893

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:
5090
095/H11.9
4 Mar 92

Director, Waste Management Division
RCRA Permitting Branch (5HR-13)
U.S. Environmental Protection Agency, Region V
Attn: Ms. Carol Witt-Smith (Indiana Section)
230 South Dearborn Street
Chicago, IL 60604

Dear Ms. Witt-Smith:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV) submits three copies of the RFI Workplan for the Pest Control Area (PCA) - R150 site as enclosure (1) for your review. Appendix A of the Workplan consist of the responses to EPA comments on the Draft Workplan. Enclosure (2) is the required Certification Statement.

This workplan will become final on April 13, 1992, unless Region V requests an extension. Figure 2.2.2 on page 24 of the Workplan illustrates the work durations and milestone dates for the RFI Phase III Groundwater Release Characterization study.

NAVSURFWARCENDIV point of contact is Mr. Thomas J. Brent, Code 09510, telephone 812-854-3233. Northern Division, Naval Facilities Engineering Command (NORTHNAVFACENGCOM) point of contact is Mr. Bill Schrock, Code 142, telephone 215-897-6280.

Sincerely,

J. D. FARIS
Assistant Public Works Officer
By direction of
the Commander

Encl:
(1) RFI Workplan for the PCA - R150 site
(2) Certification Statement

Copy to: (w/o encl)
NORTHNAVFACENGCOM, BILL SCHROCK (Code 142)
NORTHNAVFACENGCOM, JEFF CIOCCO (Code 142)
COMNAVSEASYSCOM (SEA 654E)
USAE-WES, BILL MURPHY (GG-YH)
USAE-WILMINGTON, KAMALA POWELL (EN-GG)

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USAE-WILMINGTON, KAMALA POWELL (EN-GG)

TBrent 09510 3/14
Sane 3/14/92

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant pernalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE

Assistant Public Works Officer 4 Mar 92

TITLE DATE

Enclosure (2)

111

Admin Records
015

FINAL PCA/R-150 TANK SITE

IN5 170 023 498
FEBRUARY 1992

RFI Phase II Soils & Phase III Groundwater Workplan for Pest Control Area/R-150 Tank Site, SWMU #09/05 Naval Weapons Support Center, Crane, Indiana

Prepared by:
U.S. Army Corps of Engineers
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Prepared for:
Northern Division,
Naval Facilities Engineering Command
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Philadelphia, Pennsylvania

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1.0 INTRODUCTION

1.1.0 SITE DESCRIPTION

1.1.1 **BACKGROUND**. To fulfill the Corrective Action Requirements (CAR) of the Federal Portion of the Final Resource Conservation Recovery Act/Hazardous and Solid Waste Amendments (RCRA/HSWA) Storage Permit, and the Indiana Department of Environmental Management (IDEM), Naval Weapons Support Center Crane (NWSCC), Indiana is evaluating its hazardous waste management practices at its past and present disposal sites. This RCRA Facility Investigation (RFI) Phase II Soils, Phase III Ground water study will be conducted at an area known as the Pesticide Control/R-150 Tank Site (PCA/R-150 Tank Site). The US Army Corps of Engineers' (USACE), Waterways Experiment Station (USACEWES) will be conducting the study. An Initial Assessment Study (IAS) was performed in 1981 and published in 1983 by Naval Energy and Environmental Support Activity (NEESA). The IAS is the first phase of the Navy Assessment and Control of Installation Pollutants (NACIP) Program. The NACIP Program intent was to evaluate pollution problems at Naval Facilities. With the passage of Superfund Amendments and Reauthorization Act (SARA) in 1986, NACIP Program changed to the Installation Restoration Program Navy (IRP). This RFI Phase II Soils Study and Phase III Ground water Study is the response to the necessary actions needed to be taken at this site.

1.1.2 **LOCATION**. NWSCC is a Navy facility located in Martin County Indiana. NWSCC covers 62,463 acres approximately 100 square miles. The PCA/R-150 Tank Site is located in the central portion of the facility in the NW 1/4 of section 23, T5N, R4W (Figure 1.1.2A). The site includes Building 55, the previous Pesticide Control Building located approximately 5.0 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-45, Building 2189, the present Pesticide Control Building located approximately 5.5 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-45, and the R-150 Tank Site located approximately 5.5 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-349 (Figure 1.1.2B).

1.1.3 **SITE HISTORY**. Due to the lack of complete and accurate written data of the site history of the PCA/R-150 Tank Site, the following information is as complete a summary as possible, written by NWSCC, Code 0924 Ron Bledso.

1.1.3.1 **BUILDING 55**. Pesticide spray tanks and containers were most likely rinsed in the vicinity of Building 55, (Figure 1.1.3 Area "A") the previous Pesticide Control Building. Chemicals used at this site from 1950 to 1974 include but are not limited to herbicides 2,4-D, 2,4,5-T Silvex (a mixture of 2,4-D & 2,4-T) Fenac, Monuron and Ureabor. Insecticides include Carbaryl, Chlordane DDT, Diazinon, Dieldrin, Lindane, Malathion and Pyrethrum.

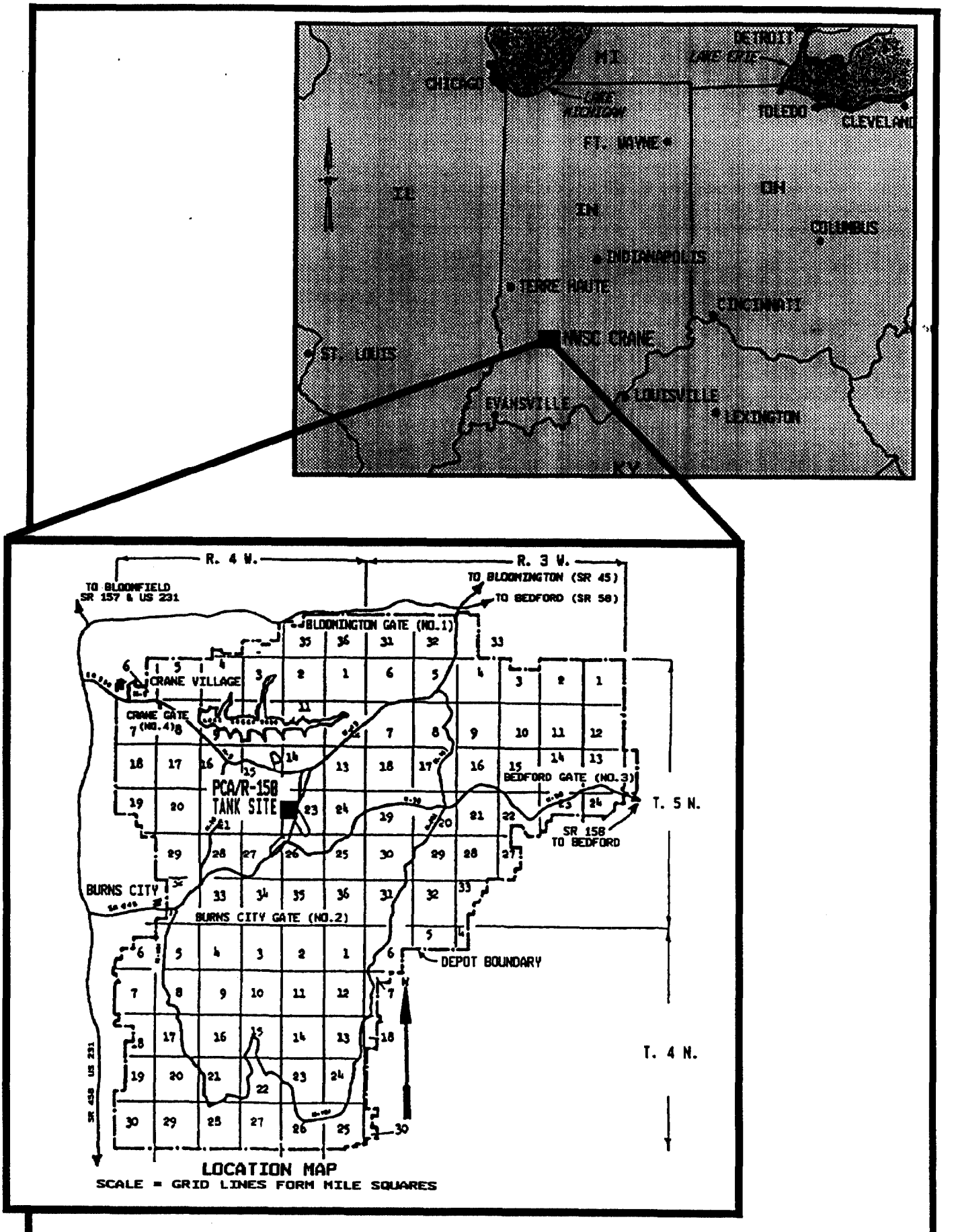
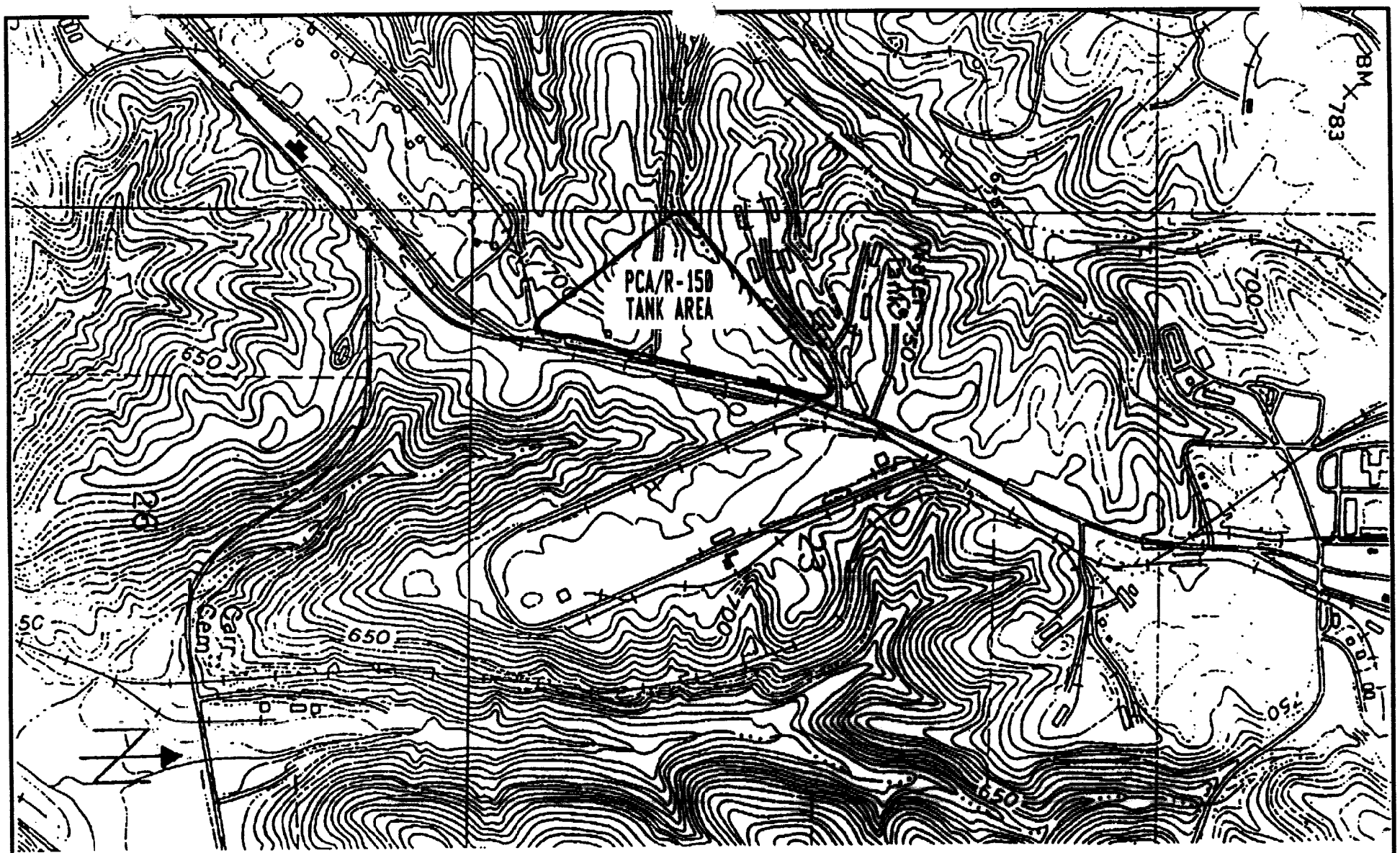


Figure 1.1.2A Location Map showing the location of NWSC Crane in the SW center of Indiana & the PCA/R-150 Tank Site located in the central portion of NWSC Crane.



SCALE 1:24000

1 1/2 0 1 MI.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

.5 0 1 KILOMETER

USGS TOPOGRAPHIC MAP OF THE CENTRAL PORTION OF NWSC CRANE SHOWING THE PCA/R-150 TANK AREA.

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE 1.1.28

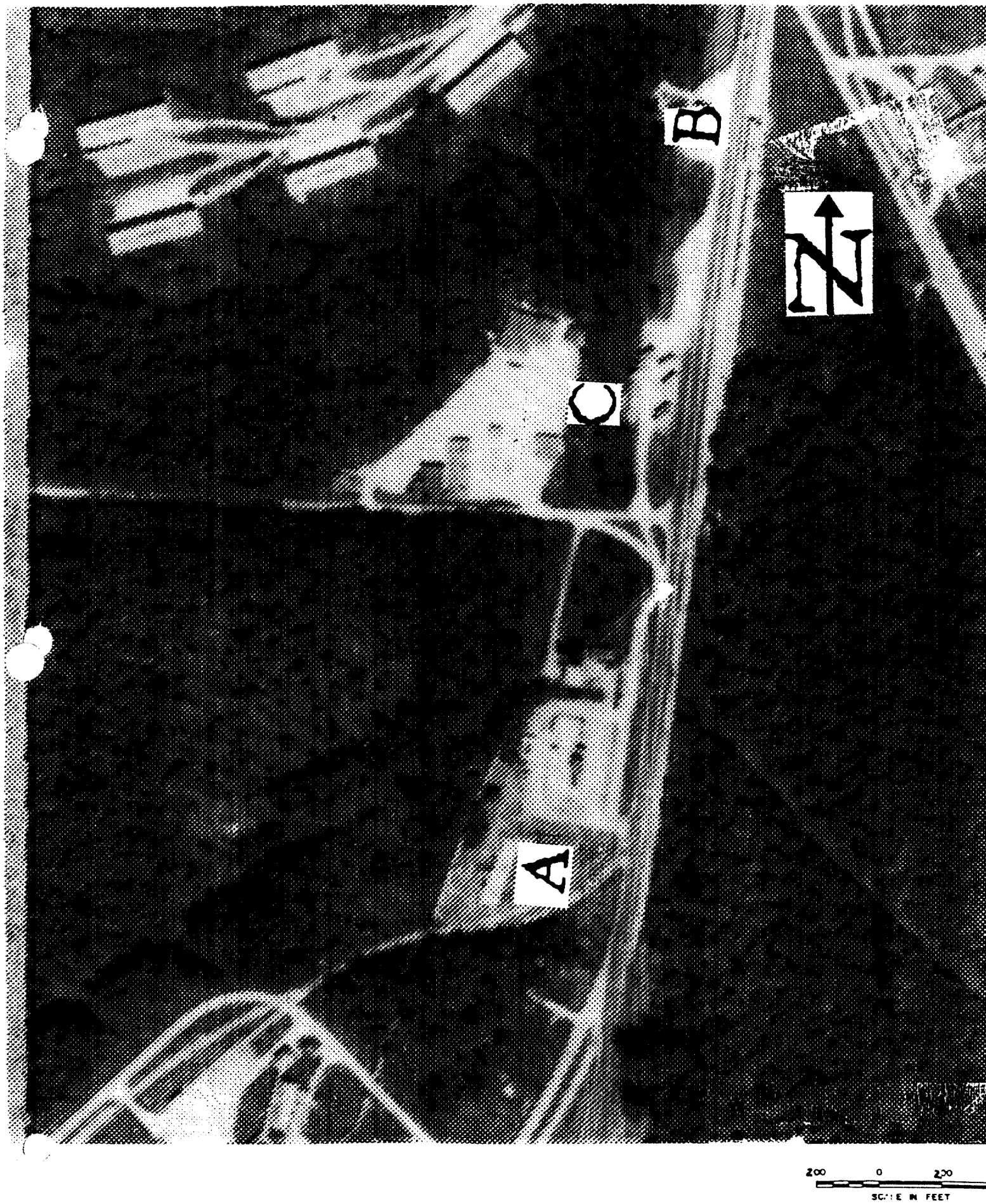


Figure 1.1.3 Aerial photograph showing Bldg 55 (A), Bldg 2189 (B), R-150 Tank Site, and Unit Boundary.

1.1.3.2 **BUILDING 2189**. The Pest Control Building was moved from Building 55 to its present location, Building 2189 (Figure 1.1.3 Area "B") around 1970. In addition to the chemicals stored and used out of Building 55, an additional inventory of chemicals were added which include herbicide Krovar (a mixture of Duron and Bromac). Krovar was used on graveled storage areas and railroad right-of-ways at a rate of 5-20 lbs per acre. During the last 5 years the herbicide oust was used on right-of-ways of railroad and magazine drives between the bunkers and blast wall at the rate of 2-4 ounces per acre. Building 55 has since been demolished and the site is now a concrete pad.

Around 1974, herbicides 2,4,5-T and Monuron stored at Building 2105 (located west of Building 2074 N.W. H-460 and H-101) and used by railroad personnel on the railroad right-of-way, was taken to Building 2189 for storage.

Neither pesticide containers nor rinsates have been emptied in the vicinity of Building 2189 since approximately 1974. Containers are triple rinsed and the rinsate used in the mixture. Large spraying equipment is flushed with water and the rinsate is used in the treatment area. When the sprayers are winterized at the end of the spraying season the rinse water is collected and used the following spring in the first spray mixture that is applicable.

1.1.3.3 **R-150 TANK AREA**. A R-150 Tank was installed in the early 1970's in the gravel parking lot adjacent to H-349 (Figure 1.1.3 Area "C"). The tank contained spent solvents. The R-150 Tank was 11 ft. wide by 35 ft. long. The base of the tank was estimated to be 15 ft. deep (Figure 1.1.4A). The tank was excavated and removed 27-28 September 1983 by NWSCC personnel. The excavated contaminated soil was placed back in the excavation site (hole) to await approval from the Illinois Environmental Protection Agency to landfill the soil in the Chemical Waste Management Landfill located at Calumet City, Illinois. The excavated contaminated soil was removed for disposal to the Chemical Waste Management Landfill in December 1983.

1.1.4 **SITE HYDROGEOLOGY**. The PCA/R-150 Tank Site lies along a northwesterly trending slope. At the foot of the slope an intermittent stream flows. The PCA/R-150 Tank Site soil consists of 2 to 10 feet of clay (CL) and clayey sand (SP-SC) overburden which is underlain by Pennsylvanian age sedimentary rocks of the Raccoon Creek and Mansfield Formation. Sedimentary rocks underlying the PCA/R-150 Tank Site consists of interbedded sandstone, clay, shale, occasional limestone and coal. Sandstone and shale are the predominant rock types (Figure 1.1.4A). Ground water studies indicate that the ground water flows through the soil or in rock fractures with the static water level averaging 14 ft. below ground surface. Ground water flow is to the west-northwest. Ground water elevations range from about 720 ft. m.s.l. near monitoring wells WES 9-1-81 and WES 9-10-83 to about 695 ft. m.s.l. near

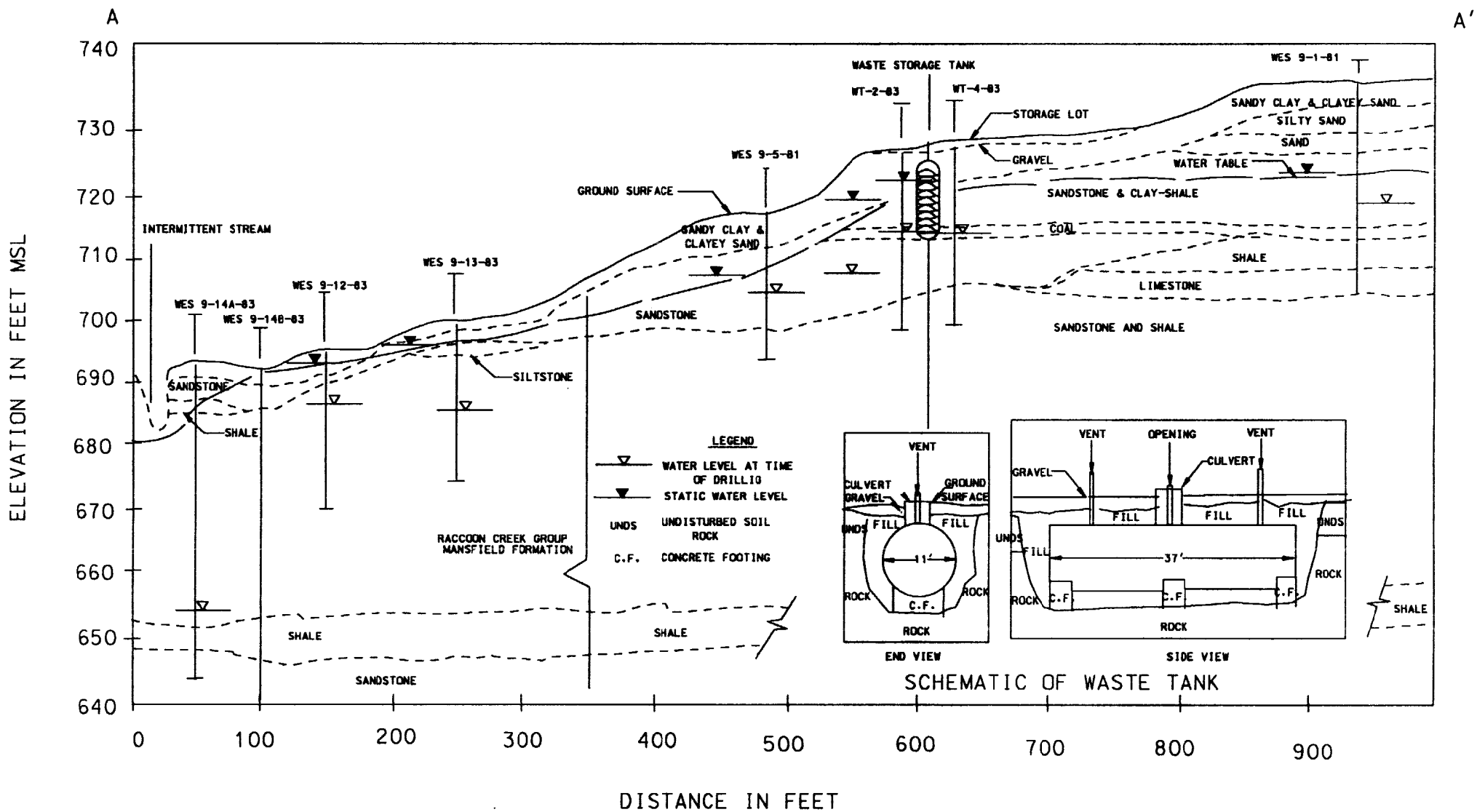


Figure 1.1.4A PCA/R-150 Tank Area Geological Cross Section and Schematic Diagram of R-150 Tank (Dunbar, 1984).

monitoring wells WES 9-12-83 and WES 9-13-83 (Figure 1.1.4B). The water table was approximately 7.5 ft. below ground surface at the R-150 Tank with a rapid decline in elevation down gradient from the R-150 Tank. Down gradient from monitoring well WES 9-3-81, the water table is found within a few feet of ground surface and is believed to drop below the stream bed as shown by Figure 1.1.4 (Dunbar, 1984).

1.2.0 STUDY HISTORY

1.2.1 PREVIOUS INVESTIGATIONS. All previous investigations were performed in the vicinity of Building 2189 and the R-150 Tank Site. Investigations were not performed at or near Building 55 due to the fact that at the time of the study it was not known that Building 55 was the previous Pesticide Control Building.

In 1981 a team from USACEWES completed a ground water and soils investigation at the PCA/R-150 Tank Site. Nine monitoring wells were installed at this time (Figure 1.2.1A, WES 9-1-81 to WES 9-9-81).

In July 1983, prior to excavation of the tank in September 1983, USACEWES drilled four core borings, one on each side of the tank (Figure 1.2.1A, WT-1-83 to WT-4-83). Water and soil samples (grab) from the borings were collected and analyzed. The analytical results from these samples collected in July are found in Table 1.2.1, 1.2.2, 1.2.3, and 1.2.4.

As the R-150 Tank was being excavated on September 27, 1983, a visual inspection was conducted to locate any areas of visible contamination (dark-oily areas). This visual inspection found two areas on the south end of the tank that appeared to be contaminated (Figure 1.2.1B). At sampling points identified as 6 and 7, soil samples were collected, composited and analyzed. As the soil around the tank was excavated using a Gradall (truck mounted backhoe), grab samples were collected and composited into three samples from each of these sampling points. The average depth of the tank was calculated to be 15 feet. One sample was composited from each 5 feet of depth. Six soil samples were collected from sampling points 6 and 7. At sampling point 5, a composite soil sample was taken at a depth of 10-15 feet. The analytical results from these seven samples are listed on Table 1.2.5 and 1.2.6.

Five monitoring wells were also installed at the PCA/R-150 Tank Site in 1983. (Figure 1.2.1C, WES 9-10-83 to WES 9-14A-83). The investigation was followed by a draft report "Definition of Contaminated Ground Water Plumes at Selected Waste Disposal Sites", Naval Weapons Support Center, Crane, Indiana (Dunbar 1984). It reported that ground water quality testing resulted in the detection of organic contaminants. Results indicated Trichloroethylene and Trans-1,2-Dichloroethylene were present in ground water samples drawn from monitoring

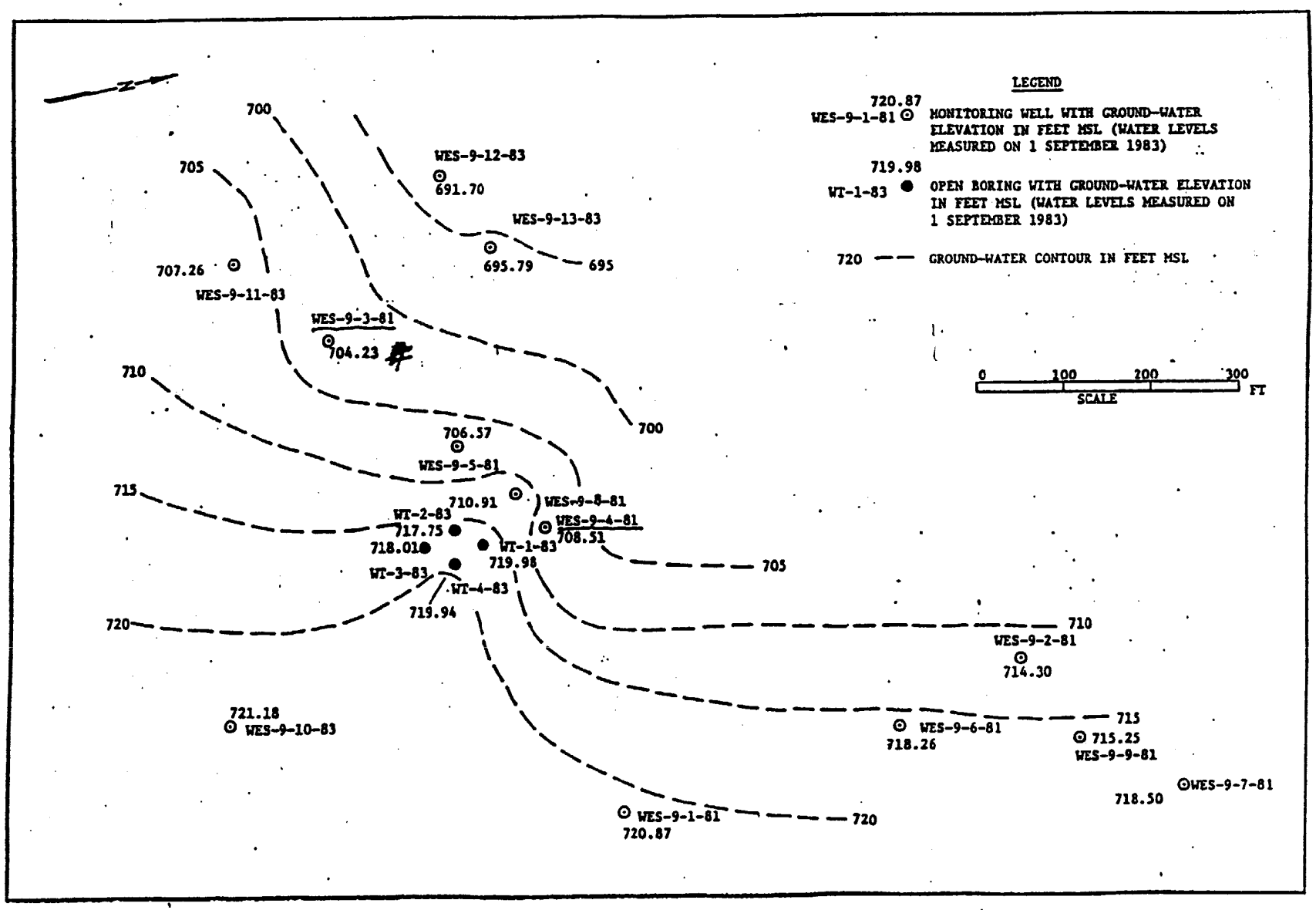


Figure 1.1.4B Ground water contour map of the PCA/R-150 Tank Site.

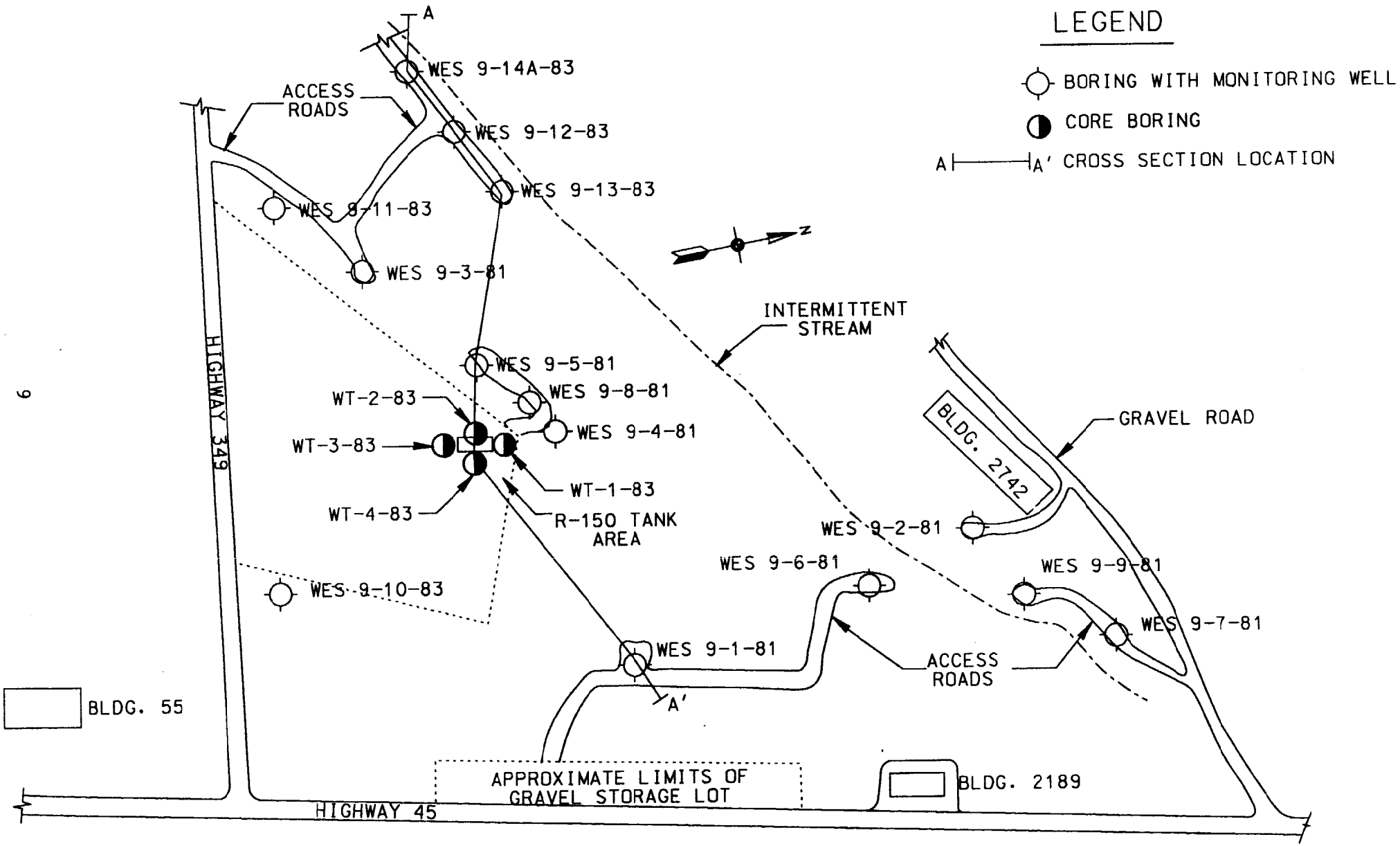


Figure 1.2.1A Schematic diagram PCA/R-150 Tank Area. Site includes Bldg 2189, Bldg 55, and R-150 Tank Area.

TABLE 1.2.1
SOIL SAMPLE RESULTS OF 4 CORE BORINGS
DRILLED IN 1983
Results: mg/kg

	SAMPLE NUMBER							
	WES WT-1-83		WES WT-2-83		WES WT-3-83		WES WT-4-83	
	WT-1A 0'-5'	WT-1B 5'-8.1'	WT-2A 0'-5'	WT-2B 5'-8.6'	WT-3A 0'-5'	WT-3B 5'-10.6'	WT-4A 0'-5'	WT-4B 5'-10.6'
PARAMETER ANALYZED FOR								
Total PCB	0.048	ND(4) (0.20)	ND (0.020)	ND (0.020)	(5)	(5)	(5)	(5)
PCB 1242	0.048	ND(4) (0.20)	ND (0.020)	ND (0.020)	(5)	(5)	(5)	(5)
PCB 1248	--(1)	ND(4) (0.020)	ND (0.020)	ND (0.020)	(5)	(5)	(5)	(5)
PCB 1254	ND (0.020)	ND(4) (0.020)	ND (0.020)	ND (0.020)	(5)	(5)	(5)	(5)
PCB 1260	ND (0.020)	ND(4) (0.020)	ND (0.020)	ND (0.020)	(5)	(5)	(5)	(5)
1,1,1-Trichloroethane	ND(2) (0.01)	ND(2) (0.01)	ND(2) (0.01)	ND(2) (0.01)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)
Trichloroethylene	ND(2) (0.01)	ND(2) (0.01)	ND(2) (0.01)	ND(2) (0.01)	ND (0.0050)	ND (0.0050)	ND (0.0050)	ND (0.0050)

NOTE: (1) Presence of PCB 1242 or 1248 precludes the determination of the detection limit of the other aroclor. Higher detection limit due to matrix interference.
(2) Results are reported on a wet-weight basis.
(3) Totals.
(4) Higher detection limit due to matrix interference.
(5) Not analyzed for.
ND - Not detectable.
Samples were taken July 20-21, 1983.

TABLE 1.2.2
SOIL SAMPLE RESULTS OF 4 CORE BORINGS
DRILLED IN 1983
Results: mg/kg

	SAMPLE NUMBER							
	WES WT-1-83		WES WT-2-83		WES WT-3-83		WES WT-4-83	
	WT-1A	WT-1B	WT-2A	WT-2B	WT-3A	WT-3B	WT-4A	WT-4B
	0'-5'	5'-8.1'	0'-5'	5'-8.6'	0'-5'	5'-10.6'	0'-5'	5'-10.6'
PARAMETER ANALYZED FOR								
Silver (3)	<0.8	(ND 0.8)	<0.8	(ND 0.08)	(5)	(5)	(5)	(5)
Cadmium (3)	<0.8	(0.8)	<0.8	<0.8	(ND 0.08)	(ND 0.08)	(ND 0.8)	(ND 0.8)
Mercury (3)	(ND 0.1)	(ND 0.1)	(ND 0.1)	(ND 0.1)	(ND 0.01)	(ND 0.01)	0.2	0.1
Zinc (3)	64	68	36	44	96	90	0.87	47
Methylene Chloride	(5)	(5)	(5)	(5)	(ND 0.12)	(ND 0.12)	0.17	(ND 0.12)
Arsenic (3)	(5)	(5)	(5)	(5)	7.1	3.8	7.5	8.6
Barium (3)	(5)	(5)	(5)	(5)	44	32	42	32
Nickel (3)	(5)	(5)	(5)	(5)	25	27	18	19

NOTE: (1) Presence of PCB 1242 or 1248 precludes the determination of the detection limit of the other aroclor. Higher detection limit due to matrix interference.
(2) Results are reported on a wet-weight basis.
(3) Totals.
(4) Higher detection limit due to matrix interference.
(5) Not analyzed for.
ND - Not detectable.
Samples were taken July 20-21, 1983.

TABLE 1.2.3
WATER SAMPLE RESULTS OF 4 CORE BORINGS
DRILLED IN 1983
Results: mg/L

	SAMPLE NUMBER				
	WES WT-1-83	WES WT-2-83		WES WT-3-83	WES WT-4-83
		0'-14'	14'		
PARAMETER ANALYZED FOR					
Total PCB	(0.0002) ND	(0.00020) ND	0.00026	(0.0002) ND	0.0002 ND
PCB 1242	(0.0002) ND	(0.00020) ND	0.00026	(0.0002) ND	0.0002 ND
PCB 124	(0.0002) ND	(0.00020) ND	(3)	(0.0002) ND	0.0002 ND
PCB 1254	(0.0002) ND	(0.00020) ND	0.00026	(0.0002) ND	0.0002 ND
PCB 1260	(0.0002) ND	(0.000 ND	0.00026	(0.0002) ND	0.0002 ND
1,1,1-Trichloroethane	1.2	(2)	(0.00050) ND (4)	(0.001) ND	(0.001) ND
Trichloroethylene	0.015	(2)	0.0028 (4) (.01)	0.14	0.290

NOTE: (1) Total.
(2) Not analyzed for.
(3) Presence of PCB 1242 or 1248 precludes the determination of the detection limit of the other aroclor.
(4) Aqueous phase analyzed; results may be unreliable due to improperly used containers.
ND - Not detectable.
Samples were taken July 20-21, 1983.

TABLE 1.2.4
WATER SAMPLE RESULTS OF 4 CORE BORINGS
DRILLED IN 1983
Results: mg/L

PARAMETER ANALYZED FOR		SAMPLE NUMBER WES WT-1-83	WES WT-2-83 0'-14'	WES WT-2-83 14'	WES WT-3-83	WES WT-4-83
Lead(1)	<	0.02	0.02	9.0	0.10	0.01
Chromium(1)	<	0.029	0.005	4.0	0.18	0.005
Copper(1)		0.008	0.009	5.5	0.11	(ND 0.005)
Nickel(1)		0.04	0.05	(2)	0.31	0.04
Arsenic(1)		0.003	0.002	(2)	0.012	0.002
Cadmium(1)		0.004	(ND 0.003)	0.065	(ND 0.003)	(ND 0.003)
Mercury(3)		0.0003	0.007	<0.1	0.0004	0.0002
Zinc(1)		0.084	0.13	20	0.53	0.096
Barium(1)		0.010	0.11	(2)	0.56	0.10

NOTE: (1) Totals.
(2) Not analyzed for.
(3) Presence of PCB 1242 or 1248 precludes the determination of the detection limit of the other aroclor.
(4) Aqueous phase analyzed; results may be unreliable due to improperly used containers.
ND - Not detectable.
Samples were taken July 20-21, 1983.

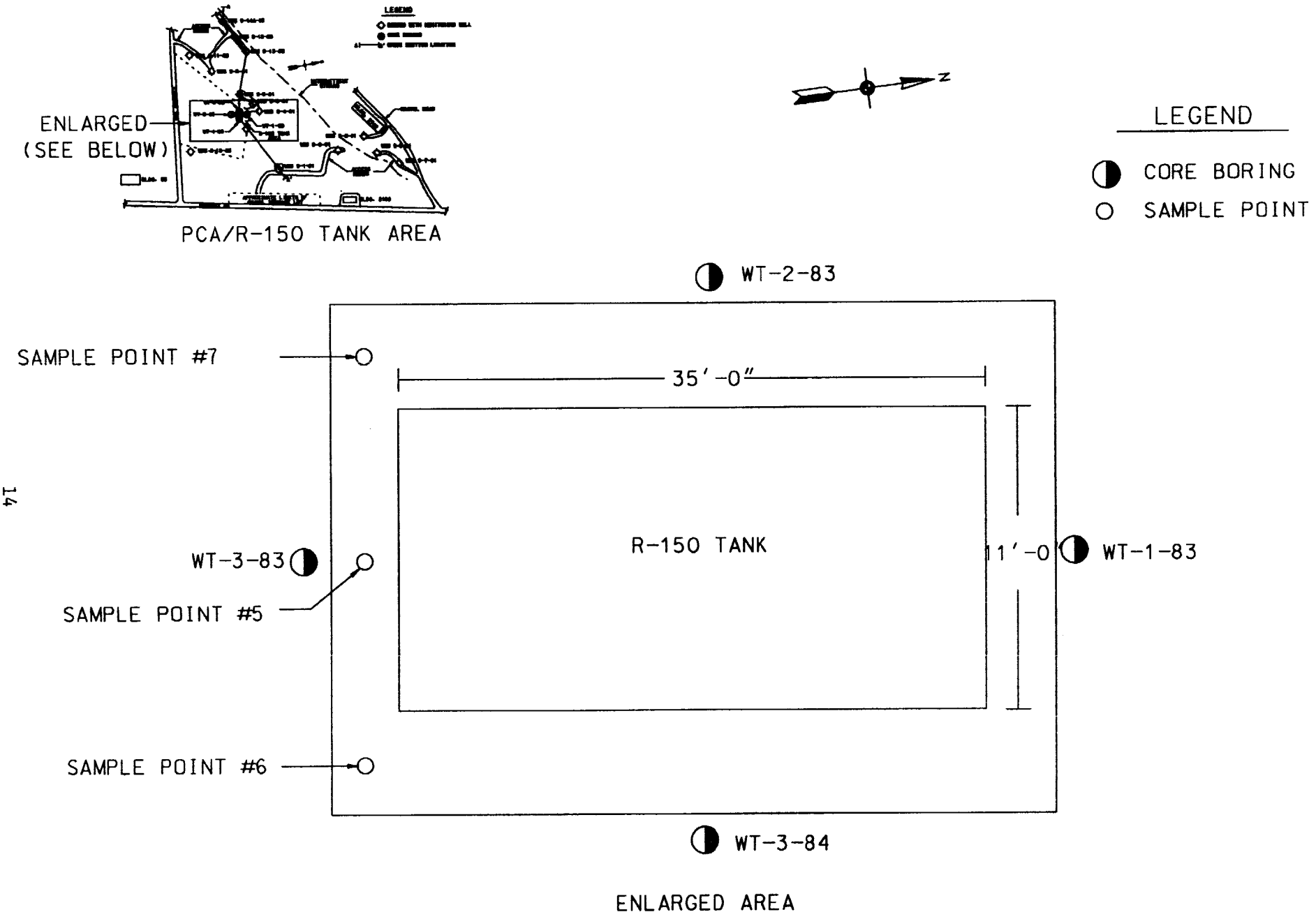


Figure 1.2.1B Schematic diagram of an enlarged area of the R-150 Tank Site, showing sample points 5, 6, and 7.

TABLE 1.2.5
SOIL SAMPLE RESULTS OF VISUAL INSPECTION
TAKEN IN 1983
Results: u/l

	SAMPLE NUMBER						
	7A	7B	7C	6A	6B	6C	5C
PARAMETER ANALYZED FOR							
Total PCB	---	---	---	---	---	---	---
PCB 1242	---	---	---	---	---	---	---
PCB 1248	---	---	---	---	---	---	---
PCB 1254	---	---	---	---	---	---	---
PCB 1260	---	---	---	---	---	---	---
1,1,1-Trichloroethane	ND-10	ND-10	ND-10	ND-10	ND-10	ND-10	ND-10
1,1,1-Trichloroethylene	ND-10	ND-10	ND-10	ND-10	ND-10	ND-10	ND-10

NOTE: A - 1-5 feet
B - 5-10 feet
C - 10-15 feet
ND - non-detectable. Detection limits are shown next to "ND" notations.

TABLE 1.2.6
SOIL SAMPLE RESULTS OF VISUAL INSPECTION
TAKEN IN 1983
Results: mg/l

PARAMETER ANALYZED FOR	SAMPLE NUMBER 7A	7B	7C	6A	6B	6C	5C
Arsenic	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	<4	<4	<4	<4	<4	<4	<4
Selenium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury	>0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Cadmium	0.016	0.012	0.005	0.009	0.008	0.007	0.009
Chromium	<0.005	0.008	0.007	<0.005	0.007	0.007	0.007
Lead	0.054	0.054	<0.010	0.019	0.018	0.013	0.024
Silver	0.020	0.015	<0.004	0.010	0.007	0.006	0.010
Hexavalent Chromium	---	---	---	---	---	---	---
pH(S.U.)	---	---	---	---	---	---	---

NOTE: A - 1-5 feet
B - 5-10 feet
C - 10-15 feet

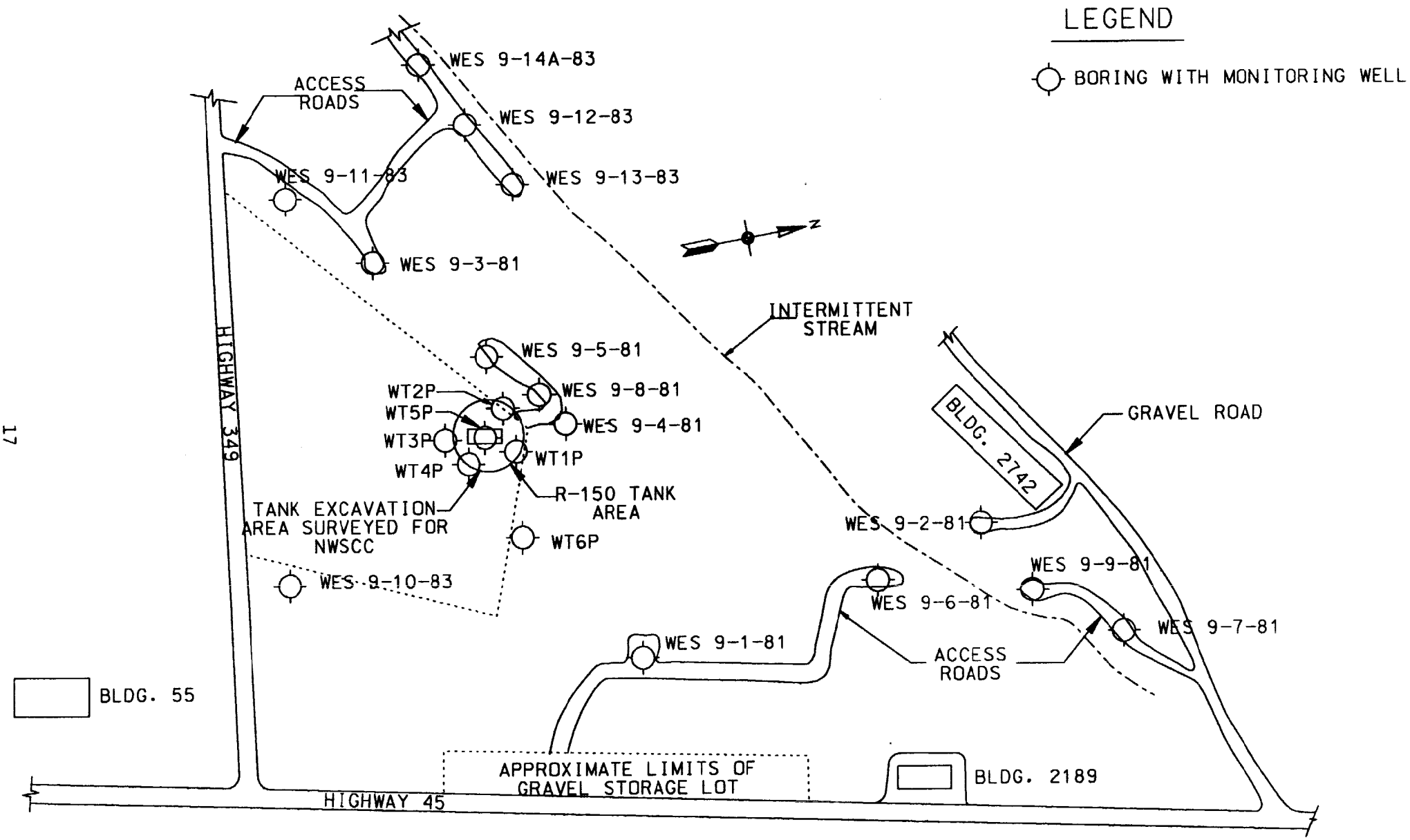


Figure 1.2.1C Schematic diagram PCA/R-150 Tank Area. Site includes Bldg 2189, Bldg 55, and R-150 Tank Area

well WES 9-3-81 located in the gravel parking lot adjacent to Highway 349. (Appendix C). Water samples taken from an open boring around the R-150 Tank Site identified concentrations of Trichloroethylene. Although contamination was present in ground water samples from around the R-150 Tank Site, monitoring wells down gradient of the tank were uncontaminated.

