	Î	î	
1,1,2 - Trichlorgethane	. 0.00	V.a '	Ŷ	Ŷ	
Dibromochloromethane		1 1	X	î	
Tetrachloroethylene	0.1	_ 1	X X	Ŷ	
Chlorobenzene	i	100	0.5	î	
Trans-1,2-Dichloroethylene	20		V.J	Ŷ	
1,2 - Dichloroethane	0.05	0.5 200	X	Ŷ	
1,1,1 - Trichloroethane	40	200 ;	X	Ŷ	
Bromodichloromethane		* ;	A I	į	
Benzene	0.067	0.57	• • • • • • • • • • • • • • • • • • • •	i	
Brosofors	<u>-</u>	- ;	X X	ì	
1,1,2,2-Tetrachloroethane		~ . ~ .	, А	Ŷ	
Toluene	68.6	343	X X	, X	
Ethylbenzene	272	1360	X	X X	
Vinyl Lhloride	0.0015	0.015	X	X	
Total xylene	1 124	620	X Y	Ϋ́	
1,2-Dichlorobenzene	125	1250	-	X	
1,3-Dichlorobenzene	125	1250	X	X	
1,4-Dichlorobenzene	150	750	X	X Y	
2-Chloroethylvinyl Ether	-	- ;	X	-	
Cis-1,2-Dichloroethylene	1 10	100	1	1.7	
trans-1,3-dichloropropene	-	- :	X	X X	
cis-1,3-dichloropropene	-	- :	X		
Total 1,2-Dichloroethylene	-	- ¦	NA	NA NA	
Bromomethane	-	- :	NA NA	NÁ	
Chloroethane	-	- :	NA	NA	
Chloromethane	-	- :	NA	NA	
Dichloromethane	-	- :	NA	NA NA	
Trichlorofluoromethane	1 698	3490	NA	NA	
Dichlorodiflouromethane	-	- ;	NA	NA	

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

Well Number P-113A

		Groundwater			Analytical		
		Standards, e g/l			Results, mg/l		
	Parameter	†	PAL	ES	i i	12/88	1/89
Indicators	:	;			1		
	COD	;	2 5	-	;	5	₹5
	BOD	i	25	-	1	₹2	₹2
	Boron	i	2	-	1	<0.05	<0.05
	Cond @ 25*	1	200	-	:	1096	1115
	ρH	1	+/-1	-	1	7.98	9.24
	Hardness	1	100	-	1.	510	634
	Alkalinity		100	-	;	328	426
	N-2HK	i	2	-	•	(0.1	0.12
Public Hea	lth						
and Welfar	e:						
	Chloride	1	125	250	ł	46	52.6
	Sulfates	1	125	2 5 0	1	325	301
	Chromium	1	0.005	0.05	1	<0.002	(0.002
	Mercury	:0	0.0002	0.002	;	(0.0002	(0.0002
	Lead	:	0.005	0.05	;	0.031	<0.002
	Cadelus	:	0.001	0.01	1	<0.001	<0.001
	Arsenic	i	0.005	0.05	ţ	<0.001	0.001
	Dis Iron	3	0.15	0.3	1	(0.05	<0.05
	NO2+NO3-N		2	10	1	0.07	₹0.05
	Barius	ì	0.2	1	i	0.24	0.22

Notes:

PAL - Denotes Preventive Action Limit (Increase above background ES - Denotes Enforcement Standard

US Army Reserve 84th Division Groundwater Sampling and Analysis

Well Number P-113A

	Groundwater Standards, ug/l			Analytical Results, ug/l	
Volatile Organic		50		2.00	1/89
Parameter	PAL	. ES	1	2/88	1/07
Methylene chloride	15	150	}	X	1.5
1.1 - Dichloroethylene	0.024	0.24	i	X	X
1.1 - Dichloroethane	85	850	1	0.2	X
Chlorofore			i i	X	X.
Carbon tetrachloride			!	X	X
1,2 - Dichloropropane	;	-	1	2	X
Trichloroetnylene (TCE)	0.18	1.8	1	X	X
1,1,2 - Trichloroethane	0.06	Ů.6	†	2	X.
Dibrosochlorosethane	l 1		1	3	I
Tetrachloroethylene	0.1	1	1	Ĭ.	Ĭ.
Chlorobenzene	:		;	X	X
Trans-1,2-Dichloroethylene	; 20	100	1	0.9	X
1.2 - Dichloroethane	0.05	0.5	1	X	X
1,1,1 - Trichloroethane	; 40	200	1	X	X
Bromodichloromethane	1		1	X	X
Benzene	0.067	0.67	1	,	1
Brosofors	م		i	4	X
1,1,2,2-Tetrachloroethane	;		1	X	X.
Toluene	68.6	343	1	X.	X
Ethylbenzene	: 277	2 1360	ŧ	X	Ä
Vinyl chloride	: 0.0015	0.015	i	X	X
Total xylene	120	4 620	1	4	X
1.2-Dichlorobenzene	125	5 1250	!	15	X
1,3-Dichlorobenzene	123	5 1250	;	25	Ï
1,4-Dichlorobenzene	1 15	0 7 5 0	}	12	X
2-Chloroethylvinyl Ether	{		i	X	X
Cis-1,2-Dichloroethylene	1	0 100	l F	X	10
trans-1,3-dichloropropene	1		ļ	1	X
cis-1,3-dichloropropene	;		}	2	1
Total 1,2-Dichloroethylene	:	-	1	NA	NA
Brososethane	1	-	1	NA	NA
Chloroethane	† 		. ;	NA	NA
Chloromethane	1	-	. ;	NA	NA
Dichloromethane	;		· }	NA	NA
Trichlorofluoromethane	1 69	8 3490	;	NA	NA
Dichlorodiflouromethane	1		• {	NA	NA

X - Analyzed for but not detected

NA - Not analyzed

PAL - Denotes Preventive Action Limit

ES - Denotes Enforcement Standard

QUALITY CONTROL REPORT

U.S. Army Reserve 34th Division (Samples 56844-56853, 56870 Analyzed 1/31/89) (Samples 56871-56876 Analyzed 2/1/89)

SURROGATE RECOVERIES

Sample	<pre>% Recovery Trifluorotoluene</pre>	% Recovery 1,4-Dichlorobutane
56344	101	91
56845	101	116
56845	83	114
56847		139
56843	79	116
56849	88	111
56850	. 89	112
56351	101	113
56852	97	. 114
56853	92	114
5687G	31	114
56871	125	131
56872		121
56873	87	107
56874	108	104
56375	88	103
56876	96	109
3lank	98	114
piked Blank	80	116
piked Blank	96	113

Spike Recoveries

	% Recovery	% Recovery Spike 2
Compound	Spike 1	JPTRC 2
1,1,1-Trichloroethane	112	96
Carbontetrachloride	94	79
Benzene	144	123
1,2-Dichloroethane	105	98
Trichloroethylene	141	138
1,4-Dichlorobenzene	145	168

Inorganics (Samples 56870-56875)

Analyte	Duplicate % RPD	Sample Spike % Recovery	Spike Blank % Recovery	External QC % Recovery
BOD	12	NA	100	103
COD	4	109	90	97
Ammonia Nitrogen	0	104	102	109
Nitrate + Nitrite	Э	94	97	103
Arsenic	12	9 8	104	98
Barium	0	96	105	103
Boron	0	104	102	NA
Cadmium	0	91	104	83
Chromium	10	115	93	102
Iron	1	102	97	108
Lead	6	100	102	100
Mercury	1	81	60	33
Alkalinity	2	95	98	92
Chloride	С	100	96	99
Sulfate	2	111	104	106
Hardness	4	111	92	102

Analyses performed in accordance with procedures approved by the U.S. EPA.

Bug Ruechel

3/10/89 Date

QUALITY CONTROL REPORT

U.S. Army Reserve 84th Division (Samples 56004-56012, Analyzed 1/3/89) (Samples 56046-56052 Analyzed 1/4/89)

SURROGATE RECOVERIES

Sample	% Recovery Trifluorotoluene	% Recovery 1,4-Dichlorobutane
56004	97	115
56005	109	130
56006	108	135
56007	103	125
56003	108	125
56009	102	125
56010	100	126
56011	105	120
56012	103	125
Blank	36	150
56046	107	100
56047	105	135
56048	107	. 110
56049	115	80
56050	109	90
56051	101	95
56052	102	95
Blank	81	135

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

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Inorganics (Samples 56046-56051)

Analyte	Duplicate % RPD	Sample Spike % Recovery	Spike Blank % Recovery	External QC % Recovery
BOD	4	NA	94	102
COD	0	102	105	104
Ammonia Nitrogen	. 0	96	90	95
Nitrate + Nitrite	0	94	103	102
Arsenic	C	90	96	97
Barium	13	114	106	88
Boron	0	106	110	NA
Cadmium	0	81	98	113
Chromium	0	78	101	100
Iron	4	106	122	115
Lead	0	118	95	95
Mercury	0	103	103	82
Alkalinity	3	106	92	39
Chloride	1	93	95	100
Sulfate	0	103	106	100
Hardness	0	106	98	95

Analyses performed in accordance with procedures approved by the U.S. EPA.

Ling Ruchel

3/10/89 Date

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 12-21-88

NO. 56007 DESCRIPTION OWIOIB

TAKEN 12-21-88

Color	Clear	
0dor	Yes; sulfur	
Turbidity	No	NTU
pH - Field	7.45	units
Methylene chloride	<1	ug/l
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	1	ug/1
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/1
1,2 - Dichloropropane	<1	ug/1
Trichloroethylene (TCE)	<0.5	ug/1
1.1.2 - Trichloroethane	<1	· ug/1
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/1
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	<0.5	ug/l
1,2 - Dichloroethane	<1	ug/1
1,1,1 - Trichloroethane	<1	ug/l
Bromodichloromethane	<1	ug/l
Benzene	<1	ug/1
Bromoform	<1	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/1
Toluene	(1	ug/1
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/1
Total Xylene	⟨2	ug/l
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	<1	ug/1
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	49	ug/1
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	<1	ug/l

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNR Laboratory I.D. No. 460060920

Project Manager/

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 12-21-88

NO. 56006 DESCRIPTION Pl01A

TAKEN 12-21-88

Color	Clear		
0dor	No		
Turbidity	No		NTU
pH - Field	7.77		units
Methylene chloride	<1		ug/l
1,1 - Dichloroethylene	<1		ug/l
1,1 - Dichloroethane	<0.5		ug/l
Chloroform	<1		. ug/l
Carbon tetrachloride	<1		ug/l
1.2 - Dichloropropane	<1		ug/l
Trichloroethylene (TCE)	<0.5		ug/l
1,1,2 - Trichloroethane	<1		ug/l
Dibromochloromethane	<1		ug/l
Tetrachloroethylene	<1		ug/l
Chlorobenzene	<1		ug/1
Trans-1,2-Dichloroethylene	<0.5		ug/1
1,2 - Dichloroethane	<1		ug/l
1,1,1 - Trichloroethane	<1		ug/l
Bromodichloromethane	<1		ug/l
Benzene	<1		ug/l
Bromoform	<1		ug/l
1,1,2,2-Tetrachloroethane	<1		ug/l
Toluene	<1		ug/l
Ethylbenzene	<1		ug/l
Vinyl chloride	<2		ug/l
Total Xylene	<2		ug/1
1,2-Dichlorobenzene	<1		ug/l
1,3-Dichlorobenzene	<1		ug/l
1,4-Dichlorobenzene	<1		ug/l
2-Chloroethylvinyl Ether	<1		ug/l
Cis-1,2-Dichloroethylene	<0.5		ug/l
trans-1,3-dichloropropene	<1		ug/l
cis-1,3-dichloropropene	<1		ug/l
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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNF Laboratory I.D. No. 460060920

-2-3-69--Date

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 12-21-88

NO. 56005 DESCRIPTION OW102B

TAKEN 12-21-88

Color	Clear	
0dor	No	
Turbidity	No	NTU
pH - Field	7.80	units
Methylene chloride	<1	ug/l
1,1 - Dichloroethylene	<1	ug/1
1,1 - Dichloroethane	1	ug/l
Chloroform	<1	ug/l
Carbon tetrachloride	<1	. ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	0.6	ug/l
1,1,2 - Trick_oroethane	<1	ug/1
Dibromochloromethane	<1	ug/1
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	<1	ug/1
1,2 - Dichloroethane	<1	ug/1
1,1,1 - Trichloroethane	<1	ug/1
Bromodichloromethane	<1	ug/1
Benzene	1	ug/1
Bromoform	<1	ug/1
1.1,2,2-Tetrachloroethane	<1	ug/1
Toluene	<1	ug/1
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/1
Total Xylene	2	ug/1
1,2-Dichlorobenzene	<1	ug/1
1,3-Dichlorobenzene	<1	ug/1
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	11	ug/1
trans-1,3-dichloropropene	(1	ug/1
cis-1,3-dichloropropene	<1	ug/1

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Analytical & Field Tervices 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNR Laboratory I.D. No. 460060920

Project Manager

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: SEE BELOW

SAMPLE RECEIVED: 12-21-88

NO. 56004 DESCRIPTION P102A

TAKEN 12-21-88

Color	Light gray	
0dor	No	
Turbidity	Yes	NTU
pH - Field	7.86	units
Methylene chloride	< 1	ug/1
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	2	ug/l
Chloroform	<1	ug/1
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/1
Trichloroethylene (TCE)	<0.5	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	3	ug/1
Tetrachloroethylene	<1	ug/1
Chlorobenzene	(1	ug/1
Trans-1,2-Dichloroethylene	<1	ug/l
1,2 - Dichloroethane	<1	ug/l
1,1,1 - Trichloroethane	<1	ug/1
Bromodichloromethane	<1	ug/l
Benzene	<1	ug/l
Bromoform	5	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/l
Toluene	<1	ug/1
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/l
Total Xylene	5	ug/l
1,2-Dichlorobenzene	10	ug/l
1,3-Dichlorobenzene	15	ug/1
1,4-Dichlorobenzene	8	ug/l
2-Chloroethylvinyl Ether	<1	.ig/1
Cis-1,2-Dichloroethylene	8	ug/l
trans-1,3-dichloropropene	1 3	ug/l
cis-1,3-dichloropropene		ug/l
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Project Manager

US Army Res. 84th Division

ATIN: Mr. Dave Voight.

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 12-21-88

NO. 56011 DESCRIPTION OW105B

TAKEN 12-21-88

Color	Clear	
0dor	No	
Turbidity	No	NTU
pH - Field	7.76	units
Methylene chloride	<1	ug/1
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	(0.5	ug/1
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/1
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	<0.5	ug/l
1,1,2 - Trichloroethane	<1	ug/1
Dibromochloromethane	<1	ug/1
Tetrachloroethylene	<1	ug/l
Chlorobenzene	(1	ug/1
Trans-1,2-Dichloroethylene	(0.5	ug/l
1,2 - Dichloroethane	<1	ug/l
1,1,1 - Trichloroethane	(1	ug/l
Bromodichloromethane	(1	ug/l
Benzene	<1	ug/l
Bromoform	(1	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/l
Toluene	(1	ug/1
Ethylbenzene	(1	ug/l
Vinyl chloride	<2	ug/l
Total Xylene	(2	ug/l
1,2-Dichlorobenzene	(1	ug/l
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/l
2-Chloroethylvinyl Ether	(1	ug/l
Cis-1,2-Dichloroethylene	(0.5	ug/l
trans-1,3-dichloropropene	(1	ug/l
cis-1,3-dichloropropene	(1	ug/l

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Analytical & Field Services 414-458-8711

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Project Manager

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US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

Collected by Donohue

COLLECTION DATA: Collected SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56049 DESCRIPTION: P112A

Total BOD5	<3				mg/l
Total COD	<5				mg/l
Ammonia Nitrogen	<0.1				mg/l
Nitrate+Nitrite Nitrogen	<0.05				mg/l
Arsenic	<1				ug/l
Barium	200				ug/l
Boron	60				ug/l
Cadmium	<1				ug/l
Chromium	⟨2				ug/l
Iron	1,430		•		ug/l
Lead	33				ug/l
Mercury	(0.2				ug/l
Alkalinity	524	•			mg/l
Total Hardness	773				mg/l
Chloride	183			•	mg/l
Sulfate	192				mg/l
Color	Clear				
0dor	No				
Turbidity	No				NTU
Specific Conductance-Field	1,795				umhos/cm
pH - Field	7.63				units
Methylene chloride	<1				ug/l
1,1 - Dichloroethylene	30				ug/1
1,1 - Dichloroethane	52				ug/1
Chloroform	<1				ug/l
Carbon tetrachloride	<1				ug/l
1,2 - Dichloropropane	<1				ug/1
Trichloroethylene (TCE)	36				ug/l
1,1,2 - Trichloroethane	<1				ug/1
Dibromochloromethane	<1				ug/1
Tetrachloroethylene	<1				ug/l
Chlorobenzene	<1				ug/l
Trans-1,2-Dichloroethylene	17		•		ug/1
1,2 - Dichloroethane	<1				ug/1
		Analyses	performed	ın	accordanc

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Analytical & Field Services 414-458-8711

Project Manager Date

Laboratory I.D. No. 460060920

procedures approved by the U.S. EPA.

Certified by the State of Wisconsin DN

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56049 DESCRIPTION: P112A

1.1.1 - Trichloroethane	<1	ug/1
Bromodichloromethane	<1	ug/l
Benzene	3	ug/l
Bromoform	<1	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/1
Toluene	<1	ug/1
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/1
Total Xylene	<2	ug/1
1,2-Dichlorobenzene	<1	ug/1
1.3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/1
Cis-1,2-Dichloroethylene	587	ug/1
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	<1	ug/1
Temperature	48 degrees	F

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNF Laboratory I.D. No. 460060920

Project Manager

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US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56047 DESCRIPTION: 0W113B

Total BOD5	<2	mg/l
Total COD	⟨5	mg/l
Ammonia Nitrogen	<0.1	mg/l
Nitrate+Nitrite Nitrogen	<0.05	mg/l
Arsenic	<1	ug/1
Barium	180	ug/l
Boron	<50	ug/l
Cadmium	<1	. ug/1
Chromium	⟨2	ug/l
Iron	80	ug/l
Lead	T9	ug/l
Mercury	(0.2	ug/l
Alkalinity	410	mg/l
Total Hardness	503	mg/l
Chloride	66.4	mg/l
Sulfate	138	mg/l
Color	Gray silty	
0dor	No	
Turbidity	Yes	NTU
Specific Conductance-Field	1,056	umhos/cm
pH - Field	7.98	units
Methylene chloride	<1	ug/l
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	<0.5	ug/l
Chloroform	(1	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	<0.5	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	0.5	ug/1
1,2 - Dichloroethane	<1	ug/l
	Analyses perform	ed in accordanc

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNF Laboratory I.D. No. 460060920

Project Manager

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56047 DESCRIPTION: OW113B

1,1,1 - Trichloroethane	<1	ug/1
Bromodichloromethane	<1	ug/l
Benzene	<1	ug/1
Bromoform	<1	ug/1
1,1,2,2-Tetrachloroethane	<1	ug/l
Toluene	<1	ug/1
Ethylbenzene	<1	ug/l
Vinyl chloride	<2	ug/l
Total Xylene	<2	ug/1
1,2-Dichlorobenzene	<1 ·	ug/l
1,3-Dichlorobenzene	$\langle 1 \rangle$	ug/1
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	<0.5	ug/1
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	<1	ug/1
Temperature	48 degrees	F