Six additional wells (WT1P, WT2P, WT3P, WT4P, WT5P, and WT6P) were installed in 1986 and reported in "Proposed Ground-Water Assessment Plan for R-150 Tank Storage Closure Pest-Control Area" (Figure 1.2.1C). Detection of Trichloroethylene in excess of the 0.001 ppm limit was discovered in monitoring wells WES 9-3-81, WES 9-5-81, WES 9-4-81 and WES 9-1-81. Trichloroethylene in excess of the 0.001 ppm limit was also detected in wells WT1P, WT2P, WT3P and WT4P. Trichloroethane in excess of detection limit 0.001 ppm was observed in wells WES 9-3-81, WT2P, WT3P and WT4P. (Table 1.2.7). The groundwater is continually being monitored on a quarterly basis. The most recent available results (Sep '91) are listed in Table 1.2.7. Drilling Log data for wells WT1P-WT6P is shown on Table 1.2.8.

1.2.2 **REGULATORY STATUS**. Under the authority of RCRA as amended by HSWA, a hazardous waste treatment, storage, and disposal facility must be permitted by the Environmental Protection Agency (EPA). In December 1989 NWSCC was issued a Storage Permit. A RCRA Facility Assessment (RFA) for the NWSCC Facility was completed. The PCA/R-150 Tank Site was named as a Solid Waste Management Unit (SWMU). The CAR were negotiated between the Navy and the USEPA Region V. As part of the CAR the NWSCC is to conduct a RFI at its SWMU and fulfill the Closure Requirements of the RCRA for the R-150 Tank Site. A RFI is a three part study, consisting of a Phase I, Environmental Monitoring Report, a Phase II, Release Assessment, and a Phase III, Release Characterization Study. A RFI Phase II Soils Study and Phase III Ground water Study for the PCA/R-150 Tank Site Facility, SWMU 09/05, is to be discussed in this work plan. The R-150 Tank Site is presently undergoing "Clean Closure" proceedings. The data gathered in this study will be used to substantiate the "Clean Closure" of the site.

1.3.0 PCA/R-150 TANK SITE WORK PLAN

1.3.1 **WORK PLAN OBJECTIVES.** This work plan is intended to adequately describe the site to be investigated, the rationale underlying procedural decisions implemented by the plan, and the quality control methods needed to assure defensible conclusions. Included in this plan are detailed directions which are to be used by the field personnel, laboratory chemist, and report writers. This work plan is intended to be reviewed and used by people familiar with commonly used drilling, sampling and RCRA terms.

TABLE 1.2.7
GROUND WATER MONITORING RESULTS
FOR DETECTED CONCENTRATIONS OF
TCE AND TRICHLOROETHANE

	TCE (ppm) Detected Jan '88	TCE (ppm) Detected Apr '88	TCE (ppm) Detected Sep '91	Trichloroethane Detected(ppm) Sep '91	Trichloroethane Detected(ppm) Sep '91	Trichloroethane Detected(ppm) Sep '91
WES 9-1-83	0.007	0.005	0.000	0.0	0.0	0.0
WES 9-3-83	0.220	0.168	0.024	0.340	0.179	0.0195
WES 9-4-83	0.011	0.016	0.003	0.0	0.0	0.001
WES 9-5-83	0.027	0.008	0.007	0.0	0.003	0.001
WT1P	0.024	0.008	0.003	0.0	0.0	0.0
WT2P	0.028	0.022	0.014	0.004	0.002	0.0
WT3P	0.598	0.575	0.140	0.007	0.006	0.0
WT4P	0.083	0.129	0.045	0.008	0.009	0.0
WT5P	0.000	0.004	0.001	0.0	0.0	0.0
WT6P	0.000	0.000	0.0	0.0	0.0	0.0

Note: Method Detection Limits: TCE = 0.001 ppm
Trichloroethane = 0.001 ppm

TABLE 1.2.8
DRILLING LOG DATA
1986 INSTALLED WELLS

Well No.	Date Developed	Depth Drilled (ft.)	Screen Zone (ft.)
WT1P	7/30/86	22.2	16.2-21.2
WT2P	7/30/86	18.4	12.4-17.4
WT3P	7/30/86	18.6	12.6-17.6
WT4P	7/31/86	20.1	14.1-19.1
WT5P	7/30/86	13.3	8.0-13.0
WT6P	7/31/86	26.7	20.7-25.7

1.3.2 **WORK PLAN STRUCTURE**. A RFI Phase II Release Assessment and a Phase III Release Characterization will cover four main tasks. They are the development of a Work Plan, a Facility Investigation, an Investigation Analysis, and a Report. This document is the Work Plan which is made up of four subplans. Those subplans are a project management plan, a sampling and analysis plan, a data management plan, and a health and safety plan. Those individual plans will be treated as major headings. Included as an appendix to the work plan is a 16 Element Quality Assurance Project Plan.

2.0 MANAGEMENT PLAN

2.1.0 PROJECT OBJECTIVES

2.1.1 **STUDY INTENT**. The intent of this Phase II Soils investigation is to: 1) determine if a hazardous release to the soil has occurred; 2) describe the hazardous release if it exists; 3) characterize the host medium, the soil; 4) and address the effects the hazardous wastes and constituents have manifested on the host medium. The intent of a Phase III Ground water investigation is to obtain ground water samples for quantitative chemical analysis. These analysis will be performed for specific compounds. The purpose of this work will be to define the contaminant plume configuration and to develop monitoring parameters.

2.1.2 **PROJECT DESCRIPTION**. The project is to determine if there are any residual contaminants present in the soils and ground water at the site.

The soil study objectives will be reached by concentrating the search at probable sites of surface and subsurface contamination. Soil samples will be gathered at those sites. Those samples will be tested for the presence of contamination.

The ground water objective will be reached using a 4-part effort:

1) Using the existing monitoring wells, the ground water will be sampled and analyzed. This is to be done to determine if the known contaminant description may have changed.

2) To fully describe the ground water system of the area, additional rock borings will be drilled, and monitoring wells will be installed. Where possible the augered portion of the drilled hole will be used as a soil sample boring. The goals of this part of the work are to determine the full depth of the shallow aquifer, to gather information about additional aquifers, and to place additional needed monitoring wells.

3) Slug tests will be run to derive the aquifer characteristics. The slug test results will be used to derive aquifer permeability values. Existing and additional wells will be used for this testing. The information will be needed to design a remedial effort and to predict the spreading rate of the contaminant.

4) Five rounds of ground water sampling and testing are planned. Appendix B methods are prescribed for the first two rounds. The number of analyte parameters will be reduced in the remaining three rounds. Only target compounds (those parameter determined through test results review to be characteristic of the contaminant) will be tested.

Conclusions concerning the presence or absence of contamination, the risk posed by those contaminants, and the possible future steps to be taken will be developed. A report explaining the findings, conclusions, and future studies will be issued.

2.2.0 STUDY MANAGEMENT

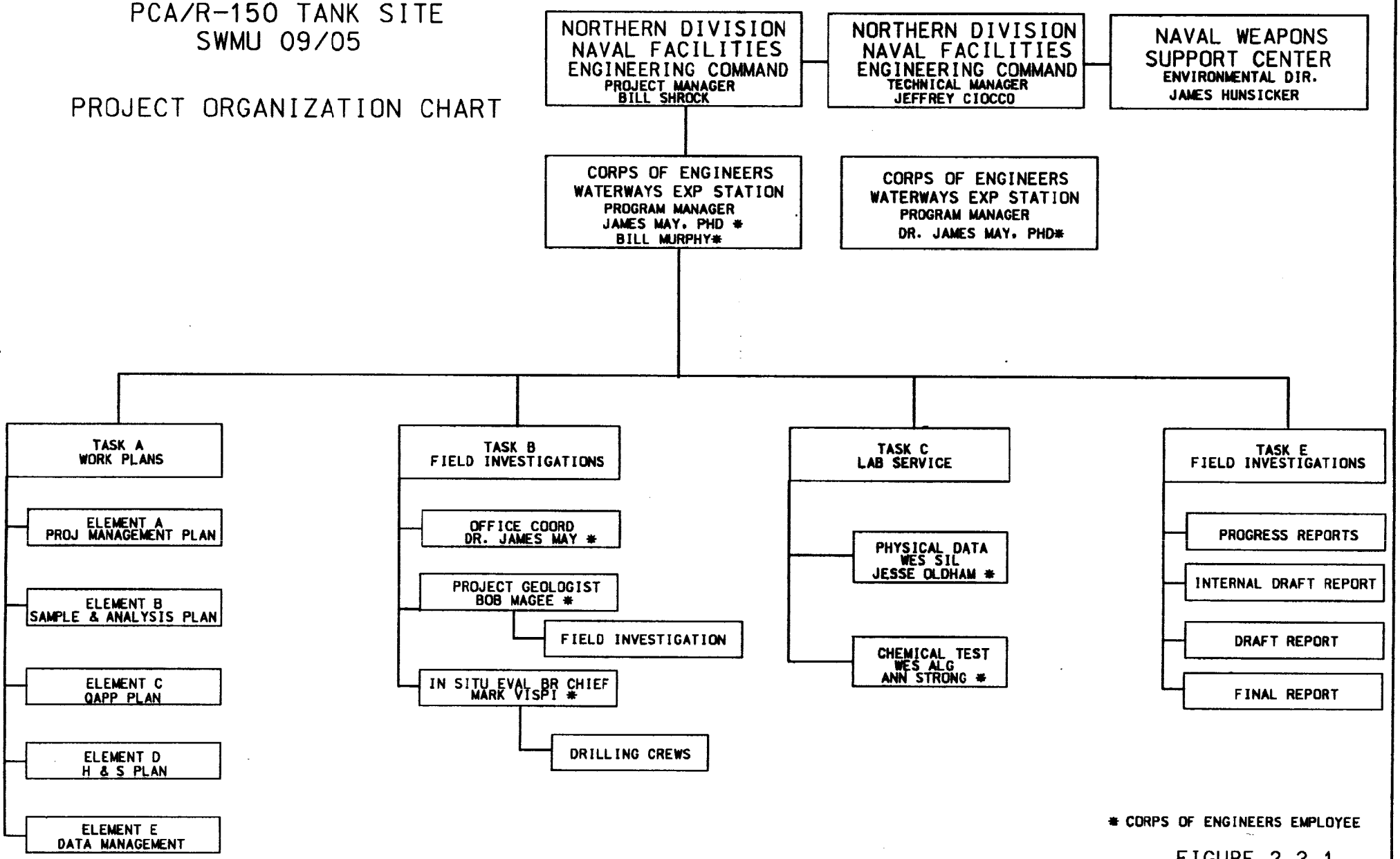
2.2.1 MANAGEMENT RESPONSIBILITIES. USACEWES is the Navy's prime contractor for this Phase II soils and Phase III ground water investigation. A project team, which is made up of United States Army Corps of Engineers (USACE) personnel, was assembled (Figure 2.2.1). Oversight and management responsibility will be handled by Dr. James May of USACEWES' Geotechnical Section. The planning, scope writing, and report preparation is the responsibility of Robert Magee of USACE Engineering District, Wilmington, N.C. Field work supervision and soil sampling will be the responsibility of Robert Magee of USACE Engineering District, Wilmington, NC. Drilling will be done by personnel from the In Situ Section, Geotechnical Branch of USACEWES. Mr. Mark Vispi is the Section Chief. The chemical analysis is to be processed through the USACEWES' Analytical Laboratory Group (ALG) under the supervision of Ann Strong. All chemical data validation will be done by the team leaders, the Quality Control Officer, and Chief, ALG. Soils classification and physical testing will be done at USACEWES' Soils Investigation Laboratory under the supervision of Mr. Jesse Oldham.

2.2.2 PROGRAM SCHEDULE. Diagram 2.2.2 is a work schedule which illustrates expected work durations, phase structure, phase completion dates and milestone dates. The dates are time figures shown in working days. Allowances for exact start dates, off days, and work delays are not shown. Forty-five days are set aside for EPA approval followed by 30 days for revision of the work plan. Field work weeks are to be 6 day weeks. The field work is scheduled to take 57 days total. To expedite data reduction the field data will be forwarded to the Wilmington Engineering District office were it will be processed into final form. Fifty-five days are set aside for chemical and physical analysis. This is followed by 55 days of data reduction, and 30 days of report preparation. The final report should be ready in 559 days after commencement of the field work. Following the start of the soils investigation, bimonthly progress reports will be issued. These reports will include overall project progress, individual study progress, impending schedule targets, and expected or existent schedule adjustments. Because the bimonthly progress reports are independent of the individual study work plans, they are not shown on the work schedule.

RCRA FACILITY INVESTIGATION

PCA/R-150 TANK SITE
SWMU 09/05

PROJECT ORGANIZATION CHART



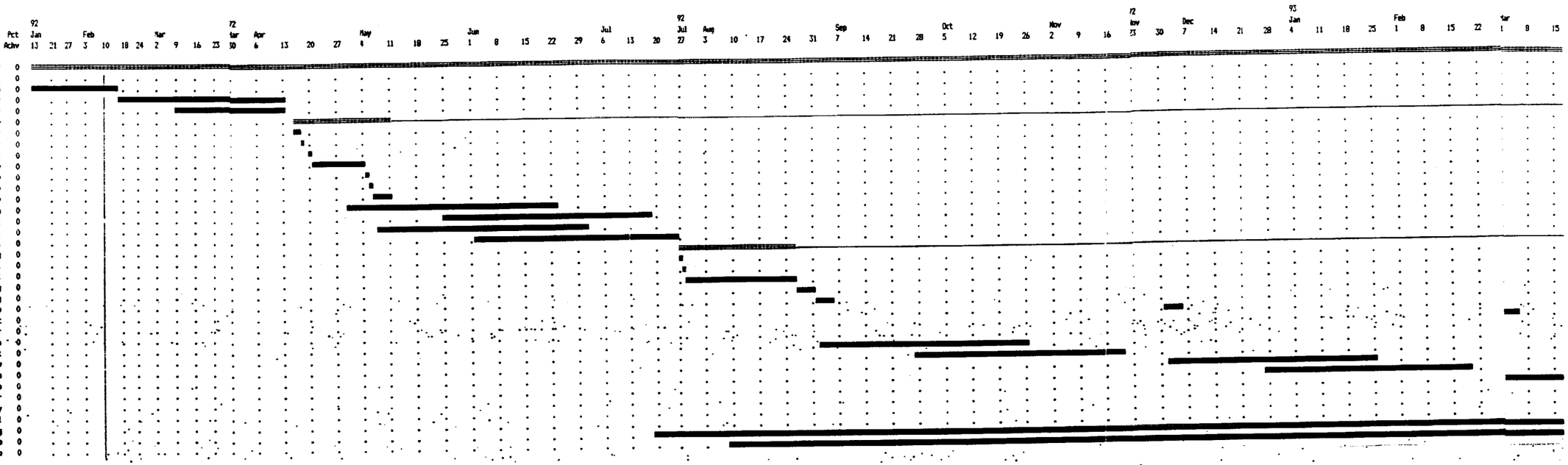
* CORPS OF ENGINEERS EMPLOYEE

FIGURE 2.2.1

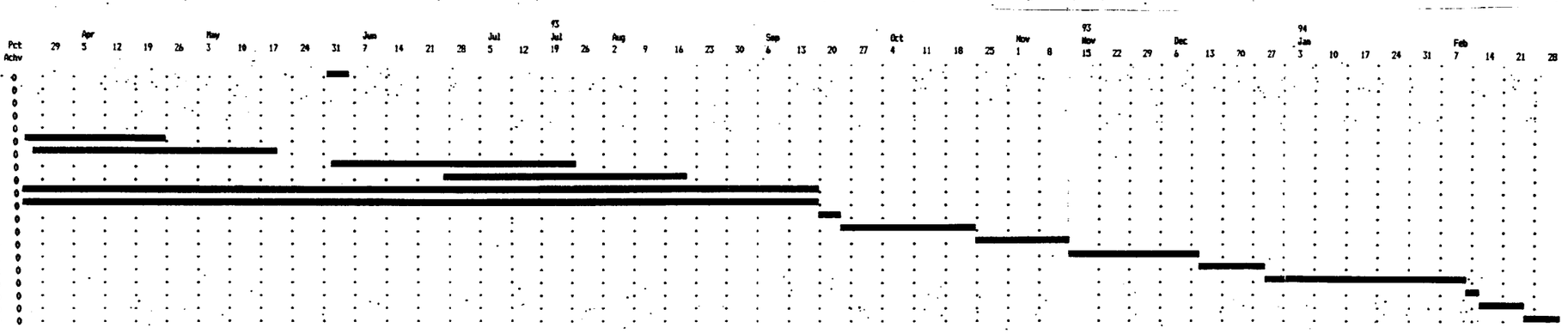
:e Name : PLAVR-150 TANK AREA SMPU 07/05 SOILS & ENGINEERING
sible : KAMALA B. POWELL
Date : 10-Feb-92 9:00am Schedule File : C:\TL3\DATA\PCA

:I SOILS, PHASE III GW. DATES SUBJECT TO CHANGE/

ame	Start Date	Duratn (Days)	End Date	Pct Achv
SCHEDULE	29-Jul	880	5-Mar	0
PA REVIEW	29-Jul	113	30-Dec	0
AVY REVISION	2-Jan	30	13-Feb	0
UBMIT FINAL MP TO EPA	14-Feb	45	13-Apr	0
RC REVIEW	9-Mar	30	13-Apr	0
IELD WORK	16-Apr	26	11-May	0
SURVEYING	16-Apr	2	17-Apr	0
LOCATIONING	18-Apr	1	18-Apr	0
RIG MOB	20-Apr	1	20-Apr	0
PLACE 15 BORINGS	21-Apr	14	4-May	0
DEMOB	5-May	1	5-May	0
SOIL SAMPLING	6-May	1	6-May	0
1ST ROUND GW SAMPLING	7-May	5	11-May	0
OIL ANALYSIS	30-Apr	55	23-Jun	0
ATA REDUCTION	25-May	55	18-Jul	0
ST ROUND GW ANALYSIS	8-May	55	1-Jul	0
ATA REDUCTION	2-Jun	55	26-Jul	0
IELD WORK	27-Jul	31	26-Aug	0
SURVEYING	27-Jul	1	27-Jul	0
RIG MOB	28-Jul	1	28-Jul	0
PLACE 12 MON. WELLS	29-Jul	29	26-Aug	0
QUIFER	27-Aug	5	31-Aug	0
ND ROUND GW SAMPLING	1-Sep	5	5-Sep	0
RD ROUND GW SAMPLING	1-Dec	5	5-Dec	0
TH ROUND GW SAMPLING	1-Mar	5	5-Mar	0
TH ROUND GW SAMPLING	1-Jun	5	5-Jun	0
ND ROUND GW ANALYSIS	2-Sep	55	26-Oct	0
ATA REDUCTION	27-Sep	35	20-Nov	0
RD ROUND GW ANALYSIS	2-Dec	35	25-Jan	0
ATA REDUCTION	27-Dec	35	19-Feb	0
TH ROUND GW ANALYSIS	2-Mar	35	25-Apr	0
ATA REDUCTION	27-Mar	35	20-May	0
TH ROUND GW ANALYSIS	2-Jun	35	26-Jul	0
ATA REDUCTION	27-Jun	35	20-Aug	0
EPORT WRITING	19-Jul	428	19-Sep	0
GRAPHICS PREPARATION	9-Aug	407	19-Sep	0



	Start Date	Duratn (Days)	End Date	Pct Achv
TH ROUND GW SAMPLING	1-Jun	5	5-Jul	0
ND ROUND GW ANALYSIS	2-Sep	55	26-Oct	0
ATA REDUCTION	27-Sep	35	20-Nov	0
RD ROUND GW ANALYSIS	2-Dec	35	25-Jan	0
ATA REDUCTION	27-Dec	35	19-Feb	0
TH ROUND GW ANALYSIS	2-Mar	35	25-Apr	0
ATA REDUCTION	27-Mar	35	20-May	0
TH ROUND GW ANALYSIS	2-Jun	35	26-Jul	0
ATA REDUCTION	27-Jun	35	20-Aug	0
EPORT WRITING	19-Jul	428	19-Sep	0
GRAPHICS PREPARATION	9-Aug	407	19-Sep	0
TYPING	20-Sep	5	24-Sep	0
IN HOUSE REVIEW	25-Sep	30	28-Oct	0
EDITING	25-Oct	21	14-Nov	0
NAVY REVIEW	15-Nov	30	14-Dec	0
EDITING	15-Dec	15	29-Dec	0
EPA REVIEW	30-Dec	45	12-Feb	0
TYPING	13-Feb	3	15-Feb	0
EDITING	16-Feb	10	25-Feb	0
FINAL REVIEW	26-Feb	8	5-Mar	0



! Detail Task ==== Summary Task M Milestone
! (Started) ==== (Started) >>> Conflict
. (Slack) ---- (Slack) ..... Resource delay
Scale: 1 day per character

TIME LINE Gantt Chart Report, Strip 6

TIME LINE Gantt Chart Report, Strip 7

FIGURE 2.2.2
Project Schedule

3.0 SAMPLE AND ANALYSIS PLAN

3.1.0 SELECTION PROCEDURES

3.1.1 SELECTION RATIONAL. The PCA/R-150 Tank Site was identified as a Solid Waste Management Unit (SWMU). A Phase II Soils Release Assessment must be performed at the PCA/R-150 Tank Site. A Phase II Soils Study will attempt to evaluate the presence of or absence of a release, and to characterize the hazardous waste and its constituents. The methods used will be SW-846 and the field and lab QC will follow CLP requirements. The soil will be physically characterized using USACE's' geotechnical procedures. This Soils Release Assessment will be accomplished by judiciously selecting sample locations, selecting the appropriate analytes, and using proper analytical methods.

A Phase III Ground water Release Characterization will be performed at this site. A Phase III Ground water Study will attempt to determine the rate and extent of contamination. The ground water will be tested for chemical confirmation using SW-846 analytical methods. The use of these methods are contained in the corrective actions portion of the permit. The particular procedures selected were determined by the site specific description of the contaminants. This description was obtained from review of ground water data and historical documentation.

3.1.2 SAMPLE LOCATION. Boring and well locations were selected with a bias toward areas having the greatest probability of contamination. Previous investigations performed by USACEWES (Dunbar, 1984) and NWSCC detected high concentration levels for Trichloroethylene at the R-150 Tank Site. Investigation by USACEWES (Dunbar, 1984) detected concentrations of Trichloroethylene and Trans-1,2-dichloroethylene in monitoring well WES 9-3-81. Investigations by NWSCC detected levels of trichloroethane exceeding the 0.001 ppm detection limit (Table 1.2.1). Detection levels of 0.179 ppm of trichloroethane were detected in well WES 9-3-81 and 0.003 ppm in WES 9-5-81. Because pesticide spray tanks and containers were likely rinsed in the parking lots of Building 55 and 2189, a possibility of contamination exists there.

Investigations will be concentrated around the R-150 Tank Site and Buildings 55 and 2189. Previous investigations of monitoring well WES 9-3-81 detected contamination, but found no apparent reason for its contamination. Three surface soil samples will be taken at well WES 9-3-81 to determine if contamination is from the surrounding soil. Area A of Figure 3.1.2A is chosen as the location for the three background borings. These borings must be within the unit boundary but removed from past operations (as stated by EPA guidelines). These background borings will attempt to establish uncontaminated soil parameters. Three borings will be drilled in the vicinity of Building 2189 (Figure 3.1.2A, Area B) to determine if there is any residue remaining from the pesticide tanks and containers. Six borings will be

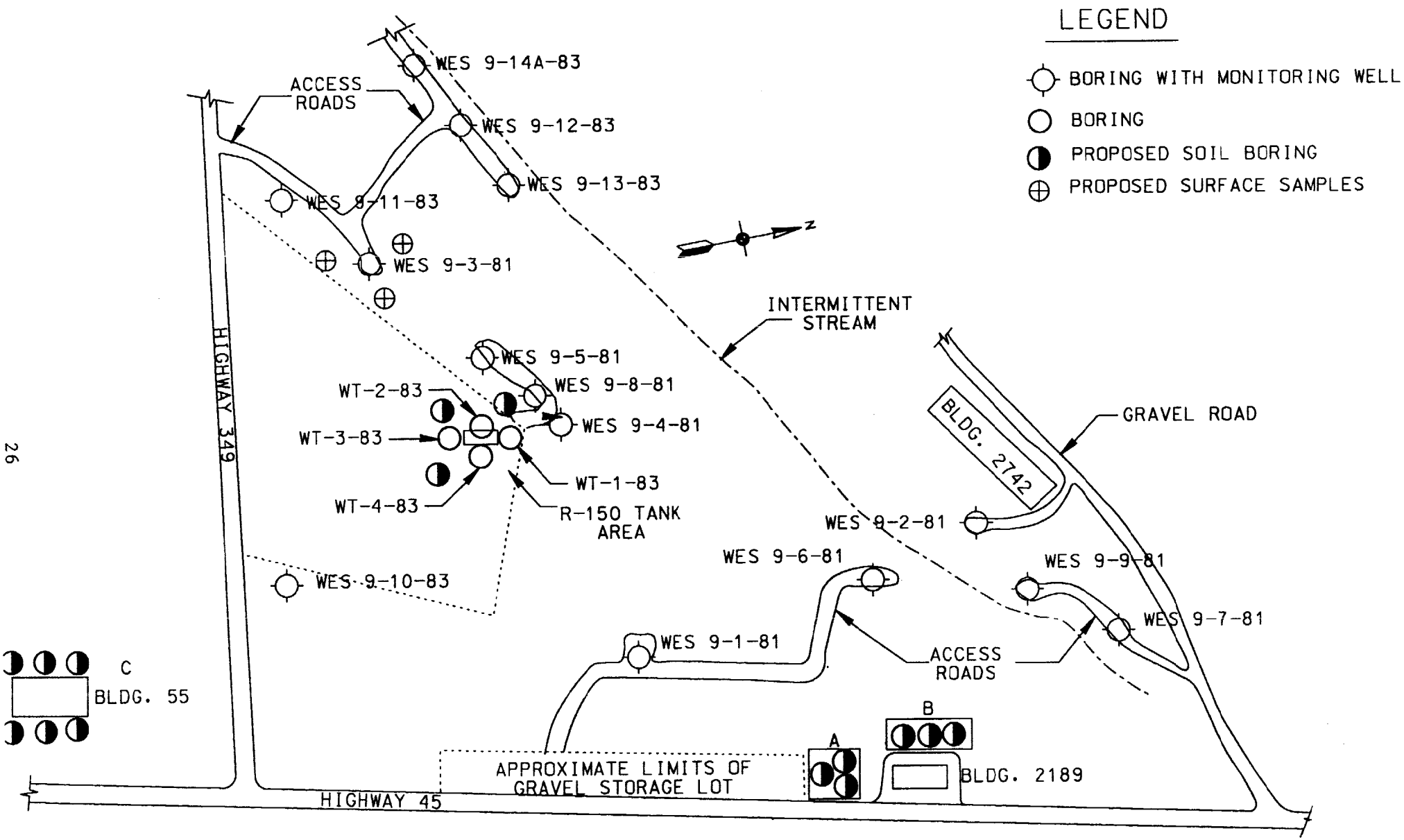


Figure 3.1.2A Schematic diagram showing Bldg 2189, Bldg 55, R-150 Tank Area, Area "A" Background borings, Area "B" borings at Bldg 2189, Area "C" borings at Bldg 55, and approximate surface sample locations

drilled at Building 55 (Figure 3.1.2A, Area C). The boring locations shown in Figure 3.1.2A are approximate. Three borings will be drilled at the R-150 Tank to positively confirm that all contaminated soil has been removed (Figure 3.1.2A). The exact location for the individual borings will be selected in the field. The field selected boring locations will be surveyed by field personnel.

Ground water monitoring wells will be used to gather ground water samples. The 20 wells presently in existence at the site will be first checked to determine their condition, to be redeveloped (bailing/surging procedure, see Section 3.4.4) if needed, checked for blockage using a plunker attached to a steel tape measure and then the first round of sampling will occur at the existing wells. This sampling effort will be done using a bailer which is to be decontaminated between each sample. Samples will be taken from the least-to-most contaminated locations as determined from prior ground water analysis. The wells will be tested in the following order WES 9-8-81, WES 9-14A-83, WES 9-13-83, WES 9-12-83, WES 9-06-81, WES 9-01-81, WES 9-02-81, WES 9-11-83, WES 9-10-83, WES 9-09-81, WES 9-07-81, WES 9-04-81, WT6P, WT5P, WT1P, WES 9-05-81, WT2P, WES 9-03-81, WT4P and WT3P. Six wells will be installed near the R-150 Tank Site in an attempt to define the contaminant plume. Proposed wells 1-4 will provide information on the extent of contamination in the aquifer around WT3P. Well 5 will better define the geology and degree of contamination toward well WES 9-3-81. Well 6 will confirm or refute that contamination does not extend up-gradient toward WT6P. Proposed wells 1-3 are approximately 50 ft. and wells 4 and 5 are approximately 100 ft. from well WT3P. Well 6 is to be place midway between WT4P and WT6P ("Proposed Ground Water Assessment Plan for R-150 Tank Storage Closure Pest-Control Area"). Very little is known about the ground water conditions around Building 55 and 2189. However, it is known that pesticide containers were rinsed in these areas. Three wells will be installed at Building 55 and 3 at Building 2189 (Figure 3.1.2B) in an attempt to adequately define any ground water contaminants. The placement of the proposed wells are dependent upon the results of the analysis of the first round of ground water and soil analysis. After placement of proposed wells, the second through the fifth round of sampling will occur. The sampling order for the second through the fifth round of sampling will be dependent upon the results of the first round of ground water analysis. Sampling for the second through the fifth round will be done on a quarterly basis. The proposed installed wells will be sampled using a bailer which is to be decontaminated between each sample.

3.1.3 SURVEY PLAN. All boring and well sites will be surveyed by certified professional surveyors. The top of casing of every well will be surveyed to determine its elevation National Geodetic Vertical Datum (NGVD) and east-west coordinates using the Indiana State Plane Coordinate System. Accuracy must be $\pm$ 0.5 ft. Accuracy of ground surface elevation must be $\pm$ 0.01 ft. The surveyors will supply USACEWES with all field survey data and a table of well elevations and locations.

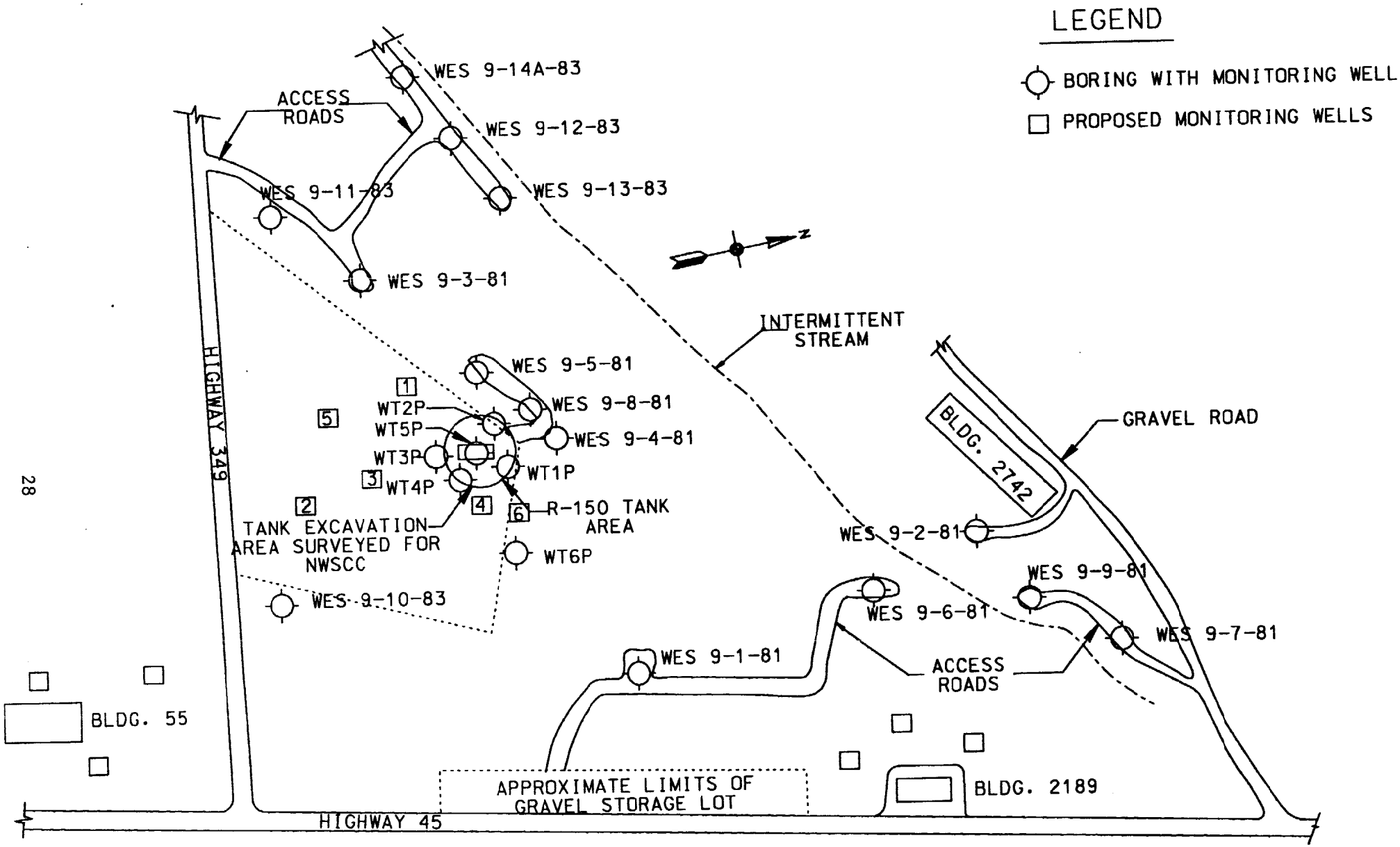


Figure 3.1.2B Schematic diagram showing Bldg. 2189, Bldg 55 R-150 Tank Area and existing and proposed monitoring wells.

3.1.4 CHEMICAL ANALYTE SELECTION. Analyte selection is based on the probability of a contaminant occurring at the site. Buildings 55 and 2189 were the centers of operation for NWSCC's pest control program. The principle contaminant would be pesticides at Bldgs. 55 and 2189. Ground water monitoring has been performed at the R-150 Tank Site and monitoring well WES 9-3-81 and the detected contaminants were organics. The ground water testing results from PCA/R-150 Tank Site wells are listed in Appendix E. The list of analytical test parameters shown in Table 3.1.4 were selected on the basis of their probability of occurring at Buildings 55, 2189 and the R-150 Tank Site. The 8240 and 8270 organics were selected because of their common industrial usage and their detected presence in the ground water surrounding the R-150 Tank Site. Analysis of pesticides, herbicides, and inorganics associated with pesticides will also be conducted.

Ground water sampling will be done at the site using existing and proposed monitoring wells. The results of these analyses will be used to determine the contaminant plume's chemical make-up, its shape and lateral extent, and to develop monitoring parameters.

TABLE 3.1.4
LIST OF PARAMETERS

INORGANICS	ORGANICS
Arsenic	8240 Volatiles
Chromium	8270 Semivolatiles
Copper	Organochlorine Pesticides & PCB's
Lead	Organophosphorus Pesticides
Mercury	Chlorinated Herbicides
Selenium	
Silver	
Zinc	

3.1.5 SLUG TESTING. The results from these tests will be used to derive aquifer characteristics. Slug tests are preferable to pumping tests for this investigation because they can be conducted without bringing contaminated water to the surface. A weight of known volume can be used to increase the head in the well and the decline in head can be measured over time. Elevation of the water service above the transducer will be measured with a pressure transducer and recorded with a data logger (Hermit). The Bouwer and Rice analytical method (based on Hvorslev) will be used to calculate hydraulic conductivities. The aquifer parameters of hydraulic conductivity and storativity can be computed for an area close to the well bore. Values for rock parameters such as porosity and permeability can be empirically derived from the hydraulic parameters.

STANDARD OPERATING PROCEDURES FOR SLUG TESTING

1. Open and check water level using steel tape.

2. Connect transducer to instrument and insert into well

   a. For 10 psi transducer, total head above transducer may not exceed 21 feet after displacement of water column during test.

   b. For 100 psi transducer, total head is generally not a concern unless the well is deeper than 150 feet.

3. Initialize Hermit recorder (or other make recorder) with test#, well#, date, time, water level, units, sample interval, etc.

4. Establish water level/depth of transducer to itialize point of test; allow transducer and well to stabilize a few minutes.

5. Quickly insert weight into well and start the recorder

   after the weight has displaced the water.

6. Record data until pressure head (increase in depth below ground surface) has returned to within 10% of the original water level, or 1 hour, whichever is shorter.

7. Transfer recorded data from the Hermit unit using Hermit DM software and field computer or PC.

Note: The sample interval will vary for each well, thus it will need to be determined in the field. Initially, a depth reading every 1 to 2 minutes is suggested, depending on the aquifer characteristics. An example of a test and plot is shown on Figure 3.1.5

3.1.6 AQUIFER TESTING. Slug testing is to be done to derive the aquifer characteristics. This test consists of introducing an artificial head pressure (changing the water level in the well casing) and recording the decay of that head pressure over time. The changes in ground water surface elevations will be derived for information gathered from a pressure transducer installed in the test well. The transducer will be installed before the test is to be run. Surface elevation changes will be used to derive aquifer characteristics. Measurements will be made with a pressure transducer and recorded with a data logger (Hermit). The specific results to be derived are

Jordan

~~FALLS~~ DAM INSTRUMENTATION
PIEZOMETER PERFORMANCE CHECK
PF-22

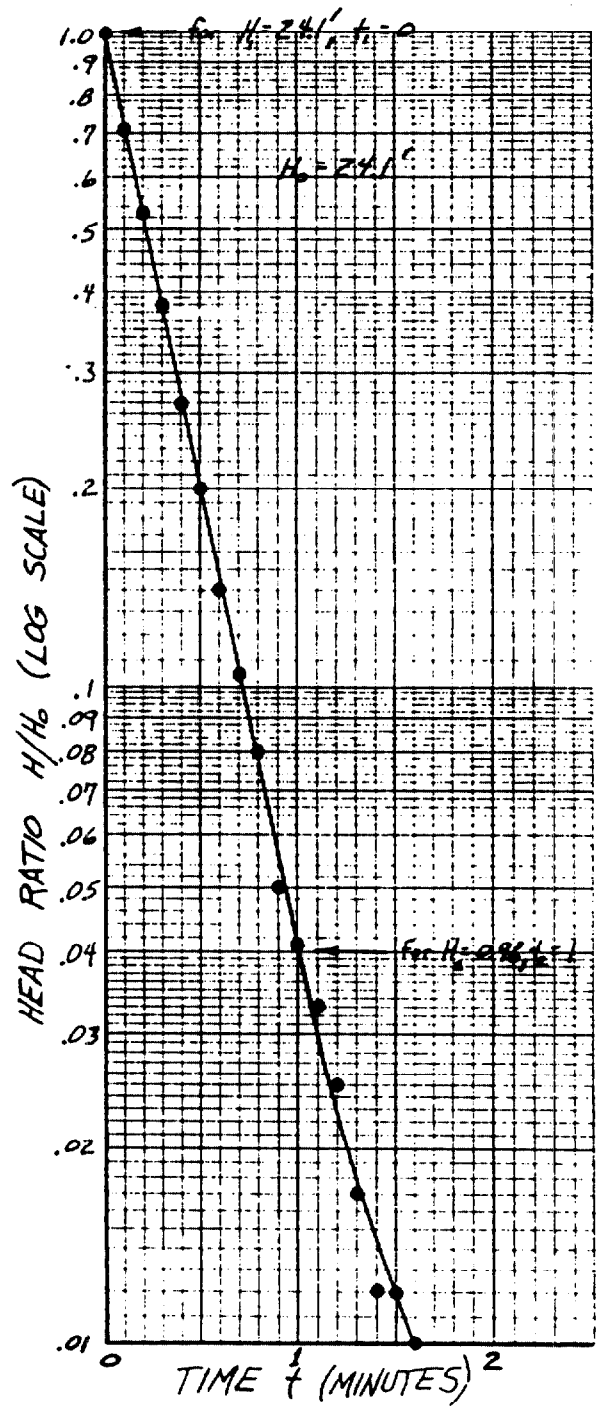
Jordan

~~FALLS~~ DAM INSTRUMENTATION
FALLING HEAD TEST
(PF-22)

TIME H:MM:SS	READING (FEET)	ELAPSED TIME(MIN)	ELAPSED TIME(SEC)	HEAD (FEET)	HEAD RATIO
1:52:00	0.00	0.00	0.00	24.10	1.000
1:52:30	7.00	0.50	30.00	17.10	0.710
1:53:00	11.40	1.00	60.00	12.70	0.527
1:53:30	15.00	1.50	90.00	9.10	0.378
1:54:00	17.50	2.00	120.00	6.60	0.274
1:54:30	19.30	2.50	150.00	4.80	0.199
1:55:00	20.70	3.00	180.00	3.40	0.141
1:55:30	21.60	3.50	210.00	2.50	0.104
1:56:00	22.20	4.00	240.00	1.90	0.079
1:56:30	22.80	4.50	270.00	1.30	0.054
1:57:00	23.10	5.00	300.00	1.00	0.041
1:57:30	23.30	5.50	330.00	0.80	0.033
1:58:00	23.50	6.00	360.00	0.60	0.025
1:58:30	23.70	6.50	390.00	0.40	0.017
1:59:00	23.80	7.00	420.00	0.30	0.012
1:59:30	23.80	7.50	450.00	0.30	0.012
:00:00	23.85	8.00	480.00	0.25	0.010
2:00:30	23.90	8.50	510.00	0.20	0.008
2:01:00	23.90	9.00	540.00	0.20	0.008
2:01:30	23.95	9.50	570.00	0.15	0.006
2:02:00	24.00	10.00	600.00	0.10	0.004
2:02:30	24.00	10.50	630.00	0.10	0.004
2:03:00	24.00	11.00	660.00	0.10	0.004
2:10:00	24.10	18.00	1080.00	0.00	0.000

NOTES:

1. TEST PERFORMED BY SNIPES & ALIG ON 30 OCT 84.
2. TEST INDICATES THAT PIEZOMETER IS FUNCTIONING PROPERLY(SEE TIME LAG CURVE).



TIME LAG CURVE

Figure 3.1.5

COMPUTATION

Compute coefficient of permeability assuming rock at piezometer tip behaves as a homogeneous soil.

Use the following:

1. Rock thickness at tip L=7.0ft=84in.
2. Radius of PZ riser r=.25in.
3. Radius of hole at PZ tip R=2.75in.

Shape factor F=2*PI*L/(ln(L/R))=154.4in.

Coeff. of Permeability $K=A*\ln(H_1/H_2)/(F(t_2-t_1))$=.0041in/min or $1.7*10^{-4}$ cm/se

Permeability of this magnitude indicates rapid response to water fluctuatio

Ref. NAVFAC DM-7, March 1971, p. 7-4-8.

transmissivity, hydraulic conductivity, and storativity. The validity of the derived results is dependent on certain assumptions being met. It is probable that these assumptions are not fully met in reality, yet they must be made in order to obtain the results. The derived results may not be absolutely valid, but within the scope of the study, they will be usable.

3.1.7 **ANALYTICAL METHODS SELECTION.** Analytical method selection for chemical analytes is a matter determined by environmental regulation. EPA mandates that RCRA studies adhere to procedures and methods set out in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" SW-846, Third Edition. Inorganic and organic test methods are given in Tables 3.1.7A and 3.1.7B respectively.

TABLE 3.1.7A
SUMMARY OF METHODS FOR
DETERMINATION OF INORGANIC ANALYSIS

		METHODS from SW-846		
INORGANIC ANALYSIS	TECHNIQUE	DIGESTION**		ANALYSIS
Arsenic	GF	3005 W	3050 S	7060
Chromium	ICP	3005 W	3050 S	6010
Copper	ICP	3005 W	3050 S	6010
Lead	ICP	3005 W	3050 S	6010
Mercury	CV			7471
Selenium	GF	3005 W	3050 S	7740
Silver	ICP	3005 W	3050 S	6010
Zinc	ICP	3005 W	3050 S	6010

*Abbreviations: GF = Graphite Furnace, ICP = Inductively Coupled Plasma, CRL = EPA Central Regional Laboratory - Region V, CV = Cold Vapor.
**Digestion process, when not noted, is included in the analytical method.
W = Water
S = Soil and sediment

TABLE 3.1.7B
SUMMARY OF METHODS FOR
DETERMINATION OF ORGANIC COMPOUND ANALYSIS

		METHODS from SW-846	
ORGANIC ANALYSIS	TECHNIQUE	DIGESTION	ANALYSIS
Volatiles	GC/MS	INC.*	8240
Semivolatiles	GC/MS	INC.*	8270
Organochlorine Pesticides & PCB's	GC/MS	INC.*	8080
Organophosphorus Pesticides	GC/MS	INC.*	8140
Chlorinated Herbicides	GC/MS	INC.*	8150

*INC.=Digestion procedure included in method procedure.

3.1.8 PHYSICAL PARAMETER SELECTION. Soil samples will be characterized using standard USACE geotechnical methods. The soil samples will be physically described and classified in the field by the field crew. Unified Soil Classification System (USCS) classification will be done at the laboratory. The classification will consist of a visual classification, a sieve and hydrometer analysis to determine grain size distribution of the sample, determination of natural water content, USCS classification, organic content and density. The sieve analysis determines the gradation of grain sizes ranging from the number 4 sieve to the number 200 sieve. The hydrometer analysis determines the percentage of silt and clay sized particles in the sample. Rocks will be examined and classified in the field and their descriptions logged in the field log book. Classification will be in accordance with EM 1110-1-1806 (located in field trailer). The classification and description of the rocks will include in the following order, as applicable:

1) Unit Designation (Miami Elite, Clayton Formation, Chattanooga shale)
2) Rock type
3) Hardness
4) Degree of weathering
5) Texture
6) Structure
7) Color
8) Solution and void conditions
9) Swelling properties
10) Slaking properties
11) Additional descriptions such as mineralization, size and spacing shale seams, etc.

3.2.0 SAMPLING PROCEDURES

3.2.1 GENERAL PRINCIPLES. Soil samples will be taken using a Shelby Tube sampler and hand tools. Protective plastic will be placed on the ground in sample areas during sampling. Direct body contact with the samples must be avoided. To minimize cross contamination between samples, the samplers will wear disposable latex gloves. The outer pair of latex gloves are to be changed between each sampling event. All sampling equipment and drilling equipment will be decontaminated between usage. Three surface samples are proposed at boring WES 9-3-81 to attempt to determine if surface spillage has occurred. Fifteen borings are planned at this site. Three of these borings will be used as background borings. The background borings will be the first borings to be augered at the location. They will be placed at a location away from the parking lot of Building 2189, but within the unit boundary. Three borings will be taken in the vicinity of Building 2189, three in the vicinity of the R-150 Tank, and six borings will be taken at Building 55. When possible, the soil boring locations will coincide with monitoring well locations which are to be installed later. The soil horizons to be augered during well installations can be used to obtain soil samples for chemical and physical testing. At each boring soil samples will be taken at the following depths, 3" to 6", 12" to 18", 18" to 24", and from 6" directly above the water, or top of rock, whichever is encountered first. These sample intervals are shown on Figure 3.2.1. No samples are to be taken below the water table and no samples will be taken below the top of rock. The borings are to be taken to bedrock/refusal, or a depth of 50' below the ground surface.

Monitoring wells will be installed throughout the PCA/R-150 Tank Site to provide for the measuring of ground water levels, piezometric surfaces, determining stratigraphic positioning, and detection of chemical contamination. These samples will be collected using a Teflon bailer. Samples of the existing wells will be taken from the least-to-most contaminated well as determined from prior ground water analysis. To insure that the samples represent the conditions existent in the aquifer, three casing volumes of water will be drawn prior to sampling. Refer to Section 3.4.2 for the handling of Investigation-Derived Waste.

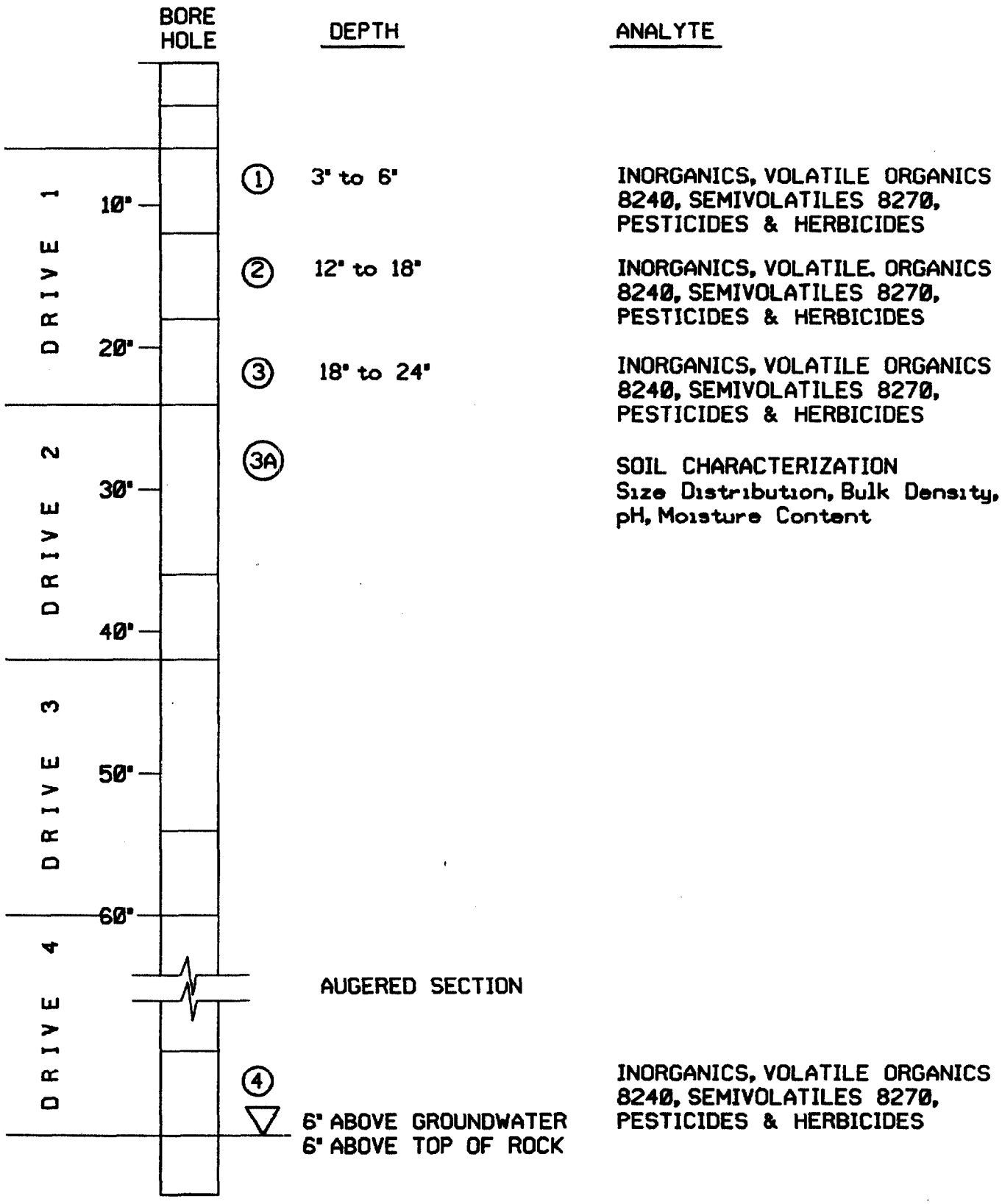


Figure 3.2.1
Diagram of Boring Log with Sample Points
NWSCC Phase II Soils

3.2.2 **SURFACE SAMPLING**. Protective plastic will be placed on the ground in sample areas during sampling. Three surface samples will be collected at locations indicated in Section 3.2.1. At each surface sample location the same procedure will be followed. Sod and top soil will be removed to a depth of approximately 3" below the ground surface. A soil sample will be taken using a pre-cleaned sampling trowel. Two 40 mL VOA vials will be taken for volatile organic compound analysis. VOA samples will be done quickly and collected first. Care will be taken to fill the head space. Two 8 oz. wide-mouth glass jars of soil will be taken for inorganic, herbicide, pesticide, and semi-volatile detection. Each 8-oz. jar will be filled to capacity, or as near to capacity as possible.

3.2.3 **SUBSURFACE SAMPLING**. Soil borings will be drilled using a Failing 1500 truck mounted drilling rig. Samples will be taken at specified depths all above the water table and refusal. A Shelby sampler will be used to collect the soil samples. The sampler will be advanced through a hollow stem auger. The hollow stem auger will be used because it will minimize cross contamination of samples. As the auger advances into the soil, protective casing is advanced which will prevent the hole from caving. At the surface, the sample will be extracted, peeled, and bottled in the shortest time possible. Peeling is the process that removes and discards the portion of the sample which is in direct contact with the sampler. Ends of the sample will not be used. Samples for volatiles analysis will be taken, bottled, and capped within 15 seconds from the time the sampler is opened. All samples will be extruded into 8-oz. wide-mouth glass jars or other containers with minimal disturbance of the sample. Stainless steel or plastic tools will be used to place the peeled samples into the containers. The sample jars or bottles will then be sealed and placed in sealed plastic packages. One sample per sealed package. Following collection, soil samples will be placed on ice with sufficient packing material to prevent breakage and shipped in a locked ice chest which will maintain a temperature of 4 degrees C. Chemical preservatives will not be required for the soil samples. The coolers containing the samples with their accompanying Chain of Custody forms which are sealed in plastic bags and taped to the inside lid of the cooler will be transported to the analytical lab for analysis. Transport will be by air freight with an overnight carrier service. A tamper-proof seal will be placed on each cooler to ensure sample integrity. Two 8 oz. jars of soil and two 40 mL. VOA vials of soil will be collected. These samples will be analyzed for the presence of pesticides, PCB's, herbicides, metals, and 8240 and 8270 organics.

The hole will be augered to a depth of 50' or bedrock which ever is shallower. The hole will be back filled using grout and bentonite cement. Refer to Section 3.4.2 for the handling of Investigation-Derived Wastes.

3.2.4 **GROUND WATER SAMPLING**. Ground water samples will be taken using a Teflon bailer lowered into the well with a stainless steel leader. For recently installed wells they must be fully developed in accordance with the Well Construction Procedures prior to sampling. The depth to the water table will be determined using a steel tape. Prior to sampling, the wells must be purged. This involves removing three well volumes of water from the well. Refer to Section 3.4.2 for the handling of Investigation-Derived Waste Before purging the wells, ground water parameters (water table depth, pH, temperature, and water conductivity) will be determined and recorded. The first round of ground water sampling will only include the 20 existing wells. Twenty-eight ground water samples will be collected per round for the second through the fifth rounds on a quarterly basis. The sampling order for the second through the fifth rounds will be dependent upon the results of the ground water analysis. A total of 116 ground water samples shall be collected for ground water analysis. The water sample is transferred from the bailer into the proper sample bottles. For volatile organic analysis, two 40 mL VOA vials are filled first. They should be completely filled with no headspace or bubbles. Samples for the other parameters will then be collected. Nitric acid (HNO_3) will be added to water collected for metal analysis. The pH of the sample should be lowered to <2 for proper preservation.

3.2.5 **SAMPLE CONTAINERS**. The sample containers will be obtained from a supplier (ICHEM Research INC.). The containers will be pre-cleaned. The containers will be shipped to the location in protected containers. The sample jar types and sizes are given in Table 3.2.5. A verification of the decontamination procedure will accompany every container shipment.

TABLE 3.2.5
SUMMARIZATION OF SAMPLE CONTAINERS,

MATRIX	PARAMETERS	CONTAINERS
Soil	Volatiles Septa vial	2x40 mL glass
Soil	Herb. & Pest.	1 x 8 oz. wide-mouth glass ea.
Soil	Inorganics & Semivolatiles	1 X 8 oz. wide-mouth glass ea.
Water	Volatiles	Two 40 mL. glass vials
Water	Semivolatiles	One 1000 mL. amber glass jar
Water	Metals	One 1000 mL. plastic jar
Water	Organochlorine Pesticides & PCB's	One 500 mL. amber glass jar
Water	Organophosphorus Pesticides	One 500 mL. amber glass jar
Water	Chlorinated Herbicides	One 500 mL. amber glass jar

3.2.6 **SAMPLE TESTING**. Soils and ground water testing for the presence of inorganics by SW-846 Method 7060, 6010, 7471, and 7740, volatiles by EPA Method 8240, semivolatiles by EPA Method 8270 Organochlorine Pesticides and PCB's by SW-846 Method 8080, Organophosphorus Pesticides by SW-846 Method 8140, and Chlorinated Herbicides by SW-846 Method 8150 will be done. The ground water samples analyzed for inorganics will be filtered. For physical testing of the soils at least one disturbed soil sample per boring will be collected. These soil samples will be analyzed to determine their particle size gradation, natural water content, and their organic content. The soils will be described using USCS System. Additional samples for physical testing will be collected at major stratigraphic breaks. This information will be used to characterize the soils and in the remedial technique selection. Table 3.2.6A list field samples required for the first round of ground water sampling , surface soil sampling and subsurface sampling. Table 3.2.6B list field samples required for the second through the fifth round of ground water sampling.

TABLE 3.2.6A
Types and Numbers of Samples
Round 1
PESTICIDE CONTROL AREA/R-150 TANK SITE

		Quality Assurance and Quality Control				
	Field Samples	Field/Dups QC	Rinsate Equip	Field Blanks	Trip Blanks	Total
	Rnd 1	Rnd 1				Rnd 1
GROUND WATER:						
Volatiles	20	2		1	2	25
B/N/A	20	2		1	NR	23
Pesticides*	20	2		1	NR	23
TRPH	20	2		1	NR	23
Metals	20	2		1	NR	23
Other:						
SURFACE WATER:						
Volatiles						
B/N/A					NR	
Pesticides					NR	
TRPH					NR	
Metals					NR	
Other:						
SURFACE SOILS:						
Volatiles 8240	3	1	1	1		9
B/N/A 8270	3	1	1	1	NR	6
Pesticides*	3	1	1	1	NR	6
TRPH	3	1	1	1	NR	6
Metals	3	1	1	1	NR	6
Other: explosives			1			
SUBSURFACE SOILS:						
Volatiles 8240	60	5	12	1	2	80
B/N/A 8270	60	5	12	1	NR	80
Pesticides	60	5	12	1	NR	80
TRPH	60	5	12	1	NR	80
Metals	60	5	12	1	NR	80
Other: explosives						

*Includes Organophosphorus Pesticides and PCB's, Organophosphorus Pesticides and Chlorinated Herbicides.
NR - Not Required.

TABLE 3.2.6B
Types and Numbers of Samples
Rounds 2-5
PESTICIDE CONTROL AREA/R-150 TANK SITE

		Quality Assurance and Quality Control				
	Field Samples	Field/Dups QC	Rinsate Equip	Field Blanks	Trip Blanks	Total
Round 2 3 4 5 (please circle)						
GROUND WATER:						
Volatiles	28	3		1	2	34
B/N/A	28	3		1	NR	32
Pesticides*	28	3		1	NR	32
TRPH	28	3		1	NR	32
Metals	28	3		1	NR	32
Other:						
SURFACE WATER:						
Volatiles						
B/N/A					NR	
Pesticides					NR	
TRPH					NR	
Metals					NR	
Other:						
SURFACE SOILS:						
Volatiles 8240						
B/N/A 8270					NR	
Pesticides*					NR	
TRPH					NR	
Metals					NR	
Other: explosives						
SUBSURFACE SOILS:						
Volatiles 8240						
B/N/A 8270					NR	
Pesticides					NR	
TRPH					NR	
Metals					NR	
Other: explosives						

*Includes Organophosphorus Pesticides and PCB's, Organophosphorus Pesticides and Chlorinated Herbicides.
NR - Not Required.

Samples collected for chemical analysis will be sent to USACEWES' Analytical Laboratory Group (ALG) in Vicksburg, Mississippi, and the samples collected for physical characterization will be sent to USACEWES' Geotechnical Laboratory also in Vicksburg, MS. ALG's (POC Ann Strong) address is: 3909 Halls Ferry Rd.; Vicksburg, Mississippi. The address for the Soils Investigation Laboratory (POC Mr. Jesse Oldham) is: 3909 Halls Ferry Rd.; Vicksburg, Mississippi.

3.2.7 SAMPLING QUALITY ASSURANCE.

Field Blanks. Field Blanks consist of the source water used in decontamination and steam cleaning. These blanks are collected and analyzed to determine the level of contamination introduced into the sample due to sampling techniques. At a minimum, one field blank from each event and each source of water must be collected and analyzed for the same parameters as the related samples.

Trip Blanks. Trip blanks are defined as samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic (VOA) samples. Two trip blanks should accompany each cooler containing VOAs, should be stored at the laboratory with the samples, and analyzed by the laboratory. Trip blanks are only analyzed for VOAs.

Equipment Rinsates. Equipment rinsates are the final analyte-free water rinse from equipment cleaning collected daily during a sampling event. Initially, samples from every other day should be analyzed. If analytes pertinent to the project are found in the rinsate, the remaining samples must be analyzed. The results from the blanks will be used to flag or assess the levels of analytes in the samples. This comparison is made during data validation. The rinsates are analyzed for the same parameters as the related samples.

Duplicates. Duplicate samples collected in the field provide precision information for the entire measurement system including sample acquisition, homogeneity, handling, shipping, storage, preparation, and analysis. Samples for duplicated analyses will be selected at random by the on-site coordinator, and submitted blind to the laboratory for analyses. Duplicate analyses will be performed for one out of every 20 investigative samples or as appropriate for each matrix.

3.3.0 WELL CONSTRUCTION PROCEDURES

3.3.1 WELL LOCATION RATIONALE. The 20 existing ground water monitoring wells will be used to initially sample the ground water. Six additional wells are proposed to be installed near the R-150 Tank Site in an attempt to define the contaminant "plume" or distribution, especially around the zone of high-concentration defined by wells WT3P and WT4P. Figure 3.1.2A presents suggested locations for the six additional wells. These wells were proposed in the "Proposed Ground-Water Assessment Plan for R-150 Tank Storage Closure Plan", submitted to the Indiana Department of Environmental Management (IDEM). Due to the levels of TCE and Trichloroethane found in well WT3P, proposed wells 1-4 will provide information on the extent of contamination in the aquifer around WT3P. Well 5 will better define the geology and the degree of contamination toward well WES 9-3-81. Well 6 will confirm or refute the assumption that contamination does not extend up-gradient toward WT6P. Wells 1-3 are approximately 50 ft. and wells 4 and 5 approximately 100 ft. from well WT3P. Well 6 is to be placed midway between WT4P and WT6P (Proposed Ground-Water Assessment Plan for R-150 Tank Storage Closure Plan, 1989).

Very little is known about the ground water conditions around Buildings 55 and 2189. Three wells are proposed at each building in an attempt to determine ground water contaminants. The exact locations for those wells have not been selected. The locations shown on Figure 3.1.2B are approximate locations. The exact number of wells is dependent upon the first round of ground water and soil analysis.

3.3.2 DRILLING TECHNIQUES. Two drilling methods (coring, augering, U.S. Army Corps of Engineers publication EM 1110-1-1804, located in drilling trailer) are to be used.

At locations needing rock coring, the following procedures are to be used. The soil zone will be drilled using a hollow stem auger down to refusal. Where possible these auger holes will serve as soil borings. Where the soil thickness is greater than 11 feet, core samples will be taken with a HQ wireline system. If the depth to refusal is less than approximately 11 feet, (the depth needed to start coring with the HQ wireline core barrel), then a 2-foot-long NX core barrel will be used to sample to 11 feet. The core samples will be placed in order of removal, into plywood boxes (filling boxes from the lower left and continuing to the upper right) for future reference. Detailed geologic logs will be prepared. The core boxes shall be "permanently labeled" and transferred to the core storage area. Cores shall be transferred at the completion of each well or at the completion of site drilling. Refer to Section 3.4.2 for the handling of Investigation-Derived Waste. This work requires the services of a professional geologist.

3.3.3 **WELL CONSTRUCTION**. A system of 2-inch-ID flush-threaded schedule 40 PVC pipe and screen will be used to install the monitoring wells. The screen length is dependent on the aquifer thickness but will not exceed 10 feet without Navy approval. The well materials will be steam-cleaned prior to installation. Well screens will consist of 2-inch-diameter, 0.020-inch-slotted PVC. The riser pipe will consist of PVC and will extend upward to a point approximately 2.5 feet above the ground surface. The bottom of the well screen will have a non-slotted PVC trap extending one foot below the screen.

Once the pipe system is installed in the boring, the annulus of the screened section and the total aquifer zone will be packed with a coarse silica sand filter material. The filter material will be poured in from the top of the well slowly by hand and periodically checked for depth with a tape measure. The filter pack will be brought up to the next higher aquiclude. The size of the filter sand will be determined based on the size of the sand in the aquifer being screened. Rock wells do not have to be packed. The silica filter sand must be certified clean and shipped to the site in sealed bags. The screened groundwater zone must be isolated for the remaining well annulus above the well screen. It is to be capped with a 3-to-5-foot thickness of bentonite pellets which will act as a sealing medium. The bentonite is allowed to set 30 minutes to 1 hour for swelling time, and the well is then to be grouted to the surface. The grout will be a cement-bentonite mixture. It is to be pumped into the well from the bottom through a 3/4-inch-diameter pipe. The top of each well has a vented PVC cap. The riser pipe is to be protected at the surface by 3-inch diameter steel pipe with locking caps. Three 4-inch-diameter steel posts will be equally spaced around the well and embedded in individual concrete pads separate from the main concrete pad around each well. A permanent tag that clearly identifies the well number, date constructed, screen interval, well depth and top of inside casing elevation will be affixed on the well. A typical well installation diagram is shown in Figure 3.3.3A.

Wells will be developed no sooner than 48 hours after grouting is completed. This general installation procedure will be used for all the new wells. It will be modified for the wells which are to test the base of the deeper aquifers. In the case where a shallower aquifer is to be drilled through, the shallow aquifer will be closed off behind pipe. Figure 3.3.3B is a diagram of a telescoping well.

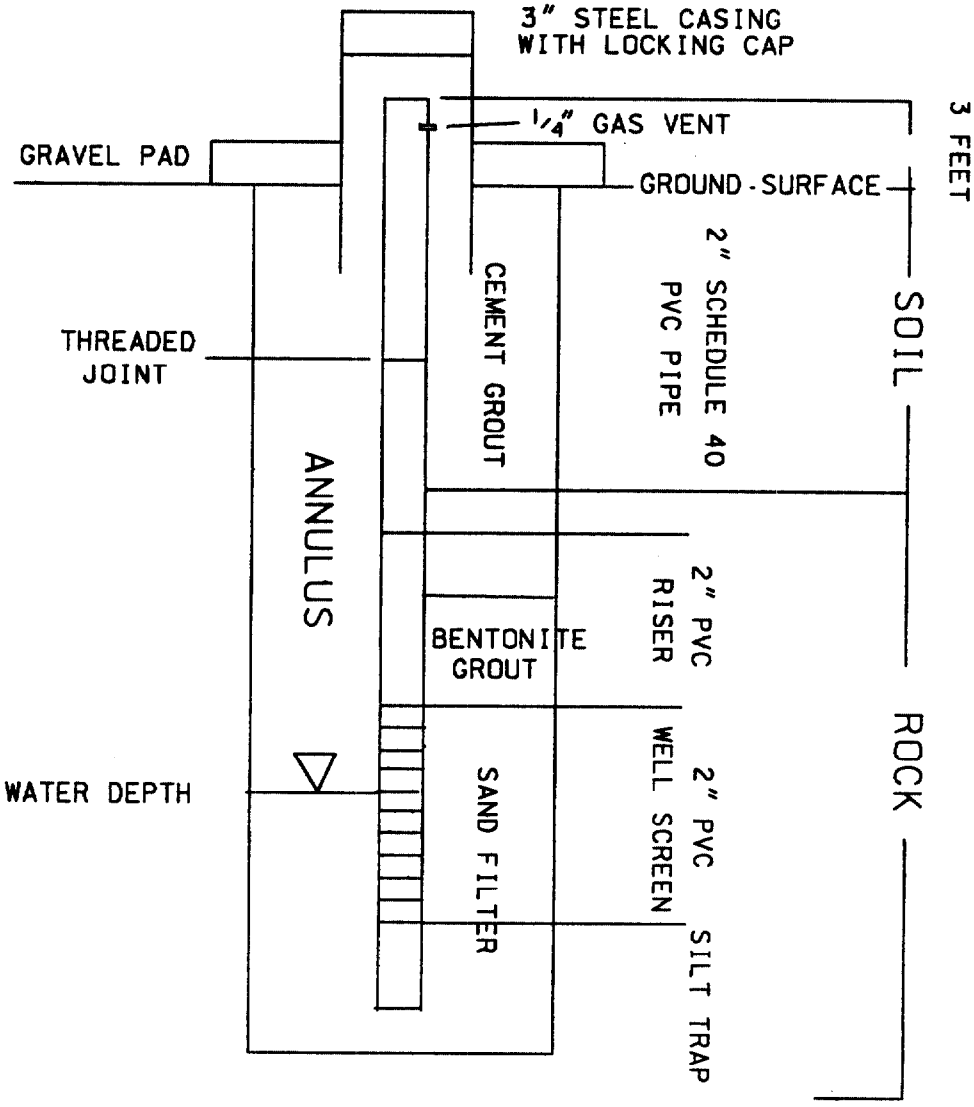


FIGURE 3.3.3A
MONITORING WELL IN ROCK

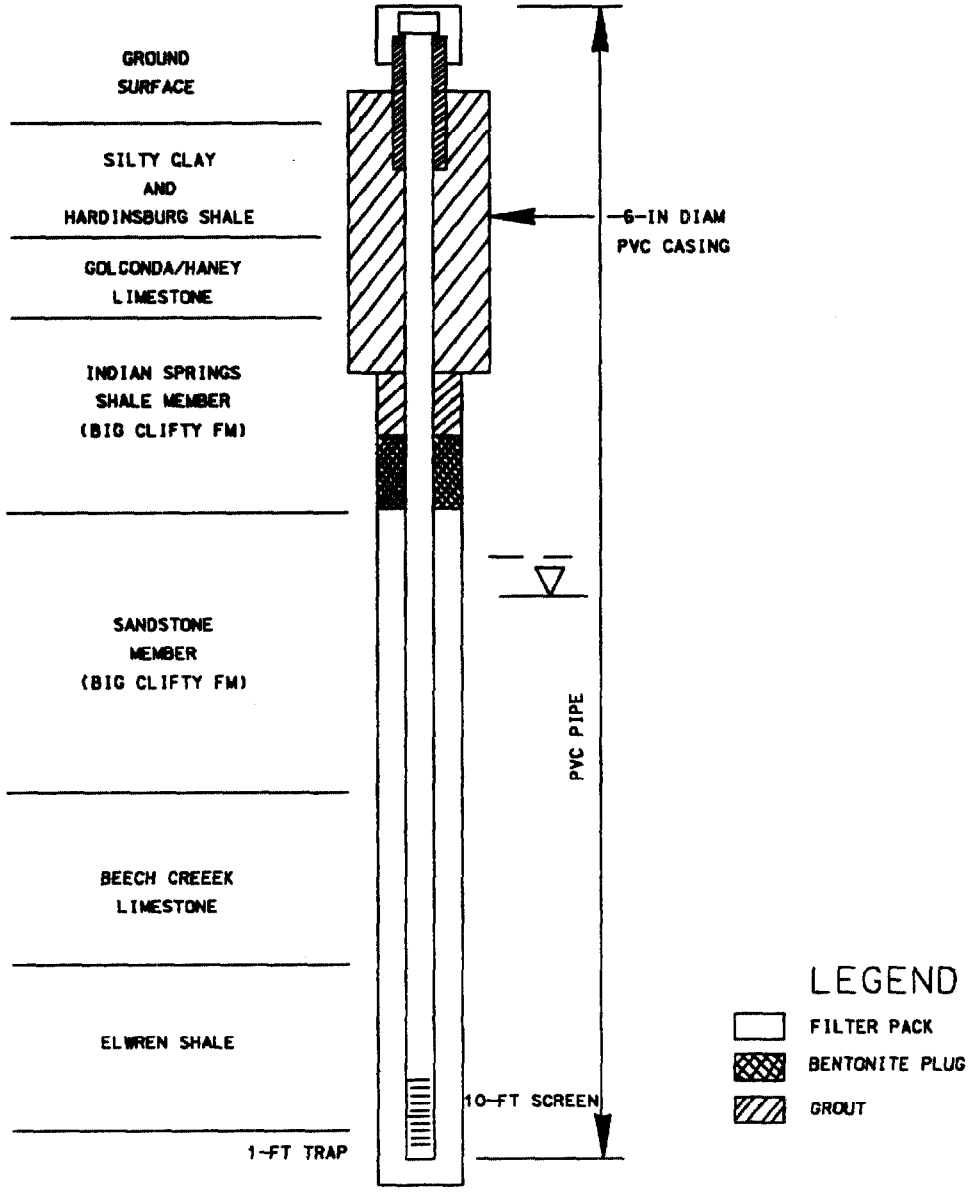


FIGURE 3.3.3B
TELESCOPING WELL

3.3.4 WELL DEVELOPMENT. A bailing and surging procedure will be used to develop the new wells and redevelop the existing wells if needed. The surge tool is a length of stainless steel rod with rubber washers attached at each end. The washers are to be slightly smaller than the inside diameter of the well pipe. The bailer is a 5-foot-long stainless steel or Teflon bucket with a diameter that is slightly less then the inside diameter of the casing. The tools are alternately lowered into the well on a stainless steel cable and pulled briskly up and down within the screened zone. This bailing/surging procedure creates a surging action within the screened zone. This action is to flush the finer particle out of the screen and packing material allowing better flow of ground water into the well from the aquifer. These processes are repeated for several hours in each well or until the water forced out at the top becomes relatively clear. The developing tools will be flushed with clean water between each well setup.

Refer to Section 3.4.2 for the handling of Investigation-Derived Waste.

3.4.0 DECONTAMINATION AND DISPOSAL OF WASTE

3.4.1 DECONTAMINATION OF EQUIPMENT.

3.4.1.1 PERSONNEL

Decontamination procedures are as follows:

- Protective disposable outer garments will be removed and placed in disposable plastic bags at the perimeter of the exclusion zone before each departure from the exclusion zone.

- If disposable outer boots are worn, they will be removed first and then gloves. If reusable rubber or neoprene boots are worn, they will be washed and rinsed before leaving the contamination reduction zone.

- Field personnel will wash and dry their hands and all exposed surfaces before leaving the contamination reduction zone, and used paper towels will be placed in the disposable bag.

- The plastic bags containing waste materials will be disposed daily in a NWSCC dumpster.

Clean outer garments will be accessible to field personnel in an area free from potential contamination. Water, soap, and paper towels will also be kept in a clean location for both regular clean-up and emergency use.

3.4.1.2 **SAMPLING DEVICES**. All sampling devices (shelby-tube, sampling trowel, bailer and hollow stem auger) will be cleaned using the following steps.

1. Scrub equipment with a non-phosphoric detergent and potable water.

2. Rinse with potable water.

3. Rinse with 0.1 N nitric acid when sampling for inorganics. 0.1 N nitric acid is prepared by adding approximately 4.2 mL. concentrated nitric acid to approximately 500 mL water. Then dilute the solution to 1 L final volume with water. Caution: add concentrated acid to water: never add water to concentrated acid.

4. Rinse with deionized water.

5. Rinse with hexane (pesticide grade).

6. Air dry.

7. Rinse with deionized water. Collect rinsate blanks now (ground water sampling).

8. Air dry. (ground water sampling)

9. Wrap or cover sampling equipment with aluminum foil (shining side out) when not in use.

Other reusable sampling equipment bowls, spatulas, etc. will be decontaminated by using only the wash and rinsing procedures.

Decontamination liquids will be handled according to Section 3.4.2

3.4.1.3 **DRILLING EQUIPMENT**. The drill rig, its substructure, auger flights, bit, and drill rods will be steam cleaned with a high pressure, high temperature, hot water cleaner. (Note Army Corps, a pressure washer with nonphosphoric detergent is not needed.) the washing is to remove all soil from the rig and drill equipment. Potable water from the NWSCC will be used. The Army Corps will collect and analyze a source water sample (i.e. field blank) from the truckload of NWSCC water. Work will proceed prior to receipt of analytical results for the source water samples. The samples will be prepared, shipped, and analyzed for the full list of compounds. An equipment decontamination zone will be designated at the site.

Decontamination of the drilling rig and equipment will take place in a designated area at the site. Water from decontamination activities will be allowed to infiltrate the ground in a non-nuisance manner.

3.4.2 **HANDLING OF INVESTIGATION-DERIVE WASTE MATERIAL**. The RFI will produce a number of types of Investigation-Derived Wastes (IDW) during the field activities. The removal of IDW which does not pose any immediate threat to human health or the environment is not recommended. The site manager, using best professional judgement, will render an IDW as hazardous or non-hazardous. Fluids and soils generated during the field work will be disposed of at the ground surface in a non-nuisance manner. The IDW will be handled as follows:

3.4.2.1 **CUTTINGS AND EXCAVATED SOILS**. Drill cuttings and soils from the investigation will be thin-spread around the borings and the ground water monitoring wells.

3.4.2.2 **LIQUIDS**. Liquids from the temporary decontamination area and those used at individual borings for decontamination of downhole equipment will be discharged to the ground surface in a non-nuisance manner.

3.4.2.3 **USED PERSONAL PROTECTIVE EQUIPMENT**. All used Tyvek suits, overboots, gloves, wastepaper, and other wastes will be collected, bagged, and place in a NWSCC dumpster.

3.4.2.4 **GROUND WATER**. Ground water derived from purging and well development will be discharged to the ground surface at the well location in a non-nuisance manner at least 10 feet away from the well so as not to recharge the well.

3.5.0 SAMPLE DOCUMENTATION PROCEDURES

3.5.1 GENERAL PROCEDURE. Field parameters will be recorded in a field notebook. These parameters will be transferred to Data Sheets, Chain of Custody Forms, Drilling Logs, and Sample Tags. Final documentation will be made from a consolidation of those notes, data sheets, and laboratory data. Photographic documentation of field activities will be taken and included in the report.

3.5.2 CHAIN OF CUSTODY. A Chain of Custody program will be initiated in the field upon collection of the sample. A Chain of Custody record will accompany each shipment of samples at all times. An example of a Chain of Custody record is shown in Figure 3.5.2. Include in the remarks section of the Chain of Custody form the container type and airbill number.

3.5.3 SAMPLE LABELING. At the time of sample collection, the sample will be placed in a prelabled, precleaned sample container. The sample label is to contain the following information:

1. Site name.
2. Field station number.
3. Date and time of sample collection.
4. Sample type (grab or composite).
5. Sample location description.
6. Signature
7. Sample preservative used.
8. Analyses type.

An example of a sample label is shown in Figure 3.5.3

3.5.4 FIELD LOGS. Field logs will be made by the geologist or inspector of each sample boring. Figure 3.5.4 is an example of a field sample/boring log. The field log documents the sample number, the date of sampling, the depth sampled, provides a field classification of the soil or other material, the type of sampler used, the container number, and job information including type of drill rig, operator's name, site name, boring number and surface elevation if available.

3.5.5 FIELD NOTEBOOK. Sampling information will also be kept in the log book. The log book is to be a bound journal. All entries in the log book will be in ink, signed and dated. No erasures will be allowed. All corrections will be slashed, dated and initialed. Information included in this book consist of: sampling dates, sample numbers, sample descriptions, sample depths, ground water conditions, and other pertinent sampling information. When sampling ground water pertinent information should include: identification of well, well depth, static water level depth and measurement technique, presence of immiscible layers and detection method, well yield-high

U.S. Army Corps of Engineers

Chain of Custody Record

(ER 1110-1-263)

Proj. No.	Project Name					Number of Containers								Remarks:
Sampler : (Signature)														
Date	Time	Pres.	Grab	Comp	Site Code/Sample Number									

Sampler Relinquished by:	Date/Time	Received by: (Sig.)	Date/Time	Hazards Associated with Samples
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Date/Time	
Relinquished by: (Sig)	Date/Time	Received for Laboratory by: (Sig.)	Date/Time	Remarks at time of receipt:
Custody Seal No.		Lab case No.:		

ENG Form 5021-R, Oct 90

Proponent: CEMP-RT

FIGURE 3.5.2

CHAIN OF CUSTODY

U. S. ARMY CORPS OF ENGINEERS
WATERWAYS EXPERIMENT STATION
P.O. DRAWER 631
VICKSBURG, MS 39180

UNITED STATES ARMY
CORPS OF ENGINEERS
...Serving the Army
...Serving the Nation

a

U. S. ARMY CORPS OF ENGINEERS

STATION NO.	DATE	TIME	SEQUENCE NO.

STATION LOCATION

_____ GRAB
_____ COMPOSITE

_____ BOD
_____ SOLIDS
_____ COD
_____ NUTRIENTS
_____ VOLATILES
_____ SEMIVOLATILES
_____ PESTICIDES

_____ METALS
_____ OIL & GREASE
_____ D.O.
_____ BACT.
_____ HERBICIDES
_____ OTHER
_____ TYPE OF CONTAINER

REMARKS/PRESERVATIVE:

SAMPLERS:

CUSTODY SEAL NO. _____

b

FIGURE 3.5.3 EXAMPLE OF CHAIN-OF-CUSTODY SAMPLE TAG
(a) FRONT (b) BACK

FIELD L[illegible] OF BORINGS

PROJECT: _____ BORING NO. _____

LOCATION _____ SHEET NO. _____ OF _____

WEATHER _____ DATE/STARTED: _____ COMPLETED: _____ OPERATOR _____

DRILL FLUID _____ SURFACE ELEV. _____ INSPECTOR _____

DEPTH TO GROUND WATER / INITIAL _____ STATIC AT _____ DAYS _____ HRS. _____ DRILL RIG _____

SAMPLE NO.	DRIVE		SAMPLE		BLOWS	TYPE OF SAMPLER	SAMPLE CONTAINER	CLASSIFICATION AND REMARKS		
	FROM	TO	FROM	TO				COLOR	SYMBOL	OTHER

SAD Form 1620-R Nov 84 Previous Editions are Obsolete. DM 1110-1-1

Figure 3.5.4

or low, time well purged, collection method for immiscible layers and sample identification numbers, well evacuation procedure/equipment, sample withdrawal procedure/equipment, date and time of collection, well sampling sequence, types of sample containers used and sample identification numbers, preservatives used, parameters requested for analysis, field analysis data and methods, sample distribution and transporter, field observations on sampling event, name of collector, climatic conditions including air temperature, and internal temperature of field and shipping (refrigerated) containers.

Other information to be found in the log book includes Chain of Custody data, sample shipment information, decontamination documentation, and personnel changes. The log book will contain a detailed inventory of all waste drums generated by the operation. This inventory will describe the drum contents, and the boring number from which it was derived. The wastes generated during the decontamination of the sampling equipment will be marked by boring number. Decontamination pad wastes will be identified as such. The field log book will be submitted to the Navy at the time of project completion. A copy of the field notes will be added as an appendix to the report.

3.5.6 DAILY WORK SCHEDULES. Each day a summary sheet is to be compiled. Information will be copied from various log books. Figure 3.5.6A and B are copies of the work summary sheets. Information found in the work summaries include: weather conditions, levels of protection, work performed, sampling efforts, field analysis, problems and corrective action, and QA/QC activities. The sheets will be kept in the field office and will become part of the final record at the end of the job. Sheets will be filled out in ink or typed. These sheets will be kept in a loose leaf notebook.

3.5.7 DRUM INVENTORY. Labels will be attached to the drums. The label will consist of the SWMU No., boring/well no., drum no., contents and date filled. An inventory of all waste material drums will be kept by the site manager. This inventory list will contain a description of the drum, its location, its content, and the date filled. The inventory will be used later to determine the drum content for disposal. This list will be kept as a part of the operational records. A spread sheet will be maintained and included in the report (Figure 3.5.7). It will list location, contents, date filled, description, SWMU no., boring/well no., and drum no.

DAILY QUALITY CONTROL REPORT (DQCR)
NAVAL WEAPONS SUPPORT CENTER, CRANE INDIANA
PROJECT NO. IN5 170 023 498

SWMU: _____

DATE: _____ AUTHOR: _____

WEATHER:

HEALTH AND SAFETY - LEVELS OF PROTECTION AND PROBLEMS/SOLUTIONS:

WORK PERFORMED:

SAMPLING PERFORMED:

Figure 3.5.6A

FIELD ANALYSIS PERFORMED:

PROBLEMS ENCOUNTERED AND CORRECTIVE ACTIONS:

QUALITY CONTROL ACTIVITIES INITIATED:

Site Coordinator Signature: _____ Date: _____

Figure 3.5.6B

DRUM INVENTORY SHEET

SITE: PCA/R-150 TANK SITE 09/05

DRUM NO.	SWMU NO.	BORING /WELL NO.	DESCRIPTION	CONTENTS	LOCATION	DATE FILLED

FIGURE 3.5.7

4.0 SAFETY, HEALTH, EMERGENCY RESPONSE AND ACCIDENT PREVENTION PLAN

SEE APPENDIX A

5.0 DATA MANAGEMENT PLAN

5.1.0 GENERAL. The Data Management Plan is the part of the Work Plan that explains the movement of the data into final report form. Chemical and Physical Data are reduced from its raw form into final form by the laboratory personnel. The final data is then put into a report format. The data will be presented in various text, tabular, and graphic formats. Concurrent with the work on the individual sites progress reports for the overall soil investigation program, bimonthly reports of progress will be issued. These bimonthly progress reports are separate from the individual SWMUs' studies and are covered under the generic work plan for the RFI soils investigation.

5.2.0 DATA RECORD. Recorded data will consist of site (SWMU) locations, sampling station (boring) numbers and location, sample number and depth sampled, date sampled, names of sampling personnel, sample descriptions and other boring log data, Chain of Custody information, parameters measured, laboratory results, and analysis of results. Locations will be recorded on map positions on base maps.

Chemical and physical laboratory results will be presented as computer print outs generated by the analyzing laboratory and will include parameters such as the sample number, parameter measured, amount detected, date analyzed, units used, a lab ID number for each sample, duplicates, and results of analysis of blanks. The data will be presented in appendixes to the draft and final report.

5.3.0 TABULAR DISPLAYS. Tables of data will include field data (sample station number, number of samples per station, depths sampled, date sampled, etc.) and laboratory data for chemical and physical testing results.

5.4.0 GRAPHICAL DISPLAYS. Data will be presented in various graphical formats. Sample boring locations will be presented on base maps. Contaminant plume maps will be made to display the contaminant spread. Cross sections of the soil profile will be made to display the vertical distribution of soil type and contaminant concentrations. Bar and line graphs will be used to show contamination levels. Pertinent photographs will be included in the report to refine a point or add emphasis to a finding. Other displays are possible.

5.5.0 DATA REVIEW. Characteristics of a release are dependent on the recognition of a release condition. The existence of explosive compounds in the sampled media indicates a release. Pesticides and herbicides are man made products and their existence in the sampled media indicates a release. Most compounds listed as SW-846 method 8240 (volatile organic analysis) and method 8270 (semivolatile organic analysis) are man made products and their presence

in the sampled media are considered a release. Inorganic compounds are naturally occurring earth materials. Release characteristics are determined by evaluating data with respect to: 1)detection limits, 2)control limits for duplicates, spikes, blanks and surrogates, 3)data control within control limits and corrective actions, and 4)flagging of consistently out of control data.

5.6.0 REPORT FORMAT. A draft and final report will be written. A period of time for commenting will occur between the draft and final report. This comment period will allow for important perspectives to be considered. The contents of the reports shall be arranged in accordance with the suggested RFI format as presented in RFI Guidance Manual (USEPA, OSWER Directive 9502.00-6c, April 1987). The report shall consist of 8 1/2" X 11" pages with drawings to be folded, if necessary, to this size. Large displays will be presented as plates found at the end of the report but referred to within the text. To reduce the number of drawings, data and ideas should be combined on drawings, but drawing details will not be cluttered or poorly organized. The data must not reduce the drawing's effectiveness. All drawings shall be of engineering quality in drafted form with sufficient detail to show interrelations of major features and/or thoughts on the installation site map. A decimal paragraphing system shall be used, with each section and paragraph of the reports having a unique decimal designation. The report covers shall consist of durable 3-ring binders and shall hold pages firmly while allowing easy removal, addition, or replacement of pages. In the appendix of the draft report there shall be a statement listing the persons who had significant and specific input into the report's preparation. This statement will include the individual's name, job title, and telephone number.

6.0 QUALITY ASSURANCE PROJECT PLAN

SEE APPENDIX B

REFERENCES

Bledso, Ron, Code 0924, 1991, "Site History of PCA/R-150 Tank Site Area" submitted January 19991 to NWSCC.

Dunbar, Joseph B., 1984, "Definition of Contaminated Ground-Water Plumes at Selected Waste Disposal Sites", Naval Weapons Support Center, Crane, Indiana.;USACEWES, Vicksburg, MS.

NEESA, 1983, "Initial Assessment Study of NWSCC", Port Hueneme, Calif.

NWSCC, 1989, "Proposed Ground-Water Assessment Plan for R-150 Tank Storage Closure, Pest Control Area", submitted to Indiana Department of Environmental Management.

NEESA, June 1988, "Sampling and Chemical Analysis Quality Assurance requirements for the Navy Installation Restoration Program".

ACRONYMS

ALG	Analytical Laboratory Group
CAR	Corrective Action Requirements
EPA	Environmental Protection Agency
IAS	Initial Assessment Study
IDEM	Indiana Department of Environmental Management
IDW	investigation-Derived Waste
IRP	Installation Restoration Program
NACIP	Navy Assessment and Control of Installation Pollutants
NEESA	Naval Energy & Environmental Support Activity
NGVD	National Geodetic Vertical Datum
NWSCC	Naval Weapons Support Center Crane
PCA/R-150 TANK SITE	Pest Control Area/R-150 Tank Site
RCRA/HSWA	Resource Conservation and Recovery Act/ Hazardous and Solid Waste Amendments
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SARA	Superfund Amendments and Reauthorization Act
SWMU	Solid Waste Management Unit
USACE	United States Army Corps of Engineers
USACEWES	United States Army Corps of Engineers Waterways Experiment Station

USCS	Unified Soil Classification System
VOA	Volatile Organic Compound Analysis

APPENDIX A

SAFETY, HEALTH EMERGENCY RESPONSE AND ACCIDENT PREVENTION PLAN FOR PCA/R-150 TANK SITE, NWSCC

IN5 170 023 498
FEBRUARY 1992

SAFETY, HEALTH, EMERGENCY RESPONSE AND ACCIDENT PREVENTION PLAN for PCA/R-150 TANK SITE NWSCC, CRANE, INDIANA

FEBRUARY 1992

Prepared by:
U.S. Army Corps of Engineers;
Waterways Experiment Station
Geotechnical Station
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Vicksburg, Mississippi

Prepared for:
Northern Division,
Naval Facilities Engineering Command
U.S. Naval Base, Bldg. 77 Low
Philadelphia, Pennsylvania

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1.0 INTRODUCTION

The Health and Safety Plan (HASP) establishes procedures that are to be followed in order to protect Corps of Engineers' employees and the public from potential safety and health hazards arising from the collection of soil/water samples from the area of and adjacent to Pesticide Control Area (PCA/R-150), of the Naval Weapons Support Center (NWSCC) Crane Indiana. All project activities will be conducted in a manner that minimizes the probability of injury, or accident, or incident occurrence. The Site Safety Plan Acknowledgement will be signed by all who actively participate at this project.

Although the plan focuses on the specific work activities planned for this site, the plan must remain flexible because of the nature of the work. Conditions may change and unforeseen situations may arise that require deviation from the original plan. This flexibility allows modification by USACE supervisors and health and safety officials.

2.0 LOCATION and SITE DESCRIPTION/HISTORY

The NWSCC is located in the northern half of Martin County, in southwestern Indiana , approximately 75 miles southwest of Indianapolis and 71 miles northwest of Louisville, Kentucky. The nearest major metropolitan area is Bloomington Indiana approximately 40 miles northeast on State Highway 45. NWSCC occupies approximately 100 sq. miles zone (62,463.46 acres) which includes 1,006 acres of improved grounds, 49,611 acres of unimproved grounds, and 800 acres of water (Figure 1.1.2A). The area is divided into facility operations, safety buffer and security zones and surrounding farmland. The area is extremely isolated,(High Security) and is not accessible to the public.

The exact site location is designated as the Pesticide Control Area (PCA/R-150 Tank Site) and is located in the central portion of the facility in the NW 1/4 of section 23, T5N, R4W (Figure 1.1.2A). The area is approximately 5.5 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-45 (Figure 1.1.2B).

Due to the lack of complete and accurate written data of the site history of the PCA/R-150 Tank Site, the following information is as complete a summary as possible written by NWSCC, Code 0924 Ron Bledso.