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

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Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNI Laboratory I.D. No. 460060920

Project Manager

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56046 DESCRIPTION: P113A

Total BOD5	<2
Total COD	5
Ammonia Nitrogen	<0.1
Nitrate+Nitrite Nitrogen	0.07
Arsenic	<1
Barium	240
Boron	<50
Cadmium	<1
Chromium	<2
Iron	₹50
Lead	31_
Mercury	(0.2
Alkalinity	328
Total Hardness	510
Chloride	46.0
Sulfate	325
Color	Gray
0dor	No
Turbidity	Yes
Specific Conductance-Field	1,096
pH - Field	7.98
Methylene chloride	<1
1,1 - Dichloroethylene	<1
1,1 - Dichloroethane	0.2
Chloroform	(1
Carbon tetrachloride	(1
1.2 - Dichloropropane	2
Trichloroethylene (TCE)	(0.5
1,1,2 - Trichloroethane	2
Dibromochloromethane	3_
Tetrachloroethylene	(1
Chlorobenzene	(1
Trans-1,2-Dichloroethylene	0.9
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1,2 - Dichloroethane

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mg/1mg/1mg/lmg/1ug/1uq/1ug/1ug/1ug/1ug/1uq/1uq/1 $m\tilde{q}/1$ mq/1mq/1mg/1

NTU

ug/1

Project Manager Date

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 12-22-88

SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56049 DESCRIPTION: P112A

Total BOD5	⟨3	mg/1
Total COD	<5	mg/l
Ammonia Nitrogen	<0.1	mg/1
Nitrate+Nitrite Nitrogen	<0.05	mg/1
Arsenic	<1	ug/1
Barium	200	ug/l
Boron	60	ug/l
Cadmium	<1	ug/1
Chromium	<2	ug/l
Iron	1,430	ug/1
Lead	33	ug/l
Mercury	(0.2	ug/l
Alkalinity	524	mg/l
Total Hardness	773	mg/1
Chloride	183	mg/l
Sulfate	192	mg/l
Color	Clear	
0dor	No	
Turbidity	No	NTU
Specific Conductance-Field	1,795	umhos/cm
pH - Field	7.63	units
Methylene chloride	<1	ug/l
1,1 - Dichloroethylene	30	ug/l
1,1 - Dichloroethane	52	ug/l
Chloroform	(1	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	36	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	(1	ug/l
Tetrachloroethylene	(1	ug/l
Chlorobenzene	<1	ug/l

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1,2 - Dichloroethane

Trans-1,2-Dichloroethylene

Analytical & Field Services 414-458-8711

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ug/1

ug/1

Jessey Schlipper. Project Manager

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56049 DESCRIPTION: P112A

1,1,1 - Trichloroethane	<1	ug/l
Bromodichloromethane	<1	ug/l
Benzene	3	ug/l
Bromoform	<1	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/l
Toluene	<1	ug/l
Ethylbenzene	<1	ug/1
Vinyl chloride	< 2	ug/l
Total Xylene	<2	ug/l
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	(1	ug/l
Cis-1,2-Dichloroethylene	587	ug/l
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	(1	<u>ug/l</u>
Temperature	· 48 degrees	F

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DN Laboratory I.D. No., 460060920

Project Manager

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 12-22-88

SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56047 DESCRIPTION: OW113B

Total BOD5	<2	mg/l
Total COD	₹5	mg/l
Ammonia Nitrogen	<0.1	mg/l
Nitrate+Nitrite Nitrogen	<0.05	mg/l
Arsenic	<1	ug/l
Barium	180	ug/l
Boron	₹50	ug/l
Cadmium	<1	ug/l
Chromium	`(2	ug/l
Iron	80	ug/l
Lead	19	ug/l
Mercury	(0.2	ug/l
Alkalinity	410	mg/l
Total Hardness	503	mg/l
Chloride	66.4	mg/l
Sulfate	138	mg/l
Color	Gray silty	
0dor	No	
Turbidity	Yes	NTU
Specific Conductance-Field	1,056	umhos/cm
pH - Field	7.98	units
Methylene chloride	(1	ug/l
1,1 - Dichloroethylene	(1	ug/l
1,1 - Dichloroethane	<0.5	ug/l
Chloroform	(1	ug/l
Carbon tetrachloride	(1	ug/l
1,2 - Dichloropropane	<1 _	ug/l
Trichloroethylene (TCE)	<0.5	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	(1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	0.5	ug/l
1,2 - Dichloroethane	<1	ug/l

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Analytical & Field Services 414-458-8711

Certified by the State of Wisconsin DR Laboratory I.D. No. 460060920 lug - Steples----1-18-29

Analyses performed in accordance with procedures approved by the U.S. EPA.

Project Manager

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56047 DESCRIPTION: 0W113B

1,1,1 - Trichloroethane	<1	ug/l
Bromodichloromethane	<1	ug/l
Benzene	<1	ug/1
Bromoform	<1	ug/1
1,1,2,2-Tetrachloroethane	<1	ug/l
Toluene	<1	ug/l
Ethylbenzene	< 1	ug/1
Vinyl chloride	<2	ug/l
Total Xylene	<2	ug/1
1,2-Dichlorobenzene	<1 .	ug/1
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylwinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	<0.5	ug/l
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	<1	ug/l
Temperature	48 degrees	F

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Analytical & Field Services 414-458-8711

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Project Manager

US Army Reserve 84th Div.