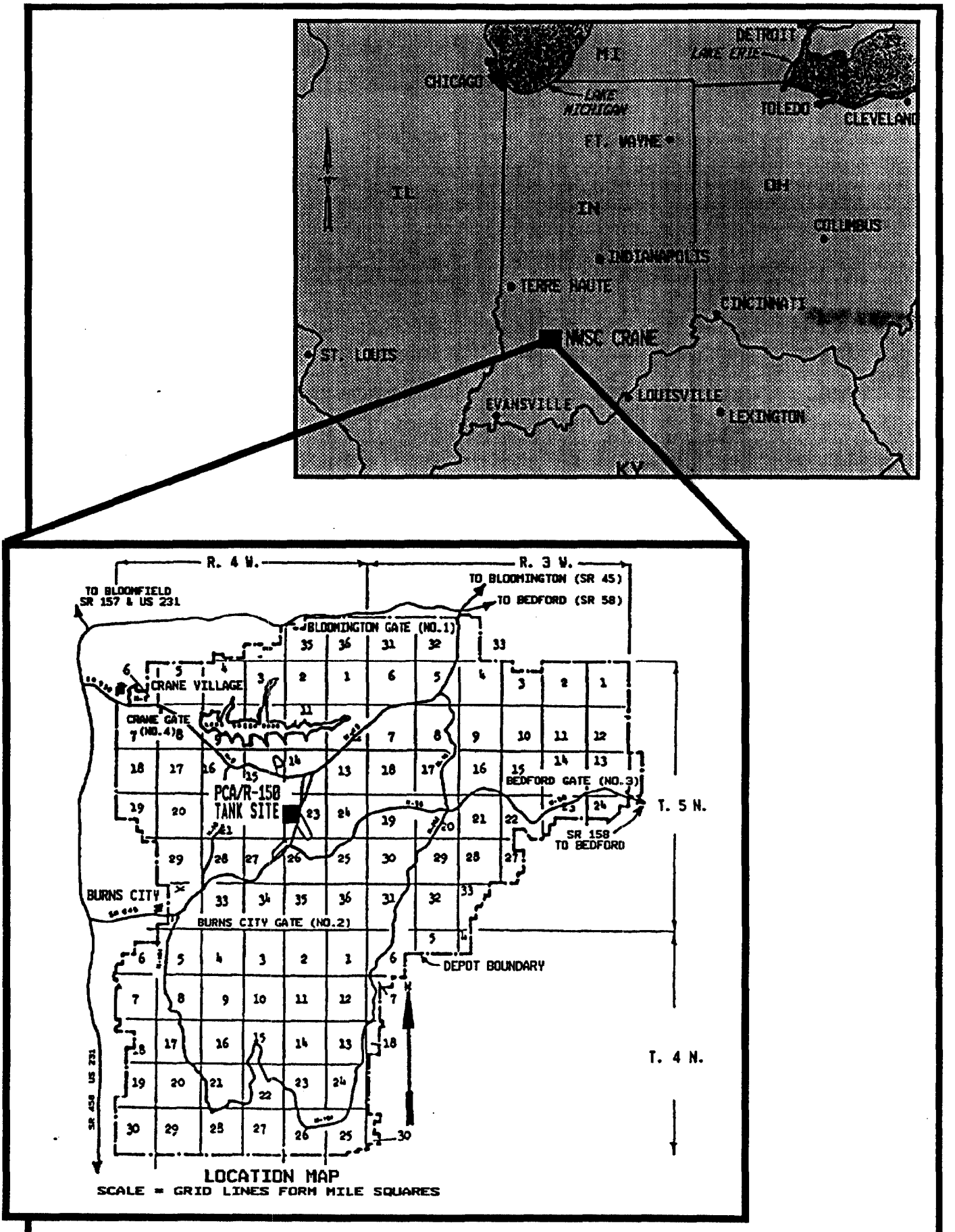
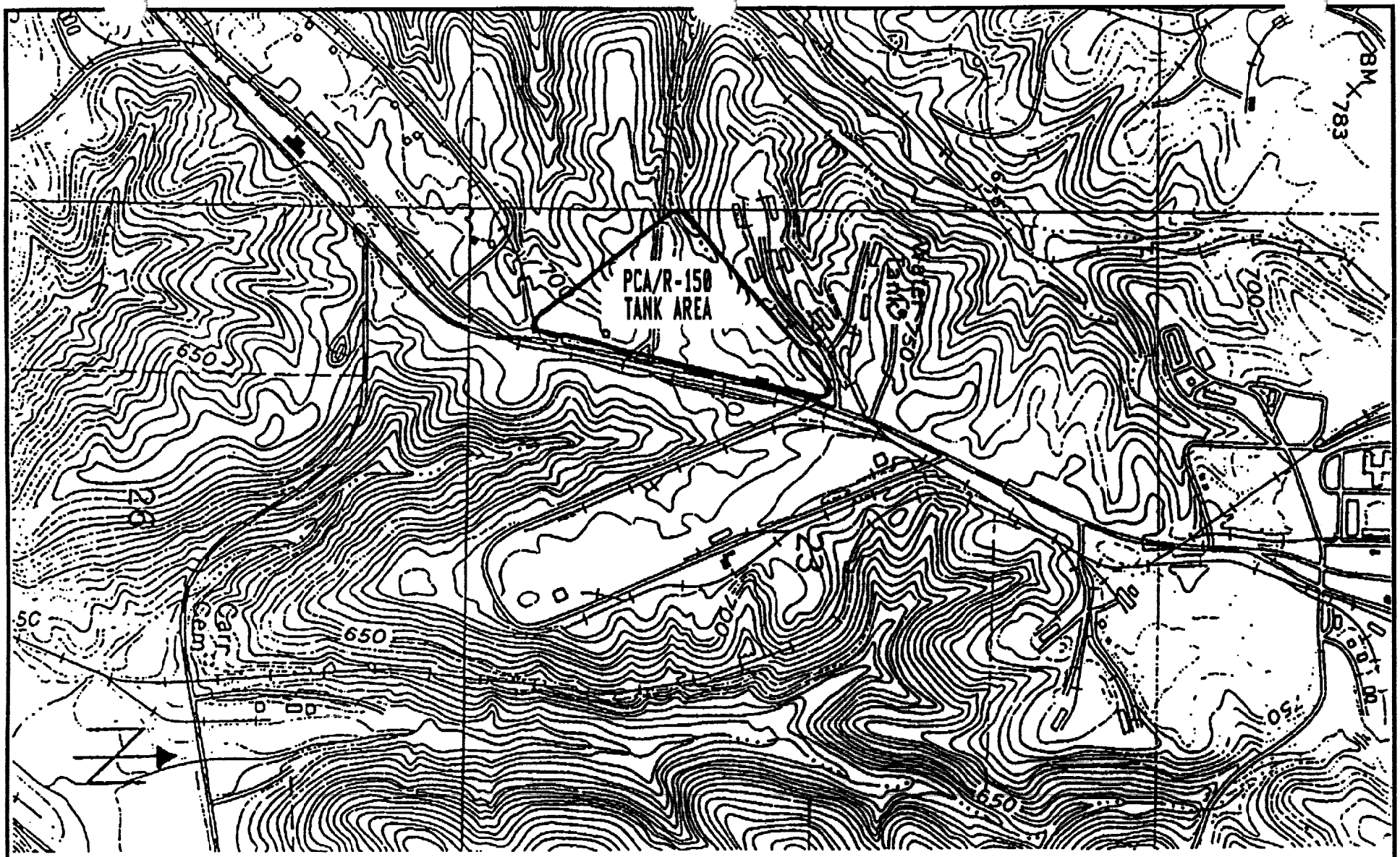


Figure 1.1.2A Location Map showing the location of NWSC Crane in the SW center of Indiana & the PCA/R-150 Tank Site located in the central portion of NWSC Crane.



SCALE 1:24000

1 1/2 0 1 MI.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

USGS TOPOGRAPHIC MAP OF THE CENTRAL PORTION
OF NWSC CRANE SHOWING THE PCA/R-150 TANK AREA.

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE 1.1.2B

BUILDING 55. Pesticide spray tanks and containers were most likely rinsed in the vicinity of Building 55, (Figure 1.1.3 Area "A") the previous Pesticide Control Building. Chemicals used at this site from 1950 to 1974 include but are not limited to herbicides 2,4-D, 2,4,5-T Silvex (a mixture of 2,4-D & 2,4-T) Fenac, Monuron and Ureabor. Insecticides include Carbaryl, Chlordane DDT, Diazinon, Dieldrin, Lindane, Malathion and Pyrethrum.

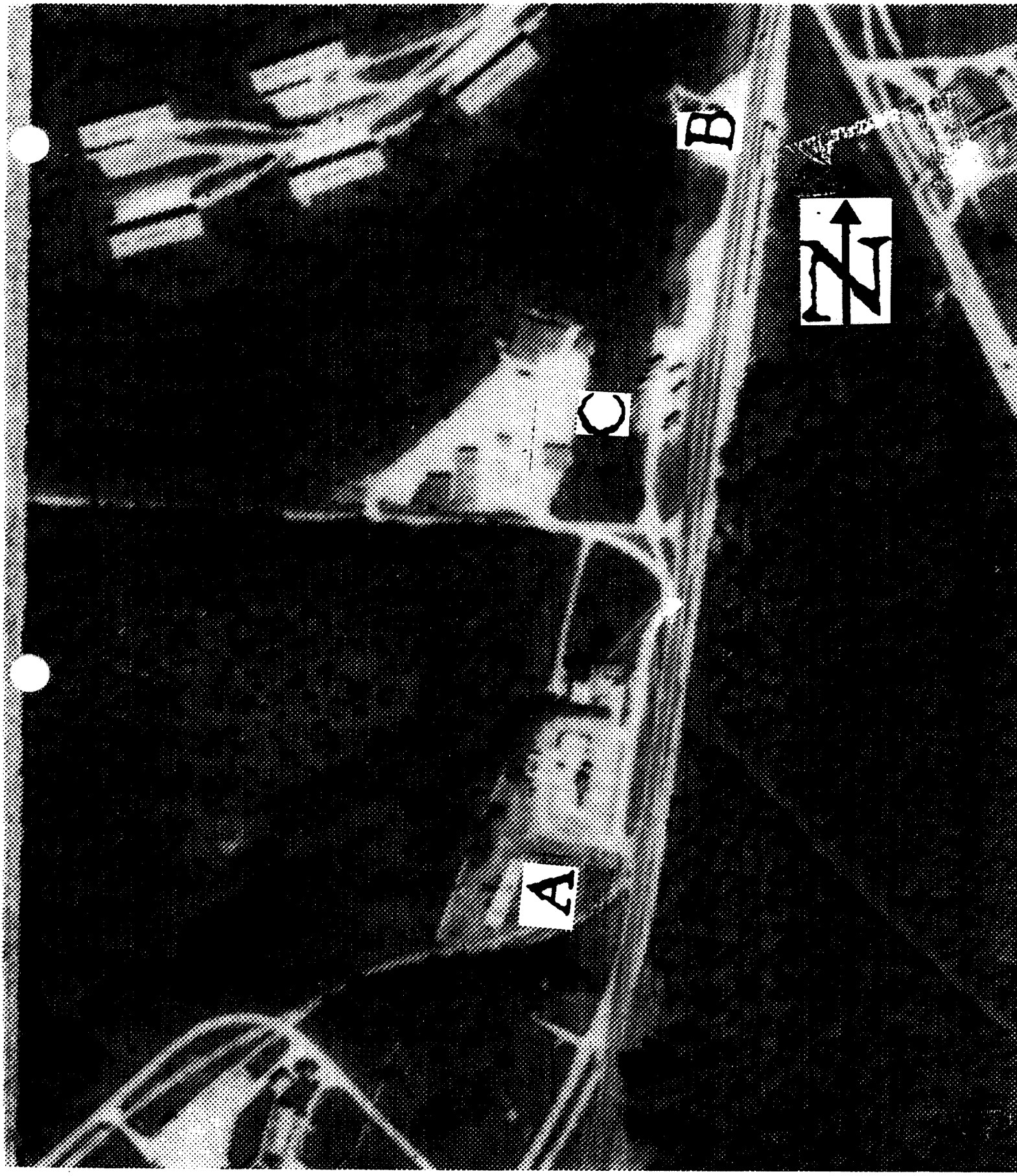
BUILDING 2189. The Pest Control Building was moved from Building 55 to its present location, Building 2189 (Figure 1.1.3 Area "B") around 1970. In addition to the chemicals stored and used out of Building 55, an additional inventory of chemicals were added which include herbicide Krovar (a mixture of Duron and Bromac). Krovar was used on graveled storage areas and railroad right-of-ways at a rate of 5-20 lbs per acre. During the last 5 years the herbicide oust was used on right-of-ways of railroad and magazine drives between the bunkers and blast wall at the rate of 2-4 ounces per acre. Building 55 has since been demolished and the site is now a concrete pad.

Around 1974, herbicides 2,4,5-T and Monuron stored at Building 2105 (located west of Building 2074 N.W. H-460 and H-101) and used by railroad personnel on the railroad right-of-way, was taken to Building 2189 for storage.

Neither pesticide containers nor rinsates have been emptied in the vicinity of Building 2189 since approximately 1974. Containers are tripled rinsed and the rinsate used in the mixture. Large spraying equipment is flushed with water and the rinsate is used in the treatment area. When the sprayers are winterized at the end of the spraying season the rinse water is collected and used the following spring in the first spray mixture that is applicable.

R-150 TANK AREA. A R-150 Tank was installed in the early 1970's in the gravel parking lot adjacent to H-349 (Figure 1.1.3 Area "C"). The tank contained spent solvents. The R-150 Tank was 11ft wide by 35ft long. The base of the tank was reportedly 15ft deep (Figure 1.1.4). The tank was excavated and removed 27-28 September 1983 by NWSCC personnel. The excavated contaminated soil was removed for disposal to a secure landfill off-site in December 1983. Contamination has been detected in the ground water at the tank site (Dunbar, 1984).

3.0 Weather Extremes . The climate in the region of NWSCC is a temperate climate with broad seasonal variations. Characterized by a mean January temperature of 26 degrees F and a mean July temperature of 89 degrees F. Precipitation averages approximately 44 inches annually, with 42 inches of rainfall and 15 inches of snowfall. Humidity averages 40 to 90 % in the summer and 60 to 90 % in the winter. Both heat stress and cold stress are significant potential hazards and severe weather with thunderstorms are also a possible feature of the area.



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SCALE IN FEET

Figure 1.1.3 Aerial photograph showing Bldg 55 (A), Bldg 2189 (B), R-150 Tank Site, and Unit Boundary.

4.0 Scope of Work and Task-Specific Risk Assessment

4.1 Drilling/Sampling

Drilling will be performed at the site for the collection of soil samples for chemical analysis. Some of the bore holes will penetrate material known or suspected to contain hazardous material. The sampling and drilling have limited potential for exposing employees to parts per million (ppm, mg/m3) levels of organic vapors, carcinogens, and heavy metals. Primary exposure routes during drilling operations will be skin absorption, ingestion and inhalation due to vapors and contaminant volatilization from the drill cuttings and water samples. Drilling will take place in and adjacent to the possible source of contamination. Health hazards risks due to drilling and sample handling are considered, minimal .

All work shall comply with all Federal, State and Local health and Safety requirements, including the Occupational Safety an Health Administration's (OSHA) requirements (29 CFR 1910 and 1926), the U.S. Environmental Protection's Agency's (EPA) hazardous waste requirements (40 CFR 260-270), the U.S. Army Corps of Engineers Safety and Health Manual (EM 385-1-1, April 1981, Revised October 1987 and all NWSCC CRANE and U.S. Army Corps of Engineers safety directives and policies).

All drill sites will be cleared with local utilities to ensure that there are no underground utilities present. All known underground utilities will be located and marked.

5.0 Site Investigation Personnel and Management

The following US Army Corps of Engineer (USACE) personnel sampling (drill crew) under the direction of a Corps of Engineers supervisor will perform the investigation activities. The Project Manager (PM), Site Supervisor (SS), Industrial Hygienist (IH) and Health And Safety Officer (HSO) and Site Safety Coordinator are responsible for formulating and enforcing health and safety requirements for this project.

5.1 Industrial Hygienist

The (IH) should be responsible for the preparation of the Health and Safety Plan (HASP) and ensure that the project complies with all federal, state and local health and safety requirements. If necessary, the IH can modify specific aspects of the project to adjust for on-site changes that affect safety. The IH will coordinate with the SSC on all modifications to the plan and will be available for consultation when required. The IH will not necessarily be on site during project activities.

5.2 Health and Safety Officer/Site Safety Coordinator

The HSO or Site Safety Coordinator (SSC), has the responsibility and qualifications to implement the site specific safety and health plan on this project.

This is to include the authority to cease the operation if he/she determines any unsafe conditions exist or if the HASP is not being implemented correctly. The SSC will monitor or inspect site conditions, equipment, protective clothing and other safety plan requirements. The SSC is responsible for safety meetings and the monitoring of personnel for signs of environmental stress (i.e heat/cold).

The SSC will modify the HASP as required due to additional information discovered during on-site work.

5.3 Project Manager

The PM has the overall responsibility for the project and to assure that the goals of the project are attained in a manner consistent with the contract. The PM will coordinate with the SS and the SSC to assure that the drilling operation and sampling goals are completed in a manner consistent with the project.

5.4 Site Supervisor

The SS is responsible for field implementation of the project. The SS will establish and ensure compliance with site control areas and procedures and coordinate these supervisory responsibilities with the HSO.

5.5 Field Team Leader (Driller)

Responsible for Drill Crew operation and safety, implementing the job hazard analysis (attached) and managing the drilling, sampling and well installations. All drilling sites will be inspected for health and safety hazards by the SSC prior to entering the site with drilling equipment. The SSC will then take all corrective measures necessary to safely work at the site. This inspection and all corrective measures will be documented and communicated to all site workers.

5.6 Field Team Members (Helpers)

Responsibility to comply with all aspects of the HASP, and to notify the SSC or SS of any unsafe conditions.

5.7 Key Safety Personnel

The following individuals share responsibility for health and safety at the site:

Industrial Hygienist: Tom Must

Health and Safety Officer: Tom Must

Site Safety Coordinator: Larry Benjamin

Alternate HSO or Site Safety Coordinator: To be determined

Project Manager Steve Nohrstedt

Site Supervisor To be determined

6.0 Employee Safety Responsibility

Each employee is responsible for the personal safety as well as the safety of others in the area. The employee will use all equipment provided in a safe and responsible manner. All USACE personnel will follow the policies set forth in this HASP, and all policies set forth in the Safety and Health Requirements Manual EM 385-1-1.

7.0 Job Hazard Analysis/Assessment

This section addresses the concerns of on-site workers.

7.1 Chemical

A description of contaminants found in monitoring wells and a listing of possible contaminants (TLV's,STEL's,PEL's) and chemical data sheets and pertinent information are found in Appendix A.

7.2 Radiological

Contact with radiological contaminants is not anticipated, based on the results of previous WES testing, but the SSC or IH will scan for any radiological contamination on this drilling operation. Use of a LUDLUM MODEL 3 Survey Meter will be available.

7.3 Environmental

Biological Hazards include insects (ticks, mosquitoes) and two species of poisonous snakes. Weather and irritant plants could pose a hazard. The SSC and SS will make every effort to alleviate these hazards should they arise.

7.3.1 Heat Stress

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. In particular:

* Heat rash, Heat cramps, Heat exhaustion, Heat exhaustion, Heat stroke

Heat stress is covered in detail at daily pre-briefing safety meeting and is covered in the 40-hr OSHA 20 CFR 1910.120 Hazardous and Toxic Waste Training Course. Workers are encouraged to increase consumption of water.
At a minimum, depending on the conditions workers will break every 2 hours for 10 to 15 minute rest periods.

In addition, workers are encouraged to take rest whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased upon worker recommendation to the SSC and SS.

A work/rest schedule can be calculated based on heat stress monitoring results. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. The frequency of monitoring is provided herein.

Ambient Temperature	Level D PPE	Level C PPE Modified Level D
90 F or above	After each 45 min.	After 15 min. of work
87.5 F-90 F	After 60 min. of work	After 30 min of work
82.5-87.5 F	After 90 min. of work	After 60 min of work
77.5-82.5 F	After 120 min of work	After 90 min of work
72.5-77.5 F	After 150 min of work	After 120 min of work

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by 1/3 and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by 1/3. The initial rest period should be at least 5 minutes.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70 degrees Fahrenheit, when wearing Level C PPE, or 80 degrees Fahrenheit for site activities performed in Level D.

7.3.2 Exposure to Cold

With outdoor work in the winter months, the potential exists for hypothermia and frostbite.

Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if needed. Employees will also be advised to change into dry cloths if their clothing becomes wet from perspiration or from exposure to precipitation.

In cold weather, the potential for frostbite exists, especially in body extremities. Personnel will be instructed to pay particular attention to hands, feet and any exposed skin when dressing. Employees will be encouraged to use a heated shelter on site at regular intervals depending upon the severity of ambient temperatures. Symptoms of cold stress, including heavy shivering, excessive fatigue, drowsiness, irritability, or euphoria necessitate immediate return to a warm shelter.

7.4 Physical Hazards

To minimize physical hazards, the USACE has developed standard safety protocols which will be followed at all times. Failure to follow safety protocols as prescribed in the Safety and Health Manual EM 385-1-1, will result in disciplinary action and expulsion of the crew member from the site.

All USACE personnel are familiar with the field activities which will be conducted at the site. They are trained to work safely under various field conditions. The SS and SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Also, hard hats, safety glasses and steel-toe safety boots are required in all areas of the site.

Heavy Equipment

A truck-mounted drilling operation presents inherent noise and equipment hazards, a Job Hazard Analysis for drilling operations is attached (Appendix B).

8.0 Task Specific Risk Assessment

8.1 Soil Excavation

Drilling work may expose workers to chemical hazards from contaminated soil and also physical hazards associated from a standard drilling operation. The potential for exposure to the listed chemicals in Appendix A may be from air release with the potential for inhalation and also from skin contact. Potential health effects are described in Appendix A. EPA Level C or Modified D will be used to prevent exposure.

8.2 Soil and Water Sampling

Soil and water sampling operations may expose workers to chemical and physical hazards. Exposure to identified chemicals from previous sampling at PCA/R-150 Tank Site may occur during sampling. EPA Level C or Modified D shall be used during sampling.

9.0 Work And Support Areas

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment (PPE) will be clearly specified prior to beginning operations. The USACE has designated work areas or zones as suggested by the referenced NIOSH/OSHA/USCG/EPA'S document titled, " Occupational Safety and Health Guidance Manual for Hazardous Waste Activities." Each work area will be divided into three zones as follows:

- An Exclusion Zone (EZ)
- A Contamination-Reduction Zone (CRZ)
- A Support Zone (SZ)

9.1 Exclusion Zone

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection for that area. In certain instances, different levels of protection will be required depending on the tasks and monitoring performed within that zone.

The outer boundary of the EZ, or Hotline, will initially be established as a 30-ft radius circle surrounding the drill rig or completed hole when bore samples are gathered. This Hotline will be defined in the field by a printed hazard ribbon or equal. Factors that will be considered in extending this boundary will be air monitoring data, the physical area necessary to conduct site operations, and the potential for contaminants to be blown from the area, but in no case will the circular boundary have a radius of less than 30-ft.

9.2 Contamination-Reduction Zone

The CRZ or transition zone will be established between the EZ and SZ. In this area, personnel will begin the sequential decontamination process required to exit the EZ. The Contamination Reduction Zone which will provide a transition between the potentially contaminated zone and the clean zone. The CRZ will serve as a buffer to further reduce the probability of the clean zone becoming contaminated. It will provide additional assurances that the physical transfer of contaminating substances on people equipment, or in the air will be limited through a combination of decontamination, zone restrictions, and work functions. To prevent off site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ.

9.3 Support Zone

The SZ serves as a clean, control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment, or clothing will not be allowed in the SZ. The support facilities should be located upwind of site activities. There will be clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored closely by the SSC to ensure proper safety protocols are followed. The location of support facilities in the Support Zone will be readily accessible to the nearest road,_____. Support facilities (i.e command post. equipment trailer, first aid station,) will be located in this zone. Since normal work clothes are appropriate within this zone, potentially contaminated personal clothing, equipment, and samples are not permitted in this zone. The on-site support zone/command post have been established at TBD. The prevailing wind conditions are TBD. This location is upwind from the Exclusion Zone.

9.4 General

The following items are requirements to protect the health and safety of workers and will be discussed in the safety briefing prior to initiating work on the site.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination is prohibited in the EZ and CRZs.

- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking or other activities which may result in ingestion of contamination.

- A buddy system will be used. Hand signals will be established to maintain communication. During site operations, each worker will consider himself as a safety backup to his partner.

- Visual contact will be maintained between buddies on site when performing hazardous duties.

- Off-site personnel will provide emergency assistance. All personnel will be aware of dangerous situations that may develop.

- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.

- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SSC or the SS, will be immediately dismissed from the site.

- Proper decontamination procedures must be followed before leaving the site.

9.5 Work Zone Integrity. The integrity of the division of the work zone during duty hours shall be maintained by control of access and egress. Before crossing into another zone, a person will be admitted by the Site Safety Coordinator only after having given proper identification, authorization and certification of required training and medical examinations. The Site Safety Coordinator will record each person's:

- Name
- Status (in or out)
- Time of entry
- Anticipated exit time
- Areas to be entered
- Task to be performed
- PPE worn if applicable

Access to any divisions of the work zone during off-duty hours shall be controlled by security at NWSCC. They will be appraised of the work at PCA/R-150 Tank Site by the SSC or IH at the site and its hazards and will be instructed in contacting emergency services.

10.0 Personal Protective Equipment

This section addresses the various levels of personal protective equipment which are or may be required at NWSCC, PCA/R-150 Tank Site. USACE employees are trained in use of all PPE utilized.

Personal protective equipment will be worn or used as required by this HASP. No downward changes to the level of protection is allowed without the approval of the SSC.

Based on the evaluation of potential hazards at PCA/R-150 Tank Site, the Modified Level D or Level C is prescribed for all activities on this activity, Except for the Support Zone, where Level D of protection beyond general safety PPE (i.e Hardhat/boots) will be required.

10.1 Anticipated Protection Levels

Task	Protection Level	Comments/Mods
Soil Excavation/Drilling	Level C/Mod D	
Soil/Water Sampling	Level C/Mod D	

10.2 Level D

Level D consists of the following:

- Safety glasses with side shields
- Hard Hat
- Steel-toed work boots
- Work clothing as prescribed by the weather

10.3 Modified Level D

- Safety glasses with side shields
- Hard Hat
- Steel-toed shoes
- Nitrile, neoprene. or PVC overboots or vinyl booties
- Outer nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvex coverall (Saranex Tyveks (Sarans) and PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludge)
- Hearing protection (ear plugs, ear canal caps or muffs)

10.4 Level C

- Full-face, air purifying respirator with North N7500-3, HEPA, Wilson T01 and Pre-filter T10 cartridges.
- Hooded Tyvex coveralls and Saranex Tyveks (Sarans) (PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludge)
- Steel toes boots, Boot Covers
- Hearing protection
- Nitrile, neoprene, or PVC overboots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Disposable coveralls
- Hard Hat

10.5 Level B

Level B protection consists of the items required for level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirators.

10.6 Level A

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulated, vapor-proof suit capable of maintaining positive pressure.

10.7 Breathing-Air Quality

Code of Federal Regulations 29 1910.134 states breathing air will meet the requirement of the specifications for Grade D breathing air as described in the compressed Gas Association Specification G 7.-1966.

10.8 Air Purifying Respirators

North and Wilson full-face air-purifying respirators will be used on PCA/R-150 Tank Site.

10.9 Respirator Cartridges

The crew members working in Level C will wear respirators equipped with North and Wilson air-purifying cartridges, unless otherwise noted. These cartridges are approved for:

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm
- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m3
- Asbestos-containing dusts and mists
- Radon daughters
- Radionuclides
- Pesticides

10.10 Cartridge Changes

All cartridges will be changed a minimum of once daily. However, water saturation of the HEPA filter or dusty condition may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance or breakthrough of a chemical warning property.

10.11 Inspection And Cleaning

Respirators are checked periodically by a qualified IH or HSO and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

10.12 Fit Testing

Annual respirator fit tests are required of all our personnel wearing negative-pressure respirators.

10.13 Corrective/Contact Lenses

Normal eyeglasses cannot be worn under full-face respirators. For workers requiring corrective lenses, special designed adapters for use with respirators will be provided.

Contact lenses will not be worn with any type of respirator.

10.14 Medical Certification

Only those workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120 (f)(7).

10.15 Site-Specific Respiratory Protection Program

The USACE Respiratory Protection Program complies with 29 CFR 1910.134. The criteria for determining respirator need are contained in the HASP's Air Monitoring Section. All respirator users are trained in proper respirator use and maintenance. The SS and SSC will observe workers during this project when using respirators and look for signs of stress and will monitor air levels of contaminants to ensure that respiratory protection is sufficient. The SSC/IH will also evaluate the HASP weekly to determine its continued effectiveness.

10.16 PPE Inspection

All PPE will be inspected by the SSC prior to being issued to workers on the job. The Site Safety Coordinator will:

- Inspect and operational testing of newly received equipment
- Inspection of equipment prior to issue to workers
- Inspect multiple-use equipment after use or training and prior to maintenance
- Periodically inspect stored safety equipment
- Insure all site workers have been trained in the use of PPE

Equipment inspection will follow procedures specified by PPE manufacturers.

The SSC will maintain records of all inspection procedures. Individual identification numbers shall be assigned to all multiple-use pieces of equipment, and records will be maintained by that number. Inspections, will record the ID number, date, inspector's name and findings. Damaged or otherwise objectionable equipment shall be repaired or removed from the job.

10.17 Work Mission Duration

Before the workers actually begin work in their PPE ensembles, the anticipated duration of their work mission will be established. Several factors will be considered in determining mission length. These will include:

- Suit/ensemble permeation and penetration by chemical contaminants.
- Ambient temperatures

10.18 In-use Monitoring

During equipment use, workers will be encouraged to report any perceived difficulties to the SSC or SS. These difficulties include, but are not limited to:

- Degradation or permeation of PPE
- Perception of odors
- Skin irritation
- Unusual residues on PPE
- Discomfort
- Resistance to breathing (if respirators are worn)
- Fatigue due to respirator use
- Interference with vision or communication
- Restriction of movement
- Personal response such as rapid pulse, nausea, and chest pain

10.19 Storage

PPE will be stored properly to prevent damage or malfunction from exposure to dust, moisture, sunlight, damaging chemicals, or extreme temperature.

11.0. Decontamination Procedures

All personnel, clothing and equipment leaving the EZ (if applicable) must be decontaminated to remove any contaminants. Decontamination activities will be conducted in the CRZ. This sequence describes the general decontamination sequence to be followed for the PCA/R-150 Tank Site.

For personnel, the following steps will be taken for decontamination:

Station 1. Deposit equipment (tools, sampling devices and containers, monitoring instruments, clipboard etc.) on plastic drop cloths.
Station 2. Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse thoroughly with water.
Station 3. Remove outer boots and gloves. Deposit in a container with a plastic liner.

Station 4. If a worker leaves the Exclusion Zone to change a canister or mask, this is the last step in the decontamination procedure. Obtain a new canister, don new outer gloves and boot covers, tape joints, and return to work.
Station 5. Remove boots, chemical-resistant splash suit, and inner gloves and deposit in separate containers lined with plastic.
Station 6. Remove facepiece/shield, or respirator and deposit
Station 7. Wash hands and face thoroughly. Shower as soon as possible.

11.1 Suspected Contamination

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station.

11.2 Personal Hygiene

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck, and face.

11.3 Equipment Decontamination

A separate area will be designated in the CRZ for equipment decontamination. The USACE will provide in this area steam cleaning equipment at a capacity capable of adequately cleaning site equipment. Wastestreams will drain in the waste-water-collection area and be collected from a sump area.

The personnel performing equipment decontamination will be provided with splash aprons or chemically impervious/water resistance gear, chemical resistance boots and gloves.

For equipment, the following steps will be taken for decontamination:

1. Remove any solid particles from the equipment by brushing and then rinsing with tap water. For drilling equipment , steam cleaning is necessary.
2. Wash equipment with a detergent solution.
3. Rinse with tap water by submerging or spraying.
4. For organic contaminants, an optional rinse with a solvent (methanol or acetone) may be used to dissolve and remove contaminants.
5. Rinse thoroughly with distilled water.
6. Air dry equipment or rinse with methanol.

To protect delicate instruments prior to use in the EZ and CRZs, instruments shall be placed in a clear plastic bag, and the bag shall be taped and secured around the instrument. Openings are made in the bag for sample intake. The plastic bag shall be discarded appropriately in lieu of decontamination.

All liquids and disposable clothing will be treated as contaminated waste and disposed of properly.

12.0 Air Monitoring

This program will be implemented for the periodic surveillance of the investigation sites so as to continually ensure the accuracy of the division of the work area and the adequacy of worker protection. During investigation activities, the SSC will monitor the work site for, combustible gas/O2 and for organic vapors. Additional air monitoring may be conducted at the discretion of the SSC or IH.

The following chart describes the air monitoring which will be required at PCA/R-150 Tank Site, and appropriate action levels. The select Engineering controls will be the PPE referenced and prescribed work practices. Initial entry will be Modified Level D at PCA/R-150 Tank Site. No IDLH conditions are expected on entry or during the operation but IDLH Hazards are listed in Appendix A.

The SSC and IH will ensure that all PPE will protect Below the designated PEL's for suspected substances listed in this HASP. The initial Entry for PCA/R-150 Tank Site will follow the proposed plan as stated below. Using the LEL meter, OVA/HNU and the Rad Survey meter.

Monitoring Device	Action Level	Action
LEL/O2 Exotox 40	>10 % LEL Explosion Hazard	Continue Monitoring, but if increase continues, evacuate.
Exotox 40	<20.8% O2 Depleted O2	Evacuate, upgrade to Level B if necessary and continue to monitor
PID/HNU 101 OVA/128	1-5 ppm unknowns above background Organic Vapors/Gas	Level C/Mod Level D
	5-100 ppm unknowns	Level B
	100 ppm unknowns	Level A

Monitoring Device	Action Level	Action
Ludlum Model 3	< 1mr/hr	Continue Monitoring, Consult Health Physicist
	> 1mr/hr Gamma Radiation	Continue Monitoring upon advice from Health Physicist
Draeger Tubes Benzene	1-5ppm	Stop work, consult for upgrade

12.1 Lower Explosive Limit/Oxygen (LEL/O2) Meter

During drilling, the SSC will monitor the work area to detect, measure, and document any explosive concentrations of contaminants. Explosion potential measurements will be made using a combination combustible gas/oxygen (LEL) (Neotronics Meter, Exotox Model 40-OFH) and hydrogen sulfide meter. Drill crews shall use the LEL meter while drilling to determine if any explosive potential exists within the working area. Readings taken at the barrel or opening of the boring are indicative of vapor-gas escape, but may be inaccurate or inconclusive. Readings taken approximately one foot above the source indicate a greater potential for a hazardous condition developing. Readings one foot above a source showing >10% of LEL or greater requires an immediate shut down of operation and area evacuation of the Exclusion Zone until bore readings return to background levels. The Industrial Hygienist (IH) or Safety Office shall be notified to determine further action. All readings shall be recorded on direct reading forms. Potential for oxygen deficient atmosphere is unlikely for the work being conducted. Hydrogen sulfide will generally not be a problem in this project, but any readings greater than 10ppm of Hydrogen Sulfide above a source require an immediate shut down.

12.2 Confined Space

Prior to entering a confined-space area or hot work area, LEL/O2 will be constantly monitored. In addition, the SSC will follow a Confined space entry procedure that is in EM 385-1-1, or the local District Policy, Appendix C

The policy will include:

- The use of a designated competent person to enforce correct procedure.

- Obtain confined space entry procedure/permit from Health and Safety Department (ATTACHED).

- Monitor atmosphere with combustible gas meter, oxygen meter and any toxic gas meter, available. (Exotox 40 , OVA or PID)

12.3 Organic Vapors OVA 128 /Photoionization Indicating Device (PID)

The SSC shall use a photoionization detector (HNU Systems Model 101, Hazardous Waste Detector or Foxboro OVA Model 128)) to monitor the levels of ionizable vapors at the investigation site. Measurements will be made in the bore hole, at ground level, and at the worker's breathing zone. The PID/OVA will be calibrated relative to benzene and methane concentrations or to standards traceable to benzene. In the event that the PID/OVA detects a contaminant(s), a 0.5a Draeger tube for benzene will be used to confirm the presence of benzene and its concentration. Benzene will be specifically monitored for each drilling. If benzene is detected, but its concentration is below 5ppm in the breathing zone, work will stop, and the IH or Safety Office will be notified to inquire about donning respirators. If the benzene level exceeds 5ppm in the breathing zone, all personnel will evacuate the Exclusion Zone until bore hole readings return to background values, and the SSC will call the designated Safety Office or IH for further instruction.

If benzene is not detected, the protection level will be based on total organic concentration levels for a 1-min detector reading in the breathing zone. The following protection levels will be used for concentration measurements in the breathing zone:

For known contaminants only , to determine a protection level from PID or OVA data, the SSC will multiply the TLV of the known compound by 25. This is the limit for Level C protection for that compound. If the PID or OVA readings exceed 25 times the TLV, Level B protection will be required. Also, regardless of the TLV, a PID/OVA reading of 1,000 ppm or more will indicate that the cartridges may become overloaded and will necessitate Level B protection.

Levels of volatile organic compounds will be measured in the air at active work sites at least once every hour or more and at the support zone once every hour when levels are detected above background in the exclusion zone.

12.4 Air Monitoring Log

All air-monitoring data results will be reported on a data sheet by the IH and record kept file (attached). The data sheet will contain the following information:

- Date and time of monitoring
- Air monitoring location
- Instrument, model #, serial #
- Calibration/background levels
- Results of monitoring
- HSO signature

12.5 Calibration Requirements

The PID/OVA, LEL/O2 meter and sampling pumps required with fixed-media air sampling will be calibrated daily prior to use. A separate log will be kept detailing date. time, span gas, or other standard, and the name of the person performing the calibration.

13.0 Contingency Plan/Emergency Response

Prior to field activities, the SSC will plan emergency egress routes and discuss them with all field personnel. These routes will be posted.

13.1 Line of Authority

The SSC will ensure that all participants conduct their work in accordance with the HASP, and will direct any employee to leave the site if the employee fails to observe safety requirements or in any way creates a safety hazard. The SSC will be backed up by a specified alternate ___TBD_____. Other personnel who may be involved in emergency response will be identified and their respective roles defined, at least two emergency response personnel on the job shall be certified in CPR and First Aid.

13.2 Pre-emergency Planning

The SSC will contact the local hospital emergency room, the local poison control center, and the NWSCC security, fire and ambulance services before activities begin. The SSC will inform the hospital emergency and ambulance service of probable emergencies.

13.3 Emergency Services/Communication

At the investigation site, the SSC shall ensure that adequate emergency equipment is at the investigation site.

Emergency equipment shall include:

- Mobile telephone/Radio Communication (optional) And in this project not authorized, Phone Number _____
- First Aid Kits
- Portable Eyewash and shower
- Blankets
- Stretchers
- Water in portable containers
- Fire-fighting equipment and supplies
- Level B PPE, available from NWSCC

The SSC shall ensure that the emergency signals, audible and universal hand signals are understood, in case of radio failure.
The following standard hand signals will be mandatory for all employees regardless of other means of communication:

- Three vehicle horn blasts is an emergency signal to leave Exclusion Zone

- Hands gripping throat (Out of AIR)
- Grip Partners Wrist (Leave Area NOW)
- Hands on Head (Need Assistance)
- Thumbs Up(OK, Allright)
- Thumbs Down (No, negative)

13.4 Fire and Accident Procedures

All employees will be made aware of the fire and accident response procedures by site-specific training prior to start of work. And the available support from the local Crane Spill Response Team.

13.5 Emergency Evacuation from Exclusion and Contamination Reduction Zone

Any personnel requiring emergency medical attention will be evacuated immediately from the EZ and CRZ. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The SS and SSC decision whether or not to decontaminate a victim prior to evacuation is based on the type of severity of the injury and the nature of the contaminant.

13.6 Emergency Decontamination

If immediate medical treatment is required to save a life, decontamination will be delayed until the victim is stabilized. If decontamination can be performed without interfering with essential first aid , decontamination will be performed immediately.

If decontamination cannot be performed immediately emergency personnel will:

- Wrap victim in blankets or plastic to reduce contamination of other personnel and emergency vehicles

- Alert emergency and medical personnel to potential contamination; instruct them about specific decontamination procedures.

- Send site personnel familiar with the incident to the hospital with the victim.

13.7 First Aid

Qualified personnel only will give first aid and stabilize an individual needing assistance. Professional medical assistance will be obtained at the earliest possible opportunity. A minimum of two first aid/CPR qualified individuals will be on site of PCA/R-150 Tank Site, they are:

1.

2.

13.8 Emergency Actions

If actual or suspected serious injury occurs, these steps will be taken:

- Remove the injured or exposed worker(s) from the immediate danger.

- If decontamination can be done, first wash, rinse and/or cut off protective clothing and equipment next render first aid as needed, and then call for transport to the hospital.

- If decontamination cannot be done, first wrap the victim in blankets or plastic to reduce contamination of other personnel. Next alert emergency and off-site medical personnel of potential contamination and instruct them of specific procedures if necessary.

- Evacuate other personnel from the immediate affected area to a safe location until the Safety Coordinator determines that the site is safe for work to resume.

13.9 General Evacuation Plan

In the general case of a large fire, explosion, or toxic vapor release, a site evacuation will be ordered and will follow these steps:

- Sound applicable alarm, Three loud blasts (air horn)
- Evaluate the immediate situation and downwind direction. All personnel will evacuate in the upwind direction.
- All personnel will assemble in an upwind area. When the situation permits a head count and buddy check will be taken
- Determine the extent of the problem. Dispatch a response team in protective clothing and SCBA's on site to evacuate any missing personnel or to correct the problem.

13.10 Fire Procedures

- Sound alarm

- Only attempt to extinguish small controllable fires which can be easily controlled with portable fire fighting equipment (i.e 5 lb ABC, Co2) until help arrives, unless imminent danger exists. Evacuation will be necessary whenever an uncontrollable fire threatens health and safety at the site. Notify the NWSCC fire department immediately following evacuation.

14.0 Emergency Information

14.1 Site Maps

Site maps showing topographic features, prevailing wind direction, work zones, and evacuation routes shall be posted conspicuously at the work site in locations known to all personnel. Site personnel must verify these numbers upon arrival to the site and prior to beginning any activities.

14.2 Emergency Telephone Numbers The following list of emergency telephone numbers will be posted conspicuously. And all site personnel will be told their locations. (attached)

EMERGENCY SERVICE/CONTACTS	TELEPHONE NUMBER
- USEPA Environmental Response Team	201/321-6460
- US Coast Guard Environmental Response Team	800/424-8802
- Association of American Railroads Response Team	202/293-4048
- Project Manager Steve Nohrstedt	
- Health & Safety Officer Tom Must	
- Alternate HSO/SSC TBD	
- Fire Department NWSCC CRANE	812/845-1235 or 854-1333
- Police/Security Department NWSCC CRANE	812/854-3300
- State Police INDIANA STATE POLICE	812/332-4411
- Hospital NWSCC CRANE	854-1220
BEDFORD MEDICAL CENTER	854-1339
- Ambulance On-Site/Off-Site NWSCC CRANE	854-1100
LAWRENCE CO	279-6545
- Poison Control Center	800/382-9097

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Name of Hospital: BEDFORD MEDICAL CENTER

Telephone Number: 812/275-1200

Hospital Address: 2900 WEST 16th ST.
BEDFORD IN. 47432

Route to Hospital Take left at Bedford Gate South, directly to city of Bedford, take first left onto 16th St.

Distance to Hospital: approx. 20 miles

14.3 Emergency Documentation

All incidents involving personal injury shall be investigated and documented so that preventive measures may be taken to avoid similar incidents. At a minimum, the following steps shall be taken:

- Notify the Safety and Occupational Health Office
- Prepare the Accident Report, EN. 3394, in accordance with Corps of Engineers regulations.
- Prevent the work area from being disturbed until the accident investigation is completed.
- Notify NWSCC personnel in accordance with their regulations.

14.4 Logs, Records, and Reports

The following logs, reports, and records shall be developed, retained and made available to entitled regulatory agencies upon request: (1) Training logs; (2) Medical records; (3) Daily safety meeting reports; (4) Daily air monitoring logs; and (5) Daily safety inspection logs. The daily records for safety meetings, air monitoring, and inspections will be kept in a separate safety and health log book, Appendix D contains blank record forms.

15.0 Training Requirements

All personnel who are engaged in hazardous waste operations must first present to the SSC certification of completion of a 40 hr hazardous waste site investigation course and 8 hrs of annual update training as required. This training is in compliance with OSHA requirements found in 29 CFR 1910.120(e). USACE have all had Hazard Communication training and are aware of proper labeling requirements and interpretation of Material Safety Data Sheets.

Personnel not safety trained will not be allowed within the control zone (a 30 foot radius) of any field investigations being conducted at the site. Besides initial training, all personnel involved in field investigations will be required to have site-specific training.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan Certification (Appendix E).

Topics to include, in site training sessions for on-site personnel:

1. Biological, Chemical, and Physical Hazards. The biological, chemical and physical hazards at the site and their respective properties.

2. Toxicology. The potential routes of exposure to chemicals, the possible toxic effects, the IDLH (Immediately Dangerous to Life and Health) and TLV (Threshold Limit Value) values of chemical hazards at the site, and the level of personal exposure which can be anticipated will be discussed.

3. Personal Hygiene. Personal cleanliness and the prohibiting on the eating, drinking, and smoking on the site will be discussed.

4. Rights and Responsibilities of Workers under OSHA. Applicable provisions of the Occupational Safety and Health Act (29 CFR 1910,1926 the US Environmental Protection Agency's Hazardous waste requirements (40 CFR 260-270) and the Corps of Engineers Safety and Health Program.

5. Monitoring Equipment. The functions, capabilities, limitations use and maintenance of monitoring equipment will be discussed. A hands-on review will be held with persons assigned to use the equipment.

6. Standard Operating Procedures. SOP's for this work will be reviewed. These SOP's are included in the appendices.

7. Personal Protective Equipment. The use, care, and disposition of the specific PPE selected for this work will be discussed. The PPE will be available for hands-on familiarity and practice donning, as needed. Individual respirator fit testing will be conducted at this time, if needed.

8. Medical Program. Handling of medical emergencies will be discussed. The names, locations and telephone numbers of an available physician, ambulance, and hospital will be posted and available.

9. Decontamination. The decontamination procedures established in the HASP.

10. Emergencies. The Emergency Contingency Plan contained in the HASP.

15.1 List of Trained Personnel

The following is a list of all trained personnel, training content (initial, supervisory, refresher, etc., date received, trainer and location, for PCA/R-150 Tank Site.

PERSONNEL	TRAINING	DATE	TRAINER/LOCATION
TBD	40 hr		
	8hr Ref.		
	8hr Sup.		
	First Aid		
	CPR		
	40 hr		
	8hr Ref.		
	8hr Sup.		
	First Aid		
	CPR		
	40 hr		
	8hr Ref.		
	8hr Sup.		
	First Aid		
	CPR		
	40 hr		
	8hr Ref.		
	8hr Sup.		
	First Aid		
	CPR		
	40 hr		
	8hr Ref.		
	8hr Sup.		
	First Aid		
	CPR		

16.0 Medical Surveillance Program

All site personnel participate in a medical monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. The annual physical will serve as an exit examination for full-time USACE personnel. A post-

construction exit examination will be required for any temporary or terminated employees. The medical monitoring program complies with OSHA regulations found at 29 CFR 1910.120(f) and Corps of Engineers requirements. A listing of USACE's medical profile is shown below.

WORKER MEDICAL PROFILE

Item	Initial	Annual
Medical History	X	X
Work History	X	X
Visual Acuity and Tonometry	X	X
Pulmonary Function Test	X	X
Physical Examination	X	X
Audiometry Tests	X	X
Chest X-Ray	X	X
Complete Blood Counts	X	X
Blood Chem (SSAC-23 or equivalent)	X	X
Urinalysis	X	X
Dermatology Examination	X	X
Electrocardiogram/Stress Test	X	X

Specific Tests (as required):
(PCB blood or fat, urine mercury, urine arsenic, urine phenol, urine halomethanes, blood cyanide, cholinesterase-pseudo-cholesterase, nerve conduction velocity tests, blood lead, urine lead.)

16.1 Unscheduled Medical Examinations

Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials

- At the discretion of the USACE occupational physician

The following signatures from each individual on the site verifies completion of requirements and Date of latest medical examination received:

PERSONNEL	DATE
TBD	

17.0 Site Safety Meetings

To ensure that the HASP is followed, the SSC shall conduct safety meetings before and after each day's work. All individuals will attend these meetings. The purpose of these meetings is to:

- Describe any changes in the SSHP.
- Obtain worker feedback on conditions affecting health and safety.
- Obtain feedback on how well the HSP is working, and discuss needed changes
- Reinforce proper work habits (i.e use of "Buddy System).

17.1 Site Inspections

The SSC will inspect daily site conditions, facilities , equipment, and activities to determine whether the HASP is adequate and being followed. In order to make inspections effective, the SSC shall:

- Have a checklist applicable for each site and activity, listing the items to be inspected.
- Review results of these inspections in the daily safety meetings.
- Document all inspections and subsequent follow-up actions. Retain these records until site activities are completed and turn them in to the Geotechnical Branch at the conclusion of the work.
- SSC will submit changes to the HASP for approval by the District Safety and Occupational Health Office or IH prior to implementing the changes.

Health And Safety Plan Certification

The following signature certifies that they have read, understand and comply with the guidelines set forth in this Safety Plan.

Site Personnel/Visitors

Name (PRINT)	Signature	Date

18.0 References

(1) U.S Army Corps of Engineers (USACE), Safety and Health Requirements Manual, EM 385-1-1, October 1987.

(2) Occupational Safety and Health Administration (OSHA), Construction Industry Standards, 29 CFR 1926, and General Industry Standards, 29 CFR 1910; 29 CFR 1910.120 " Hazardous Waste Site Operations and Emergency Response ",
Federal Register, Vol. 54, NO. 42, dated 6 March 1990.

(3) NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities", October 1985.

(4) EPA " Standard Operating Safety Guides", July 1988.

(5) Hawley's , Condensed Chemical Dictionary, 11 Edition, Van Nostrand Reinhold Company, NY. 1987.

(6) Sax, Dangerous Properties of Industrial Materials, Fifth Edition, Van Nostrand Reinhold Company, NY,79.

(7) ACGIH, Threshold Limit Values and Biological Exposure Indices for 1989-1990, 2nd Edition, Cincinnati, Ohio.

APPENDIX A

CONTAMINANT CONCENTRATION RANGES OF CONTAMINANTS

at the PCA/R-150 TANK SITE

APPENDIX A

Appendix A contains information on the chemicals/compounds previously identified or suspected of being present in the area to be investigated. The information sheets and table contain physical and chemical property data, hazard information, and toxicological data for the chemical/compound.

1. Trichloroethylene
2. Chloroform
3. Trichloroflurometh ane
4. Dichloromethane
5. 1-,2-Dichloroethylene
6. 1,1-Dichloroethane
7. 1,1,1-Trichloroethane
8. Mercury
9. Lead
10. Chromium
11. Selenium
12. Silver
13. Arsenic

APPENDIX A

Contaminant Concentration Ranges of Contaminants
at the PCA/R-150

CONTAMINANT	TLV-TWA	PEL	STEL	IDLH
Trichloroethylene	50ppm, 269mg/m3	50ppm, 270mg/m3	200ppm 1070mg/m3	1000mg/m3
NIOSH-Reduce to lowest Possible			Ca	

Exposure Routes:
- Inhalation
- Ingestion
- Skin and or Eye Contact

Symptoms/Effects of Overexposure:
- Headache, Vertigo, Visual Disturbance
- Tremors, Somnolence, Nausea
- Vomiting, Eye Irritation, dermatitis
- Cardiac arrhythmias, CARCINOGEN

Personnel will be removed from the site and placed under observation immediately if any of the above symptoms occur.

	TWA	PEL	STEL	IDLH
Chloroform	10ppm, 49mg/m3	2 ppm 9.78 mg/m3	50ppm for 10 min	1000ppm
synonym(Trichloromethane)				Ca
NIOSH-Reduce to Lowest Possible				

Exposure Routes:

- Inhalation
- Ingestion
- Skin/Eye Contact

Symptoms/Effects of Overexposure:

- Dizziness, Mental Dullness, Nausea
- Disorientation, Headache, Fatigue
- Anesthesia, Liver Damage, Irritation of skin/eyes, CARCINOGEN

Personnel will be removed from the site and placed under observation immediately if any of the above symptoms occur.

	TWA	STEL/CEIL	PEL	STEL/CEIL	
Trichlorofluoromethane	1000ppm	5620 mg/m3	1000ppm	5600ppm	NO DATA
synonym: Fluorotrichloromethane		C(Synergistic)			

Exposure Routes:
- Inhalation
- Ingestion
- Skin/Eye Contact

Symptoms/Effects of Overexposure:
- Incoordination, Tremors, dermatitis
- Frostbite, Cardiac Arrhythmias
- Cardiac Arrest

Personnel will be removed from the site under observation immediately if any of the above symptoms occur.

	TWA	STEL/CEIL	PEL	IDLH
Dichloromethane synonym(Methyl Chloride)	50ppm 103mg/m3	100ppm/205mg/m3	50ppm/105mg/m3	10,000ppm Ca

NIOSH-Reduce to Lowest Possible

Exposure Routes:	Symptoms/Effects of Overexposure
- Inhalation	- Dizziness, Nausea, Visual Disturbance
- Skin/Eye Contact	- Stagger, Slurred Speech, Convulsions, Coma, Liver Damage, Frostbite,CARCINOGEN

Personnel will be removed from the site and placed under observation immediately if any of the above symptoms occur.

	TWA	STEL/CEIL	PEL	IDLH
1,2-Dichloroethylene synonym:(Acetylene dichloride)	200ppm/810mg/m3	250/1010mg/m3	100ppm/400mg/m3	4000ppm

Exposure Routes:	Symptoms/Effects of Overexposure:
- Inhalation	- Irritation to Eyes, Respiratory system, Central Nervous System
- Ingestion	- Depression
_ Skin/Eye Contact	

Personnel will be removed from the site and placed under observation immediately if any of the above symptoms occur.

	TWA	STEL/CEIL	PEL	IDLH
1-Dichloroethane synonym(Ethylidene chloride)	200ppm/810mg/m3	250ppm/1010 mg/m3	250ppm/1010mg/m3	4000ppm

Exposure Routes:	Symptoms/Effects of Overexposure:
- Inhalation	- CNS Depression; Skin Irritation
- Ingestion	- Liver, Kidney Damage
- Skin,Eye Contact	

Personnel will be removed from the site and placed under observation immediately if any of the above symptoms occur.

	TWA	STEL/CEIL	PEL	IDLH
1,1,1-Trichloroethane synonym(Methyl chloroform)	350ppm/1910mg/m3	450ppm/2460mg/m3	350ppm/1900mg/m3	1000ppm

Exposure Routes:

- Inhalation
- Ingestion
- Skin,Eye Contact

Symptoms/Effects of Exposure

- Headache,Exhaustion, CNS depression
- Poor Equilibrium, Eye Irritation
- Dermatitis, Cardiac arrhythmias

Personnel will be removed from the site and placed under observation immediately if any of these symptoms occur.

	TWA	PEL	IDLH
Mercury	.05mg/m3	.05mg/m3	28mg/m3

Exposure Routes:

- Inhalation
- Skin Absorption
- Skin/Eye Contact

Symptoms/Effects of Exposure:

- Cough , Chest Pain, Difficult Breathing
- Bronchitis, Tremors
- Insomnia, Fatigue, Anorexia,

Personnel will be removed from the site and placed under observation immediately if any of these above symptoms occur.

	TWA	PEL	IDLH
Lead	.15mg/m3	.05mg/m3	700mg/m3

Exposure Routes:

- Inhalation
- Ingestion
- Skin/Eye Contact

Symptoms/Effects of Exposure:

- Weak, Lassitude, Insomnia,
- Pallor, Anorexia,
- Low weight, malnutrition, constipation Tremor, Hypotension, abdominal pain Colic, Anemia

Personnel will be removed from the site and placed under observation immediately if any of these above symptoms occur.

	TWA	PEL	IDLH	
Chromium	.5mg/m3	1mg/m3		Ca

Exposure Routes:

- Inhalation
- Ingestion

Symptoms/Effects of Exposure:

- Histologic fibrosis of lungs

Personnel will be removed from the site and placed under observation immediately if any of these symptoms occur.

	TWA	PEL	IDLH
Selenium	.2mg/m3	.2mg/m3	unknown

Exposure Routes:

- Inhalation
- Skin Absorbtion
- Ingestion
- Skin/Eye Contact

Symptoms/Effects of Exposure:

- Irritation to Eyes, Nose, Throat
- Visual Disturbance, Chills
- Fever, Hard Breathing, Metallic Taste Dermatitis, Skin/Eye Burn, Anemia

Personnel will be removed from the site and placed under observation immediately if any of these symptoms occur.

	TWA	PEL
Silver	.1mg/m3	.01mg/m3

Exposure Routes:
- Inhalation
- Ingestion
- Skin and Eye Contact

Symptoms/Effects of Exposure:
- Blue-gray, nasal
- Septum, Throat irritation
- Skin, Ulceration, GI disturbance

Personnel will be removed from the site and placed under observation immediately if any of these symptoms occur.

	TWA	PEL	
Arsenic	.2mg/m3	.5,.01mg/m3	Ca

Exposure Routes:
- Inhalation
- Absorbtion
- Skin/Eye Contact

Symptoms/Effects of Exposure:
- Ulceration of Nasal Septum
- Dermatitis, GI Tract Disturbance
- Respiratory Irritation

Personnel will be removed from the site and placed under observation immediately if any of these symptoms occur.

ACGIH-TLV/TWA Threshold Limit Value-Time Weighted Average, An airborne concentration of substance under which it is believed that nearly all workers may be repeatedly exposed day after day (8hr ,40hr workweek) without adverse effects.

" Skin " Notation. Listed substances followed by skin, refer to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eye, either by airborne or more particularly, by direct contact with the substance.

Ca Confirmed or Suspect Carcinogen. Note, if high values occur, no cartridge filter respirators are approved protection.

STEL Defined as a 15 min TWA exposure which should not be exceeded at anytime during a work day even if the 8hr TWA is within the TLV-TWA.

IDLH Immediately Dangerous to Life and Health. No exposure at all, allowed at this level.

NIOSH-Lowest Possible Exposure Recommended exposure below ACGIH TWA.

APPENDIX B

PHYSICAL DRILLING HAZARDS

ACTIVITY HAZARD ANALYSIS

ACTIVITY Earth drilling operations

ANALYZED BY [illegible] REVIEWED BY [illegible] DATE 31 JAN 92

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
General	Lack of knowledge in safety requirements and safe use of equipment.	Training in safety requirements (EM 385-1-1); training in manufacturer's literature (e.g., operator,s manual); review of activity hazard analyses.
	Pre-existing physical condition; physically unqualified.	Pre-employment and follow-up physical examinations.
	Unfamiliar with project rules and procedures.	Project safety and health orientation; make accident prevention plan available to employees.
	Exposure to the elements.	Meet minimum clothing requirements.
Traveling	Collision.	Know dimensions/capacities of rig; trained and licensed operators.
	Persons riding rig.	Prohibit persons riding on rig in other than proper seating arrangements.
	Running over objects.	Require use of spotter.
	Moving equipment w/mast up.	Prohibit moving equipment with mast up; interlock to prevent movement of equipment with mast up; warning device to sound when equipment is moved with mast up.
	Traveling on rough terrain.	Survey terrain prior to travel; if necessary, smooth terrain prior to operation; move equipment parallel to slope; use of spotter to identify terrain hazards.
Set-up	Contact w/overhead electrical lines.	Use of proximity warning devices; warning signs; training.
	Unstable ground.	Check ground stability prior to set-up.
	Machinery out of level.	Extend and level outriggers; use of warning device.

ACTIVITY Earth drilling operations ANALYZED BY REVIEWED BY DATE 31 JAN 92

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
	Defective equipment.	Pre-operation check of fluids, pressures, clearances, gauges, warning devices, safety devices, operation of controls, belts, hoses, nuts/bolts, drilling fluid levels, etc.
	Two-blocking of hoist.	Anti two-blocking device and alarm.
	Operation of hoists beyond capacities.	Know capacities and loads; use hoists only for their designed intent, not for lifting other materials and personnel.
Drill operations	Personnel caught in machinery during start-up and operation.	Sound alarm to warn persons prior to starting/engaging equipment; proper machine guarding; lubrication points shall be located in safe positions; use long-handled shovels to move auger cuttings away from the auger; clean augers only when the rotation mechanism is in neutral and the auger stopped.
	Contact w/hazardous chemicals agents in soil.	Pre-work surveys to identify previous use of land; soil sampling, if necessary to determine type and concentrations of hazards; use protective clothing.
	Contact with hazardous drilling fluids.	Train workers in hazards of fluids (MSDS); proper protective cothing.
	Defective equipment.	Periodically inspect (same as above).
	Hoisting hazards.	Use slings/chains - don't wrap hoist line around object.
	Clothing/equipment caught in reciprocating equipment.	Don't wear loose clothing, jewelry; keep body parts, rags, tools, etc. away from equipment.
	Tripping (housekeeping) hazards.	Keep work area clean and equipment properly stored/secured
	Striking head, head struck.	Use of hard hats.
	Object falling on foot.	Use of steel-toed safety boots.

ACTIVITY Earth drilling operations ANALYZED BY REVIEWED BY DATE 31 JAN 92

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
	Hazards in using hoists (incl. cathead) and wire rope.	Keep the cathead clean and lubricated; periodically inspect rope and keep rope clean; periodically check cathead for rope wear groves; compliance with hoist and wire rope requirements.
	Rope grabbing on cathead.	Release rope and warn others to back away and keep clear of rig; shut down engine and take safe measures to release hoisted load.
	Objects pulled into cathead.	Rope handler shall maintain at least 3 ft. clearance from cathead; keep rope free and untangled.
	Starting/guiding auger.	Use auger guide on hard surfaces; apply adequate down pressure on drill rod to penetrate ground surface prior to starting auger; start auger slowly and watch to ensure a controlled penetration into the ground; if auger head slides out of alignment, stop and repeat process.
	Rotary and core drilling - hydraulic equipment.	Compliance with requirements for hydraulic equipment.
	Rotary and core drilling - general.	Inspect and maintain water swivels, hoisting plugs, and drill rod chuck jaws.

ACTIVITY Earth drilling operations ANALYZED BY REVIEWED BY DATE 31 JAN 92

PRINCIPAL STEPS	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
	Hands cut by equipment.	Use of work gloves.
	Dust.	Use of wet drilling techniques or other dust control procedures.
	Foreign object in eye.	Use of goggles.
	Hazardous noise.	Use of hearing protection devices: enrollment, if necessary, in hearing conservation program.
	Hazards of on-line maintenance and repair.	Stop and lockout/block energized equipment; lower mast for repairs. grease/lubrication fittings located at safe positions.
	Contact w/underground utilities.	Contact utilities/review existing site plans to identify ungerground utilities.
	Climbing/falls from rig.	Use safe means of access; fall protection devices if necessary; clean mud and grease from shoes prior to climbing rig.
	Uncovered boreholes (tripping hazards).	Cap/flag boreholes.
	Operation during electrical storm.	Monitor weather if necessary; cease operations when thunderstorms are impending.
	Hazards w/rod slipping device.	Do not run/rotate drill rods through device; do not hoist more than 1 ft. of drill rod column above the top of the mast; do not hoist a drill rod column which has loose tool joints; do not make up, tighten, or loosen tool joints while the rod column is supported by a rod slipping device.
	Improperly secured/-stored rod sections.	Ensure drill rod columns which are not being used are properly stored and secured.
	Hazardous air due to operation in enclosed areas (incl. trenches).	Air monitoring; compliance with confined space procedures.
	Operator leaving station during rig operation.	Operators required to remain at station at all times of operation.

APPENDIX C

CONFINED SPACE ENTRY PROGRAM

APPENDIX U

USACE CONFINED SPACE ENTRY PROGRAM

1. PURPOSE. The procedures established in this regulation are meant to insure the safety of workers and significantly reduce the possibility of accidental injury or death associated with entering, working in, or exiting confined spaces.

2. SCOPE. This regulation applies to all civilian and military personnel assigned to or performing duty in the Wilmington District.

3. REFERENCES.

a. USACE Safety and Health Requirements Manual, EM 385-1-1 (1987).

b. Control of Gas Hazards Aboard Vessels, ANSI-NFPA 306.

c. Criteria for a Recommended Standard, Working in Confined Spaces, National Institute of Occupational Safety and Health (NIOSH) (1979)

d. Proposed OSHA Standard 29 CFR 1910.146.

4. DEFINITIONS.

a. The term Confined Space as defined by the National Institute for Occupational Safety and Health (NIOSH) refers to any space by design which has limited openings for entry and exit, unfavorable natural ventilation which could contain or produce dangerous air contaminants, and which is not intended for continuous employee occupancy. Confined spaces include, but are not limited to, storage tanks, compartments of ships, process vessels, pits, silos, vats, degreasers, reaction vessels, boilers, ventilation and exhaust ducts, sewers, tunnels, oil circuit breakers, underground utility vaults and pipelines.

b. The primary hazards encountered with entering and working in confined spaces are oxygen deficiency and enrichment, combustible gases, and exposure to toxic materials.

c. Competent Person - A person designated by the employer, in writing, as capable (by education and/or specialized training) of recognizing and evaluating employee exposure to hazardous materials and/or other unsafe conditions in a confined space. This person shall be capable of specifying the necessary protection and/or precautions needed to insure worker safety; perform initial atmospheric tests before entering confined space and insure a confined space entry permit has been completed, signed, and posted during a confined space operation.

d. Qualified Entrant Personnel - A person trained to follow the confined space entry procedures as outlined by the employer or designated competent person. This person shall be able to recognize the special hazards of the job, wear personal protective equipment, and perform preparation procedures, such as isolation/lockout/tag, when applicable. The entrant employee shall also be trained to wear monitoring devices and interpret the readings as necessary during confined space operation.

e. Standby Person - A person assigned to remain on the outside of the confined space while remaining in communication with those persons working inside. This person must be capable of monitoring what transpires in a confined space and trained in procedures for rescue assistance.

f. Entry Permit - An authorization and approval in writing that specifies the location and type of work to be done in the confined space. The permit certifies that all existing hazards have been evaluated by the competent person and all necessary protective measures have been taken to insure the safety of the worker (see attached).

5. POLICY AND PROCEDURES.

a. When performance of duties involves inspection and maintenance in confined spaces, correct procedures for safe entry and exit are essential. To insure that a safe condition exists in any confined space, entry shall be allowed only after a competent person has tested the work environment and has completed and signed an approved confined space entry permit. This regulation follows with those requirements for ventilation, testing, and labeling as described in references 3.a, 3.b, and 3.c, and is to be implemented as applicable.

b. The supervisor or designated competent person shall establish a list of confined spaces or suspected confined spaces in their area of responsibility. Once these areas have been identified and reviewed, a confined space SOP will be written for each respective location. A copy of the listing and SOP will be provided to the District Safety & Occupational Health Office for review.

c. A trained competent person will be available at each project site for any confined space operation. This will insure that each confined space entry operation or work environment is properly tested and determined safe for entry. Competent person training shall be initiated through the District training office. The entrant and standby employee will be trained by the designated competent person and/or District Industrial Hygienist to insure proper compliance with proposed standard 29 CFR 1910.146. This will insure that there is an adequate number of trained personnel at the project so that employees working in confined spaces can and shall work in teams (3a).

d. The supervisors and District Safety and Occupational Health Office shall maintain a written record of all individuals trained, tests and maintenance on equipment, safety drills and inspections. The records shall be retained 1 year after the last date of training, inspection, tests, or maintenance (3c).

e. Provide continuous monitoring combustible gas and oxygen meters and any specialized safety equipment needed to satisfy confined space entry conditions. The types of meters and equipment are to be coordinated with the District Safety & Occupational Health Office. This equipment is to be used only by properly trained "Competent Persons" and "Qualified Entrant Personnel" as applicable to their respective tasks.

f. Where possibility of a toxic atmosphere is recognized by a competent person, the determination of concentrations and appropriate safety procedures and record maintenance will be administered by the District Safety and Occupational Health Office.

Attachment
CESAW Form 562, Confined Space Entry Permit

CONFINED SPACE ENTRY PERMIT ENTRY/EXIT TIME: _____ / _____

LOCATION OF WORK: _____ WORK TO BE DONE: _____

EMPLOYEES ASSIGNED: _____ , _____ STANDBY PERSON: _____

HAZARDOUS WORK: Open Flame/Burning Other:
HAZARDS EXPECTED: Flammable/Corrosive Materials, Other:
ISOLATION CHECKLIST: Blanking Lines, Disconnect Electrical, Mechanical, Other:
PERSONAL SAFETY: Respirators, Rescue Equipment, Ventilation, Other ;
FIRE SAFETY: Extinguishers Available, Other:

ATMOSPHERIC GAS TESTS:	Time	Results	Initial	Time	Results	Initial
Oxygen(19.5%-21%)						
Combustible Gas(<10%LEL)						
Toxicity (ppm)						

AUTHORIZATION: This space tested SATISFACTORY/UNSATISFACTORY for entry.

COMPETENT PERSON SIGNATURE: _____ DATE: _____

****

CONFINED SPACE ENTRY PERMIT ENTRY/EXIT TIME: _____ / _____

LOCATION OF WORK: _____ WORK TO BE DONE: _____

EMPLOYEES ASSIGNED: _____ , _____ STANDBY PERSON: _____
HAZARDOUS WORK: Open Flame/Burning Other:
HAZARDS EXPECTED: Flammable/Corrosive Materials, Other:
ISOLATION CHECKLIST: Blanking Lines, Disconnect Electrical, Mechanical, Other:
PERSONAL SAFETY: Respirators, Rescue Equipment, Ventilation, Other::
FIRE SAFETY: Extinguishers Available, Other:

ATMOSPHERIC GAS TESTS:	Time	Results	Initial	Time	Results	Initial
Oxygen(19.5%-21%)						
Combustible Gas(<10%LEL)						
Toxicity (ppm)						

AUTHORIZATION: This space tested SATISFACTORY/UNSATISFACTORY for entry.

COMPETENT PERSON SIGNATURE: _____ DATE: _____

****

CONFINED SPACE ENTRY PERMIT ENTRY/EXIT TIME: _____ / _____

LOCATION OF WORK: _____ WORK TO BE DONE: _____

EMPLOYEES ASSIGNED: _____ , _____ STANDBY PERSON: _____

HAZARDOUS WORK: Open Flame/Burning Other:
HAZARDS EXPECTED: Flammable/Corrosive Materials, Other:
ISOLATION CHECKLIST: Blanking Lines, Disconnect Electrical, Mechanical, Other:
PERSONAL SAFETY: Respirators, Rescue Equipment, Ventilation, Other:
FIRE SAFETY: Extinguishers Available, Other:

ATMOSPHERIC GAS TESTS:	Time	Results	Initial	Time	Results	Initial
Oxygen(19.5%-21%)						
Combustible Gas(<10%LEL)						
Toxicity (ppm)						

AUTHORIZATION: This space tested SATISFACTORY/UNSATISFACTORY for entry.

COMPETENT PERSON SIGNATURE: _____ DATE: _____

CESAW Form 562
1 Dec 88

APPENDIX D

LOGS, RECORDS, REPORTS

AIR MONITORING WORKSHEET

DATE: ______________

Site: ____

Activity:
____ Drilling ___ Soil/Gas ___ Groundwater Sampling___ Other (explain)

____

Instrument:
(P) - Photoinization Meter, Type_______ Unit/Model______ Calibration______
(C) - Combust Gas/O_2 Meter, Type_______ Unit/Model______ Calibration______
(HS)- Hydrogen Sulfide, Type_______ Unit/Model______ Calibration______
(DT)- Detector Tubes, Type_______ Unit/Model______ Calibration______

Monitoring Requirements: ____

____

General Comments: ____

____

READINGS:

Time	Instr.	Reading	Location	Comments

Prepared by ______________________

APPENDIX E

SITE SAFETY PLAN CERTIFICATION

Health And Safety Plan Certification

The following signature certifies that they have read, understand and comply with the guidelines set forth in this Safety Plan.

Site Personnel/Visitors

Name (PRINT)	Signature	Date

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

Draft
Quality Assurance Project Plan for the RCRA Facility Investigation Phase II Soils and Phase III Groundwater at the Pesticide Control Area/R-150 Tank Site NWSCC, Crane Martin County, Indiana

Prepared for Northern Division,
Naval Facilities Engineering Command
Environmental Division, Code 1421

Prepared by Robert Magee
Wilmington Engineering District
US Army Corps of Engineers
Wilmington, N.C.

Date:

Approvals: _____ Date _____

Carol Witt-Smith
Corrective Action Expert

_____ Date _____

Director, Central Region Laboratory

_____ Date _____

Regional QA Manager

ELEMENT 2

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ATTACHMENT 1 CHEMICAL DETECTION PROCEDURES & LIMITS
ATTACHMENT 2 CLP FORMS

ELEMENT 3

PROJECT DESCRIPTION

Introduction. The Pest Control Area/R-150 Tank Area (PCA) is made up of three separate sites, which in some way, are related to the pest control activities at NWSCC. Building 2189 is where the present operation is found. Building 55 is the old site of the operation. The R-150 Tank site was used to store pesticide wastes. Expected contaminants are pesticides, metals, and solvents. A RCRA RFI Phase II soils release assessment must be performed at the PCA.

Background. To fulfill the Corrective Action Requirements of the Federal Portion of the Final RCRA/HSWA Part B Permit, Naval Weapons Support Center (NWSCC), Crane, Indiana will be conducting a RCRA Facility Investigation (RFI) at the Pest Control Area/R-150 Tank Area (PCA). The US Army Corps of Engineers' (USACE), Waterways Experiment Station (USACEWES) will be conducting the study.

These sites have been in use since the 1950's. Various pesticides have been used at NWSCC at different times. The list of chemicals is lengthy. Pesticide spray tanks and containers were most likely rinsed in the vicinity of Building 55, (Figure 1.1.3 Area "A") the previous Pesticide Control Building. Chemicals used at this site from 1950 to 1974 include but are not limited to herbicides 2,4-D, 2,4,5-T Silvex (a mixture of 24-D & 24-T) Fenac, Monuron and Ureabor. Insecticides include Carbaryl, Chlordane DDT, Diazinon, Dieldrin, Lindane, Malathion and Pyrethrum. The Pest Control Operation was moved from Building 55 to its present location, Building 2189 (Figure 1.1.3 Area "B") around 1970. In addition to the chemicals stored and used out of Building 55, an additional inventory of chemicals were added which include herbicide Krovar (a mixture of Duron and Bromac). During the last 5 years the herbicide Oust was used on right-of-ways of railroad and magazine drives between the bunkers and blast walls. Building 55 has since been demolished and the site is now a concrete pad.

Since 1970 Building 2189 has been used to store pest control chemicals. Around 1974, herbicides 2,4,5-T and Monuron stored at Building 2105 (located west of Building 2074 N.W. H-460 and H-101) and used by railroad personnel on the railroad right-of-way, was taken to Building 2189 for storage. Pest control chemicals have been mixed here. Since approximately 1974 strict waste control practices have been followed. Containers are tripled rinsed and

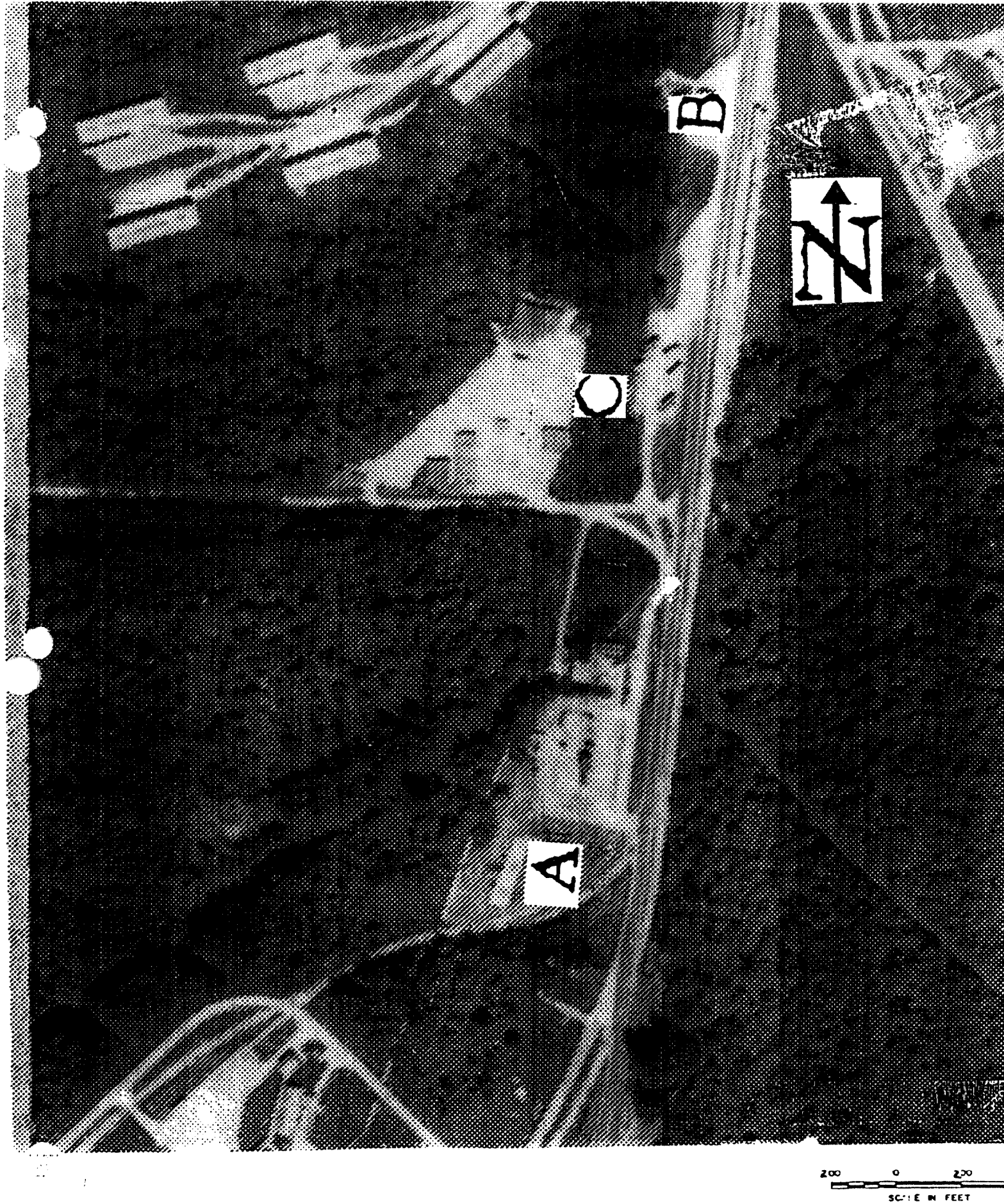


Figure 1.1.3 Aerial photograph showing Bldg 55 (A), Bldg 2189 (B), R-150 Tank Site, and Unit Boundary.

the rinsate used in the mixture. Large spraying equipment is flushed with water and the rinsate is used in the treatment area. When the sprayers are winterized at the end of the spraying season the rinse water is collected and used the following spring in the first spray mixture that is applicable. Neither pesticide containers nor rinsates have been emptied in the vicinity of Building 2189. Any wastes, which were not to be reused, were collected and put into the R-150 Storage Tank.

A R-150 Tank was installed in the early 1970's in the gravel parking lot adjacent to H-349 (Figure 1.1.3 Area "C"). The R-150 Tank was 11ft wide by 35ft long. The base of the tank was reportedly 15ft deep (Figure 1.1.4). The tank was excavated and removed 27-28 September 1983 by NWSCC personnel. The excavated contaminated soil was removed for disposal in a secure landfill off-site in December 1983. Contamination has been detected in the groundwater at the tank site.

A ground water and soils investigation was started in 1981. Between 1981 and 1983 a total of 14 monitoring wells were installed at this site (Figure 1.2.1A). A north-northwest trending contaminated groundwater plume was detected. The detected groundwater contaminants were chlorinated organic solvents (Trichloroethylene and Trichloroethane). The source of the chemical contamination has not been substantiated. Six additional wells were installed in 1986 and placed around the R-150 Tank excavation area. All 6 wells placed around the R-150 tank excavation were contaminated (Figure 1.2.1C).

Site Setting. NWSCC is a Navy facility located in Martin County Indiana. NWSCC covers approximately 62,463 acres (Figure 1.1.2a). The PCA/R-150 Tank Site is located in the central portion of the facility in the NW 1/4 of section 23, T5N, R4W (Figure 1.1.2a). The site includes Building 55, the previous Pesticide Control Building located approximately 5.0 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-45, Building 2189, the present Pesticide Control Building located approximately 5.5 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-45, and the R-150 Tank Site located approximately 5.5 miles northeast of the Burns City Gate No. 2 and accessed using Crane Road H-349 (Figure 1.1.2b). This site is located near several of NWSCC's industrial site. Building 55 is now demolished but on the site a steam generation plant is located. Building 2189 is now being used but it is scheduled to be demolished soon. The R-150 tank area is used as a pallet and material storage yard.

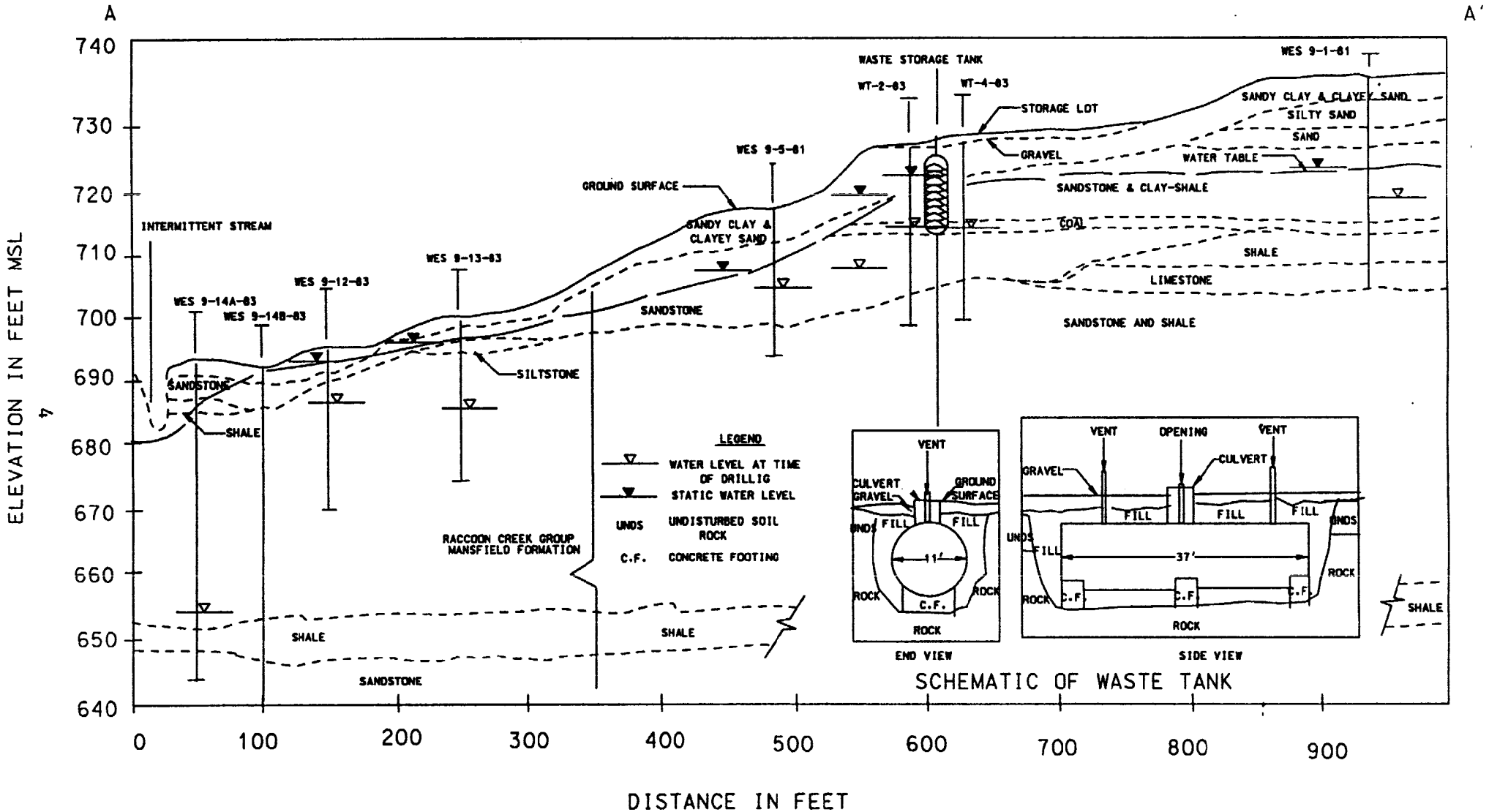


Figure 1.1.4 PCA/R-150 Tank Area Geological Cross Section and Schematic Diagram of R-150 Tank (Dunbar, 1984).

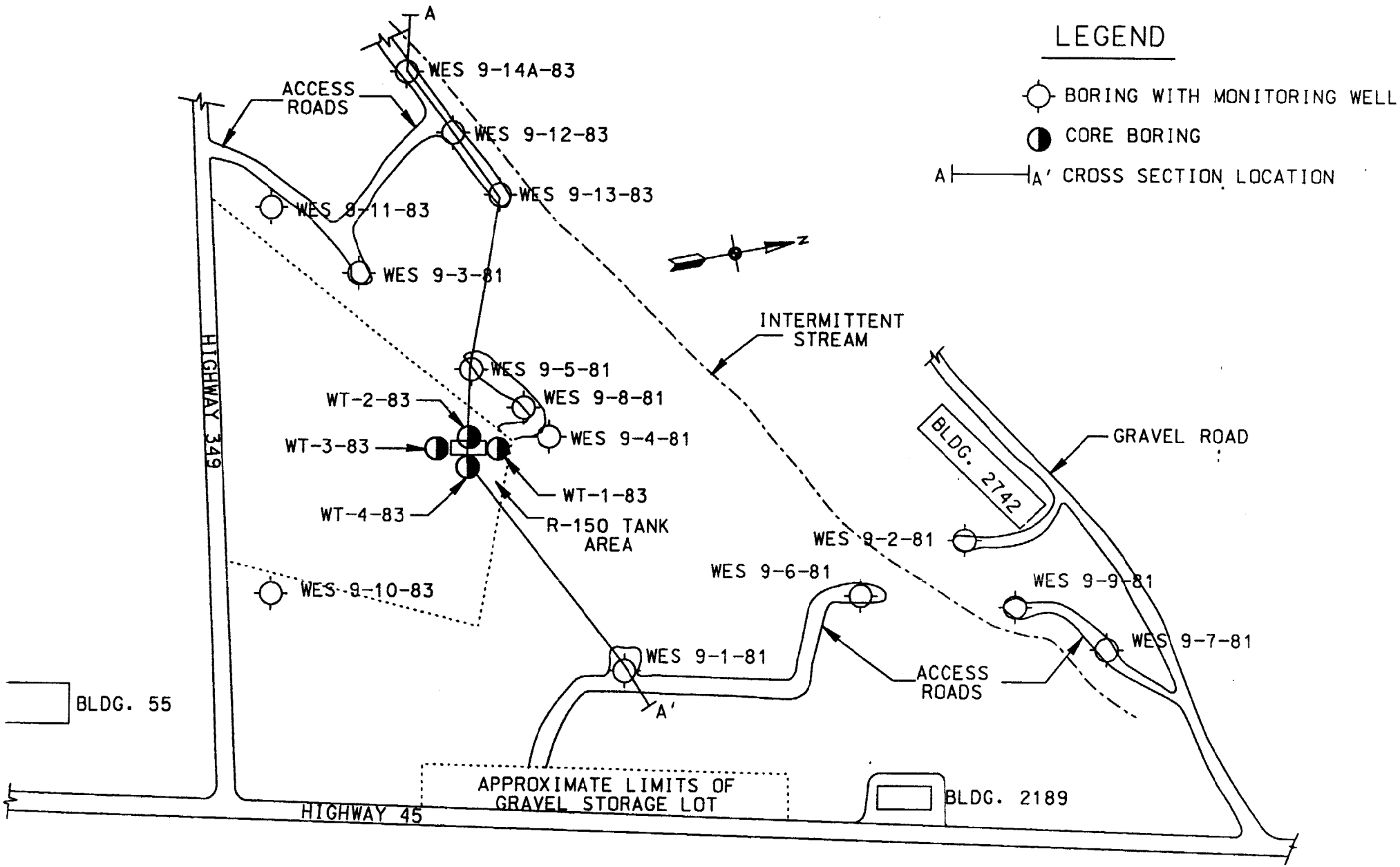


Figure 1.2.1A Schematic diagram PCA/R-150 Tank Area. Site includes Bldg 2189, Bldg 55, and R-150 Tank Area.

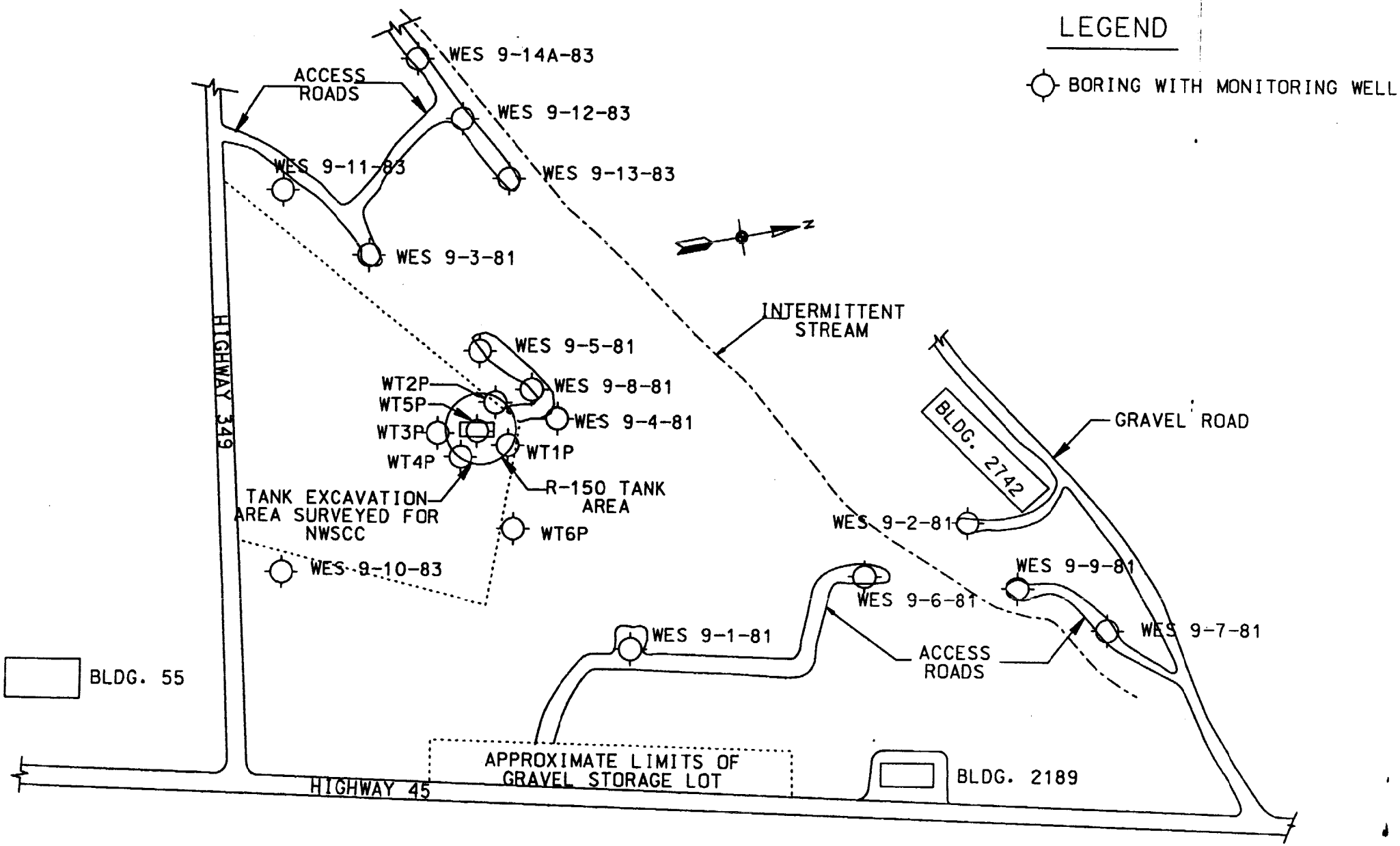


Figure 1.2.1C Schematic diagram PCA/R-150 Tank Area. Site includes Bldg 2189, Bldg 55, and R-150 Tank Area.