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 12-22-88

SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56046 DESCRIPTION: P113A

Total COD 5 Total COD 5 Ammonia Nitrogen (0.1 mg/l Nitrate+Nitrite Nitrogen 0.07 mg/l Arsenic (1 ug/l Barium 240 ug/l Boron (50 ug/l Cadmium (1 ug/l Chromium (2 ug/l Iron (50 ug/l Lead 31 ug/l Mercury (0.2 ug/l Mercury 328 mg/l Total Hardness 510 mg/l Total Hardness 510 mg/l Color Gray Odor No Turbidity Yes 325 mg/l Color Gray Odor No Turbidity Yes Units Specific Conductance-Field 1,096 units Specific Conductance (1 ug/l 1.1 - Dichloroethylene (1 ug/l 1.1 - Dichloroethylene (1 ug/l Carbon tetrachloride (1 ug/l Carbon tetrachloride (1 ug/l Carbon tetrachloroethane (2 ug/l 1.1.2 - Trichloroethane (2 ug/l 1.1.2 - Trichloroethane (1 ug/l 1.1.2 - Trichloroethane (1 ug/l 1.1.2 - Trichloroethane (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l	maka 1 DADE	⟨2			. 1	mg/l
Ammonia Nitrogen (0.1 mg/l Nitrate+Nitrite Nitrogen 0.07 mg/l Arsenic (1 ug/l Barium 240 ug/l Barium (50 ug/l Cadmium (1 ug/l Chromium (2 ug/l Iron (50 ug/l	Total BOD5					
Ammonta Nitrogen Nitrate+Nitrogen 0.07 mg/l Arsenic (1 ug/l Barium 240 ug/l Boron (50 ug/l Cadmium (1 ug/l Chromium (2 ug/l Iron (50 ug/l Iron (50 ug/l Iron (50 ug/l Alkalinity 32 ug/l Alkalinity 328 mg/l Alkalinity 328 mg/l Chloride 325 mg/l Color Gray Odor Gray Odor No Turbidity Yes NTU Specific Conductance-Field 1,096 umhos/cr pH - Field 7,98 units Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l 1,1 - Dichloroethylene (1 ug/l Carbon tetrachloride (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Trichloroethane 2 ug/l 1,1,2 - Trichloroethane 2 ug/l 1,1,2 - Trichloroethane 3 ug/l Trichloroethylene (1 ug/l 1,1,2 - Trichloroethane 2 ug/l 1,1,2 - Trichloroethane 3 ug/l Trichloroethylene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chlorobenzene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l Chloroethylene (1 ug/l						
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Cadmium (1 ug/1 Chromium (2 ug/1 Iron (50 ug/1 Iron (50 ug/1 Lead 31 ug/1 Mercury (0.2 ug/1 Alkalinity 328 mg/1 Total Hardness 510 mg/1 Chloride 46.0 mg/1 Sulfate 325 mg/1 Color Gray Odor No Turbidity Yes NTU Specific Conductance-Field 1.096 umhos/cr pH - Field 7.98 units Methylene chloride (1 ug/1 1.1 - Dichloroethylene (1 ug/1 1.1 - Dichloroethylene (1 ug/1 1.2 - Dichloropropane 2 ug/1 Carbon tetrachloride (1 ug/1 1.2 - Trichloroethane 2 ug/1 I,1.2 - Trichloroethane 2 ug/1 I,1.2 - Trichloroethane 2 ug/1 Dibromochloromethane 3 ug/1 Tetrachloroethylene (1 ug/1 Chlorobenzene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1)					1	ug/1
Chromium (2 ug/1						
Second Second		-				
Lead 31 ug/1 Mercury (0.2 ug/1 Alkalinity 328 mg/1 Total Hardness 510 mg/1 Chloride 46.0 mg/1 Sulfate 325 mg/1 Color Gray Odor No Turbidity Yes NTU Specific Conductance-Field 1.096 umhos/cr pH - Field 7.98 units Methylene chloride (1 ug/1 1.1 - Dichloroethylene (1 ug/1 1.1 - Dichloroethylene (1 ug/1 Carbon tetrachloride (1 ug/1 Carbon tetrachloride (1 ug/1 1.2 - Dichloropane 2 Trichloroethylene (TCE) (0.5 1.1,2 - Trichloroethane 2 Dibromochloromethane 3 Tetrachloroethylene (1 ug/1 Chlorobenzene (1 ug/1 Chlorobenzene (1 ug/1 Chlorobenzene (1 ug/1 Chlorobenzene (1 ug/1 Chloropethylene (2 ug/1 Dibromochloromethane 3 Tetrachloroethylene (1 ug/1 Chlorobenzene (1 ug/1 Chlorobenzene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1) Trans-1,2-Dichloroethylene (1 ug/1)				•		
Mercury 328 mg/1 Alkalinity 328 mg/1 Total Hardness 510 mg/1 Chloride 46.0 mg/1 Sulfate 325 mg/1 Color Gray Odor No Turbidity Yes NTU Specific Conductance-Field 1,096 umhos/cr pH - Field 7.98 units Methylene chloride (1 ug/1 1,1 - Dichloroethylene (1 ug/1 1,1 - Dichloroethane 0.2 ug/1 Chloroform (1 ug/1 Carbon tetrachloride (1 ug/1 1,2 - Dichloropropane 2 ug/1 Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/1 Dibromochloromethane 3 Tetrachloroethylene (1 ug/1 Chlorobenzene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1 Trans-1,2-Dichloroethylene (1 ug/1						
Mercury 328 mg/l Alkalinity 328 mg/l Total Hardness 510 mg/l Chloride 46.0 mg/l Sulfate 325 mg/l Color Gray NO Odor No NTU Turbidity Yes NTU Specific Conductance-Field 1.096 umhos/cr pH - Field 7.98 units Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l Chloroform (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Dichloroethane 2 ug/l Trichloroethylene (1 ug/l Ug/l ug/l ug/l						
Total Hardness 510 mg/l Chloride 46.0 mg/l Sulfate 325 Color Gray Odor No Turbidity Yes NTU Specific Conductance-Field 1,096 umhos/cr pH - Field 7.98 units Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l 1,1 - Dichloroethane 0.2 Chloroform (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Dichloropropane 2 Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 Dibromochloromethane 3 Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l 1,2 - Dichloroethane 2 ug/l Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 3 Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Trans-1,2-Dichloroethylene (1 ug/l Trans-1,2-Dichloroethylene (1 ug/l Trans-1,2-Dichloroethylene (1 ug/l						
Chloride 46.0 mg/l Sulfate 325 mg/l Odor Gray Odor No Turbidity Yes NTU Specific Conductance-Field 1,096 pH - Field 7.98 units Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l 1,1 - Dichloroethane 0.2 ug/l Chloroform (1 ug/l Carbon tetrachloride (1 ug/l 1.2 - Dichloropropane 2 ug/l Trichloroethylene (TCE) (0.5 ug/l 1,1,2 - Trichloroethane 3 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l 1,2 - Dichloroethylene (1 ug/l 1,3 - Dichloroethylene (1 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Ug/l Trans-1,2-Dichloroethylene (1 ug/l Trans-1,2-Dichloroethylene (1 ug/l Trans-1,2-Dichloroethylene (1 ug/l				ē		-
Sulfate Color Odor Odor Turbidity Specific Conductance-Field PH - Field Methylene chloride 1,1 - Dichloroethylene 1,1 - Dichloroethane Carbon tetrachloride 1,2 - Dichloropropane Trichloroethylene (TCE) 1,1,2 - Trichloroethane Tetrachloroethylene Chlorobenzene Trans-1,2-Dichloroethylene C1 C1 C1 C1 C2 C3 C4 C4 C5 C5 C1 C4 C6 C7 C7 C8 C7 C8 C8 C8 C8 C8 C8 C8 C8 C8 C8 C8 C8 C8	- · - ·					-
Color Odor Turbidity Specific Conductance-Field PH - Field Methylene chloride 1,1 - Dichloroethylene 1,1 - Dichloroethane Chloroform Carbon tetrachloride 1,2 - Dichloropropane Trichloroethylene (TCE) 1,1,2 - Trichloroethane Tetrachloroethylene Chlorobenzene Trans-1,2-Dichloroethylene						
Odor Turbidity Specific Conductance-Field 1,096 pH - Field 7.98 Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l 1,1 - Dichloroethane (1 ug/l Carbon tetrachloride (1 ug/l 1.2 - Dichloropropane 2 ug/l Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l 0.5 1,1,2 - Trichloroethane 2 ug/l 0.5 1,1,2 - Trichloroethane 3 ug/l 0.6 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7		_				
Turbidity Yes Specific Conductance-Field 1,096 pH - Field 7.98 Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Dichloropropane 2 ug/l Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Ug/l		-				
Specific Conductance-Field 1,096 pH - Field 7.98 Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l Chloroform (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Dichloropropane 2 ug/l Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Ug/l		_				NTU
pH - Field 7.98 Methylene chloride (1 ug/l 1,1 - Dichloroethylene (1 ug/l 1,1 - Dichloroethane 0.2 Chloroform (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Dichloropropane 2 ug/l Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Trans-1,2-Dichloroethylene 0.9 1 2 - Dichloroethane 0.9	Turbidity					umhos/cm
Methylene chloride 1,1 - Dichloroethylene 1,1 - Dichloroethane 1,1 - Dichloroethane 1,1 - Dichloroethane 1,2 - Dichloropropane 1,2 - Dichloropropane 1,1,2 - Trichloroethane 2		•				
1,1 - Dichloroethylene (1 ug/l ug/l l,1 - Dichloroethane 0.2 ug/l ug/l chloroform (1 ug/l ug/l l,2 - Dichloropropane 2 ug/l ug/l trichloroethylene (TCE) (0.5 ug/l ug/l l,2 - Trichloroethane 2 ug/l ug/l ug/l ug/l trachloroethylene (1 ug/l	pH - Field					
1,1 - Dichloroethane 0.2 Chloroform (1 ug/l Carbon tetrachloride (1 ug/l 1,2 - Dichloropropane 2 ug/l Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Trans-1,2-Dichloroethylene 0.9 1,2 - Dichloroethane (1 ug/l 1,3 - Dichloroethane (1 ug/l 1,4 - Dichloroethane (1 ug/l 1,5 - Dichloroethane (1 ug/l 1,6 - Dichloroethane (1 ug/l 1,7 - Dichloroethane (1 ug/l 1,8 - Dichloroethane (1 ug/l						•
Chloroform Carbon tetrachloride 1.2 - Dichloropropane Trichloroethylene (TCE) 1.1.2 - Trichloroethane Dibromochloromethane Tetrachloroethylene Chlorobenzene Trans-1,2-Dichloroethylene 1.2 - Dichloroethane 1.3 - Dichloroethane 1.4 ug/l 1.5 ug/l 1.6 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l 1.7 ug/l						
Carbon tetrachloride 1.2 - Dichloropropane Trichloroethylene (TCE) 1.1.2 - Trichloroethane Dibromochloromethane Tetrachloroethylene Chlorobenzene Trans-1,2-Dichloroethylene 1.2 - Dichloroethane (1						ug/1
1.2 - Dichloropropane 2 ug/1 Trichloroethylene (TCE) (0.5 1.1.2 - Trichloroethane 2 ug/1 Dibromochloromethane 3 ug/1 Tetrachloroethylene (1 ug/1 Chlorobenzene (1 ug/1 Trans-1.2-Dichloroethylene 0.9 1.2 - Dichloroethane (1 ug/1)						
Trichloroethylene (TCE) (0.5 1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Trans-1,2-Dichloroethylene 0.9 1,2 - Dichloroethane (1 ug/l)						
1,1,2 - Trichloroethane 2 ug/l Dibromochloromethane 3 ug/l Tetrachloroethylene <1 ug/l Chlorobenzene <1 ug/l Trans-1,2-Dichloroethylene 0.9 ug/l 1,2 - Dichloroethane <1 ug/l	1.2 - Dichloropropane					
Dibromochloromethane 3 ug/l Tetrachloroethylene (1 ug/l Chlorobenzene (1 ug/l Trans-1,2-Dichloroethylene 0.9 ug/l 1 2 - Dichloroethane (1 ug/l	Trichloroethylene (TCE)					
Tetrachloroethylene (1 ug/1 Chlorobenzene (1 ug/1 Trans-1,2-Dichloroethylene 0.9 ug/1 ug/1 ug/1 ug/1 ug/1 ug/1 ug/1 ug/1						-
Chlorobenzene (1 ug/l Trans-1,2-Dichloroethylene 0.9 ug/l 1 2 - Dichloroethane (1 ug/l						
Trans-1.2-Dichloroethylene 0.9 ug/l		_		•		
1 2 - Dichloroethane (1						
) / = 11701070ELOGOE						
	1,2 - Dichloroethane	< 7	A? ***	nerformed	in	accordance

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

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Project Manager

1-15-39

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

> SAMPLE NO: 56046 DESCRIPTION: P113A

1,1,1 - Trichloroethane	<1	ug/1
Bromodicl.loromethane	<1	ug/1
Benzene	<1	ug/l
Bromoform	4	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/1
Toluene	<1	ug/l
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/l
Total Xylene	4	ug/l
1,2-Dichlorobenzene	15	ug/l
1,3-Dichlorobenzene	25	ug/1
1,4-Dichlorobenzene_	12	ug/ <u>l</u>
2-Chloroethylvinyl Ether	<1	ug/1
Cis-1,2-Dichloroethylene	<0.5	ug/l
trans-1,3-dichloropropene	1	ug/1
cis-1,3-dichloropropene	2	<u>ug/l</u>
Temperature	48 degrees	F

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Project Mamager

US Army Res. 84th Division

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 12-21-88

NO. 56012 DESCRIPTION Field Blank

TAKEN 12-21-88

Color	NA	•			
Odor	NA				
Turbidity	NA				NTU
pH - Field	NA				units
Methylene chloride	<1				ug/l
1,1 - Dichloroethylene	<1				ug/l
1,1 - Dichloroethane	<0.5				ug/1
Chloroform	<1				ug/l
Carbon tetrachloride	<1				ug/1
1,2 - Dichloropropane	<1		-		ug/1
Trichloroethylene (TCE)	<0.5				ug/l
1,1,2 - Trichloroethane	<1				ug/l
Dibromochloromethane	<1				ug/l
Tetrachloroethylene	<1				ug/l
Chlorobenzene	<1			•	ug/l
Trans-1,2-Dichloroethylene	<0.5				ug/l
1,2 - Dichloroethane	<1				ug/l
1,1,1 - Trichloroethane	<1				ug/l
Bromodichloromethane	<1		,		ug/l
Benzene	<1				ug/l
Bromoform	<1				ug/l
1,1,2,2-Tetrachloroethane	<1				ug/l
Toluene	<1				ug/l
Ethylbenzene	<1				ug/l
Vinyl chloride	<2				ug/l
Total Xylene	<2				ug/l
1,2-Dichlorobenzene	<1				ug/l
1,3-Dichlorobenzene	<1				ug/l
1,4-Dichlorobenzene	<1				ug/1
2-Chloroethylvinyl Ether	<1				ug/l
Cis-1,2-Dichloroethylene	<0.5				ug/l
trans-1,3-dichloropropene	<1				ug/l
cis-1,3-dichloropropene	<1			_	ug/l
		2	mawfarmad	1 20	BCCOV

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

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Project Manager I

US Army Reserve 84th Div.