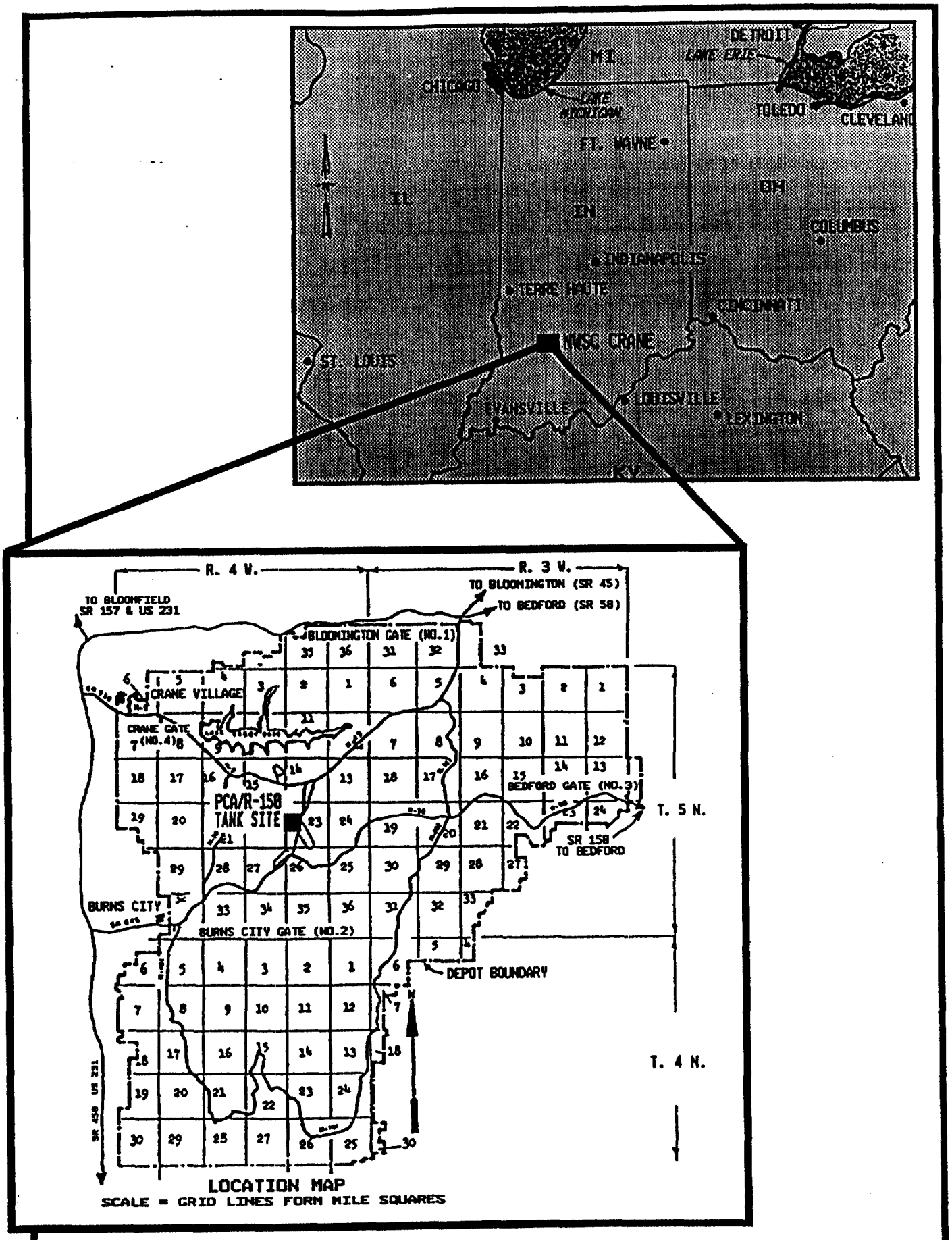
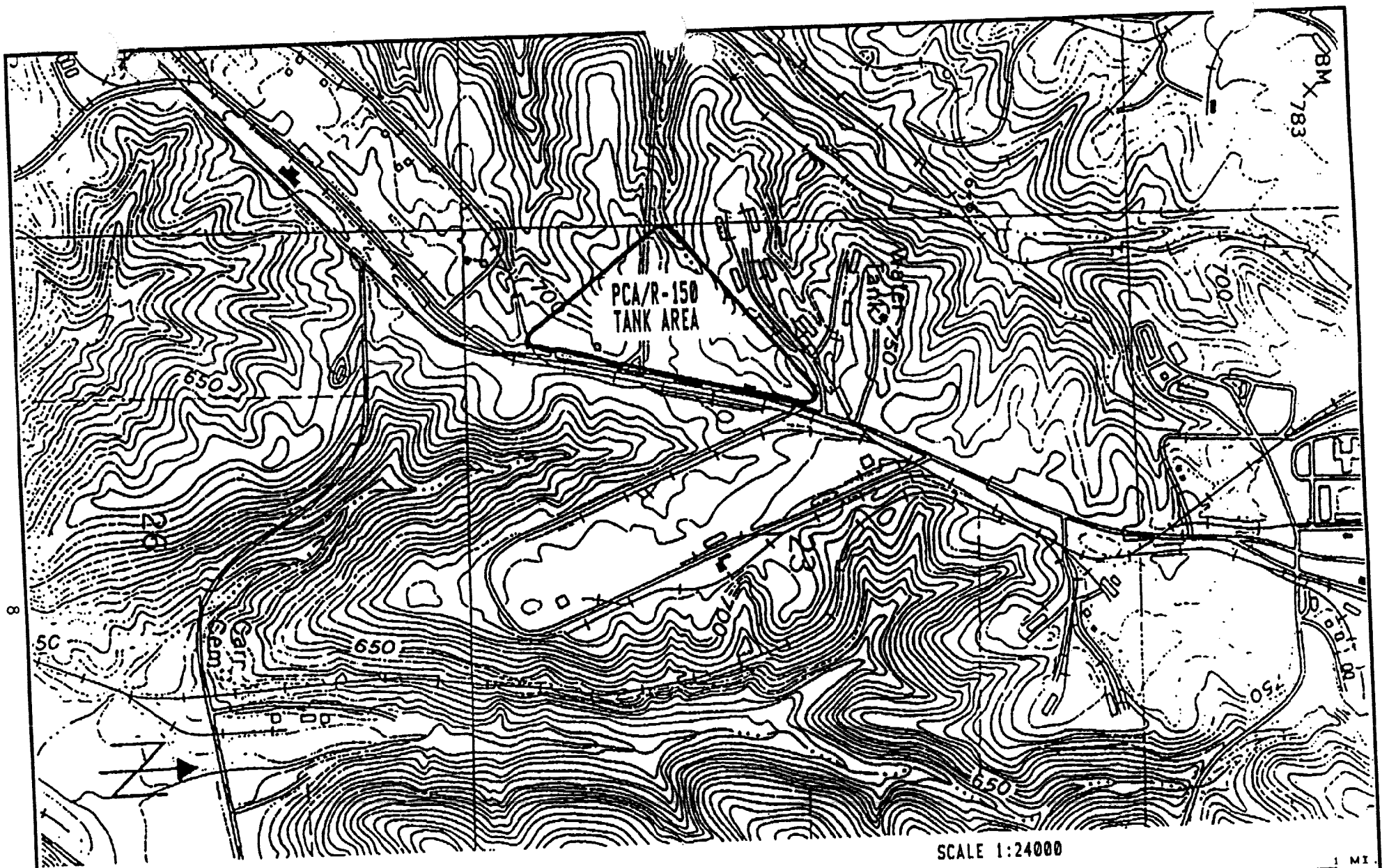


Figure 1.1.2A Location Map showing the location of NWSC Crane in the SW center of Indiana & the PCA/R-150 Tank Site located in the central portion of NWSC Crane.



USGS TOPOGRAPHIC MAP OF THE CENTRAL PORTION OF NWSC CRANE SHOWING THE PCA/R-150 TANK AREA.

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE 1.1.2B

The PCA/R-150 Tank Site soil consists of 2 to 10 feet of clay (CL) and clayey sand (SP-SC). Sedimentary rocks underlying the PCA/R-150 Tank Site consists of interbedded sandstone, clay shale, shale, occasional limestone and coal. The groundwater studies indicate that the static water level averages 14 ft below ground surface, and its gradient is to the west-northwest. (Dunbar, 1984). The superficial and upper bedrock aquifer form one groundwater system.

Target Compounds. Soil samples will be analyzed for the presence of organic and inorganic compounds. Chemical analysis will be done using SW-846 analytical methods, or other accepted methods when no SW-846 method is available. The contamination detected in the groundwater is principally chlorinated solvent compounds. The other possible contaminants are metals. EPA methods 8240 and 8270 analysis will be run to detect the organic contamination.

Project Objective. This is a RFI Phase II Soils and Phase III Groundwater Study. The intent of the project is to provide data of sufficient quality to support Corrective Action decisions. The QAPjP was prepared in accordance with the USEPA Region 5 guidance on preparing the 16 Element QAPjPs. The chemical analyte date must meet NEESA Level C (EPA Level 4 equivalent) specifications. This will be accomplished by judiciously selecting sample locations, selecting the appropriate analytes, and using proper analytical methods.

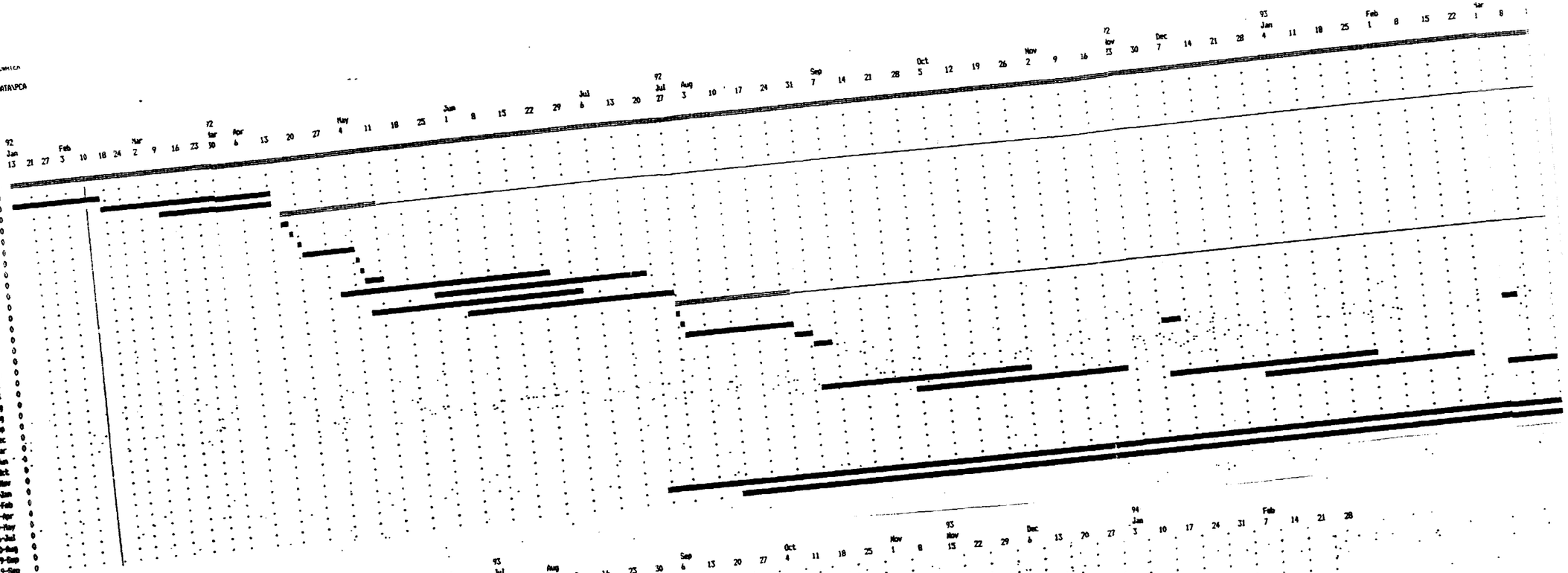
Sample Network and Rationale. Refer to Part 3.0, Sample Plan, of the Work Plan for further discussion and rationale.

Project Schedule. Refer to Diagram 2.3.2.

e Name : PLOW-120 INC. AREA SAMPL 07/03 SOILS S ENGINEERING
sible : KAMALA B. POWELL
Date : 10-Feb-92 9:00am Schedule File : C:\TLJ\DATA\PCA

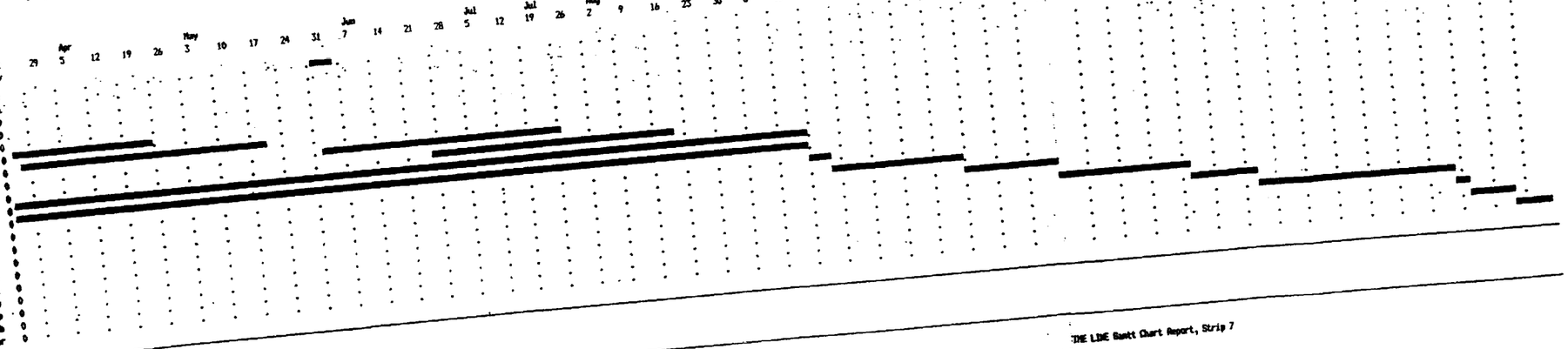
:: SOILS, PHASE III GW. DATES SUBJECT TO CHANGE/

Name	Start Date	Duration (Days)	End Date	Pct Achv
SCHEDULE	29-Jul	880	5-Mar	0
PA REVIEW	29-Jul	113	30-Dec	0
NAVY REVISION	2-Jan	30	13-Feb	0
UBMIT FINAL WP TO EPA	14-Feb	45	13-Apr	0
RC REVIEW	9-Mar	30	13-Apr	0
IELD WORK	16-Apr	26	11-May	0
SURVEYING	15-Apr	2	17-Apr	0
LOCATIONING	18-Apr	1	18-Apr	0
RIG MOB	20-Apr	1	20-Apr	0
PLACE 15 BORINGS	21-Apr	14	4-May	0
DEMOB	5-May	1	5-May	0
SOIL SAMPLING	6-May	1	6-May	0
1ST ROUND GW SAMPLING	7-May	5	11-May	0
OIL ANALYSIS	30-Apr	55	23-Jun	0
ATA REDUCTION	25-May	55	18-Jul	0
ST ROUND GW ANALYSIS	8-May	55	1-Jul	0
ATA REDUCTION	2-Jun	55	26-Jul	0
IELD WORK	27-Jul	31	26-Aug	0
SURVEYING	27-Jul	1	27-Jul	0
RIG MOB	28-Jul	1	28-Jul	0
PLACE 12 MON. WELLS	29-Jul	29	26-Aug	0
QUIFER	27-Aug	5	31-Aug	0
ND ROUND GW SAMPLING	1-Sep	5	5-Sep	0
RD ROUND GW SAMPLING	1-Dec	5	5-Dec	0
TH ROUND GW SAMPLING	1-Mar	5	5-Mar	0
TH ROUND GW SAMPLING	1-Jun	5	5-Jun	0
RD ROUND GW ANALYSIS	2-Sep	55	26-Oct	0
ATA REDUCTION	27-Sep	55	20-Nov	0
RD ROUND GW ANALYSIS	2-Dec	55	23-Jan	0
ATA REDUCTION	27-Dec	55	19-Feb	0
TH ROUND GW ANALYSIS	2-Mar	55	25-Apr	0
ATA REDUCTION	27-Mar	55	20-May	0
TH ROUND GW ANALYSIS	2-Jun	55	26-Jul	0
ATA REDUCTION	27-Jun	55	20-Aug	0
ATA REDUCTION	19-Jul	428	19-Sep	0
EPORT WRITING	9-Aug	407	19-Sep	0
GRAPHICS PREPARATION	20-Sep	5	24-Sep	0
TYPING	25-Sep	30	24-Oct	0
IN HOUSE REVIEW	25-Oct	21	14-Nov	0
EDITING	15-Nov	30	14-Dec	0
NAVY REVIEW	15-Dec	15	29-Dec	0
EDITING	30-Dec	45	12-Feb	0
EPA REVIEW	13-Feb	3	15-Feb	0
TYPING	16-Feb	10	25-Feb	0
EDITING	26-Feb	8	5-Mar	0
FINAL REVIEW				



TIME LINE Gantt Chart Report, Strip 6

Name	Start Date	Duration (Days)	End Date	Pct Achv
TH ROUND GW SAMPLING	1-Jun	5	5-Jun	0
RD ROUND GW ANALYSIS	2-Sep	55	26-Oct	0
ATA REDUCTION	27-Sep	55	20-Nov	0
RD ROUND GW ANALYSIS	2-Dec	55	23-Jan	0
ATA REDUCTION	27-Dec	55	19-Feb	0
TH ROUND GW ANALYSIS	2-Mar	55	25-Apr	0
ATA REDUCTION	27-Mar	55	20-May	0
TH ROUND GW ANALYSIS	2-Jun	55	26-Jul	0
ATA REDUCTION	27-Jun	55	20-Aug	0
ATA REDUCTION	19-Jul	428	19-Sep	0
EPORT WRITING	9-Aug	407	19-Sep	0
GRAPHICS PREPARATION	20-Sep	5	24-Sep	0
TYPING	25-Sep	30	24-Oct	0
IN HOUSE REVIEW	25-Oct	21	14-Nov	0
EDITING	15-Nov	30	14-Dec	0
NAVY REVIEW	15-Dec	15	29-Dec	0
EDITING	30-Dec	45	12-Feb	0
EPA REVIEW	13-Feb	3	15-Feb	0
TYPING	16-Feb	10	25-Feb	0
EDITING	26-Feb	8	5-Mar	0
FINAL REVIEW				



TIME LINE Gantt Chart Report, Strip 7

Detail Task	Summary Task	Milestone
(Started)	(Started)	Conflict
(Slack)	(Slack)	Resource delay

Scale: 1 day per character

ELEMENT 4

PROJECT ORGANIZATION

Management Responsibilities. U.S.Army Corps of Engineers Waterways Experiment Station (USACEWES) is the Navy's prime contractor for this RCRA investigation. The project team is made up of United States Army Corps of Engineers (USACE) personnel. Oversight and management responsibility will be handled by Dr. James May of USACEWES' Geotechnical Section. The planning, scope writing, and report preparation is the responsibility of Robert Magee of USACE Engineering District, Wilmington, N.C. and Dr. James May of USACEWES' Geotechnical Section. Field work supervision will be the responsibility of Robert Magee of USACE Engineering District, Wilmington, N.C.. Drilling will be done by personnel from the In situ Section, Geotechnical Branch of USACEWES. Mr. Mark Vispi is the Section Chief. The chemical analysis is to be processed through the USACEWES' Analytical Laboratory Group (ALG) under the supervision of Ann Strong. All chemical data validation will be done by Blaze Willis of USACE Engineering District, Savannah, Ga.. Soils classification and physical testing will be done at USACEWES' Soils Investigation Laboratory under the supervision of Mr. Jesse Oldham.

ELEMENT 5

QUALITY ASSESSMENT OBJECTIVES

QC Level Selection. The field QC NEESA Level is a Level B. The QC level for the chemical detection is a NEESA Level C., EPA Level 4 equivalent. The objective of such a plan is to insure that the data collected is comparable with known conditions, that sources of extraneous contamination can be determined, and that decisions made are meaningful and supported.

A site requiring Level C QC would be a site near a populated area, not on the NPL, and not likely to be undergoing litigation. The Level C QC includes review and approval of laboratory QA and the site work plan. The laboratory must successfully analyze a performance sample, undergo an audit, correct deficiencies found during the audit, and provide monthly QA progress reports.

Level C allows the use of non-CLP methods. All methods used must be EPA methods or be equivalent to EPA methods. When EPA methods are not available other documented methods may be used.

Level C provides for the minimum detection limits, a wide range of calibrated analytes, matrix recovery information, laboratory process control information, and known precision and accuracy. Level C data may be used for risk assessment, site characterization, evaluation of alternatives, engineering design, and monitoring during implementation.

Chemical Data Quality Objectives The Navy's Level C requires that certain procedures be followed. They are:

1. EPA approved methods (SW-846 Third Edition), when available, be used.
2. Trip blanks must accompany every volatile organic analysis shipment.
3. Rinsate blanks be collected each day.
4. Field blanks be collected from each source of water.
5. A 10% duplication of samples be taken.

TABLE 1
CHEMICAL ANALYSIS
PRESERVATION AND HOLDING TIMES

MATRIX	PARAMETERS	PRESERVATION	MAX. HOLDING TIMES	
			EXTRACTION	ANALYSIS
Soil	Volatiles	Ice to 4 Deg. C	14 days	14 days
Soil	Semivolatiles	Ice to 4 Deg. C	14 days	40 days
Soil	Metals	Ice to 4 Deg. C	180 days	180 days
Water	Volatiles	Ice to 4 Deg. C	14 days	14 days
Water	Semivolatiles	Ice to 4 Deg. C	7 days	40 days
Water	Metals	Ice to 4 Deg. C	180 days	180 days

When only analysis holding time is given, this implies total holding time from sampling until analysis. Extraction and analysis is the same for soil and water.

The validity of the data depend on the following of specific procedural constraints. Holding times are dictated by SW-846 procedures. Those holding times are parameter specific (Table 1). They are to be adhered to specifically to assure an effective data quality control program.

ELEMENT 6

SAMPLE PROCEDURE

REFER TO WORK PLAN SECTION 4: SAMPLE & ANALYSIS PLAN

ELEMENT 7

SAMPLE CUSTODY PROCEDURES

Field Procedures. The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. All bottles must be labeled with management stickers and seals. Sample labels are to be completed using waterproof ink. The project manager will review all field activity to determine whether proper custody procedures are being followed. Sample information is to be recorded in the Field Logbook. This information should include measurements made, sample numbers, numbers of samples, sampled depths, boring and well numbers sampled, analysis requested, packing procedures, and date shipped.

Transfer of Custody. Samples are to be accompanied by a properly completed chain of custody form identifying the contents (Figure 4). One copy of the chain of custody is kept at the site, one copy of the chain of custody is sent to the project manager, and the original copy will travel with the samples. The sample numbers and locations will be listed on the chain of custody form. Each cooler of samples will be accompanied by a signed chain of custody. A commercial carrier is not required to sign off on the custody form as long as the custody forms are sealed inside the sample cooler and the custody seals remain intact. The sample custody is transferred from the sampler to the laboratory at the time when the ice chest containing the chain of custody is sealed. The laboratory assumes custody of the samples when the cooler is received in the laboratory and the seals are broken. Samples will not be accepted by the laboratory if the seals are not intact when received.

Receipt of chain of custody samples is recorded in a permanent receipt book. Upon receipt at the laboratory, the sample management officer fills out a cooler receipt form (Figure 5). The sample collector or project manager is notified of any discrepancies noted on the cooler receipt form.

If samples are received from a commercial carrier, Form 2097 is filled out by the sample management officer. The ALG uses preprinted consecutively numbered duplicate gummed labels to identify samples. One label is placed on the sample bottle and the other label is placed on Form 2097 under the heading Lab I.D. No. next to the corresponding Project I. D. NO. This information is also entered into a permanent log book, WES Form 2108. The estimated cost is calculated, entered onto the Sample Receipt Form 2118, and the original copy returned to the Project manager.

All samples except volatiles are stored in the locked walk-in cooler which is maintained at 4 degrees Celsius and equipped with an alarm system that goes off when the temperature deviates by more than two degrees. A separate refrigerator is maintained for volatile analysis and temperatures are

FIGURE 4

Figure 5

COOLER RECEIPT FORM
PROJECT:
Cooler received on and opened on by

Signature

1. Were custody seals on outside of cooler----------YES NO
   If yes, how many and where?
   Were signature and date correct?----------YES NO

2. Were custody papers taped to lid inside cooler--------YES NO

3. Were custody papers properly filled out(ink, signed)--YES NO

4. Did you sign custody papers in the appropriate place? YES NO

5. What kind of packing material was used?

6. Was sufficient ice used(if appropriate)----------YES NO

7. Were all bottles sealed in separate plastic bags?------YES NO

8. Did all bottles arrive in good condition(unbroken)?----YES NO

9. Were all bottle labels complete(date, signed,anal., preserv. etc.)? ----------YES NO
10. Did bottle labels and tags agree with custody papers? YES NO
11. Were correct bottles used for tests indicated?---------YES NO
12. Were VOA vials checked for absence of bubbles?---------YES NO
13. Did each bottle contain sufficient sample?----------YES NO
14. Were acid/base preserved samples checked with pH paper? YES NO

Explain any discrepancies------->

recorded in a refrigerator log. Two ALG employees have keys to the cooler and a permanent log is maintained to check chain of custody samples in and out of the cooler for analysis. The analyst is required to keep chain of custody samples behind locked doors if he is away from the area where analyses are in progress.

The sample management officer then enters the information into the ALG computer data management system. Job files are created for use by the analysts in recording their data.

FINAL EVIDENCE FILES: All data generated (raw and final) are kept at the laboratory on permanent file. This data is kept in digital format. It can be retrieved and duplicated upon request.

ELEMENT 8

CALIBRATION PROCEDURES

Field. Several field methods are to be used in the field as scanning and detection tools. The scanning field instruments are the HNU, the OVA, and the geigercounter device. All of these instruments will be calibrated by a qualified repair representative prior to being used. The instruments calibration will be checked daily using instrument specific procedures prior to the start of the work effort for that day. These daily instrument checks will be recorded by the site manager in site logbook.

For the geophysical devices there are no specific calibration methods needed. These devices record relative data and are not calibration specific. The devices either work or they do not work.

LABORATORY. All analytical methods require calibration. In keeping with method calibration requirements, the following requirements are presented. For all semivolatile and volatile analysis by GC/MS, the current CLP calibration method shall be used. The current CLP criteria shall be used for frequency of calibration, for the system performance check compounds (SPCCs), and for the calibration check compounds (CCCs).

For other methods, a minimum of three different concentration standards for each analyte shall be analyzed for initial calibration. Calibration shall be checked every 12h. of operation and prior to sample analysis. The laboratory shall use the calibration check acceptance criteria specified by the methods. The initial calibration curve shall be plotted and the correlation coefficient and response factors evaluated. The calibration shall include one standard at a concentration at the method detection limits. The calibration curve shall bracket all samples in the concentration range. If the samples are not within the 3 calibration ranges, appropriate dilution shall be performed to bring the samples into the calibration range.

ELEMENT 9

ANALYTICAL PROCEDURES

RCRA studies adhere to procedures and methods set out in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" SW-846, Third Edition when available. Inorganic and organic test methods are given in Tables 2 & 3 respectively. Detection limits for these analytes are given in Attachment 1 of the QAPjP.

TABLE 2
SUMMARY OF METHODS FOR
DETERMINATION OF INORGANIC ANALYSIS

		METHODS from SW-846		
INORGANIC ANALYSIS	TECHNIQUE	DIGESTION**		ANALYSIS
Arsenic	GF	3005 W	3050 S	7060
Chromium	ICP	3005 W	3050 S	6010
Copper	ICP	3005 W	3050 S	6010
Lead	ICP	3005 W	3050 S	6010
Mercury	CV			7471
Selenium	GF	3005 W	3050 S	7740
Silver	ICP	3005 W	3050 S	6010
Zinc	ICP	3005 W	3050 S	6010

*Abbreviations: GF = Graphite Furnace, ICP = Inductively Coupled Plasma, CV = Cold Vapor.
**Digestion process, when not noted, is included in the analytical method.
W = Water
S = Soil and Sediment

TABLE 3
SUMMARY OF METHODS FOR
DETERMINATION OF ORGANIC COMPOUND ANALYSIS

		METHODS from SW-846	
ORGANIC ANALYSIS	TECHNIQUE	DIGESTION	ANALYSIS
Volatiles	GC/MS	INC.*	8240
Semivolatiles	GC/MS	INC.*	8270
Organochlorine Pesticides & PCB's	GC/MS	INC.*	8080
Organophosphorus Pesticides	GC/MS	INC.*	8140
Chlorinated Herbicides	GC/MS	INC.*	8150

*INC.= Digestion procedure included in method procedure.
GC/MS = Gas Chromatograph/Mass Spectrograph

ELEMENT 10

INTERNAL QUALITY CONTROL CHECKS

Laboratory Analysis. For Level C a blank/spike control shall be analyzed with each batch and shall be plotted on control charts. For metals, and other wet chemical analysis, a method blank shall also be processed with each batch and shall contain less than the method detection limit for compounds of interest. For volatile organic analysis a method blank shall be run each day and shall not contain levels over five times the detection limits for common laboratory solvents. All other compounds should not be found in the blank at levels exceeding the detection limits. For semivolatile organic analysis a method blank shall be run each day. All compounds except Phthalate should not be found in the blank at levels exceeding the detection limit. Phthalate should not be found in the blank at levels over five times the detection limit. In any method using surrogates spiked into the blank, the blank shall serve as both the method blank and blank/spike control. In methods not using surrogates such as metals, and wet chemical analysis, a blank and a blank/spike (laboratory control sample) shall be analyzed.

A matrix spike and matrix spike duplicate are required for volatiles, semivolatiles, and all GC analysis for every 20 samples of similar matrix. For metals analysis, a duplicate and a matrix spike are required for every 20 samples of similar matrix.

Data for spiked samples and standard reference materials are used to determine laboratory accuracy. Data for duplicate sample analyses are used to determine precision.

For all GC methods used in Level C QC, second column confirmation shall be used for all positive responses for the analytes of interest.

Field Activities.

HNU-Daily calibration checks will be done and their results will be recorded to assure any drift if instrument reading can be found.

OVA-Daily calibration checks will be done and their results will be recorded to assure any drift if instrument reading can be found.

Control Samples

Field QC Samples. The number of QC samples are determined by the level of QC implemented. The types of QC samples are:

1) Duplicates are identical splits of individual samples which are analyzed by the laboratory to test for method reproducibility. These samples are to be split in the laboratory.

2) Equipment Rinsates are the final analyte-free water rinse from equipment cleaning collected daily during a sampling event. Initially, samples from every other day should be analyzed. If analytes pertinent to the project are found in the rinsate, the remaining samples must be analyzed. The results from the blanks will be used to flag or assess the levels of analytes in the samples. This comparison is made during data validation. The rinsates are analyzed for the same parameters as the related samples.

3) Field Blanks consist of the source water used in decontamination and steam cleaning. These blanks are collected and analyzed to determine the level of contamination introduced into the sample due to sampling techniques. At a minimum, one field blank from each event and each source of water must be collected and analyzed for the same parameters as the related samples.

4) Field Duplicates for soil samples are collected, homogenized, and split. All samples except VOAs are homogenized and split. Volatiles are not mixed, but select segments of soil are taken from the length of the core and placed in 40-mL glass vials. Field duplicates of water are aliquots of water collected from the same sampler at the same time. Field duplicates should be collected at a frequency of 10% per matrix for Level C. All the duplicates should be sent to the laboratory responsible for analysis. The same samples used for field duplicates shall be split by the laboratory and be used as the laboratory duplicate or matrix spike. Spikes are known amounts of specific chemical constituents added by the laboratory to selected samples to test the appropriateness and recovery efficiencies of specific analytical methods. This means that for the duplicate sample, there will be analysis of the normal sample, the field duplicate, and the laboratory matrix spike/duplicate.

5) Matrix Spike is an aliquot of matrix (water or soil) spiked with known quantities of compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

6) Matrix spike Duplicate is a second aliquot of the same matrix as the matrix spike that is spiked in order to determine the precision of the method.

7) Method Blank is a blank sample run to ensure reported analytical results are not the results of laboratory contamination.

8) Method Blank/Spike is the distilled and /or deionized water for soil or sand spiked with known compounds or elements. The method blank as defined by the CLP for organics and the laboratory control sample as defined by the CLP maybe used as the method blank/spike.

9) Preparation Blank is an analytical control that contains distilled, deionized water and reagents, which is carried through the entire analytical procedure (digested and analyzed).

10) Trip Blanks are defined as samples which originate from analyte-free water taken from the laboratory to the sampling site and returned to the laboratory with the volatile organic (VOA) samples. Two trip blank should accompany each cooler containing VOAs, should be stored at the laboratory with the samples, and analyzed by the laboratory. Trip blanks are only analyzed for VOAs.

ELEMENT 11

DATA REDUCTION VALIDATION AND REPORTING

Data Reduction. Data generated by this project will be in two forms, direct read and calculated. The following is a description of data reduction and reporting procedures that will be used.

1) The chemical detection data is reduced using EPA specified Contract Laboratory Program procedures.

2) The physical data is determined by direct measurement.

3) The OVA and HNU are direct reading instruments.

Deliverables. For these studies the method blanks, blank/spike, surrogates, matrix spikes, matrix spike duplicates, duplicates, and initial and continuing calibration data shall be reported. Holding time begins when the samples are collected. Table 4 is a list of the needed documentary forms. The forms referred to are the current CLP forms for organics and metals/cyanide. The CLP forms are Attachment 2 of the QAPjP.

Table 4

Data set deliverables for Level C QA

	Method requirements	Deliverables
Organics -	Method blank spikes with results and control chart. Run with each batch of samples processed.	Control Charts.
	Results to be reported on CLP Form 1 or spreadsheet. Sample results using CLP data flags.	Form 1 or Sect. 9 1/Sample chromatograms and mass spectra
	Surrogate recovery from samples reported on CLP Form 2. Surrogates to be used in volatiles, semivolatiles, pesticides/PCB. For volatiles by GC, the names of surrogates should be changed to reflect the surrogate used.	Form 2

	Method requirements	Deliverables
	A duplicate sample will be collected daily for every set of 20 samples or less.	Form 3
	Method blank reported on CLP Form 4.	Form 4.
	For volatiles by GC, a similar format will be used as CLP Form 4 for blanks.	
	GC/MS tuning for volatiles/semi-volatiles. Report results on Form 5.	Form 5
	Initial calibration data reported on Form 6.	Form 6
	For volatiles by GC, the initial calibration data with response factors must be reported.	No Form
	For pesticide/PCB data Form 9 must be used for calibration data.	Form 9
	Continuing calibration GC/MS data reported on Form 7.	Form 7
	For volatiles, GC data, the response factors and their percent differences from the initial must be reported.	No Form
	Internal Standard Area for volatiles and Semivolatiles.	Form 8
Metals -	Level C, requirements	Deliverables
	Sample results with CLP flagging system	CLP Form 1 or Equiv.
	Initial and continuing calibration	CLP Form 2, Part 1 only
	Blanks 10% frequency	Form 3

Method requirements	Deliverables
Method blank taken through digestion (1/20 samples of same matrix)	Form 3
ICP interference check sample	Form 4
Matrix spike recovery (1 per 20 samples of similar matrix)	Form 5, Part 1
Postdigestion spike sample recovery for ICP metals. Only done if predigest spike recovery exceed CLP limits.	Form 5, Part 2,1 (never used for GFAA work)
Postdigest spike for GFAA.	Recovery will be noted on raw data
Duplicates (1 per 20 samples will be samples split and digested as separate Method blank spike information will be plotted on control chart, one per batch of samples processed.	Form 6
Standard addition. The decision process outlined in CLP page E-3 will be used to determine when standard additions are required.	Form 8
Holding times	Form 10

Level C Data Validation. Listed below are the validation criteria which will be utilized in evaluating the analytical data for a Level C QC site:

1. Volatile Organic Analysis

Holding Times - Samples must be analyzed within the holding times specified in Sect. 3 or the data should be marked as estimated (J).

GC/MS Tuning - Check that bromofluorobenzene tune is completed each 12-h shift of operation. Check that it meets the SW-846 Methods for volatiled organic analysis. Assure that each sample is associated with a tune.

Initial Calibration - The maximum relative standard deviation [(RSD) percent RSD] shall not be .30% for indicated CLP CCC. The maximum mean relative response factor (RRF) for SPCC shall be .0.300 (0.250 for bromoform). The SPCCs are chloromethane, 1,1-dichloroethane, bromoform, 1,1,2,2-tetrachloroethane, and chlorobenzene. The CCC compounds are vinyl chloride, 1,1-dichloroethene, chloroform, 1,2dichloropropane, toluene, and ethylbenzene.

Continuing Calibration - The minimum response factor for the SPCC components for VOA analyses shall not be <0.300 (0.250 for bromoform). The maximum response factor percent deviation for indicated CLP CCC components from the mean initial calibration response factor shall not exceed 25%. If these criteria are exceeded, a new calibration for the compound shall be employed.

Blank/Spike Control Samples - Any control sample which exceeds the internal QC limits for a given sample matrix shall require all data from the associated batch of samples to be closely inspected. If no analytical problems are found, the data analyzed with the out-of-control point shall be discussed in the QC section of the MPR and final report. The Navy shall receive a carbon copy of the MPR. If problems are found in the analytical data, the samples associated with the batch shall be reanalyzed and the data from reanalysis reported. If holding times are exceeded in the reanalysis, both sets of data shall be presented.

If the blank/spike results are outside the internal laboratory limits and if the matrix spike results are outside the matrix spike limits, the laboratory will either reanalyze the samples within the holding times or the data shall be flagged as usable (R).

Surrogates - If surrogates exceed the surrogate recovery limits (Attachment 1), the data shall be flagged that the surrogates exceeded limits.

Method Blanks - A method blank should be run each day following the Continuing Calibration Standard. Common laboratory solvents should not be found in the blank at levels over five times the detection limits. Other compounds should not be found in the blank at levels exceeding the detection limits. If common contaminant compounds are detected in samples at a concentration of <10 times the concentration found in the blank, or other compounds at <5 times the concentration in the blank, report those compounds as not detected. Adjust the sample quantitation limit to the value reported in the samples and flag the limit as estimated (UJ).

Matrix Spike/Spike Duplicate - Ensure that 1 out of 20 samples has been spiked in duplicate. The recoveries shall fall within the spike range limits (Attachment 1). If the recoveries do not fall within the range, examine the blank spike data. If the blank spike data exceed the limits and the matrix spikes exceed limits, the data shall be flagged as unusable (R). If the blank spike data from the batch are satisfactory, the data is usable, and the low recovery is discussed in the final report QA/QC and in the QC report sent to the NCR.

Field Trip and Equipment Blanks - If contaminant analytes are detected in samples at concentrations of <5 times the concentration found in the highest associated blank, the results are considered suspect and are reported as estimated.

2. Semivolatile Organics Analysis

Holding Times - Samples must be extracted within 7 days of collection and analyzed within 40 days of extraction. Any samples which do not meet these requirements must be flagged as estimated.

GC/MS Tune - Make certain that a decafluorotriphenylphosphine tune is completed every 12 h of sample analysis, that each sample is associated with a tune, and that each tune meets SW-846 Methods for semi-volatile organic analysis. Data are not reported if the instrument does not meet tune.

Initial Calibration - Ensure that a 5-point curve has been completed. The RRF of the BNA compounds shall be a minimum of 0.050 for the SPCC listed in the current revision of the CLP. The maximum RSD for the CCC listed in the CLP procedure is 30.0%. The minimum RRF for the SPCC is 0.050, and the maximum percent difference for the CCC is 25%. If these limits are exceeded, a new calibration curve shall be generated.

Continuing Calibration - The continuing calibration check will be performed once every 12 h during operation. The minimum RRF for the SPCC is 0.05, and the maximum percent difference from the initial calibration shall not exceed 25% for the CCC. If these limits are exceeded, a new calibration curve shall be generated.

Blank/Spike Control Samples - Any control sample which exceeds the internal QC limits for a given sample matrix shall require all data from the associated batch of samples to be closely inspected. If no analytical problems are found, the data and the out-of-control point shall be discussed in the QC section of the report. If problems are found in the analytical data, the samples associated with the batch shall be reanalyzed and the data from reanalysis reported. If holding times are exceeded in the reanalysis, both sets of data shall be presented.

If the blank/spike results are outside the internal laboratory limits and if the matrix spike results are outside the matrix spike limits, the laboratory will either reanalyze the samples or the data will be flagged with an "R," and the data is not usable.

Surrogates - If surrogates exceed the surrogate recovery limits (Attachment 1), the data shall be flagged that the surrogates exceeded limits.

Method Blanks - A method blank should be run each day following the Continuing Calibration Standard. Phthalate should not be found in the blank at levels over five times the detection limits. Other compounds should not be found in the blank at levels exceeding the detection limits. If common contaminant compounds are detected in samples at a concentration of <10 times the concentration found in the blank, or other compounds at <5 times the concentration in the blank, report those compounds as not detected. Adjust the sample quantitation limit to the value reported in the samples and flag the limit as estimated (UJ).

Matrix Spike/Spike Duplicate - Ensure that 1 out of 20 samples has been spiked in duplicate. The recoveries shall fall within the spike range limits (Attachment 1). If the recoveries do not meet the limits, examine the blank spike data. If the blank spike data exceed the limits and the matrix spikes exceed limits, the data shall be flagged as unusable (R).

3. Metals

Holding Times - Samples must be analyzed within six months, except mercury shall be analyzed in 28 days from sample collection.

ICP Initial Calibration - A calibration blank and at least one standard must be analyzed daily. An initial calibration verification standard must be within 90 to 110% recovery or the samples should be reanalyzed. If it is not possible to perform reanalysis, the data are rejected and flagged with an "R."

AA Calibration - Calibration blank and at least three standards shall be used in establishing the curve prior to sample analysis. A curve shall be analyzed each day prior to sample analysis.

Calibration Verification - Verification using a standard obtained from a source other than that of the initial calibration shall be used and the result shall be within 90 to 110% of the true value for both ICP and AA work. Calibration verification shall be done at a minimum frequency of 10% or every 2 h, whichever is more frequent, and shall be done at the end of the analytical run.

Method Blanks - At least one preparation blank shall be prepared with each batch of samples. The blanks shall contain less than the detection limit for all analytes. If the concentration of the associated blanks is above the detection limit and if the lowest analyte concentration is #10 times the blank, reanalysis of the sample must occur. If reanalysis is not done, the data shall be reported and flagged as estimated. The blank shall never be subtracted from the sample.

Field and Equipment Blanks - If contaminant analytes are detected in samples at concentrations of <5 times the concentration found in the highest associated blank, the results are considered suspect and are reported as estimated.

Blank/Spike Laboratory Control Samples - Any laboratory control sample which exceeds the internal QC limits for a given sample matrix shall require all data from the associated batch of samples to be closely inspected. If no analytical problems are found, the data and out-of-control point shall be discussed in the QC section of the report. If problems are found in the analytical data, the samples associated with the batch shall be reanalyzed and the data from reanalysis reported. If holding times are exceeded in the reanalysis, both sets of data shall be presented. A discussion of data reported when the blank/spike laboratory control sample is out of control shall be presented in the QC section of both the final report and the MPR.

If the blank/spike results are outside the internal laboratory limits and if the matrix spike results are outside the matrix spike limits, the laboratory will either reanalyze the samples or the data will be flagged with an "R," and the data are not usable.

ELEMENT 12

PERFORMANCE AND SYSTEM AUDITS

Field Audits. The project manager is responsible for monitoring the quality of the field activities. This will be accomplished by monitoring daily, weekly, and monthly goals given to the field team. Site inspections will be performed. Chain of custody forms will be audited. Coordination with the laboratory will be maintained on a least a weekly basis.

Laboratory Approval. All chemical analytical laboratories working on Navy Installation Restoration Program (IRP) projects must pass the Navy's laboratory screening program. NEESA has been assigned the task of managing that program. The program is instituted by a Navy contractor.

Once a laboratory has received Navy approval to begin analysis of samples, maintaining that approval requires adherence to the QA plan and reporting of QA-related information. The performance and reporting requirements outlined below are essential to ensuring that data of known and defensible quality are being generated throughout the course of a site investigation. Topics covered include control samples, control charts, out-of-control events, corrective action reports, significant changes in the QA plan, and other reporting requirements.

Monthly Progress Report. The primary means of communication from the laboratories to the NCR will be the monthly progress report (MPR) to be submitted by the laboratories to the NCR on the 15th of each month in which work for the Navy is performed. The following information is to be included in the MPR:

1. Site name and contract number.

2. Numbers, types and locations of samples collected and analyzed for Navy project only.

3. Data for blanks, spikes, laboratory duplicates and controls related to Navy samples.

4. New methods used for analysis and changes in old methods.

5. Copies of all control charts pertinent to Navy samples and to which results have been added over the reporting period.

6. Summaries of out-of-control incidents during the reporting period, including references to documentation and corrective action reports.

7. Descriptions of and justifications for significant changes in the QA.

8. Changes in LQAC personnel and other key technical personnel; resumes of new personnel must be submitted.

9. Completeness of sample data - (1)ensures that all samples and analyses have been processed, (2)complete records including chain of custody for each analysis and associated QC samples were used, (3)procedures specified in project planning were followed, and (4)all calibrations were performed.

Much of the information presented in an MPR is incremental in nature and relates to changes and findings since the previous MPR:

1. Control charts from the minimizing control charts program and any additional control charts from monitoring matrix spikes, duplicates, or other QC parameters.

2. Personnel changes relating to QA responsibilities.

3. Method changes (e.g., a minor modification with an attached EPA variance).

4. Procedural changes in establishing control limits and/or the preparation and use of control charts.

Since the first such report for each laboratory has no precedent, more explanation and detail may be necessary; subsequent MPRs will likely not require as much detail in some areas.

ELEMENT 13

PREVENTATIVE MAINTENANCE

All Perkin-Elmer instruments (atomic absorption units) at WES are maintained by service contract that provides for twice yearly preventive maintenance and emergency repair. Permanent records are maintained of service visits.

The Plasma Emission Spectrometer (Spectrametrix) is maintained by service contract that provides for twice yearly preventive maintenance and emergency service. Permanent records are maintained of service visits.

All Hewlett-Packard Instruments (GC and GC/MS systems) are maintained by service contract that provides for twice yearly preventive maintenance and emergency repair. In addition, the GC/MS systems are tied via modem to the Analytical Response Center Support which can duplicate software problems at HP,s service center. Records of all service calls are maintained in permanent files.

All analytical balances are serviced annually by a certified balance technician.

All other instrumentation is serviced on an as needed basis and records are maintained of any repair calls.

Daily or routine maintenance of instruments is performed by the individual analysts and recorded in the instrument logs.

ELEMENT 14

DATA ASSESSMENT

All data is checked by the analyst, the inorganic team leader or the organic team leader, and the Chief, ALG before it is submitted to the customer. The following items are checked:

1. Completeness
2. Duplicate values for precision
3. Recovery of Spikes for accuracy
4. Method blanks for contamination
5. Surrogate recoveries for organic analysis
6. Data for QA check samples
7. Reasonableness and trends

If data falls outside acceptable limits as described in the procedures, sample is rerun if sample is available. If data falls outside acceptable limits on the reruns and QA check sample data is good, then data may be reported with qualifying explanations. Acceptable data is usually defined by the specific procedural method (i.e. SW-846).

DATA REDUCTION
ANALYSIS FLOW CHART

LABORATORY DATA MANAGEMENT SYSTEM
(Bench Sheets)

ANALYSIS OF SAMPLES

ANALYST'S NOTEBOOK

RAW DATA TO BENCH SHEETS

TEAM LEADER

LABORATORY DATA MANAGEMENT SYSTEM QC CHECK

CHIEF, ANALYTICAL LABORATORY GROUP

LABORATORY DATA MANAGEMENT SYSTEM

FINAL REPORT
(Initialed by C/ALG)

ELEMENT 15

CORRECTIVE ACTION

The laboratory uses EPA Contract Laboratory Program procedures for determining Out of Control events, reporting those events, and corrective actions responses to those events.

ELEMENT 16

QUALITY ASSURANCE REPORT

APPENCIX C

EXCERPTS FOR ALG's SUBMISSION TO THE NAVY

ATTACHMENT 1

CHEMICAL DETECTION LIMITS

Appendix B

ALG Procedures - FY 91

References:

1. U. S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, March 1979 and EPA 600/4-82-055 Dec 1982. Environmental Monitoring and Support Laboratory, Cincinnati, OH 45268.

2. U. S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, SW-846 Third Edition, November 1986 with December 1988 revisions. Office of Solid Waste and Emergency Response, Washington, DC 20460.

3. U. S. Environmental Protection Agency, Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples, EPA-600/8-80-038, June 1980. Health Effects Research Laboratory, Research Triangle Park, NC 27711.

4. Federal Register, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act", Vol 49, No. 209, Friday, October 26, 1984.

5. Plumb, Russell H., Jr. Procedures for Handling and Chemical Analysis of Sediment and Water Analysis, EPA/CE-81-1 May 1981. Environmental Laboratory, U. S. Army Engineer Waterways Experiment Station, Vicksburg, MS 39180.

6. American Public Health Association, Standard Methods for the Examination of Water and Wastewater 16th Edition, 1985. 1015 Fifteenth Street NW, Washington, DC 20005.

7. ASTM, 1990 Annual Book of ASTM Standards, Water and Environmental Technology Vol 11.01 and 11.02. 1987. 1916 Race Street, Philadelphia, PA 19103.

8. U. S. Environmental Protection Agency, Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing March 1979. Region V Central Regional Laboratory, 536 Clark Street, Chicago, IL 60605.

9. Palermo, Michael R. "Development of a Modified Elutriate Test for Estimating the Quality of Effluent from Confined Dredged Material Disposal Areas" Technical Report D-86-4. August 1986. Department of the Army Waterways Experiment Station, Corps of Engineers, P. O. Box 631, Vicksburg, MS 39180.