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 12-22-88

SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56048 DESCRIPTION: 114A

Total BOD5	⟨2	mg/l
Total COD	(5	mg/l
Ammonia Nitrogen	<0.1	mg/l
Nitrate+Nitrite Nitrogen	<0.05	mg/l
Arsenic	1	ug/l
Barium	150	ug/l
Boron	(50	ug/1
Cadmium	.<1	ug/1
Chromium	₹2	ug/l
Iron	<50	ug/1
Lead	19	ug/l
	<0.2	ug/l
Mercury Alkalinity	450	mg/l
Total Hardness	500	mg/l
Chloride	67.6	mg/l
Sulfate	136	mg/l
Color	Gray silty	_
Odor	No	
Turbidity	Yes	NTU
Specific Conductance-Field	1,056	umhos/cm
pH - Field	7.98	units
Methylene chloride	\1	ug/l
1,1 - Dichloroethylene	<1	ug/l
1.1 - Dichloroethane	(0.5	ug/l
Chloroform	(1	ug/l
Carbon tetrachloride	⟨1	ug/l
1,2 - Dichloropropane	(1	ug/l
Trichloroethylene (TCE)	⟨1	ug/l
1.1.2 - Trichloroethane	<1	ug/1
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	(1	ug/l
Chlorobenzene	(1	ug/l
Trans-1,2-Dichloroethylene	<0.5	ug/l
1,2 - Dichloroethane	<1	ug/l
•	Analyses performed in	accordance with
	procedures approved b	y the U.S. EPA.
Donohue Analytical	Certified by the Stat	e of Wisconsin Di
4738 North 40th Street	Laboratory I.D. No. 4	60060920
Sheboygan, Wisconsin 53083	/ -	

Analytical & Field Services 414-458-8711

Lysta ---Project Manager Date

US Army Reserve 84th Div.

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 12-22-88

SAMPLE RECEIVED: 12-22-88

56048 SAMPLE NO: DESCRIPTION: 114A

1.1.1 - Trichloroethane	<1	ug/1
	₹1	ug/1
Bromodichloromethane	₹1	ug/]
Benzene	\(\frac{1}{1} \)	ug/1
Bromoform		ug/1
1,1,2,2-Tetrachloroethane	<1	_
Toluene	<1	ug/l
Ethylbenzene	<1	ug/1
Vinyl chloride	√2	ug/l
	⟨2	ug/1
Total Xylene	\1	ug/1
1,2-Dichlorobenzene		ug/1
1,3-Dichlorobenzene	<1	
1.4-Dichlorobenzene_	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	<0.5	ug/l
	(1	ug/l
trans-1,3-dichloropropene)î	ug/l
cis-1,3-dichloropropene	14 40 dommons	F
Temperature	48 degrees	•

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DN Laboratory I.D. No., 460060920

Jeny defusion Project Manager

py guyg Date

US Army Reserve 84th Div.

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

Collected by Donohue COLLECTION DATA:

SAMPLE COLLECTED: 12-22-88 12-22-88 SAMPLE RECEIVED:

> SAMPLE NO: 56051

DESCRIPTION: Field Blank

Total BOD5	2	mg/1
Total COD	<5	mg/1
Ammonia Nitrogen	<0.1	mg/1
Nitrate+Nitrite Nitrogen	<0.05	mg/l
Arsenic	<1	ug/l
Barium	<100	ug/l
Boron	₹50	ug/l
Cadmium	<1	ug/l
Chromium	<2	ug/l
Iron	60 .	ug/l
Lead	<2	ug/l
Mercury	<0.2	ug/l
Alkalinity .	(5.0	mg/l
Total Hardness	<5.0	mg/1
Chloride	<0.50	mg/1
Sulfate	<2.0	mg/1
Color	NA	
0dor	NA	
Turbidity	NA	NTU
Specific Conductance-Field	NA	umhos/cm
pH - Field	NA	units
Methylene chloride	<1	ug/l
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	<0.5	ug/l
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	<1	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	0.8	ug/l
1,2 - Dichloroethane	<1	ug/l
	Amalwaca marfarmad	l in accordance

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DN Laboratory I.D. No. 460060920

Project Manager

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56051

DESCRIPTION: Field Blank

1,1,1 - Trichloroethane	<1	ug/l
Bromodichloromethane	<1	ug/1
Benzene	<1	ug/1
Bromoform	<1	ug/1
1,1,2,2-Tetrachloroethane	<1	ug/1
Toluene	<1	ug/l
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/l
Total Xylene	<2	ug/1
1,2-Dichlorobenzene	<1	. ug/l
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethy vinyl Ether	<1	ug/1
Cis-1,2-Dichloroethylene	7	ug/l
trans-1,3-dichloropropene	<1	ug/ <u>l</u>
cis-1,3-dichloropropene	<1	ug/1
Temperature	NA	F

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DN Laboratory I.D. No. 460060920

Project Manager

1-18-49

US Army Reserve 84th Div.

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 12-22-88 SAMPLE RECEIVED: 12-22-88

SAMPLE NO: 56052

DESCRIPTION: Trip Blank

Methylene chloride	<1	ug/1
1,1 - Dichloroethylene	<1	ug/1
1,1 - Dichloroethane	<0.5	ug/1
Chloroform	<1	ug/1
Carbon tetrachloride	<1	ug/1
1,2 - Dichloropropane	<1	ug/1
Trichloroethylene (TCE)	<1	ug/1
1,1,2 - Trichloroethane	<1	ug/1
Dibromochloromethane	<1	ug/1
Tetrachloroethylene	<1	ug/1
Chlorobenzene	<1	ug/1
Trans-1,2-Dichloroethylene	<0.5	ug/1
1,2 - Dichloroethane	<1	ug/1
1,1,1 - Trichloroethane	<1	ug/1
Bromodichloromethane	<1	ug/1
Benzene	<1	ug/1
Bromoform	<1	ug/1
1,1,2,2-Tetrachloroethane	<1	ug/1
Toluene	(1	ug/l
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/1
Total Xylene	<2	ug/1
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	<1	ug/1
1,4-Dichlorobenzene	<1	ug/l
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	<0.5	ug/1
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	<1	ug/l

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Analytical & Field Services 414-458-8711

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Project Manager

U.S. Army Reserve

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

Collected by Donohue COLLECTION DATA:

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

).	56845	DESCRIPTION	OWIOIB
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TAKEN 01-23-89

		_
Methylene chloride	2	ug/1
1,1 - Dichloroethylene	<1	ug/1
1,1 - Dichloroethane	3	ug/l
Chloroform	<1	ug/1
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	<0.5	ug/l
1,1,2 - Trichloroethane	<1	ug/1
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	<0.5	ug/l
1,2 - Dichloroethane	<1	ug/l
1,1,1 - Trichloroethane	(1	ug/l
Bromodichloromethane	<1	ug/l
Benzene	ζī	ug/1
Bromoform	<u> </u>	ug/1
1,1,2,2-Tetrachloroethane	(1	ug/1
	(1	ug/l
Toluene	(1	ug/l
Ethylbenzene	₹2	ug/l
Vinyl chloride	ζ2	ug/l
Total Xylene	\1	ug/l
1,2-Dichlorobenzene	(1	ug/l
1,3-Dichlorobenzene	\1	ug/1
1,4-Dichlorobenzene	\1	ug/1
2-Chloroethylvinyl Ether	· · · · ·	ug/l
Cis-1,2-Dichloroethylene	86	ug/1
trans-1,3-dichloropropene	(1	ug/1
cis-1,3-dichloropropene	<1	uy/1

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U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

). 56844 DESCRIPTION P101A	TAKEN 01-23-69
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an in the second of the	6	ug/l
Methylene chloride	(1	ug/1
1,1 - Dichloroethylene	(0.5	ug/l
1,1 - Dichloroethane		ug/l
Chloroform	<1	ug/1
Carbon tetrachloride	<1	
1,2 - Dichloropropane	<1	ug/1
Trichloroethylene (TCE)	<.0.5	ug/1
1,1,2 - Trichloroethane	<1	ug/1
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	(1	ug/l
Trans-1,2-Dichloroethylene	(0.5	ug/1
1,2 - Dichloroethane	2	ug/l
1,2 - Dichioroethane	~ 1	ug/l
1,1,1 - Trichloroethane	ζî	ug/1
Bromodichloromethane	<u> </u>	ug/1
Benzene	\(\frac{1}{1}\)	ug/l
Bromoform	_	ug/l
1,1,2,2-Tetrachloroethane	<u> </u>	ug/1
Toluene	<1	
Ethylbenzene	<1	ug/1
Vinyl chloride	<2	ug/1
Total Xylene	₹2	ug/1
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	<1	ug/1
1,4-Dichlorobenzene	3	ug/l
I'd-Dicutofopeurene	<1	ug/l
2-Chloroethylvinyl Ether	₹0.5	ug/1
Cis-1,2-Dichloroethylene	<1 <1	ug/l
trans-1,3-dichloropropene		ug/l
cis-1,3-dichloropropene	<1	~7· =