Table 1

List of Nonmetal Inorganic Test Procedures

	Parameter	Media	Reference (Method No. or page) Ref 1 EPA 1979	Ref 2 SW-846	Ref 6 Std Meth	Other
1.	Acidity	Water	305.1			
2.	Alkalinity	Water	310.2			
3.	Ammonia-N	Water	350.1			
4.	BOD	Water			507	
5.	Cation Exchange Capacity	Soil				Ref 5, p 3-20
6.	COD	Water	410.4			
7.	COD,	Sediment				Ref 8, p 54
8.	Chloride	Water	325.2			
9.	Cyanide	Water	335.3			
10.	CN amenable to Cl	Water	335.1 & 335.3			
11.	Hardness	Water	130.1			
12.	Kjeldahl N	Water	351.2			
13.	Nitrate-Nitrite-N	Water	353.2			
14.	Nitrite-N	Water	353.2			Ref 5, p 3-163
15.	Oil & Grease	Water	413.1			
16.	TOC	Water & Sed			505C	
17.	Phenols, tot	Water	420.2			
18.	Phosphorus, total	Water	365.4			
19.	Othophosphate	Water	365.1			

(Continued)

Table 1 (Concluded)

	Parameter	Media	Reference (Method No. or page) Ref 1 EPA 1979	Ref 2 SW-846	Ref 6 Std Meth	Other
20.	Total solids Dried 103-105°C	Water	160.3		209A	
		Soil, Sed			209F	
21.	Total Dissolved Solids Dried 180°C	Water	160.1		209B	
22.	Total Suspended Dried 103-105°C	Water	160.2		209C	
23.	Settleable solids	Water	160.5		209E	
24.	Total Volatile Solids	Water	160.4		209D	
25.	Sulfate	Water	375.2			
26.	Sulfide	Water	376.2			
27.	Elutriate test sediments, std					Ref 5 p 2-28
28.	Elutriate test sed, modified					Ref 9
29.	EP Toxicity Liquid & Solid			1310		
30.	TCLP			1311		

Table 2

Analytical Procedures for Metals

	Parameter	Media	Ref 1 EPA-1979	Ref 2 SW-846	Other	Routine Meth Det. limits
1.	Digest for tot rec met	Water		3005		
2.	Digest for tot metals	Water		3010		
3.	Digest for Metals-GFAA	Water		3020		
4.	Digest for Metals	Sed., Soil & Sludge		3050		
5.	Simultaneous anal by DCP				Ref 7, D4190-82	
5a.	Simultaneous anal by ICP		200.7	6010		
6.	Aluminum, DCP ICP		 200.7	 6010	Ibid	10ug/l 100ug/l
7.	Antimony, DCP ICP		 200.7	 6010	Ibid	
8.	Antimony, GFAA		204.2	7041		5ug/l
9.	Arsenic, GFAA		206.2	7060		5ug/l
10.	Arsenic, hydride		206.3	7061		5ug/l
11.	Barium, AA		208.1	7080		100ug/l
12.	Barium, GFAA		208.2			2ug/l
13.	Barium, DCP ICP		 200.7	 6010	Ref 7, D4190-82	30ug/l 30ug/l
14.	Beryllium, DCP ICP	 200.7	 6010		Ibid	1ug/L 1ug/L
15.	Boron, DCP ICP	 200.7	 6010		Ibid	30ug/l 1ug/L

(Continued)

Table 2 (Continued)

Parameter	Media	Ref 1 EPA-1979	Ref 2 SW-846	Other	Routine Meth Det. limits
16. Cadmium, DCP				Ibid	20ug/L
ICP		200.7	6010		20ug/l
17. Cadmium, GFAA		213.2	7131		0.1ug/l
18. Calcium, DCP				Ibid	30ug/l
ICP		200.7	6010		
19. Calcium, AA		215.1	7140		
20. Chromium, DCP				Ibid	20ug/l
ICP		200.7	6010		20ug/l
21. Chromium, GFAA		218.2	7191		1ug/l
22. Chromium VI		218.4	7197		10ug/l
23. Cobalt, DCP				Ibid	50ug/l
ICP		200.7	6010		50ug/l
24. Cobalt, GFAA		219.2	7201		1ug/l
25. Copper, DCP				Idid	
ICP		200.7	6010		30ug/l
26. Copper, GFAA		220.2			1ug/l
27. Iron, DCP				Ibid	30ug/l
ICP		200.7	6010		30ug/l
28. Iron, AA		236.1	7380		30ug/l
29. Iron, GFAA		236.2	7381		1ug/l
30. Lead, DCP				Ibid	1mg/l
ICP		200.7	6010		100ug/l
31. Lead, GFAA		239.2	7421		1ug/l
32. Magnesium, DCP				Ibid	30ug/l
ICP		200.7	6010		30ug/l
33. Magnesium, AA		242.1	7450		
34. Manganese, DCP				Ibid	30ug/l
ICP		200.7	6010		30ug/l

(Continued)

Table 2 (Continued)

	Parameter	Media	Ref 1 EPA-1979	Ref 2 SW-846	Other	Routine Meth Det. limits
35.	Manganese, AA		243.1	7460		
36.	Manganese, GFAA		243.2			1ug/l
37.	Mercury, Cold Vapor	Water Sed.	245.1 245.5	7470 7471		0.2ug/l 0.2ug/l
38.	Molydenum, DCP ICP		 200.7	 6010	Ibid	30ug/l 30ug/l
39.	Molydenum, GFAA		246.2	7481		1ug/l
40.	Nickel, DCP ICP		 200.7	 6010	Ibid	30ug/l 30ug/l
41.	Nickel, GFAA		249.2			1ug/l
42.	Potassium, DCP ICP		 200.7	 6010	Ibid	50ug/l
43.	Potassium, AA		258.1	7610		10ug/l
44.	Selenium, GFAA		270.2	7740		5ug/l
45.	Selenium, Hydride		270.3	7741		5ug/l
46.	Silver, DCP ICP		 200.7	 6010	Ibid	30ug/l 30ug/l
47.	Silver, GFAA		272.1	7761		1ug/l
48.	Sodium, DCP ICP		 200.7	 6010	Ibid	50ug/l 50ug/l
49.	Sodium, AA		273.1	7770		5ug/l
50.	Thallium, DCP ICP		 200.7	 6010	Ibid	50ug/l 50ug/l
51.	Thallium, GFAA		279.2	7841		1ug/l
52.	Tin, DCP				Ibid	50ug/l
53.	Tin, GFAA		282.2			5ug/l

(Continued)

Table 2 (Concluded)

Parameter	Media	Ref 1 EPA-1979	Ref 2 SW-846	Other	Routine Meth Det. limits
54. Titanium, GFAA	283.2				10ug/l
55. Vanadium, DCP				Ibid	100ug/l
ICP	200.7	6010			50ug/l
56. Vanadium, GFAA	286.2	7911			5ug/l
57. Zinc, DCP				Ibid	30ug/l
ICP	200.7	6010			10ug/l
58. Zinc, GFAA	289.2				5ug/l

Table 3

Organic Procedures

	Parameter	Media	Reference		
			Ref 4 Fed Reg 1984	Ref 2 SW-846	Ref 6 Std Meth
1.	Soxhlet Extraction	Soil & Sed.		3540	
2.	Sep funnel Liq-Liq extr	Water Soluble		3510	
3.	Purge & trap Prep-GC			5030	
4.	Sonication Extraction	Soil, Tissue & Sed.		3550	
5.	Florisil Cleanup	Pest, PCB, & ClHC		3620	
6.	Silica Gel Cleanup	PAH		3630	
7.	Sulfur Cleanup	Sed.		3660	
8.	Volatile Organics	Water	624		
		Water & Solid Ext.		8260	
9.	Semivol. Organics (BNA)	Water	625		
		Water & Solid Ext.		8270	
10.	Cl-Pest & PCBs	Water	608		
		Water & Solid Ext.		8080	
11.	Polynuclear Aromatic HC	Water	610		
		Water & Solid Ext.		9100	
12.	Organophos Pesticides	Water & Solid Ext.		8140	509A
13.	Chlorinated Herbicides	Water & Solid Ext.		8150	509B

(Continued)

Table 3 (Continued)

Parameter	Media	Reference		
		Ref 4 Fed Reg 1984	Ref 2 SW-846	Ref 6 Std Meth
14. Explosives	Water			*
15. Explosives	Soil			**

16. Other Methods as Requested Such as Hydrazine, Nitrosoamines, TNT, and DIMP.

Detection limits for organic analysis are typically those given for the methods. They are, however, subject to matrix interferences and may be higher depending on the nature of the interference.

* Jenkins, T. F., et al., USA Cold Regions Research and Engineering Laboratory, CRREL Report 84-29.

** Jenkins, T. F. and Walsh, Marianne E., USA Cold Regions Research and Engineering Laboratory, CRRL Report 87-7.

Appendix C

DFTPP TUNING

REFERENCES:

E-16	
D-98	regulations detailed
E-11	spectrum
D-102	1.6.1.2 - Demonstrates consistent spectra from MS to MS. Spells out requirements for qualitative verification that must be met.

NOTES:

A) DFTPP must be verified once per shift or every 12 hrs.

B) Note that all MS give different looking DFTPP spectra, which implies a wide range of PFTBA spectra.

```
69 = 100 --
219 = 55       -- fairly normal
502 = 1.2 --

69 = 100 --
219 =  20      -- perfectly ok, often
502 = 0.2 --      seen on benchtops
```

C) There are many different ways to tune DFTPP. The methods given below (some specific, some general) are ways that many users have found successful. In addition, there are many "markers" that different users look for during the tune that seem to indicate that the tune will be successful. Some of the more popular of these goals are:

1) Tune until 219 and 131 are approximately equal and range between 20 and 60% of 69.

2) After tuning, check spectrum scan and see if m/e 50 and m/e 502 are equal. The closer to equal, the better the chance that the tune will be successful.

Look for guidelines such as these on your MS to help guide you during tuning.

D) DO NOT TUNE UNLESS IT IS NECESSARY! It will cost you only 5 - 10 min to attempt to verify your last tune. Experience has shown that the more often you tune, the more often you have to recalibrate your ID file. This is because you are adjusting your mass response ratios when you tune.

PROCEDURE A: 5987/5988

MANUAL TUNE - PFTBA OPEN

1) REPEAT PROFILE - set plunger to max 219
2) Set GC temp to 225-275 (ie. elution temp of DFTPP) so GC flow = flow at DFTPP elution.
3) Run AUTOTUNE - set source to 250
4) MANUAL TUNE (source @ 250, GC ~ 250)
5) set A/D = 1 (0.5 sec/scan or faster)
6) run REPEAT PROFILE about 1 min to warm up and stabilize the source and EM.
7) PARAMETER RAMP (make sure plunger is adjusted)
   Begin to max 219, starting with REP
   - A) REP
   - B) IF
   - C) DO
   - D) ENT LENS

   leave the X-RAY alone at this point.
8) in REPEAT PROFILE use the X-RAY to set 69:219:502 ratio. 502/219 should be >3% and <5%. (do not be confused and set 502/69 ratio).
9) use DO to achieve final ratios, if needed.
10) do PEAK WIDTH and MASS AXIS CALIBRATION
11) check spectrum to make sure calibrations did not shift peak ratios.
12) store tune as MTDFTP

NOTES:

A) If 502 has a precursor, you will probably lose m/e 441 in DFTPP spectra. This is more of a problem on bench-tops than big systems. Cleaning the ENT LENS will often eliminate this precursor.

PROCEDURE B: 5995

A) Set oven to 250 with XFR, OVN1, 250 (ie. elution temp of DFTPP, so GC flow = flow at DFTPP elution)
B) Set source to 250 with XFR, SORS, 250
C) Run AUTOTUNE
D) MANUAL TUNE - PFTBA OPEN
Note: If you have previously created a manual tune file, use NEW TUNE FILE to load it.
1) Edit temp zones
Source 250
Analyser 180
Transfer 280
2) Edit scan parameters to set A/D = 1 (0.5 sec/scan or faster)
3) run REPEAT PROFILE about 1 min to warm up and stabilize source and EM.
4) PARAMETER RAMP - begin to max 219
A) REP leave alone
B) IF most useful lens
C) ENT LENS can be useful
leave the X-RAY alone at this point.
NOTE: on benchtops, if we set IF = 100, this is often all that is necessary. As a first attempt just adjust the IF and leave other lenses alone.
5) in REPEAT PROFILE, use X-RAY to set 69:219:502 ratio. 502/219 ratio should be >3% and <5% (do not be confused and set 502/69 ratio). Adjust ratio using X-RAY, being careful not to adjust too far and deteriorate peak shape.
6) do PEAK WIDTH and MASS AXIS CALIBRATION
7) SPECTRUM SCAN - check spectrum to make sure calibrations did not shift peak ratios. Remember, 502/219 should be >3% and <5%. Also, look at 131/219 ratio. They should be approximately equal.
8) Store tune as MTDTP

NOTES:
A) If 502 has a precursor, you will probably lose m/e 441 in DFTPP spectra. This is more of a problem on benchtops than big systems. Cleaning the ENT LENS will often eliminate this precursor.

Appendix D

Detection Limits

Table 1

Method 608

Chromatographic Conditions and Method

Detection Limits

Parameter	Retention time (min) Col. 1	Col. 2	Method detection limit (μg/L)
α-BHC	1.35	1.82	0.003
γ-BHC	1.70	2.13	0.00
β-BHC	1.90	1.97	0.00
Heptachlor	2.00	3.35	0.003
δ-BHC	2.15	2.20	0.009
Aldrin	2.40	4.10	0.004
Heptachlor epoxide	3.50	5.00	0.083
Endosulfan I	4.50	6.20	0.014
4,4'-DDE	5.13	7.15	0.004
Dieldrin	5.45	7.23	0.002
Endrin	6.55	8.10	0.006
4,4'-DDD	7.83	9.08	0.011
Endosulfan II	8.00	8.28	0.004
4,4'DDT	9.40	11.75	0.012
Endrin aldehyde	11.82	9.30	0.023
Endosulfan sulfate	14.22	10.70	0.066
Chlordane	mr	mr	0.014
Toxaphene	mr	mr	0.24
PCB-1016	mr	mr	nd
PCB-1221	mr	mr	nd
PCB-1232	mt	mr	nd
PCB-1242	mr	mr	0.065
PCB-1248	mr	mr	nd
PCB-1254	mr	mr	nd
PCB-1260	mr	mr	nd

Column 1 conditions: Suplecoport (100/120 mesh) coated with 1.5% SP-2250/1.95% SP-2401 packed in a 1.8 m long × 4 mm ID glass column with 5% methane/95% argon carrier gas at 60 mL/min flow rate. Column temperature held isothermal at 200°C, except for PCB-1016 through PCB-1248, should be measured at 160°C.

Columne 2 conditions: Supelcoport (100/120 mesh) coated with 3% OV-1 packed in a 1.8 m long × 4 mm ID glass column with 5% methane/95% argon carrier gas at 60 mL/min flow rate. Column temperature held isothermal at 200°C for the pesticides; at 140°C for PCB-1221 and 1232; and at 170°C for PCB-1016 and 1242 to 1268.

mr = Multiple peak response. Se Figures 2 thru 10.

nd = Not determined.

Table 1

Method 624

Chromatographic Conditions and Method

Detection Limits

Parameter	Retention time (min)	Method detection limit (μg/L)
Chloromethane	2.3	nd
Bromomethane	3.1	nd
Vinyl chloride	3.8	nd
Chloroethane	4.6	nd
Methylene chloride	6.4	2.8
Trichlorofluoromethane	8.3	nd
1,1-Dichloroethene	9.0	2.8
1,1-Dichloroethane	10.1	4.7
trans-1,2-Dichloroethene	10.8	1.6
Chloroform	11.4	1.6
1,2-Dichloroethane	12.1	2.8
1,1,1-Trichloroethane	13.4	3.8
Carbon tetrachloride	13.7	2.8
Bromodichloromethane	14.3	2.2
1,2-Dichloroproane	15.7	6.0
cis-1,3-Dichloropronene	15.9	5.0
Trichloroethene	16.5	1.9
Benzene	17.0	4.4
Dibromochloromethane	17.1	3.1
1,1,2-Trichloroethane	17.2	5.0
trans-1,3-Dichloropropene	17.2	nd
2-Chloroethylvinlyl ether	18.6	nd
Bromoform	19.8	4.7
1,1,2,2-Tetrachloroethane	22.1	6.9
Tetrachloroethene	22.2	4.1
Toluene	23.5	6.0
Chlorobenzene	24.6	6.0
Ethyl benzene	26.4	7.2
1,3-Dichlorobenzene	33.9	nd
1,2-Dichlorobenzene	35.0	nd
1,4-Dichlorobenzene	35.4	nd

Column conditions: Carbopak B (60/80 mesh) coated with 1% SP-1000 packed in a 6 ft by 0.1 in. ID glass column with helium carrier gas at 30 mL/min flow rate. Column temperature held at 45°C for 3 min, then programmed at 8°C/min to 220°C and held for 15 min.

nd = not determined.

Method 625

Chromatographic Conditions and Method Detection Limits

for Base/Neutral Extractables

Parameter	Retention time (min)	Method detection limit (μg/L)
1,3-Dichlorobenzene	7.4	1.9
1,4-Dichlorobenzene	7.8	4.4
Hexachloroethane	8.4	1.6
Bis(2-Chlorethyl) ether	8.4	5.7
1,2-Dichlorobenzene	8.4	1.9
Bis(2-chloroisopropyl) ether	9.3	5.7
N-Nitrosodi-n-propylamine		
Nitrobenzene	11.1	1.9
Hexachlorobutadiene	11.4	0.9
1,2,4-Trichlorobenzene	11.6	1.9
Isophorone	11.9	2.2
Naphthalene	12.1	1.6
Bis(2-chloroethoxy) methane	12.2	5.3
Hexachlorocyclopentadiene[a]	13.9	
2-Chloronaphthalene	15.9	1.9
Acenaphthylene	17.4	3.5
Acenaphthene	17.8	1.9
Dimethyl phthalate	18.3	1.6
2,6-Dinitrotoluene	18.7	1.9
Fluorene	19.5	1.9
4-Chlorophenyl phenyl ether	19.5	4.2
2,4-Dinitrotoluene	19.8	5.7
Diethylphthalate	20.1	1.9
N-Nitrosodiphenylamine[a]	20.5	1.9
Hexachlorobenzene	21.0	1.9
β-BHC[a]	21.1	
4-Bromophenyl phenyl ether	21.2	1.9
δ-BHC[a]	22.4	
Phenanthrene	22.8	5.4
Anthracene	22.8	1.9
β-BHC	23.4	4.2
Heptachlor	23.4	1.9
δ-BHC	23.7	3.1
Aldrin	24.0	1.9
Dibutyl phthalate	24.7	2.5
Heptachlor expoxide	25.6	2.2
Endosulfan I[a]	26.4	
Fluoranthene	26.5	2.2
Dieldrin	27.2	2.5
4,4'-DDE	27.2	5.6

(Continued)

[a] See Section 1.2.

Chromatographic Conditions and Method Detection Limits for Base/Neutral Extractables (Concluded)

Parameter	Retention time (min)	Method detection limit (μg/L)
Pyrene	27.3	1.9
Endrin[a]	27.9	
Endosulfan II[a]	28.6	
4,4'-DDD	28.6	
Benzidine[a]	28.8	44
4,4'-DDT	29.3	4.7
Endosulfan sulfate	29.8	5.6
Endrin aldehyde		
Butyl benzyl phthalate	29.9	2.5
Bis(2-ethylhexyl) phthalate	30.6	2.5
Chrysene	31.5	2.5
Benzo(a)anthracene	31.5	7.8
3,3'-Dichlorobenzidine	32.2	16.5
Di-n-octyl phthalate	32.5	2.5
Benzo(b)fluoranthene	34.9	4.8
Benzo(k)fluoranthene	34.9	2.5
Benzo(a)pyrene	36.4	2.5
Indeno(1,2,3-c,d)pyrene	42.7	3.7
Dibenzo(a,h)anthracene	43.2	2.5
Benzo(ghi)perylene	45.1	4.1
N-Nitrosodimethylamine[a]		
Chlordane[b]	19-30	
Toxaphene[b]	25-34	
PCB 1016[b]	18-30	
PCB 1221[b]	15-30	30
PCB 1232[b]	15-32	
PCB 1242[b]	15-32	
PCB 1248[b]	12-34	
PCB 1254[b]	22-34	36
PCB 1260[b]	23-32	

[b] These compounds are mixtures of various isomers. (See figures 2 thru 12.) Column conditions: Supecoport (100/120 mesh) coated with 3% SP-2250 packed in a 1.8 m long × 2mm ID glass column with helium carier gas at 30 mL/min flow rate. Column temperature held isothermal at 50°C for 4 min, then pro grammed at 8°C/min to 270°C and held for 30 min.

Chromatographic Conditions, Method Detection Limits,

and Characteristic Masses for Acid Extractables

Parameter	Retention time (min)	Method detection limit (μg/L)
2-Chlorophenol	5.9	3.3
2-Nitrophenol	6.5	3.6
Phenol	8.0	1.5
2,4-Dimethylphenol	9.4	2.7
2,4-Dichlorophenol	9.8	2.7
2,4,6-Trichlorophenol	11.8	2.7
4-Chloro-3-methylphenol	13.2	3.0
2,4-Dinitrophenol	15.9	42
2-Methyl-4,6-dinitrophenol	16.2	24
Pentachlorophenol	17.5	3.6
4-Nitrophenol	20.3	2.4

Column conditions: Supelcoport (100/120 mesh) coated with 1% SP-1240DA packed in a 1.8 m × 2mm ID glass column with helium carrier gas at 30 mL/min flow rate. Column temperature held isothermal at 70°C for 2 min then programmed at 8°C/min to 200°C.

CLP Required Limits

Volatiles

Target Compound List (TCL) and Contract

Required Quantitation Limits (CRQL)*

Volatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-34-3	5	5
10. 1,2-Dichloroethene (total)	540-59-0	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Dutanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,2-Dichloropropane	78-87-5	5	5
19. cis-1,3-Dichloropropene	10061-01-5	5	5
20. Trichloroethene	79-01-6	5	5
21. Dibromochloromethane	124-48-1	5	5
22. 1,1,2-Trichloroethane	79-00-5	5	5
23. Benzene	71-43-2	5	5
24. trans-1,3-Dichloropropene	10061-02-6	5	5
25. Bromoform	75-25-2	5	5

(Continued)

[a] Medium Soil/Sediment Contract Required Quatitation Limits (CRQL) for Volatile TCL Compunds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Volatiles

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)* (Concluded)

Volatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/kg
26. 4-Methyl-2-pentanone	108-10-1	10	10
27. 2-Hexanone	591-78-6	10	10
28. Tetrachloroethene	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5
31. Chlorobenzene	108-90-7	5	5
32. Ethyl Benzene	100-41-4	5	5
33. Styrene	100-42-5	5	5
34. Xylenes (Total)	1330-20-7	5	5

CLP Required Limits

Semivolatiles Target Compound List (TCL) and Contract

Required Quantitation Limits (CRQL)*

Semivolatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[b] ug/kg
35. Phenol	108-95-2	10	330
36. bis(20Chloroethyl) ether	111-44-4	10	330
37. 2-Chlorophenol	95-57-8	10	330
38. 1,3-dichlorobenzene	541-73-1	10	330
39. 1,4-Dichlorobenzene	106-46-7	10	330
40. Benzyl aclcohol	100-51-6	10	330
41. 1,2-Dichlorobenzene	95-50-1	10	330
42. 2-Methylphenol	95-48-7	10	330
43. bis(2-Chloroisopropyl) ether	108-60-1	10	330
44. 4-Methylphenol	106-44-5	10	330
45. N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46. Hexachloroethane	67-72-1	10	330
47. Nitrobenzene	98-95-3	10	330
48. Isophorone	78-59-1	10	330
49. 2-Nitrophenol	88-75-5	10	330
50. 2,4-Dimethylphenol	105-67-9	10	330
51. Benzoic acid	65-85-0	50	1600
52. bis(2-Chloroethoxy) methane	111-91-1	10	330
53. 2,4-Dichlorophenol	120-83-2	10	330
54. 1,2,4-Trichlorobenzene	120-82-1	10	330

(Continued)

[b] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for SemiVolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Semivolatiles Target Compound List (TCL) and Contract

Required Quantitation Limits (CRQL)* (Continued)

Semivolatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[b] ug/kg
55. Naphthalene	91-20-3	10	330
56. 4-Chloroaniline	106-47-8	10	330
57. Hexachlorobutadiene	87-68-3	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59. 2-Methylnaphthalene	91-57-6	10	330
60. Hexachlorocyclopentadiene	77-47-4	10	330
61. 2,4,6-Trichlorophenol	88-06-2	10	330
62. 2,4,5-Trichlorophenol	95-95-4	50	1600
63. 2-Chloronaphthalene	91-58-7	10	330
64. 2-Nitroaniline	88-74-4	50	1600
65. Dimethylphthalate	131-11-3	10	330
66. Acenaphthylene	208-96-8	10	330
67. 2,6-Dinitrotoluene	606-20-2	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl-phenylether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butylphthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butylbenzylphthalate	85-68-7	10	330
89. 3,3'-Dichlorobenzidine	91-94-1	20	660

(Continued)

Semivolatiles Target Compound List (TCL) and Contract

Required Quantitation Limits (CRQL)* (Concluded)

Semivolatiles	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[b] ug/kg
90. Benzo(a)anthracene	56-55-3	10	330
91. Chrysene	218-01-9	10	330
92. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
93. Di-n-octylphthalate	117-84-0	10	330
94. Benzo(b)fluoranthene	205-99-2	10	330
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
98. Dibenz(a,h)anthracene	53-70-3	10	330
99. Benzo(g,h,i)perylene	191-24-2	10	330

CLP Required Limits

Pesticides and PCBs Target Compound List (TCL) and

Contract Required Quantitation Limits (CRQL)*

Pesticides/PCBs	CAS Number	Quantitation Limits** Water ug/L	Low Soil/Sediment[c] ug/kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	50-29-3	0.10	16.0
115. Methoxychlor	72-43-5	0.5	80.0
116. Endrin ketone	53494-70-5	0.10	16.0
117. alpha-Chlordane	5103-74-2	0.5	80.0
118. gamma-Chlordane	5103-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. Aroclor-1016	12674-11-2	0.5	80.0
121. Aroclor-1221	11104-28-2	0.5	80.0
122. Aroclor-1232	11141-16-5	0.5	80.0
123. Aroclor-1242	53469-21-9	0.5	80.0
124. Aroclor-1248	12672-29-6	0.5	80.0
125. Aroclor-1254	11097-69-1	1.0	160.0
126. Aroclor-1260	11096-82-5	1.0	160.0

[c] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for SemiVolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Table 1

GAS Chromatography of Pesticides and PCBs[a]

Method 8080

Parameter	Retention time (min) Col. 1	Col. 2	Method detection limit (μg/L)
Aldrin	2.40	4.10	0.004
α-BHC	1.35	1.82	0.003
β-BHC	1.90	1.97	0.006
δ-BHC	2.15	2.20	0.009
γ-BHC	1.70	2.13	0.004
Chlordane (technical)	e	e	0.014
4,4'-DDD	7.83	9.08	0.011
4,4'-DDE	5.13	7.15	0.004
4,4'-DDT	9.40	11.75	0.012
Dieldrin	5.45	7.23	0.002
Endosulfan I	4.50	6.20	0.014
Endosulfan II	8.00	8.28	0.004
Endosulfan sulfate	14.22	10.70	0.066
Endrin	6.55	8.10	0.006
Endrin aldehyde	11.82	9.30	0.023
Heptachlor	2.00	3.35	0.003
Heptachlor epoxide	3.50	5.00	0.083
Methoxychlor	18.20	26.60	0.176
Toxaphene	e	4	0.24
PCB-1016	e	e	nd
PCB-1221	e	e	nd
PCB-1232	e	e	nd
PCB-1242	e	e	0.065
PCB-1248	e	e	nd
PCB-1254	e	e	nd
PCB-1260	e	e	nd

[a] U.S. EPA Method 1-617. Organochloride Pesticides and PCBs. Environmental Monitoring and Support Laboratory, Cincinnati, Ohio 45268.

e Multiple response.

nd Not determined.

Method 8240 Practical Quantitation Limits (PQL)

for Volatile Organics[a]

Volatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment ug/kg
Acetone	100	100
Acetonitrile	100	100
Allyl chloride	5	5
Benzene	5	5
Benzyl chloride	100	100
Bromodichloromethane	5	5
Bromoform	5	5
Bromomethane	10	10
2-Butanone	100	100
Carbon disulfide	100	100
Carbon tetrachloride	5	5
Chlorobenzene	5	5
Chlorodibromomethane	5	5
Chlorethane	10	10
2-Chloroethyl vinyl ether	10	10
Chloroform	5	5
Chloromethane	10	10
Chloroprene	5	5
1,2-Dibromo-3-chloropropane	100	100
1,2-Dibromoethane	5	5
Dibromomethane	5	5
1,4-Dichloro-2-butene	100	100
Dichlorodifluoromethane	5	5
1,1-Dichloroethane	5	5
1,2-Dichloroethane	5	5
1,1 Dichloroethene	5	5
trans-1,2-Dichlorethane	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloroprepene	5	5
trans-1,3-Dichloropropene	5	5
Ethylbenzene	5	5
Ethyl methacrylate	5	5
2-Hexanone	50	50
Isobutyl alcohol	100	100

[a] Sample PQLs are highly matrix-dependent. The PQLs listed herein are provided for guidance and may not always be achievable. See the following information for further guidance on matrix-dependent PQLs.

[b] PQLs listed for soil/sediment are based on wet weight. Normally data is reported on a dry weight basis; therefore, PQLs will be higher, based on the percent moisture in each sample.

Method 8240 Practical Quantitation Limits (PQL)

for Volatile Organics[a] (Continued)

Volatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment ug/kg
Methacrylonitrile	100	100
Methylene chloride	5	5
Methyl iodide	5	5
Methyl methacrylate	5	5
4-Methyl-2-pentanone	50	50
Pentachloroethane	10	10
Propionitrile	100	100
Styrene	5	5
1,1,1,2-Tetrachloroethane	5	5
1,1,2,2-Tetrachloroethane	5	5
Tetrachloroethene	5	5
Toluene	5	5
1,1,1-Trichloroethane	5	5
1,1,2-Trichloroethane	5	5
Trichloroethene	5	5
1,2,3-Trichloropropane	5	5
Vinyl acetate	50	50
Vinyl chloride	10	10
Xylene (Total)	5	5

Other Matrices:	Factor[1]
Water miscible liquid waste	50
High-level soil & sludges	125
Non-water miscible waste	500

[1]PQL = [PQL for ground water (Table 2)] X [Factor]. For non-aqueous samples, the factor is on a wet-weight basis.

Surrogate Spike Recovery Limits for Water and Soil/Sediment Samples

Method 8240

Surrogate Compound	Low/Medium Water	Low/Medium Soil/Sediment
4-Bromofluorobenzene	86-115	74-121
1-2 Dichloroethane-d_4	76-114	70-121
Toluene-d_8	88-110	81-117

Method 8260 Chromatographic Retention Times and Method Detection Limits (MDL) for Volatile Organic Compounds on Wide Bore Capillary Columns

Analyte	Retention Time (minutes) Column 1[a]	Column2[b]	Column 3[c]	MDL[d] (ug/L)
Dichlorodifluoromethane	1.55	0.70	--	0.10
Chloromethane	1.63	0.73	2.07	0.13
Vinyl Chloride	1.71	0.79	2.12	0.17
Bromomethane	2.01	0.96	2.26	0.11
Chloroethane	2.09	1.02	2.31	0.10
Trichlorofluoromethane	2.27	1.19	2.42	0.08
1,1-Dichloroethane	2.89	1.57	3.08	0.12
Methylene chloride	3.60	2.06	3.32	0.03
trans-1,2-Dichloroethene	3.98	2.36	3.48	0.06
1,1-Dichloroethane	4.85	2.93	4.10	0.04
2,2-Dichloropropane	6.01	3.80	4.43	0.35
cis-1,2-Dichloroethene	6.19	3.90	4.42	0.12
Chloroform	6.40	4.80	4.58	0.03
Bromochloromethane	6.74	4.38	4.54	0.04
1,1,1-Trichloroethane	7.27	4.84	5.09	0.08
Carbon tetrachloride	7.61	5.26	5.18	0.21
1,1-Dichloropropene	7.68	5.29	5.18	0.10
Benzene	8.23	5.67	5.29	0.04
1,2-Dichloroethane	8.40	5.83	5.29	0.04
Trichloroethene	9.59	7.27	6.07	0.19
1,2-Dichloropropane	10.09	7.66	6.20	0.06
Bromodichloromethane	10.59	8.49	6.39	0.08
Dibromomethane	10.65	7.93	6.27	0.24
Toluene	12.43	10.00	7.36	0.11
1,1,2-Trichloroethane	13.41	11.05	8.07	0.10
Tetrachloroethene	13.74	11.15	8.21	0.14
1,3-Dichloropropane	14.04	11.31	8.20	0.04
Dibromochloromethane	14.39	11.85	8.39	0.05
1,2-Dibromoethane	14.73	11.83	--	0.06
1-Chlorohexane	15.46	13.29	--	0.05
Chlorobenzene	15.76	13.01	9.33	0.04

(Continued)

[a] Column 1 - 60 meter × 0.75 mm i.d. VOCOL capillary. Hold at 10°C for 5 minutes, then program to 160°C at 6°/min.

[b] Column 2 - 30 meter × 0.53 mm i.d. DB-624 wide-bore capillary using cryogenic oven. Hold at 10°C for 5 minutes, then program to 160°C at 6°/min.

[c] Column 3 - 30 meter × 0.53 i.d. DB-624 wide-bore capillary, cooling GC oven to ambient temperatures. Hold at 45°C for 2 minutes, then program to 200°C at 8°/min and hold for 6 minutes.

[d] MDL based on a sample volume.

Method 8260 Chromatographic Retention Times and Method Detection Limits (MDL) for Volatile Organic Compounds on Wide Bore Capillary Columns (Continued)

Analyte	Retention Time (minutes) Column 1[a]	Column2[b]	Column 3[c]	MDL[d] (ug/L)
1,1,1,2-Tetrachloroethane	15.94	13.33	9.41	0.05
Ethylbenzene	15.99	13.39	9.44	0.06
p-Xylene	16.12	13.69	9.56	0.13
m-Xylene	16.17	13.68	9.56	0.05
o-Xylene	17.11	14.52	10.32	0.11
Styrene	17.31	14.60	10.33	0.04
Bromoform	17.93	14.88	10.48	0.12
Isopropylbenzene	18.06	15.46	--	0.15
1,1,2,2-Tetrachloroethane	18.72	16.35	11.38	0.04
Bromobenzene	18.95	15.86	11.35	0.03
1,2,3-Trichloropropane	19.02	16.23	11.40	0.32
n-Propylbenzene	19.06	16.41	--	0.04
2-Chlorotoluene	19.34	16.42	11.57	0.04
1,3,5-Trimethylbenzene	19.47	16.90	--	0.05
4-Chlorotoluene	19.50	16.72	12.08	0.06
tert-Butylbenzene	20.28	17.57	--	0.14
1,2,4-Trimethylbenzene	20.34	17.70	--	0.13
sec-Butylbenzene	20.79	18.09	--	0.13
p-Isopropyltoluene	21.20	18.52	--	0.12
1,3-Dichlorobenzene	21.22	18.14	13.16	0.12
1,4-Dichlorobenzene	21.55	18.39	13.27	0.03
n-Butylbenzene	22.22	19.49	--	0.11
1,2-Dichlorobenzene	22.52	19.17	14.10	0.03
1,2-Dibromo-3-chloropropane	24.53	21.08	--	0.26
1,2,4-Trichlorobenzene	26.55	23.08	--	0.04
Hexachlorobutadiene	26.99	23.68	--	0.11
Naphthalene	27.17	23.52	--	0.04
1,2,3-Trichlorobenzene	27.78	24.18	--	0.03
INTERNAL STANDARDS/SURROGATES				
4-Bromofluorobenzene	18.63	15.71	11.22	

Method 8270 Practical Quantitation Limits (PQL)

For Semivolatile Organics[A]

Semivolatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment[1] ug/Kg
Acenapthene	10	660
Acenaphthylene	10	660
Acetophenone	10	ND
2-Acetylaminoflurene	20	ND
1-Acetyl-2-thiourea	1000	ND
2-Aminoanthraquinone	20	ND
Aminoazobenzene	10	ND
4-Aminobiphenyl	20	ND
Anilazine	100	ND
o-Anisidine	10	ND
Anthracene	10	660
Aramite	20	ND
Azinphos-methyl	100	ND
Barban	200	ND
Benz(a)anthrace	10	660
Benzo(b)fluoranthene	10	660
Benzo(k)fluoranthene	10	660
Benzoic acid	50	3300
Benzo(g,h,i)perylene	10	660
Benzo(a)pyrene	10	660
p-Benzoquinone	10	ND
Benzyl alcohol	20	1300
Bis(2-chloroethoxy) methane	10	660
Bis(2-chloroethyl) ether	10	660
Bis(2-chloroisopropyl) ether	10	660
4-bromophenyul phenyl ether	10	660
Bromoxynil	10	ND
Butyl benzyl phthalate	10	660
Captafol	20	ND
Captan	50	ND
Carbaryl	10	ND
Carbofuran	10	ND
Carbophenothion	10	ND
Chlorfenvinphos	20	ND

(Continued)

[a] PQLs listed for soil/sediment are based on wet weight. Normally data is reported on a dry weight basis, therefore, PQLs will be higher based on the % moisture in each sample. This is based on a 30-g sample and gel permeation chromatography cleanup.

[b] Sample PQLs are highly matrix-dependent. The PQLs listed herein are provided for guidance and may not always be achievable.

ND Not detemined.

Method 8270 Practical Quantitation Limits (PQL)

For Semivolatile Organics[A] (Continued)

Semivolatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment[1] ug/Kg
4-Chloroaniline	20	1300
Chlorobenzilate	10	ND
5-Chloro-2-methylaniline	10	ND
4-Chloro-3-methylphenol	20	1300
3-(Chloromethyl) pyridine hydro-chloride	100	ND
2-Chloroanaphthalene	10	660
2-Chlorophenol	10	660
4-Chlorophenyl phenyl ether	10	660
Chrysene	10	660
Coumaphos	40	ND
p-Cresidine	10	ND
Crotoxyphos	20	ND
2-Cyclohexyl-4,6-dinitrophenol	100	ND
Demeton-o	10	ND
Demeton-s	10	ND
Diallate (cis or trans)	10	ND
Diallate (trans or cis)	10	ND
2,4-Diaminotoluene	20	ND
Dibenz(a,j)acridine	10	ND
Dibenz(a,h)anthracene	10	660
Dibenzofuran	10	660
Dibenzo(a,e)pyrene	10	ND
Di-n-butylphthalate	10	ND
Dichlone	NA	ND
1,2-Dichlorobenzene	10	660
1,3-Dichlorobenzene	10	660
1,4-Dichlorobenzidine	10	660
3,3'-Dichlorobenzidine	20	1300
2,4-Dichlorophenol	10	660
2,6-Dichlorophenol	10	ND
Dichlorovos	10	ND
Dicrotophos	10	ND
Diethylphthalate	10	660
Diethylstilbesterol	20	ND
Diethyl sulfate	100	ND
Dimethoate	20	ND
3,3'-Dimethoxybenzidine	100	ND
Dimethylaminoazobenzene	10	ND
7,12-Dimethylbenz(a)anthracene	10	ND
3,3'-Dimethylbenzidine	10	ND

(Continued)

NA Not applicable.

Method 8270 Practical Quantitation Limits (PQL)

For Semivolatile Organics[A] (Continued)

Semivolatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment[1] ug/Kg
a,a-Dimethylphenethylamine	ND	ND
2,4-Dimethylphenol	10	660
Dimethyl phthalate	10	660
1,2-Dinitorbenzene	40	ND
1,3-Dinitrobenzene	20	ND
1,4-Dinitrobenzene	40	ND
4,6-Dinitro-2-methylphenol	50	3300
2,4-Dinitrophenol	50	3300
2,4-Dinitrotoluene	10	660
2,6-Dinitrotoluene	10	660
Dinocap	100	ND
Dinoseb	20	ND
5,5-Diphenylhydantoin	20	ND
Di-n-octyl phthalate	10	660
Disulfoton	10	ND
EPN	10	ND
Ethion	10	ND
Ethyl carbamate	50	ND
Bis(2-ethylhexyl)phthalate	10	660
Ethyl methanesulfonate	20	ND
Famphur	20	ND
Fensulfothion	40	ND
Fenthion	10	ND
Fluchloralin	20	ND
Fluoranthene	10	660
Fluorene	10	660
Hexachlorobenzene	10	660
Hexachlorobutadiene	10	660
Hexachlorocyclopentadiene	10	660
Hexachloroethane	10	660
Hexachlorophene	50	ND
Hexachloropropene	10	ND
Hexamethyl phosphoramide	20	ND
Hydroquinone	ND	ND
Indeno(1,2,3-cd)pyrene	10	660
Isodrin	20	ND
Isophorone	10	660
Isosafrole	10	ND
Kepone	20	ND
Leptophos	10	ND
Malathion	50	ND
Maleic anhydride	NA	ND
Mestranol	20	ND
Methapyrilene	100	ND

(Continued)

Method 8270 Practical Quantitation Limits (PQL)

For Semivolatile Organics[A] (Continued)

Semivolatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment[1] ug/Kg
Methoxychlor	10	ND
3-Methylcholanthrene	10	ND
4,4'-Methylenebis(2-chloroaniline)	NA	ND
Methylmethanesulfonate	10	ND
2-Methylnaphthalene	10	660
Methyl parathion	10	ND
2-Methylphenol	10	660
3-Methylphenol	10	ND
4-Methylphenol	10	660
Mevinphos	10	ND
Mexacarbate	20	ND
Mirex	10	ND
Monocrotophos	40	ND
Naled	20	ND
Naphthalene	10	660
1,4-Naphthoquinone	10	ND
1-Naphthylamine	10	ND
2-Naphthylamine	10	ND
Nicotine	20	ND
5-Nitroacenaphthene	10	ND
2-Nitroaniline	50	3300
3-Nitroaniline	50	3300
4-Nitroaniline	20	ND
5-Nitro-o-anisidine	10	ND
Nitrobenzene	10	660
4-Nitrobiphenyl	10	ND
Nitrofen	20	ND
2-Nitrophenol	10	660
4-Nitrophenol	50	3300
5-Nitro-o-toluidine	10	ND
4-Nitroquinoline-1-oxide	40	ND
N-Nitrosodibutylamine	10	ND
N-Nitrosodiethylamine	20	ND
N-Nitrosodiphenylamine	10	660
N-Nitroso-di-n-propylamine	10	660
N-Nitrosopiperidine	20	ND
N-Nitrosopyrrolidine	40	ND
Octamethyl pyrophosphoramide	200	ND
4,4'-Oxydianiline	20	ND
Parathion	10	ND
Pentachlorobenzene	10	ND
Pentachloronitrobenzene	20	ND
Pentachlorophenol	50	3300
Phenacetin	20	ND

(Continued)

Method 8270 Practical Quantitation Limits (PQL)

For Semivolatile Organics[A] (Concluded)

Semivolatiles	Practical Quantitation Limits[b] Ground Water ug/L	Low Soil/Sediment[1] ug/Kg
Phenanthrene	10	660
Phenobarbital	10	ND
Phenol	10	660
1,4-Phenylenediamine	10	ND
Phorate	10	ND
Phosalone	100	ND
Phosmet	40	ND
Phosphamidon	100	ND
Phthalic anhydride	100	ND
2-Picoline	ND	ND
Piperonyl sulfoxide	100	ND
Pronamide	10	ND
Propylthiouracil	100	ND
Pyrene	10	660
Pyridine	ND	ND
Resorcinol	100	ND
Safrole	10	ND
Syrychnine	40	ND
Sulfallate	10	ND
Terbufos	20	ND
1,2,4,5-Tetrachlorobenzene	10	ND
2,3,4,6-Tetrachlorophenol	10	ND
Tetrachlorvinphos	20	ND
Tetraethyl pyrophosphate	40	ND
Thionazine	20	ND
Thiophenol (Benzenethiol)	20	ND
Toluene diisocyanate	100	ND
o-Toluidine	10	ND
1,2,4-Trichlorobenzene	10	660
2,4,5-Trichlorophenol	10	660
2,4,6-Trichlorophenol	10	660
Trifluralin	10	ND
2,4,5-Trimethylaniline	10	ND
Trimethyl phosphate	10	ND
1,3,5-Trinitrobenzene	10	ND
Tris(2,3-dibromopropyl) phosphate	200	ND
Tri-p-tolyl phosphate(h)	10	ND
0,0,0-Triethylphosphorothioate	NT	ND

NT Not tested.

Other Matrices	Factor[1]
Medium-level soil and sludges by sonicator	7.5
Non-water miscible waste	75

[1]PQL = [PQL for Low Soil/Sediment (Table 2)] X [Factor].

ATTACHMENT 2

CLP FORMS

U.S. EPA - CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

SOW No.: _____

EPA Sample No.	Lab Sample ID.

Were ICP interelement corrections applied? Yes/No __

Were ICP background corrections applied? Yes/No __

If yes-were raw data generated before application of background corrections? Yes/No __

Comments:

Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Lab Manager: _____

Date: _____

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Contract: _____

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: _____

Level (low/med): _____ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Lab Sample ID: _____

Level (low/med): _____ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

Rev. IFB Amendment 7

U.S. EPA - CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Initial Calibration Source: _____

Continuing Calibration Source: _____

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

(1) Control Limits: Mercury 80-120; Other Metals 90-110; Cyanide 85-115

U.S. EPA - CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

AA CRDL Standard Source: _____

ICP CRDL Standard Source: _____

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Final Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

U.S. EPA - CLP

3
BLANKS

Contract: _____

Lab Name: _____ SDG No.: _____

Case No.: _____ SAS No.: _____

Lab Code: _____

Preparation Blank Matrix (soil/water): _____

Preparation Blank Concentration Units (ug/L or mg/kg): _____

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Preparation Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron											
Lead											
Magnesium											
Manganese											
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											

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FORM III - IN

U.S. EPA - CLP

ICP INTERFERENCE CHECK SAMPLE

Lab Name: _____ Contract: _____

Lab Code: _____ Case No: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ ICS Source: _____

Concentration Units: ug/L

Analyte	True Sol. A	True Sol. AB	Initial Found Sol. A	Initial Found Sol. AB	%R	Final Found Sol. A	Final Found Sol. AB	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								

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5A
SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

U.S. EPA - CLP

SR
POST DIGEST SPIKE SAMPLE RECOVERY

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix (soil/water): _____ Level (low/med): _____

% Solids for Sample: _____ % Solids for Duplicate: _____

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron								
Lead								
Magnesium								
Manganese								
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Cyanide								

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7

LABORATORY CONTROL SAMPLE

Contract: _____

Lab Name: _____ SAS No.: _____ SDG No.: _____

Lab Code: _____ Case No.: _____

Solid LCS Source: _____

Aqueous LCS Source: _____

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

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8
STANDARD ADDITION RESULTS

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Concentration Units: ug/L

EPA Sample No.	An	Dil	0 ADD ABS	1 ADD CON	1 ADD ABS	2 ADD CON	2 ADD ABS	3 ADD CON	3 ADD ABS	Final Conc.	r	Q

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ICP SERIAL DILUTIONS

EPA SAMPLE NO.