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Project Manager

26-22

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

NO.	56846 DESCRIPTION OW102B		TAKEN 01-23-89
	Methylene chloride	3	ug/l
	1,1 - Dichloroethylene	<1	ug/l
	1,1 - Dichloroethane	3	ug/l
	Chloroform	<1	ug/l
	Carbon tetrachloride	<1	ug/l
	1,2 - Dichloropropane	<1	ug/l
	Trichloroethylene (TCE)	€0.5	ug/l
	1,1,2 - Trichloroethane	<1	ug/l
	Dibromochloromethane	<1	ug/l
	Tetrachloroethylene	<1	ug/l
	Chlorobenzene	<1	ug/l
	Trans-1,2-Dichloroethylene	<0.5	ug/l
	1,2 - Dichloroethane	<1	ug/l
	1,1,1 - Trichloroethane	<1	ug/l
	Bromodichloromethane	<1	ug/l
	Benzene	<1	ug/l
	Bromoform	(1	ug/1
	1,1,2,2-Tetrachloroethane	<1	ug/l
	Toluene	<1	ug/l
	Ethylbenzene	<1	ug/l
	Vinyl chloride	<2	ug/l
	Total Xylene	<2	ug/l
	1,2-Dichlorobenzene	< 1	ug/l
	1,3-Dichlorobenzene	<1	ug/l
	1,4-Dichlorobenzene	<1	ug/l
	2-Chloroethylvinyl Ether	<1	ug/l
	Cis-1,2-Dichloroethylene	16	ug/1
	trans-1,3-dichloropropene	<1	ug/l
	cis-1,3-dichloropropene	<1	ug/l

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Analytical & Field Services 414-458-8711

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MAYEN 01 22-80

Project Manager Date

U.S. Army Reserve

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

Collected by Donohue COLLECTION DATA:

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

ο.	56847 DESCRIPTION P102A		TAKEN 01-23-89
0.	Methylene chloride 1,1 - Dichloroethylene 1,1 - Dichloroethane Chloroform Carbon tetrachloride 1,2 - Dichloropropane Trichloroethylene (TCE) 1,1,2 - Trichloroethane	10 <1 7 <1 <1 <1 8 5	ug/1 ug/1 ug/1 ug/1 ug/1 ug/1
	Dibromochloromethane	2 <1	ug/1 ug/1
	Tetrachloroethylene Chlorobenzene	3 <0.5	ug/1 ug/1
	Trans-1,2-Dichloroethylene 1,2 - Dichloroethane	5 <1	ug/1 ug/1
	1,1,1 - Trichloroethane Bromodichloromethane	5	ug/1 ug/1
	Benzene Bromoform	(1 (1	ug/1 ug/1
	1,1,2,2-Tetrachloroethane Toluene	<1 <1	ug/1
	Ethylbenzene Vinyl chloride	<1 <2	ug/1 ug/1
	Total Xylene 1,2-Dichlorobenzene	5 18	ug/l ug/l
	1,3-Dichlorobenzene 1,4-Dichlorobenzene	14 14	ug/l ug/l
	2-Chloroethylvinyl Ether	<1 30	ug/1 ug/1
	Cis-1,2-Dichloroethylene	J 0	

<1

<1

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

trans-1,3-dichloropropene

cis-1,3-dichloropropene

Analytical & Field Services 414-458-8711

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ug/1

ug/1

2-6-49 Project Manager Date

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: SEE BELOW

SAMPLE RECEIVED: 01-23-89

NO.	56850 DESCRIPTION OW105B		TAKEN 01-23-89
_	Methylene chloride	7	ug/1
	1,1 - Dichloroethylene	<1	ug/l
ı	1,1 - Dichloroethane	4.8	ug/1
	Chloroform	<1	ug/l
1	Carbon tetrachloride	3	ug/1
	1,2 - Dichloropropane	<1	ug/l
	Trichloroethylene (TCE)	3.1	ug/1
	1,1,2 - Trichloroethane	3	ug/1
	Dibromochloromethane	<1	. ug/l
I	Tetrachloroethylene	2	ug/1
	Chlorobenzene	2	ug/l
	Trans-1,2-Dichloroethylene	2.4	ug/l
	1.2 - Dichloroethane	6 6	ug/l
	1,1,1 - Trichloroethane	6	ug/l
•	Bromodichloromethane	2	ug/l
	Benzene	<1	ug/l
l	Bromoform	<1	ug/l
	1,1,2,2-Tetrachloroethane	<1	ug/l
	Toluene	<1	ug/l
	Ethylbenzene	<1	ug/l
	Vinyl chloride	<2	ug/l
	Total Xylene	3	ug/1
	1.2-Dichlorobenzene	6	ug/l
	1.3-Dichlorobenzené	6 5 3	ug/l
	1,4-Dichlorobenzene	3	ug/l
	2-Chloroethylvinyl Ether	<1	ug/l
	Cis-1,2-Dichloroethylene	6.6	ug/l
	trans-1,3-dichloropropene	<1	ug/1
	cis-1,3-dichloropropene	<1	ug/1

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DN Laboratory I.D. No. 460060920

Project Manager

Date

2-6-02

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

0. 56851 DESCRIPTION PlOSA		TAKEN 01-23-89
Methylene chloride	2	ug/l
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	<0.5	ug/l
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	1.2	ug/l
1,1,2 - Trichloroethane	⟨1	ug/l
Dibromochloromethane	(1	ug/1
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<u>(1</u>	ug/l
Trans-1,2-Dichloroethylene	0.5	ug/l
1,2 - Dichloroethane	4	ug/l
1,1,1 - Trichloroethane	(1	ug/1
Bromodichloromethane	ζī	ug/l
	ζī	ug/l
Benzene	<1	ug/l
Bromoform	₹1	ug/1
1,1,2,2-Tetrachloroethane	(1	ug/l
Toluene	₹1	ug/1
Ethylbenzene	₹2	ug/l
Vinyl chloride	₹2	ug/1
Total Xylene	6	ug/1
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	4	ug/1
1,4-Dichlorobenzene	~ ~ 1	ug/l
2-Chloroethylvinyl Ether	20	ug/l
Cis-1,2-Dichloroethylene	20 <1	ug/1
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	/ T	~~~

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNF Laboratory I.D. No. 460060920

- Alley Milley Str ---Project Manager

U.S. Army Reserve

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

10.	56849 DESCRIPTION OW106B		TAKEN 01-23-89
•	Methylene chloride	5	ug/l
1	1,1 - Dichloroethylene	(1	ug/l
	1,1 - Dichloroethane	0.9	ug/l
•	Chloroform	3	ug/l
	Carbon tetrachloride	(1	ug/1
		ζī	ug/l
•	1,2 - Dichloropropane Trichloroethylene (TCE)	0.7	ug/1
	1,1,2 - Trichloroethane	3	ug/l
i	Dibromochloromethane	<1	ug/1
	Tetrachloroethylene	<1	ug/l
	Chlorobenzene	<u> </u>	ug/l
1	Trans-1,2-Dichloroethylene	(0.5	ug/l
	1,2 - Dichloroethane	2	ug/l
	1,1,1 - Trichloroethane	< 1	ug/1
_	Bromodichloromethane	2	ug/l
ļ	Benzene	(1	ug/1
	Bromoform	<1	ug/l
	1,1,2,2-Tetrachloroethane	<1	ug/1
1	Toluene	<1	ug/1
	Ethylbenzene	<1	ug/l
•	Vinyl chloride	〈2	ug/l
•	Total Xylene	<2	ug/l
	1,2-Dichlorobenzene	10	ug/l
1	1,3-Dichlorobenzene	8	ug/l
	1,4-Dichlorobenzene	8	ug/1
	2-Chloroethylvinyl Ether	<1	ug/l
	Cis-1,2-Dichloroethylene	4	ug/l
•	trans-1,3-dichloropropene	<1	ug/1
f	cis-1,3-dichloropropene	<1	ug/l

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Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNR Laboratory I.D. No. 46,0060920

Shyden 2-6-47 Project Manager

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

).	56848 DESCRIPTION Pl06A		TAKEN 01-23-89
	Methylene chloride	9	ug/l
	1,1 - Dichloroethylene	<1	ug/l
	1,1 - Dichloroethane	2	ug/l
	Chloroform	5	ug/l
	Carbon tetrachloride	<1	ug/l
	1,2 - Dichloropropane	<1	ug/l
	Trichloroethylene (TCE)	<0.5	ug/l
	1,1,2 - Trichloroethane	6	ug/l
	Dibromochloromethane	3	ug/l
	Tetrachloroethylene	<1	ug/1
	Chlorobenzene	2	ug/l
	Trans-1,2-Dichloroethylene	<0.5	ug/l
	1,2 - Dichloroethane	5	ug/l
	1,1,1 - Trichloroethane	<1	ug/l
	Bromodichloromethane	4	ug/1
	Benzene	<1	ug/l
	Bromoform	2	ug/l
	1,1,2,2-Tetrachloroethane	<1	ug/l
	Toluene	<1	ug/l
	Ethylbenzene	<1	uġ/l
	Vinyl chloride	<2	ug/l
	Total Xylene	4	ug/l
	1,2-Dichlorobenzene	17	ug/l
	1,3-Dichlorobenzene	12	ug/l
	1,4-Dichlorobenzene	12	ug/l
	2-Chloroethylvinyl Ether	<1	ug/l
	Cis-1,2-Dichloroethylene	10	ug/1
	trans-1,3-dichloropropene	<1	ug/l
	cis-1,3-dichloropropene	<1	ug/1

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Project Manager

Date

2-6-49

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56874 DESCRIPTION: 0W112B

Mohal BODE	⟨2	mg/1
Total BOD5	\2 \5	mg/1
Total COD	₹0.1	mg/1
Ammonia Nitrogen	<0.05	mg/l
Nitrate+Nitrite Nitrogen		-
Arsenic	2	ug/1
Barium	180	ug/1
Boron	160	ug/1
Cadmium	<u><1</u>	ug/1
Chromium	(2	ug/1
Iron	870	ug/1
Lead	(2	ug/1
Mercury	<0.2	ug/l
Alkalinity	376	mg/1
Total Hardness	600	mg/l
Chloride	23.5	mg/l
Sulfate	226	mg/l
Methylene chloride	<1	ug/l
1,1 - Dichloroethylene	5	ug/l
1,1 - Dichloroethane	15	ug/l
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/1
Trichloroethylene (TCE)	209	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	2.0	ug/l
1,2 - Dichloroethane	2	ug/l
1,1,1 - Trichloroethane	<1	ug/l
Bromodichloromethane	<1	ug/1
Benzene	<1	ug/l
Bromoform	<1	ug/l
1,1,2,2-Tetrachloroethane	(1	ug/l

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNR Laboratory I.D. No. 460060920

Project Manager

2-14-19_ Date

U.S. Army Reserve

ATIN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56874 DESCRIPTION: OW112B

Toluene	<1		ug/l
Ethylbenzene	<1		ug/1
Vinyl chloride	· <2		ug/l
Total Xylene	<2		ug/l
1,2-Dichlorobenzene	<1		ug/1
1,3-Dichlorobenzene	<1		ug/l
1,4-Dichlorobenzene	<1		ug/l
2-Chloroethylvinyl Ether	<1		ug/l
Cis-1,2-Dichloroethylene	118		ug/l
trans-1,3-dichloropropene	<1	•	ug/l
cis-1,3-dichloropropene	<1		ug/l

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Analytical & Field Services 414-458-8711

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Project Manager

2:/4:49__ Date

U.S. Army Reserve

m-L-1 DADE

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56872 DESCRIPTION: P112A

Total BOD5	<2				mg/l
Total COD	<5				mg/l
Ammonia Nitrogen	<0.1				mg/1
Nitrate+Nitrite Nitrogen	<0.05	ı			mg/1
Arsenic	1				ug/l
Barium	180				ug/1
Boron	130				ug/1
Cadmium	<1		•		ug/l
Chromium	< 2				ug/1
Iron	1,810		•		ug/l
Lead	<2				ug/l
Mercury	<0.2				ug/l
Alkalinity	382				mg/1
Total Hardness	670		•		mg/1
Chloride	195				mg/1
Sulfate	201				mg/l
Methylene chloride	<1				ug/1
1,1 - Dichloroethylene	46				ug/l
1,1 - Dichloroethane	104				ug/l
Chloroform	<1				ug/l
Carbon tetrachloride	<1				ug/l
1,2 - Dichloropropane	<1				ug/1
Trichloroethylene (TCE)	56				ug/1
1,1,2 - Trichloroethane	<1				ug/l
Dibromochloromethane	<1				ug/l
Tetrachloroethylene	<1				ug/l
Chlorobenzene	<1				ug/l
Trans-1,2-Dichloroethylene	27				ug/l
1,2 - Dichloroethane	22				ug/l
1,1,1 - Trichloroethane	<1				ug/l
Bromodichloromethane	<1				ug/1
Benzene	4				ug/l
Bromoform	<1				ug/l
1,1,2,2-Tetrachloroethane	<1				ug/l
•		Analyses	performed	in	accord

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Analytical & Field Services 414-458-8711

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---- / J

Project Manager

2-/4- Y2 Date

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56872 DESCRIPTION: P112A

Toluene	<1	ug/l
Ethylbenzene	<1	ug/l
Vinyl chloride	⟨2	ug/l
Total Xylene	<2	ug/l
1,2-Dichlorobenzene	(1	ug/l
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/l
2-Chloroethylvinyl Ether	(1	ug/l
Cis-1,2-Dichloroethylene	762	ug/l
trans-1,3-dichloropropene	<1	ug/l
cis-1,3-dichloropropene	<1	ug/l

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

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fully infers 2-14-69

U.S. Army Reserve

M-4-1 DADC

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56871 DESCRIPTION: 0W113B

Total BOD5	<2	ma/l
Total COD	(5	mq/1
Ammonia Nitrogen	0.12	mg/l
Nitrate+Nitrite Nitrogen	<0.05	mg/1
Arsenic	2	ug/l
Barium	140	ug/1
Boron	<50	ug/l
Cadmium	<1	ug/l
Chromium	<2	ug/l
Iron	90	ug/l
Lead	<2	ug/l
Mercury	(0.2	ug/l
Alkalinity	336	mg/1
Total Hardness	478	mg/l
Chloride	45.5	mg/l
Sulfate	131	mg/1
Methylene chloride	3	ug/l
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	<0.5	ug/l
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/1
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	<0.5	ug/l
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	(0.5	ug/l
1,2 - Dichloroethane	<1	ug/1
1,1,1 - Trichloroethane	(1	ug/l
Bromodichloromethane	(1	ug/l
Benzene	(1	ug/1
Bromoform	(1	ug/l
1,1,2,2-Tetrachloroethane	(1	ug/1

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Analytical & Field Services 414-458-8711

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m~/1

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56871 DESCRIPTION: 0W113B

Toluene	<1	ug/l
Ethylbenzene	<1	ug/l
Vinyl chloride	<2	ug/l
Total Xylene	< 2	ug/l
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/l
2-Chloroethylvinyl Ether	<1·	ug/l
Cis-1,2-Dichloroethylene	1.7	ug/l
trans-1,3-dichloropropene	<1	ug/l
cis-1,3-dichloropropene	<1	ug/l

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

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Project Manager

2-14-29

U.S. Army Reserve

Mr. Dave Voight ATTN:

PROJECT NUMBER: 15977.007

Collected by Donohue COLLECTION DATA:

SAMPLE COLLECTED: 01-24-89 01-24-89 SAMPLE RECEIVED:

> 56870 SAMPLE NO: DESCRIPTION: P113A

Total BOD5	< 2			mg/1
Total COD	₹5			mg/1
Ammonia Nitrogen	0.12			mg/l
Nitrate+Nitrite Nitrogen	<0.05			mg/1
Arsenic	1			ug/l
Barium	220			ug/l
Boron	⟨50			ug/1
Cadmium	(1			ug/l
Chromium	〈 2			ug/l
Iron	₹50			ug/l
Lead	<2			ug/l
Mercury	(0.2			ug/l
Alkalinity	426			mg/1
Total Hardness	634			mg/l
Chloride	52.6			mg/l
Sulfate	301			$m\sigma/1$
Methylene chloride	1.5			ug/l
1,1 - Dichloroethylene	<1			ug/l
1.1 - Dichloroethane	(0.5			ug/l
Chloroform	<1			ug/1
Carbon tetrachloride	₹1			ug/l
1,2 - Dichloropropane	<ί			ug/1
Trichloroethylene (TCE)	₹0.5			ug/1
1,1,2 - T ichloroethane	<1			ug/1
Dibromoch promethane	ζī			ug/1
	ζÎ			ug/l
Tetrachloroethylene	₹1			ug/l
Chlorobenzene	(0.5			ug/1
Trans-1.2-Dichloroethylene	(1			ug/l
1,2 - Dichloroethane	(1			ug/1
1,1,1 - Trichloroethane	₹1			ug/1
Bromodichloromethane	⟨1			ug/1
Benzene	1			ug/1
Bromoform	(1			ug/l
1,1,2,2-Tetrachloroethane	/ T	Analyses	performed	

Donohue Analytical 4738 North 40th Street Sheboygan, Wisconsin 53083

Analytical & Field Services 414-458-8711

Analyses performed in accordance with procedures approved by the U.S. EPA. Certified by the State of Wisconsin DNR Laboratory I.D. No. 460060920

Project Manager

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56870 DESCRIPTION: P113A

Toluene	<1	ug/l
Ethylbenzene	<1	uq/l
Vinyl chloride	< 2	ug/l
Total Xylene	< 2	ug/1
1,2-Dichlorobenzene	<1	uq/l
1,3-Dichlorobenzene	(1	ug/l
1,4-Dichlorobenzene	<1	ug/l
2-Chloroethylvinyl Ether	<1	uq/l
Cis-1,2-Dichloroethylene	10	uq/1-
trans-1,3-dichloropropene	<1	uq/1
cis-1,3-dichloropropene	<1	ug/1

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Analytical & Field Services 414-458-8711

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Project Manager

2-14-2

U.S. Army Reserve

Mr. Dave Voight ATTN:

15977.007 PROJECT NUMBER:

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

NO.	56852 DESCRIPTION Field	Blank	TAKEN 01-23-89
	Methylene chloride	6	ug/1
	1,1 - Dichloroethylene	<1	ug/1
	1,1 - Dichloroethane	<0.5	ug/1
	Chloroform	<1	ug/l
	Carbon tetrachloride	<1	ug/1
	1,2 - Dichloropropane	<1	ug/l
	Trichloroethylene (TCE)	1.1	ug/1
	1,1,2 - Trichloroethane	<1	. ug/1-
	Dibromochloromethane	(1	ug/l
	Tetrachloroethylene	<1	ug/1
	Chlorobenzene.	<u>(1</u>	ug/l
	Trans-1,2-Dichloroethylene	⟨0.5	ug/l
	1,2 - Dichloroethane	(1	ug/l
	1,1,1 - Trichloroethane	<1	ug/l
	Bromodichloromethane	⟨1	ug/l
	Benzene	<1	ug/1
	Bromoform	⟨1	ug/l
	1,1,2,2-Tetrachloroethane	₹1	ug/l
	Toluene	(1	ug/1
		₹1	ug/l
	Ethylbenzene	₹2	ug/1
	Vinyl chloride	₹2	ug/1
	Total Xylene	₹1	ug/1
	1,2-Dichlorobenzene	λī	ug/l
,	1,3-Dichlorobenzene	λī	ug/1
	1,4-Dichlorobenzene 2-Chloroethylvinyl Ether	₹1	ug/1
	Cis-1,2-Dichloroethylene	0.6	ug/1
	trans-1,3-dichloropropene	<1	ug/1
	cis-1,3-dichloropropene	₹1	ug/1
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Analytical & Field Services 414-458-8711

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2-6-49 Project Manager

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: SEE BELOW SAMPLE RECEIVED: 01-23-89

. 56853 DESCRIPTION 1	Trip Blank	TAKEN 01-23-89
Methylene chloride	43	ug/1
1,1 - Dichloroethylene	e <1	ug/l
1,1 - Dichloroethane	<0.5	ug/1
Chloroform	4	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE	E) <0.5	ug/l
1,1,2 - Trichloroethan	ne <1	ug/1
Dibromochloromethane	<1	ug/l
Tetrachloroethylene	<1	ug/l
Chlorobenzene	(1	ug/l
Trans-1,2-Dichloroethy		ug/1
1,2 - Dichloroethane	1.3	ug/l
1,1,1 - Trichloroethan		ug/l
Bromodichloromethane	<1	ug/l
Benzene	<1	ug/l
Bromoform	<u>(1</u>	ug/l
1,1,2,2-Tetrachloroeth		ug/l
Toluene	(1	ug/l
Ethylbenzene	$\langle 1 \rangle$	ug/l
Vinyl chloride	<2	ug/1
Total Xylene	<2	ug/l
1,2-Dichlorobenzene	(1	ug/1
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	3	ug/l
2-Chloroethylvinyl Eth		ug/l
Cis-1,2-Dichloroethyle	ne <0.5	ug/l
trans-1,3-dichloroprop		ug/l
cis-1,3-dichloropropen	e <1	ug/l

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Project Manager

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: 56873 DESCRIPTION: P122B

Total BOD5	<2				mg/l
Total COD	< 5				mā∖J
Ammonia Nitrogen	<0.1				mg/l
Nitrate+Nitrite Nitrogen	(0.05				mg/l
Arsenic	<1				ug/l
Barium	160				ug/1
Boron	220				ug/l
Cadmium	<1				ug/l
Chromium	<2				ug/l
Iron	1,810				ug/l
Lead	<2				ug/l
Mercury	<0.2				ug/l
Alkalinity	388				mg/l
Total Hardness	688				mg/l
Chloride	231				mg/l
Sulfate	181				mg/l
Methylene chloride	<1				ug/l
1,1 - Dichloroethylene	20				ug/1
1,1 - Dichloroethane	38				ug/l
Chloroform	23				ug/l
Carbon tetrachloride	<1				ug/1
1,2 - Dichloropropane	<1				ug/l
Trichloroethylene (TCE)	28				ug/l
1,1,2 - Trichloroethane	<1				ug/l
Dibromochloromethane	<1				ug/l
Tetrachloroethylene	<1				ug/l
Chlorobenzene	<1				ug/l
Trans-1,2-Dichloroethylene	12.2				ug/l
1.2 - Dichloroethane	<1				ug/1
1,1,1 - Trichloroethane	<1				ug/1
Bromodichloromethane	2				ug/1
Benzene	<1				ug/1
Bromoform	<1				ug/1
1,1,2,2-Tetrachloroethane	<1	_			ug/l
•		Analyses	performed	ın	accord

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U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

> SAMPLE NO: .56873 DESCRIPTION: P122B

Toluene	< 1	ug/1
	(1	ug/1
Ethylbenzene	₹2	ug/l
Vinyl chloride		ug/1
Total Xylene	₹2	ug/1
1,2-Dichlorobenzene	<1	•
1,3-Dichlorobenzene	<1	ug/1
1.4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/1
Cis-1,2-Dichloroethylene	422	ug/l
trans-1,3-dichloropropene	<1	ug/1
cis-1,3-dichloropropene	<1	ug/l

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Project Manager

2-14-09

U.S. Army Reserve

Total BOD5

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 01-24-89

SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56875

DESCRIPTION: Field Blank

TOTAL HODS	\ 2			mg/1
Total COD	₹5			mq/1
Ammonia Nitrogen	<0.1			mg/1
Nitrate+Nitrite Nitrogen	<0.05			mg/1
Arsenic	<1			ug/l
Barium	<100			ug/1
Boron	<50			ug/1
Cadmium	<1.			ug/l
Chromium	(2			ug/1
Iron	<50			ug/1
Lead	<2			ug/l
Mercury	<0.2			ug/1
Alkalinity	<10.0			mq/1
Total Hardness	(5.0			mg/1
Chloride	<0.50			mg/1
Sulfate	<2.0			mq/1
Methylene chloride	5			ug/1
1,1 - Dichloroethylene	(1			ug/1
1,1 - Dichloroethane	<0.5			ug/1
Chloroform	<1			ug/1
Carbon tetrachloride	<1			ug/l
1,2 - Dichloropropane	<1			ug/l
Trichloroethylene (TCE)	<0.5			ug/1
1,1,2 - Trichloroethane	<1			ug/l
Dibromochloromethane	<1			ug/1
Tetrachloroethylene	<1			ug/l
Chlorobenzene	(1			ug/l
Trans-1,2-Dichloroethylene	(0.5			ug/l
1,2 - Dichloroethane	<1			ug/l
1,1,1 - Trichloroethane	<1			ug/l
Bromodichloromethane	<1			ug/1
Benzene	<1			ug/l
Bromoform	<1			ug/l
1,1,2,2-Tetrachloroethane	<1			ug/l
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Project Manager

2-14-49

U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue

SAMPLE COLLECTED: 01-24-89 SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56875

DESCRIPTION: Field Blank

Toluene	<1	ug/1
Ethylbenzene	<1	ug/1
Vinyl chloride	⟨2	ug/l
Total Xylene	<2	ug/l
1,2-Dichlorobenzene	<1	ug/1
1,3-Dichlorobenzene	<1	ug/1
1,4-Dichlorobenzene	<1	ug/1
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	<0.5	. ug/l·
trans-1,3-dichloropropene	<1	ug/l
cis-1,3-dichloropropene	<1	ug/1

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U.S. Army Reserve

ATTN: Mr. Dave Voight

PROJECT NUMBER: 15977.007

COLLECTION DATA: Collected by Donohue SAMPLE COLLECTED: 01-24-89

SAMPLE RECEIVED: 01-24-89

SAMPLE NO: 56876

DESCRIPTION: Trip Blank

Methylene chloride	6	ug/l
1,1 - Dichloroethylene	<1	ug/l
1,1 - Dichloroethane	<0.5	ug/l
Chloroform	<1	ug/l
Carbon tetrachloride	<1	ug/l
1,2 - Dichloropropane	<1	ug/l
Trichloroethylene (TCE)	<0.5	ug/1
1,1,2 - Trichloroethane	<1	ug/l
Dibromochloromethane	<1	ug/1
Tetrachloroethylene .	<1	. ug/l
Chlorobenzene	<1	ug/l
Trans-1,2-Dichloroethylene	<0.5	ug/l
1,2 - Dichlorcethane	<1	ug/l
1,1,1 - Trichloroethane	<1	ug/1
Bromodichloromethane	<1	ug/l
Benzene	<1	ug/l
Bromoform	<1	ug/l
1,1,2,2-Tetrachloroethane	<1	ug/l
Toluene	<1	ug/1
Ethylbenzene	<1	ug/l
Vinyl chloride	<2	ug/l
Total Xylene	<2	ug/l
1,2-Dichlorobenzene	<1	ug/l
1,3-Dichlorobenzene	<1	ug/l
1,4-Dichlorobenzene	<1	ug/l
2-Chloroethylvinyl Ether	<1	ug/l
Cis-1,2-Dichloroethylene	<0.5	ug/l
trans-1,3-dichloropropene	<1	ug/l
cis-1,3-dichloropropene	<1	ug/l

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Analytical & Field Services 414-458-8711

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Project Manager

APPENDIX G

WISCONSIN DNR GROUNDWATER MONITORING WELL INSTALLATION FORM

GROUNDWATER MONTIONING TO Chapter 144, Wis. State.

Pacific Name				Γ	Pecificy ID Number Date	300			Completed	Completed By (Name and Pirm)									
U.S. Acmy	Reserve	U.S. ACITY Reserve Complex Milwaukee	Ä	88		3/8/80	Œ/		D. Void		hre 6	ASS	ciates						
			-	L) PPM	4		Elevations		Rolor	83	Reference Screen	3			90	Type of Well [-]	2
Well Name		Well Location	_ z	8	W Established	Diam. Type	Type	Top of Well Casing	Ground Surface	Screen Top	MSL Date	312	Length	Material	Well Depth PIEZOW PWLYSOther	PIEZ	OW P	WLYE	SOther
		418017.3	×	口								_					-	-	
OW-1128		2539210.0		×	11/17/88	2 "	۵	691.36	694.54	67765	×		10.01	PVC	23.71		×		_
P-112A		418021.4	×	×	11/23/88	2	۵	691.22	691.76	653.03	×		5.0	PVC	43.19	×			
		415877.9	 ×						7								\dagger	╁	-
04-1138		<u></u>	\vdash	×	11/15/88	2"	Ь	682.94	679.44	672.60	×		10.1	PYC	20.64		×		
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