Contract: _____

Lab Name: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab Code: _____ Level (low/med): _____

Matrix (soil/water): _____

Concentration Units: ug/L

Analyte	Initial Sample Result (I)	C	Serial Dilution Result (S)	C	% Difference	Q	M
Aluminum							
Antimony							
Arsenic							
Barium							
Beryllium							
Cadmium							
Calcium							
Chromium							
Cobalt							
Copper							
Iron							
Lead							
Magnesium							
Manganese							
Mercury							
Nickel							
Potassium							
Selenium							
Silver							
Sodium							
Thallium							
Vanadium							
Zinc							

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10
HOLDING TIMES

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

EPA Sample No.	Matrix	Date Received	Mercury Prep Date	Mercury Holding Time	Cyanide Prep Date	Cyanide Holding Time

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11

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Flame AA ID Number: _____

Furnace AA ID Number: _____

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum			200		
Antimony			60		
Arsenic			10		
Barium			200		
Beryllium			5		
Cadmium			5		
Calcium			5000		
Chromium			10		
Cobalt			50		
Copper			25		
Iron			100		
Lead			5		
Magnesium			5000		
Manganese			15		
Mercury			0.2		
Nickel			40		
Potassium			5000		
Selenium			5		
Silver			10		
Sodium			5000		
Thallium			10		
Vanadium			50		
Zinc			20		

Comments:

_____

_____

_____

_____

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12A

ICP INTERELEMENT CORRECTION FACTORS (QUARTERLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Analyte	Wave-length (nm)	Interelement Correction Factors for: Al	Ca	Fe	Mg	_____
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

_____

_____

_____

_____

U.S. EPA - CLP

12B

ICP INTERELEMENT CORRECTION FACTORS (QUARTERLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Analyte	Wave-length (nm)	Interelement Correction Factors for:				
Aluminum						
Antimony						
Arsenic						
Barium						
Beryllium						
Cadmium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Magnesium						
Manganese						
Mercury						
Nickel						
Potassium						
Selenium						
Silver						
Sodium						
Thallium						
Vanadium						
Zinc						

Comments:

7/87

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13

ICP LINEAR RANGES (QUARTERLY)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

ICP ID Number: _____ Date: _____

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Aluminum			
Antimony			
Arsenic			
Barium			
Beryllium			
Cadmium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Magnesium			
Manganese			
Mercury			
Nickel			
Potassium			
Selenium			
Silver			
Sodium			
Thallium			
Vanadium			
Zinc			

Comments:

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) _____ Lab Sample ID: _____

Sample wt/vol: _____ (g/mL) _____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec. _____ dec. _____ Date Extracted: _____

Extraction: (SepF/Cont/Sonc) _____ Date Analyzed: _____

GPC Cleanup: (Y/N) ___ pH: ___ Dilution Factor: _____

CONCENTRATION UNITS: (ug/L or ug/Kg) _____

CAS NO.	COMPOUND		Q
108-95-2	Phenol		
111-44-4	bis(2-Chloroethyl)ether		
95-57-8	2-Chlorophenol		
541-73-1	1,3-Dichlorobenzene		
106-46-7	1,4-Dichlorobenzene		
100-51-6	Benzyl alcohol		
95-50-1	1,2-Dichlorobenzene		
95-48-7	2-Methylphenol		
108-60-1	bis(2-Chloroisopropyl)ether		
106-44-5	4-Methylphenol		
621-64-7	N-Nitroso-di-n-propylamine		
67-72-1	Hexachloroethane		
98-95-3	Nitrobenzene		
78-59-1	Isophorone		
88-75-5	2-Nitrophenol		
105-67-9	2,4-Dimethylphenol		
65-85-0	Benzoic acid		
111-91-1	bis(2-Chloroethoxy)methane		
120-83-2	2,4-Dichlorophenol		
120-82-1	1,2,4-Trichlorobenzene		
91-20-3	Naphthalene		
106-47-8	4-Chloroaniline		
87-68-3	Hexachlorobutadiene		
59-50-7	4-Chloro-3-methylphenol		
91-57-6	2-Methylnaphthalene		
77-47-4	Hexachlorocyclopentadiene		
88-06-2	2,4,6-Trichlorophenol		
95-95-4	2,4,5-Trichlorophenol		
91-58-7	2-Chloronaphthalene		
88-74-4	2-Nitroaniline		
131-11-3	Dimethylphthalate		
208-96-8	Acenaphthylene		
606-20-2	2,6-Dinitrotoluene		

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) _____ Lab Sample ID: _____

Sample wt/vol: _____ (g/mL) ____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec. _____ dec. _____ Date Extracted: _____

Extraction: (SepF/Cont/Sonc) _____ Date Analyzed: _____

GPC Cleanup: (Y/N) ___ pH: ____ Dilution Factor: _____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) _____	Q
99-09-2	3-Nitroaniline		
83-32-9	Acenaphthene		
51-28-5	2,4-Dinitrophenol		
100-02-7	4-Nitrophenol		
132-64-9	Dibenzofuran		
121-14-2	2,4-Dinitrotoluene		
84-66-2	Diethylphthalate		
7005-72-3	4-Chlorophenyl-phenylether		
86-73-7	Fluorene		
100-01-6	4-Nitroaniline		
534-52-1	4,6-Dinitro-2-methylphenol		
86-30-6	N-Nitrosodiphenylamine (1)		
101-55-3	4-Bromophenyl-phenylether		
118-74-1	Hexachlorobenzene		
87-86-5	Pentachlorophenol		
85-01-8	Phenanthrene		
120-12-7	Anthracene		
84-74-2	Di-n-butylphthalate		
206-44-0	Fluoranthene		
129-00-0	Pyrene		
85-68-7	Butylbenzylphthalate		
91-94-1	3,3'-Dichlorobenzidine		
56-55-3	Benzo(a)anthracene		
218-01-9	Chrysene		
117-81-7	bis(2-Ethylhexyl)phthalate		
117-84-0	Di-n-octylphthalate		
205-99-2	Benzo(b)fluoranthene		
207-08-9	Benzo(k)fluoranthene		
50-32-8	Benzo(a)pyrene		
193-39-5	Indeno(1,2,3-cd)pyrene		
53-70-3	Dibenz(a,h)anthracene		
191-24-2	Benzo(g,h,i)perylene		

(1) - Cannot be separated from Diphenylamine

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(35-114)
S2 (FBP)	= 2-Fluorobiphenyl	(43-116)
S3 (TPH)	= Terphenyl-d14	(33-141)
S4 (PHL)	= Phenol-d6	(10-94)
S5 (2FP)	= 2-Fluorophenol	(21-100)
S6 (TBP)	= 2,4,6-Tribromophenol	(10-123)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

2D
SOIL SEMIVOLATILE SURROGATE RECOVERY

Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level: (low/med) _____

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	OTHER	TOT OUT
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

		QC LIMITS
S1 (NBZ)	= Nitrobenzene-d5	(23-120)
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)
S3 (TPH)	= Terphenyl-d14	(18-137)
S4 (PHL)	= Phenol-d6	(24-113)
S5 (2FP)	= 2-Fluorophenol	(25-121)
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

3C

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: _____ Contract: _____

Matrix Spike - EPA Sample No.: _____

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
Phenol					12- 89
2-Chlorophenol					27-123
1,4-Dichlorobenzene					36- 97
N-Nitroso-di-n-prop.(1)					41-116
1,2,4-Trichlorobenzene					39- 98
4-Chloro-3-methylphenol					23- 97
Acenaphthene					46-118
4-Nitrophenol					10- 80
2,4-Dinitrotoluene					24- 96
Pentachlorophenol					9-103
Pyrene					26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					42	12- 89
2-Chlorophenol					40	27-123
1,4-Dichlorobenzene					28	36- 97
N-Nitroso-di-n-prop.(1)					38	41-116
1,2,4-Trichlorobenzene					28	39- 98
4-Chloro-3-methylphenol					42	23- 97
Acenaphthene					31	46-118
4-Nitrophenol					50	10- 80
2,4-Dinitrotoluene					38	24- 96
Pentachlorophenol					50	9-103
Pyrene					31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: _____ out of _____ outside limits
Spike Recovery: _____ out of _____ outside limits

COMMENTS: _____

3D

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name:_____ Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix Spike - EPA Sample No.:_____ Level:(low/med)_____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC	QC. LIMITS REC
Phenol					26- 90
2-Chlorophenol					25-102
1,4-Dichlorobenznene					28-104
N-Nitroso-di-n-prop.(1)					41-126
1,2,4-Trichlorobenzene					38-107
4-Chloro-3-methylphenol					26-103
Acenaphthene					31-137
4-Nitrophenol					11-114
2,4-Dinitrotoluene					28- 89
Pentachlorophenol					17-109
Pyrene					35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					35	26- 90
2-Chlorophenol					50	25-102
1,4-Dichlorobenzene					27	28-104
N-Nitroso-di-n-prop.(1)					38	41-126
1,2,4-Trichlorobenzene					23	38-107
4-Chloro-3-methylphenol					33	26-103
Acenaphthene					19	31-137
4-Nitrophenol					50	11-114
2,4-Dinitrotoluene					47	28- 89
Pentachlorophenol					47	17-109
Pyrene					36	35-142

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD:_____out of_____outside limits
Spike Recovery:_____out of_____outside limits

Comments:_____

4B

SEMIVOLATILE METHOD BLANK SUMMARY

,b Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ Lab Sample ID: _____

Date Extracted: _____ Extraction: (SepF/Cont/Sonc) _____

Date Analyzed: _____ Time Analyzed: _____

Matrix: (soil/water) _____ Level: (low/med) _____

Instrument ID: _____

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

MMENTS: _____

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ DFTPP Injection Date: _____

Instrument ID: _____ DFTPP Injection Time: _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	
68	Less than 2.0% of mass 69	(
69	Mass 69 relative abundance	
70	Less than 2.0% of mass 69	(
127	40.0 - 60.0% of mass 198	
197	Less than 1.0% of mass 198	
198	Base Peak, 100% relative abundance	
199	5.0 to 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	Greater than 1.00% of mass 198	
441	Present, but less than mass 443	
442	Greater than 40.0% of mass 198	
443	17.0 - 23.0% of mass 442	(

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

6B

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date(s): _____ _____

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = _____ RRF50 = _____
RRF80 = _____ RRF120= _____ RRF160= _____

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
Phenol	*						*
bis(2-Chloroethyl)ether							
2-Chlorophenol							
1,3-Dichlorobenzene							
1,4-Dichlorobenzene	*						*
Benzyl alcohol							
1,2-Dichlorobenzene							
2-Methylphenol							
bis(2-Chloroisopropyl)ether							
4-Methylphenol							
N-Nitroso-di-n-propylamine	#						#
Hexachloroethane							
Nitrobenzene							
Isophorone							
2-Nitrophenol	*						*
2,4-Dimethylphenol							
Benzoic acid							
bis(2-Chloroethoxy)methane							
2,4-Dichlorophenol	*						*
1,2,4-Trichlorobenzene							
Naphthalene							
4-Chloroaniline							
Hexachlorobutadiene	*						*
4-Chloro-3-methylphenol	*						*
2-Methylnaphthalene							
Hexachlorocyclopentadiene	#						#
2,4,6-Trichlorophenol	*						*
2,4,5-Trichlorophenol							
2-Chloronaphthalene							
2-Nitroaniline							
Dimethylphthalate							
Acenaphthylene							
2,6-Dinitrotoluene							
3-Nitroaniline							
Acenaphthene	*						*
2,4-Dinitrophenol	#						#
4-Nitrophenol	#						#

6C

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date(s): _____ _____

Min $\overline{RRF}$ for SPCC(#) = 0.050 Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = _____ RRF50 = _____
RRF80 = _____ RRF120= _____ RRF160= _____

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
Dibenzofuran							
2,4-Dinitrotoluene							
Diethylphthalate							
4-Chlorophenyl-phenylether							
Fluorene							
4-Nitroaniline							
4,6-Dinitro-2-methylphenol							
N-Nitrosodiphenylamine (1) *							
4-Bromophenyl-phenylether							
Hexachlorobenzene							
Pentachlorophenol *							
Phenanthrene							
Anthracene							
Di-n-butylphthalate							
Fluoranthene *							
Pyrene							
Butylbenzylphthalate							
3,3'-Dichlorobenzidine							
Benzo(a)anthracene							
Chrysene							
bis(2-Ethylhexyl)phthalate							
Di-n-octylphthalate *							
Benzo(b)fluoranthene							
Benzo(k)fluoranthene							
Benzo(a)pyrene *							
Indeno(1,2,3-cd)pyrene							
Dibenz(a,h)anthracene							
Benzo(g,h,i)perylene							
Nitrobenzene-d5							
2-Fluorobiphenyl							
Terphenyl-d14							
Phenol-d6							
2-Fluorophenol							
2,4,6-Tribromophenol							

(1) Cannot be separated from Diphenylamine

7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date: _____ Time: _____

Lab File ID: _____ Init. Calib. Date(s): _____ _____

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) =

COMPOUND	$\overline{RRF}$	RRF50	%D
Phenol	*		*
bis(2-Chloroethyl)ether			
2-Chlorophenol			
1,3-Dichlorobenzene			
1,4-Dichlorobenzene	*		*
Benzyl alcohol			
1,2-Dichlorobenzene			
2-Methylphenol			
bis(2-Chloroisopropyl)ether			
4-Methylphenol			
N-Nitroso-di-n-propylamine	#		#
Hexachloroethane			
Nitrobenzene			
Isophorone			
2-Nitrophenol	*		*
2,4-Dimethylphenol			
Benzoic acid			
bis(2-Chloroethoxy)methane			
2,4-Dichlorophenol	*		*
1,2,4-Trichlorobenzene			
Naphthalene			
4-Chloroaniline			
Hexachlorobutadiene	*		*
4-Chloro-3-methylphenol	*		*
2-Methylnaphthalene			
Hexachlorocyclopentadiene	#		#
2,4,6-Trichlorophenol	*		*
2,4,5-Trichlorophenol			
2-Chloronaphthalene			
2-Nitroaniline			
Dimethylphthalate			
Acenaphthylene			
2,6-Dinitrotoluene			
3-Nitroaniline			
Acenaphthene	*		*
2,4-Dinitrophenol	#		#
4-Nitrophenol	#		#

FORM VII SV-1

7C

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date: _____ Time: _____

Lab File ID: _____ Init. Calib. Date(s): _____ _____

Min RRF50 for SPCC(#) = 0.050 Max %D for CCC(*) = 25.0

COMPOUND	$\overline{RRF}$	RRF50	%D
Dibenzofuran			
2,4-Dinitrotoluene			
Diethylphthalate			
4-Chlorophenyl-phenylether			
Fluorene			
4-Nitroaniline			
4,6-Dinitro-2-methylphenol			
N-Nitrosodiphenylamine (1) *			*
4-Bromophenyl-phenylether			
Hexachlorobenzene			
Pentachlorophenol *			*
Phenanthrene			
Anthracene			
Di-n-butylphthalate			
Fluoranthene *			*
Pyrene			
Butylbenzylphthalate			
3,3'-Dichlorobenzidine			
Benzo(a)anthracene			
Chrysene			
bis(2-Ethylhexyl)phthalate			
Di-n-octylphthalate *			*
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Benzo(a)pyrene *			*
Indeno(1,2,3-cd)pyrene			
Dibenz(a,h)anthracene			
Benzo(g,h,i)perylene			
Nitrobenzene-d5			
2-Fluorobiphenyl			
Terphenyl-d14			
Phenol-d6			
2-Fluorophenol			
2,4,6-Tribromophenol			

(1) Cannot be separated from Diphenylamine

8B

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): _____ Date Analyzed: _____

Instrument ID: _____ Time Analyzed: _____

		IS1(DCB) AREA #	RT	IS2(NPT) AREA #	RT	IS3(ANT) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

page __ of __

8C

SEMIVOLATILE INTERNAL STANDARD AREA SUMMARY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): _____ Date Analyzed: _____

Instrument ID: _____ Time Analyzed: _____

		IS4(PHN) AREA #	RT	IS5(CRY) AREA #	RT	IS6(PRY) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

UPPER LIMIT = + 100% of internal standard area.
LOWER LIMIT = - 50% of internal standard area.

Column used to flag internal standard area values with an asterisk

page __ of __

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) _____ Lab Sample ID: _____

Sample wt/vol: _____ (g/mL) ____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec. _____ dec. _____ Date Extracted: _____

Extraction: (SepF/Cont/Sonc) _____ Date Analyzed: _____

GPC Cleanup: (Y/N) ___ pH: ____ Dilution Factor: _____

Number TICs found: _____

CONCENTRATION UNITS: (ug/L or ug/Kg) _____

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
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16.					
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22.					
23.					
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27.					
28.					
29.					
30.					

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) _____ Lab Sample ID: _____

Sample wt/vol: _____ (g/mL) _____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec. _____ Date Analyzed: _____

Column: (pack/cap) _____ Dilution Factor: _____

CONCENTRATION UNITS: (ug/L or ug/Kg) _____

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
108-05-4	Vinyl Acetate		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) _____ Lab Sample ID: _____

Sample wt/vol: _____ (g/mL) ____ Lab File ID: _____

Level: (low/med) _____ Date Received: _____

% Moisture: not dec. _____ Date Analyzed: _____

Column: (pack/cap) _____ Dilution Factor: _____

Number TICs found: _____

CONCENTRATION UNITS:
(ug/L or ug/Kg) _____

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
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26.				
27.				
28.				
29.				
30.				

allotch = file

2A
WATER VOLATILE SURROGATE RECOVERY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
S1 (TOL)	= Toluene-d8	(88-110)
S2 (BFB)	= Bromofluorobenzene	(86-115)
S3 (DCE)	= 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

2B
SOIL VOLATILE SURROGATE RECOVERY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Level: (low/med) _____

	EPA SAMPLE NO.	S1 (TOL) #	S2 (BFB) #	S3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
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19						
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22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
S1 (TOL)	= Toluene-d8	(81-117)
S2 (BFB)	= Bromofluorobenzene	(74-121)
S3 (DCE)	= 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: _____ out of _____ outside limits
Spike Recovery: _____ out of _____ outside limits

COMMENTS: _____

3B

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

b Name: _____ Contract: _____

Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix Spike - EPA Sample No.: _____ Level: (low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene					59-172
Trichloroethene					62-137
Benzene					66-142
Toluene					59-139
Chlorobenzene					60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					22	59-172
Trichloroethene					24	62-137
Benzene					21	66-142
Toluene					21	59-139
Chlorobenzene					21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: _____ out of _____ outside limits
Spike Recovery: _____ out of _____ outside limits

COMMENTS: _____

4A
VOLATILE METHOD BLANK SUMMARY

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: _____ Lab Sample ID: _____

Date Analyzed: _____ Time Analyzed: _____

Matrix: (soil/water) _____ Level: (low/med) _____

Instrument ID: _____

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
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22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS: _____

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date(s): _____ _____

Matrix: (soil/water) _____ Level: (low/med) _____ Column: (pack/cap) _____

Min $\overline{RRF}$ for SPCC(#) = 0.300 (0.250 for Bromoform) Max %RSD for CCC(*) =

LAB FILE ID: RRF20 = _____ RRF50 = _____
RRF100= _____ RRF150= _____ RRF200= _____

COMPOUND	RRF20	RRF50	RRF100	RRF150	RRF200	$\overline{RRF}$
Chloromethane #						
Bromomethane						
Vinyl Chloride *						
Chloroethane						
Methylene Chloride						
Acetone						
Carbon Disulfide						
1,1-Dichloroethene *						
1,1-Dichloroethane #						
1,2-Dichloroethene (total)						
Chloroform *						
1,2-Dichloroethane						
2-Butanone						
1,1,1-Trichloroethane						
Carbon Tetrachloride						
Vinyl Acetate						
Bromodichloromethane						
1,2-Dichloropropane *						
cis-1,3-Dichloropropene						
Trichloroethene						
Dibromochloromethane						
1,1,2-Trichloroethane						
Benzene						
trans-1,3-Dichloropropene						
Bromoform #						
4-Methyl-2-Pentanone						
2-Hexanone						
Tetrachloroethene						
1,1,2,2-Tetrachloroethane #						
Toluene *						
Chlorobenzene #						
Ethylbenzene *						
Styrene						
Xylene (total)						
Toluene-d8						
Bromofluorobenzene						
1,2-Dichloroethane-d4						

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Instrument ID: _____ Calibration Date: _____ Time: _____

Lab File ID: _____ Init. Calib. Date(s): _____ _____

Matrix: (soil/water) _____ Level: (low/med) _____ Column: (pack/cap) _____

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 2

COMPOUND	$\overline{RRF}$	RRF50	%D
Chloromethane	#		#
Bromomethane			
Vinyl Chloride	*		*
Chloroethane			
Methylene Chloride			
Acetone			
Carbon Disulfide			
1,1-Dichloroethene	*		*
1,1-Dichloroethane	#		#
1,2-Dichloroethene (total)			
Chloroform	*		*
1,2-Dichloroethane			
2-Butanone			
1,1,1-Trichloroethane			
Carbon Tetrachloride			
Vinyl Acetate			
Bromodichloromethane			
1,2-Dichloropropane	*		*
cis-1,3-Dichloropropene			
Trichloroethene			
Dibromochloromethane			
1,1,2-Trichloroethane			
Benzene			
trans-1,3-Dichloropropene			
Bromoform	#		#
4-Methyl-2-Pentanone			
2-Hexanone			
Tetrachloroethene			
1,1,2,2-Tetrachloroethane	#		#
Toluene	*		*
Chlorobenzene	#		#
Ethylbenzene	*		*
Styrene			
Xylene (total)			
Toluene-d8			
Bromofluorobenzene			
1,2-Dichloroethane-d4			

8A

VOLATILE INTERNAL STANDARD AREA SUMMARY

L Name: _____ Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): _____ Date Analyzed: _____

Instrument ID: _____ Time Analyzed: _____

Matrix: (soil/water) _____ Level: (low/med) _____ Column: (pack/cap) _____

		IS1(BCM) AREA #	RT	IS2(DFB) AREA #	RT	IS3(CBZ) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
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18							
19							
20							
21							
22							

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

UPPER LIMIT = + 100% of internal standard area
LOWER LIMIT = - 50% of internal standard area

Column used to flag internal standard area values with an asteris

page __ of __

EPA SAMPLE NO.

HPLC EXPLOSIVES IDENTIFICATION

Lab Name: CE-WES ANALYTICAL LAB GRP Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No.: _____

HPLC Column ID (1) : C-18 HPLC Column ID (2) : CN

Instrument ID (1) : 96 Instrument ID (2) : 96

Lab Sample ID: _____

EXPLOSIVE	RETENTION TIME		STANDARD RT FROM	TO	QUANT? (Y/N)
01 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
02 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
03 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
04 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
05 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
06 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
07 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____
08 _____	Column 1	_____	_____	_____	_____
	Column 2	_____	_____	_____	_____

page____ of____

ALG File No.(s) _____

WATER EXPLOSIVE MATRIX SPIKE / DUPLICATE RECOVERY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix Spike - EPA Sample No.:_____

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	MS CONCENTRATION (mg/L)	MS % REC #	QC LIMITS
HMX					
RDX					
TNB					
DNB					
Tetryl					
TNT					
2,6-DNT					
2,4-DNT					

COMPOUND	SAMPLE CONCENTRATION (mg/L)	DUPLICATE CONCENTRATION (mg/L)	% RPD #	QC LIMITS
HMX				
RDX				
TNB				
DNB				
Tetryl				
TNT				
2,6-DNT				
2,4-DNT				

Column to be used to flag recovery and RPD values with an asterisk

Comments:_____

ALG File No.(s)_____

SOIL EXPLOSIVE MATRIX SPIKE / DUPLICATE RECOVERY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix Spike - EPA Sample No.:_____

COMPOUND	SPIKE ADDED (mg/Kg)	SAMPLE CONCENTRATION (mg/Kg)	MS CONCENTRATION (mg/Kg)	MS % REC #	QC LIMITS
HMX					
RDX					
TNB					
DNB					
Tetryl					
TNT					
2,6-DNT					
2,4-DNT					

COMPOUND	SAMPLE CONCENTRATION (mg/Kg)	DUPLICATE CONCENTRATION (mg/Kg)	% RPD #	QC LIMITS
HMX				
RDX				
TNB				
DNB				
Tetryl				
TNT				
2,6-DNT				
2,4-DNT				

Column to be used to flag recovery and RPD values with an asterisk

Comments:_____

2E-S
WATER PESTICIDE SURROGATE RECOVERY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract:_____

Lab Code:_____ Case NO.:_____ SAS No.:_____ SDG No.:_____

	EPA SAMPLE NO.	S1	S2
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
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25			
26			
27			
28			
29			
30			

Column to be used to flag recovery values

D Surrogates diluted out

page_____of_____

FORM II PEST-1 SUPPLEMENT 1/87 Rev.

ALG File No.(s)_____
ALG Archive No._____

2F-S

SOIL PESTICIDE SURROGATE RECOVERY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract:_____

Lab Code:_____ Case NO.:_____ SAS No.:_____ SDG No.:_____

Level:(low/med)_____

	EPA SAMPLE NO.	S1	S2
01			
02			
03			
04			
05			
06			
07			
08			
09			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

Column to be used to flag recovery values

D Surrogates diluted out

page_____of_____

FORM II PEST-2 SUPPLEMENT 1/87 Rev.

ALG File No.(s)_____

ALG Archive No._____

3E-S

WATER HERB/PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix Spike - EPA Sample No.:_____

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	
Disulfoton					
Ethyl Parathion					
Famphur					
Phorate					
Methyl Parathion					
2,4-D					
2,5-T					
2,4,5-TP					
Dinoseb					

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #		
Disulfoton						
Ethyl Parathion						
Famphur						
Phorate						
Methyl Paration						
2,4-D						
2,4,5-T						
2,4,5-TP						
Dinoseb						

Column to be used to flag recovery and RPD values with an asterisk

Comments:_____

FORM III PEST-1 SUPPLEMENT 1/87 Rev.

Page____of____

ALG File No._____

ALG Archive No._____

3F-S

SOIL HERB/PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract:_____

Lab Code:_____ Case No.:_____ SAS No.:_____ SDG No.:_____

Matrix Spike - EPA Sample No.:_____

COMPOUND	SPIKE ADDED (ug/kg)	SAMPLE CONCENTRATION (ug/kg)	MS CONCENTRATION (ug/kg)	MS % REC #	
Disulfoton					
Ethyl Parathion					
Famphur					
Phorate					
Methyl Parathion					
2,4-D					
2,5-T					
2,4,5-TP					
Dinoseb					

COMPOUND	SPIKE ADDED (ug/kg)	MSD CONCENTRATION (ug/kg)	MSD % REC #	% RPD #		
Diazinon						
Ethyl Parathion						
Ethyl Trithion						
Ethion						
Methyl Paration						
2,4-D						
2,4,5-T						
2,4,5-TP						
Dinosec						

Column to be used to flag recovery and RPD values with an asterisk

Comments:_____

FORM III PEST-2 SUPPLEMENT 1/87 Rev.

Page____of_____

ALG File No.(s)_____

ALG Archive No._____

9-S
PESTICIDE STANDARDS SUMMARY

Lab Name: CE-WES ANALYTICAL LAB GRP Contract: _____

Lab Code: _____ Case No.: _____ SAS No.: _____ SDG No: _____

Instrument ID: 97 GC Column ID: DB-5

	DATE(S) OF ANALYSIS FROM: _____ TO: _____ TIME(S) OF ANALYSIS FROM: _____ TO: _____				DATE OF ANALYSIS _____ TIME OF ANALYSIS _____ EPA SAMPLE NO. (STANDARD) _____			
COMPOUND	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR	RT	CALIBRATION FACTOR	QNT Y/N	% D
Disulfoton								
Ethyl Parathion								
Famphur								
Phorate								
Methyl Parath.								
2,4-D								
2,5-T								
2,4,5-TP								
Dinoseb								

Under QNT Y/N: enter Y if quantitation was performed, N if not performed. % D must be less than or equal to 15.0% for quantitation, and less than or equal to 20.0% for confirmation.

Note: Determining that no compounds were found above the CRDL is a form of quantitation, and therefore at least one column must meet the 15.0% critera

page___ of___

FORM IX PEST SUPPLEMENT 8/87 Rev

ALG File No.(s) _____
ALG Archive No. _____

APPENDIX D

PCA/R-150 TANK SITE GROUNDWATER ANALYTICAL RESULTS

FIRST QUARTER

Monitoring Results for the First Year

RUN DATE: 05 MAR 82

INSTALLATION: CRANE AAA, IN

FACILITY: PEST CONTROL STORAGE AREA

SAMPLING SITES
RESULTS

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	9-1	9-7	9-4	9-8	9-5	9-3	9-9
TOX	14 DEC 81	10.	UGL	12.C	ND	27.C	64.C	96.C	343.C	50.C
TOX	14 DEC 81	10.	UGL	25.C	11.C	23.C	69.C	37.C	255.C	42.C
TOX	14 DEC 81	10.	UGL	43.C	17.C	21.C	65.C	22.C	225.C	42.C
TOX	14 DEC 81	10.	UGL	12.C	22.C	40.C	65.C	33.C	228.C	43.C

LEGEND
NOTES: ALL METALS AND OTHER PARAMETERS WHERE APPROPRIATE ARE ON A DISSOLVED (FILTERED) BASIS UNLESS OTHERWISE NOTED. DETECTION LIMITS SHOWN ARE NORMAL LEVELS; ACTUAL LIMITS MAY VARY IN ENVIRONMETAL SAMPLES. ANALYTICAL RESULTS ARE ACCURATE TO EITHER 2 OR 3 SIGNIFICANT FIGURES; TRAILING ZEROES DO NOT ALWAYS INDICATE SIGNIFICANCE, BUT ARE THE RESULTS OF COMPUTER FORMATTING.
A VALUES SHOWN ARE FOR WATER LEVEL ELEVATION ABOVE A REFERENCE DATUM
B UPGRADIENT SITE
C RESULTS ARE FOR UNFILTERED SAMPLE

RUN DATE: 05 MAR 82

INSTALLATION: CRANE AAA, IN

FACILITY: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-2	9-8
WATER					
LEVELS A	13 DEC 81		FT	715.20	717.35
ARSENIC	14 DEC 81	.010	MGL	ND	ND
BARIUM	14 DEC 81	.1	MGL	ND	ND
CADMIUM	14 DEC 81	.005	MGL	ND	ND
CHROMIUM	14 DEC 81	.010	MGL	ND	ND
FLUORIDE	14 DEC 81	.10	MGL	.12	.29
LEAD	14 DEC 81	.010	MGL	ND	ND
MERCURY	14 DEC 81	.2	UGL	ND	ND
NO2+NO3 AS N	14 DEC 81	.05	MGL	.08	.10
SELENIUM	14 DEC 81	.005	MGL	.013 *	ND
SILVER	14 DEC 81	.01	MGL	ND	ND
ENDRIN	14 DEC 81	.04	UGL	ND	ND
LINDANE	14 DEC 81	.08	UGL	ND	ND
TOXAPHENE	14 DEC 81	1.6	UGL	ND	ND
METHOXYCHLOR	14 DEC 81	1.6	UGL	ND	ND
2,4-D	14 DEC 81	3.8	UGL	ND	ND
SILVEX	14 DEC 81	.5	UGL	ND	ND
GROSS ALPHA	14 DEC 81	4.17	PCL	ND	ND
GROSS ALPHA	14 DEC 81	4.17	PCL		ND
GROSS BETA	14 DEC 81	1.30	PCL	3.45	1.30
GROSS BETA	14 DEC 81	1.30	PCL		2.39
TOTCOLBACT	15 DEC 81	1.	PHM	13. *	3. *
CHLORIDE	14 DEC 81	1.0	MGL	12.4	34.1
IRON	14 DEC 81	.03	MGL	.06	4.36 *
MANGANESE	14 DEC 81	.01	MGL	34.50 *	3.20 *
PHENOL	14 DEC 81	.01	MGL	ND	ND
SODIUM	14 DEC 81	1.	MGL	58.	42.
SULFATE	14 DEC 81	5.0	MGL	316.0 *	186.0
PH(FIELD)	14 DEC 81		PH	6.5	6.3 *
PH(FIELD)	14 DEC 81		PH	6.5	6.3 *
PH(FIELD)	14 DEC 81		PH	6.5	6.3 *
PH(FIELD)	14 DEC 81		PH	6.5	6.3 *
SPEC COND	14 DEC 81	1.	UMC	1000.	860.
SPEC COND	14 DEC 81	1.	UMC	1000.	860.
SPEC COND	14 DEC 81	1.	UMC	1000.	860.
SPEC COND	14 DEC 81	1.	UMC	1000.	840.
TOC	14 DEC 81	1.0	MGL	9.0	2.0
TOC	14 DEC 81	1.0	MGL	9.0	2.0
TOC	14 DEC 81	1.0	MGL	8.0	2.0
TOC	14 DEC 81	1.0	MGL	9.0	2.0

SECOND QUARTER

Monitoring Results for the First Year

RUN DATE: 18 JUN 82

INSTALLATION: CRANE NWSC, IN

FACILITY: PEST CONTROL STORAGE AREA

SAMPLING SITES
RESULTS

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	9-1	9-7	9-4	9-8	9-5	9-3	9-9
WATER										
LEVELS (A)	06 APR 82		FT	721.8	719.3	707.4		707.0	706.3	
ARSENIC	06 APR 82	.010	MGL	ND	ND	ND	ND	ND	ND	ND
BARIUM	06 APR 82	.1	MGL	ND	ND	ND	ND	ND	ND	ND
CADMIUM	06 APR 82	.005	MGL	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	06 APR 82	.010	MGL	ND	ND	ND	ND	ND	ND	ND
FLUORIDE	06 APR 82	.10	MGL	.14	.36	.10	.13	.12	.14	ND
LEAD	06 APR 82	.010	MGL	ND	ND	ND	ND	ND	ND	ND
MERCURY	06 APR 82	.2	UGL	ND	ND	ND	ND	ND	ND	ND
NO2+NO3 AS N	06 APR 82	.05	MGL	.70	.05	.12	.51	.48	.12	.18
SELENIUM	06 APR 82	.005	MGL	ND	ND	ND	ND	ND	ND	ND
SILVER	06 APR 82	.01	MGL	ND	ND	ND	ND	ND	ND	ND
ENDRIN	06 APR 82	.04	UGL	ND	ND	ND	ND	ND	ND	
LINDANE	06 APR 82	.08	UGL	ND	ND	ND	ND	ND	ND	
TOXAPHENE	06 APR 82	1.6	UGL	ND	ND	ND	ND	ND	ND	
METHOXYCHLOR	06 APR 82	1.6	UGL	ND	ND	ND	ND	ND	ND	
2,4-D	06 APR 82	3.8	UGL	ND	ND	ND	ND	ND	ND	
SILVEX	06 APR 82	.5	UGL	ND	ND	ND	ND	ND	ND	
GROSS ALPHA	06 APR 82	2.79	PCL	1.56	ND	ND	2.52	ND	ND	ND
GROSS BETA	06 APR 82	2.62	PCL	ND	ND	2.33	ND	ND	ND	ND
CHLORIDE	06 APR 82	1.0	MGL	ND	13.0	24.0	17.0	20.1	13.0	10.0
IRON	06 APR 82	.03	MGL	.17	.19	.08	.14	.22	.21	.10
MANGANESE	06 APR 82	.01	MGL	.02	1.45#	.56#	2.07#	.94#	.42#	35.00#
PHENOL	06 APR 82	.01	MGL	.02	ND	ND	ND	ND	.02	.01
SODIUM	06 APR 82	1.	MGL	41.	108.	32.	43.	40.	40.	62.
SULFATE	06 APR 82	5.0	MGL	44.0	460.0#	91.0	130.0	132.0	96.0	220.0
PH(FIELD)	06 APR 82		PH	6.7	6.3#	6.1#	6.1#	6.2#	6.4#	6.1#
PH(FIELD)	06 APR 82		PH	6.7	6.4#	6.1#	6.2#	6.1#	6.4#	6.1#
PH(FIELD)	06 APR 82		PH	6.8	6.4#	6.1#	6.2#	6.2#	6.4#	6.0#
PH(FIELD)	06 APR 82		PH	6.6	6.4#	6.0#	6.2#	6.2#	6.4#	6.1#
SPEC COND	06 APR 82	1.	UMC	461.	1600.	850.	790.	819.	649.	990.
SPEC COND	06 APR 82	1.	UMC	462.	1600.	850.	792.	820.	650.	988.
SPEC COND	06 APR 82	1.	UMC	462.	1600.	850.	791.	820.	650.	990.
SPEC COND	06 APR 82	1.	UMC	463.	1600.	850.	790.	820.	649.	989.
TOC	06 APR 82	1.0	MGL	2.0	3.0	3.0	3.0	3.0	3.0	4.0
TOC	06 APR 82	1.0	MGL	2.0	3.0	3.0	3.0	3.0	3.0	4.0
TOC	06 APR 82	1.0	MGL	2.0	3.0	2.0	3.0	3.0	3.0	3.0
TOC	06 APR 82	1.0	MGL	2.0	3.0	3.0	3.0	3.0	3.0	4.0
TOX	06 APR 82	.010	MGL	ND	.140 C	.025 C	.058 C	.150 C	.061 C	.080 C
TOX	06 APR 82	.010	MGL	.130 C	.130 C	.026 C	.063 C	.140 C	.036 C	.070 C
TOX	06 APR 82	.010	MGL	.150 C	.140 C	.030 C	.054 C	.130 C	.063 C	.064 C
TOX	06 APR 82	.010	MGL	.150 C	.140 C	.026 C	.067 C	.140 C	.060 C	.059 C

THIRD QUARTER

Monitoring Results for the First Year

RUN DATE: 18 JUN 82

INSTALLATION: CRANE NWSC, IN

FACILITY: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-2	9-6	
WATER LEVELS (A)	06 APR 82		FT	717.3	719.2	
ARSENIC	06 APR 82	.010	MGL	ND	ND	
BARIUM	06 APR 82	.1	MGL	ND	ND	
CADMIUM	06 APR 82	.005	MGL	ND	ND	
CHROMIUM	06 APR 82	.010	MGL	ND	ND	
FLUORIDE	06 APR 82	.10	MGL	.10	.26	
LEAD	06 APR 82	.010	MGL	ND	ND	
MERCURY	06 APR 82	.2	UGL	ND	ND	
NO2+NO3 AS N	06 APR 82	.05	MGL	.33	.28	
SELENIUM	06 APR 82	.005	MGL	ND	ND	
SILVER	06 APR 82	.01	MGL	ND	ND	
ENDRIN	06 APR 82	.04	UGL	ND	ND	
LINDANE	06 APR 82	.08	UGL	ND	ND	
TOXAPHENE	06 APR 82	1.6	UGL	ND	ND	
METHOXYCHLOR	06 APR 82	1.6	UGL	ND	ND	
2,4-D	06 APR 82	3.8	UGL	ND	ND	
SILVEX	06 APR 82	.5	UGL	ND	ND	
GROSS ALPHA	06 APR 82	1.37	PCL	2.56	ND	
GROSS BETA	06 APR 82	2.56	PCL	ND	ND	
CHLORIDE	06 APR 82	1.0	MGL	7.0	32.0	
IRON	06 APR 82	.03	MGL	1.81#	3.47#	
MANGANESE	06 APR 82	.01	MGL	35.00#	1.66#	
PHENOL	06 APR 82	.01	MGL	.01	.01	
SODIUM	06 APR 82	1.	MGL	63.	53.	
SULFATE	06 APR 82	5.0	MGL	170.0	140.0	
PH(FIELD)	06 APR 82		PH	6.0#	5.9#	
PH(FIELD)	06 APR 82		PH	6.1#	5.9#	
PH(FIELD)	06 APR 82		PH	6.1#	5.9#	
PH(FIELD)	06 APR 82		PH	6.1#	5.8#	
SPEC COND	06 APR 82	1.	UMC	870.	630.	
SPEC COND	06 APR 82	1.	UMC	870.	629.	
SPEC COND	06 APR 82	1.	UMC	869.	630.	
SPEC COND	06 APR 82	1.	UMC	870.	630.	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOX	06 APR 82	.010	MGL	ND	.063	C
TOX	06 APR 82	.010	MGL	ND	.061	C
TOX	06 APR 82	.010	MGL	ND	.049	C
TOX	06 APR 82	.010	MGL	ND	.064	C

RUN DATE: 18 JUN 82

INSTALLATION: CRANE NWSC, IN

FACILITY: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-2	9-6	
WATER LEVELS (A)	06 APR 82		FT	717.3	719.2	
ARSENIC	06 APR 82	.010	MGL	ND	ND	
BARIUM	06 APR 82	.1	MGL	ND	ND	
CADMIUM	06 APR 82	.005	MGL	ND	ND	
CHROMIUM	06 APR 82	.010	MGL	ND	ND	
FLUORIDE	06 APR 82	.10	MGL	.10	.26	
LEAD	06 APR 82	.010	MGL	ND	ND	
MERCURY	06 APR 82	.2	UGL	ND	ND	
NO2+NO3 AS N	06 APR 82	.05	MGL	.33	.28	
SELENIUM	06 APR 82	.005	MGL	ND	ND	
SILVER	06 APR 82	.01	MGL	ND	ND	
ENDRIN	06 APR 82	.04	UGL	ND	ND	
LINDANE	06 APR 82	.08	UGL	ND	ND	
TOXAPHENE	06 APR 82	1.6	UGL	ND	ND	
METHOXYCHLOR	06 APR 82	1.6	UGL	ND	ND	
2,4-D	06 APR 82	3.8	UGL	ND	ND	
SILVEX	06 APR 82	.5	UGL	ND	ND	
GROSS ALPHA	06 APR 82	1.37	PCL	2.56	ND	
GROSS BETA	06 APR 82	2.56	PCL	ND	ND	
CHLORIDE	06 APR 82	1.0	MGL	7.0	32.0	
IRON	06 APR 82	.03	MGL	1.81#	3.47#	
MANGANESE	06 APR 82	.01	MGL	35.00#	1.66#	
PHENOL	06 APR 82	.01	MGL	.01	.01	
SODIUM	06 APR 82	1.	MGL	63.	53.	
SULFATE	06 APR 82	5.0	MGL	170.0	140.0	
PH(FIELD)	06 APR 82		PH	6.0#	5.9#	
PH(FIELD)	06 APR 82		PH	6.1#	5.9#	
PH(FIELD)	06 APR 82		PH	6.1#	5.9#	
PH(FIELD)	06 APR 82		PH	6.1#	5.8#	
SPEC COND	06 APR 82	1.	UMC	870.	630.	
SPEC COND	06 APR 82	1.	UMC	870.	629.	
SPEC COND	06 APR 82	1.	UMC	869.	630.	
SPEC COND	06 APR 82	1.	UMC	870.	630.	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOC	06 APR 82	1.0	MGL	5.0	1.0	
TOX	06 APR 82	.010	MGL	ND	.062	C
TOX	06 APR 82	.010	MGL	ND	.061	C
TOX	06 APR 82	.010	MGL	ND	.049	C
TOX	06 APR 82	.010	MGL	ND	.064	C

FOURTH QUARTER

Monitoring Results for the First Year

RUN DATE: 14 JAN 83

INSTALLATION: CRANE NWSC, IN

FACILITY: PEST CONTROL STORAGE AREA

SAMPLING SITES
RESULTS

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	9-1	9-7	9-4	9-8	9-5	9-3	9-9
WATER LEVELS (A)	13 SEP 82		FT	721.8	718.8	706.4		706.5	705.3	
ARSENIC	14 SEP 82	.010	MGL	ND	ND	ND	ND	ND	ND	ND
BARIUM	14 SEP 82	.1	MGL	.2	ND	ND	ND	ND	ND	.2
CADMIUM	14 SEP 82	.005	MGL	ND	ND	ND	ND	ND	ND	ND
CHROMIUM	14 SEP 82	.010	MGL	ND	ND	ND	ND	ND	ND	ND
FLUORIDE	14 SEP 82	.10	MGL	.13	.29	ND	.11	.12	.16	ND
LEAD	14 SEP 82	.010	MGL	ND	ND	ND	ND	ND	ND	ND
MERCURY	14 SEP 82	.2	UGL	ND	ND	ND	ND	ND	ND	ND
NO2+NO3 AS N	14 SEP 82	.05	MGL	.78	ND	.31	1.00	.28	ND	.41
SELENIUM	14 SEP 82	.005	MGL	ND	ND	ND	ND	ND	ND	ND
SILVER	14 SEP 82	.01	MGL	ND	ND	ND	ND	ND	ND	ND
ENDRIN	14 SEP 82	.04	UGL	ND	ND	ND	ND	ND	ND	ND
LINDANE	14 SEP 82	.08	UGL	ND	ND	ND	ND	ND	ND	ND
TOXAPHENE	14 SEP 82	1.6	UGL	ND	ND	ND	ND	ND	ND	ND
METHOXYCHLOR	14 SEP 82	1.6	UGL	ND	ND	ND	ND	ND	ND	ND
2,4-D	14 SEP 82	3.8	UGL	ND	ND	ND	ND	ND	ND	ND
SILVEX	14 SEP 82	.5	UGL	ND	ND	ND	ND	ND	ND	ND
GROSS ALPHA	14 SEP 82	7.76	PCL	<3.23	<7.76	<5.01	4.38	<5.18	<4.72	<6.87
GROSS BETA	14 SEP 82	1.77	PCL	ND	1.54	2.99	1.45	1.37	ND	ND
CHLORIDE	14 SEP 82	1.0	MGL	2.0	8.0	12.0	26.0	23.6	12.0	3.0
IRON	14 SEP 82	.03	MGL	.13	.12	.10	ND	.15	.06	.07
MANGANESE	14 SEP 82	.01	MGL	ND	.67#	.63#	2.07#	1.95#	.75#	21.00#
PHENOL	14 SEP 82	.01	MGL	ND	ND	ND	ND	ND	ND	ND
SODIUM	14 SEP 82	1.	MGL	26.	116.	24.	29.	29.	33.	85.
SULFATE	14 SEP 82	5.0	MGL	31.0	420.0#	71.0	100.0	116.0	87.0	120.0
PH(FIELD)	14 SEP 82		PH	6.4#	6.1#	6.2#	5.1#	6.4#	6.3#	6.1#
PH(FIELD)	14 SEP 82		PH	6.4#	6.1#	6.3#	6.0#	6.4#	6.2#	6.0#
PH(FIELD)	14 SEP 82		PH	6.3#	6.1#	6.1#	5.9#	6.4#	6.3#	6.0#
PH(FIELD)	14 SEP 82		PH	6.4#	6.0#	6.0#	6.1#	6.3#	6.1#	5.9#
SPEC COND	14 SEP 82	1.	UMC	385.	1170.	930.	780.	820.	770.	1300.
SPEC COND	14 SEP 82	1.	UMC	390.	1160.	940.	780.	820.	775.	1300.
SPEC COND	14 SEP 82	1.	UMC	390.	1160.	940.	780.	820.	775.	1300.
SPEC COND	14 SEP 82	1.	UMC	385.	1160.	935.	770.	820.	780.	1280.
TOC	14 SEP 82	1.0	MGL	10.0	12.0	16.0	16.0	4.0	15.0	4.0
TOC	14 SEP 82	1.0	MGL	10.0	13.0	15.0	17.0	4.0	16.0	5.0
TOC	14 SEP 82	1.0	MGL	11.0	12.0	16.0	18.0	4.0	15.0	4.0
TOC	14 SEP 82	1.0	MGL	10.0	12.0	15.0	16.0	4.0	16.0	5.0
TOX	14 SEP 82	.010	MGL	.110 C	.150 C	.060 C	.150 C	.160 C	.710 C	.200 C
TOX	14 SEP 82	.010	MGL	.130 C	.120 C	.079 C	.150 C	.160 C	.700 C	.170 C
TOX	14 SEP 82	.010	MGL	.100 C	.120 C	.100 C	.200 C	.120 C	.740 C	.160 C
TOX	14 SEP 82	.010	MGL	.088 C	.120 C	.075 C	.150 C	.120 C	.700 C	.150 C

RADIOLOGICAL Monitoring
Results for the First Year

RUN DATE: 14 JAN 83

INSTALLATION: CRANE NWSC, IN

FACILITY: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-1	9-7	9-4	9-8	9-5	9-3	9-9
GROSS ALPHA	14 DEC 81	7.56	PCL	<3.07	<7.56	<5.06	<4.51	<4.82	<4.19	<4.91
GROSS ALPHA	06 APR 82	2.79	PCL	1.56	ND	ND	2.52	ND	ND	ND
GROSS ALPHA	27 JUL 82	7.19	PCL	<3.53	<7.19	<4.59	<7.00	<4.87	<5.30	<7.18
GROSS ALPHA	14 SEP 82	7.76	PCL	<3.23	<7.76	<5.01	4.38	<5.18	<4.76	<6.87
RADIUM-226	27 JUL 82	.11	PCL		ND		.41		.83	.40
GROSS BETA	14 DEC 81	1.51	PCL	1.62	1.22	5.38	6.73	4.14	ND	2.75
GROSS BETA	06 APR 82	2.62	PCL	ND	ND	2.33	ND	ND	ND	ND
GROSS BETA	27 JUL 82	1.65	PCL	ND	ND	1.67	ND	ND	ND	ND
GROSS BETA	14 SEP 82	1.77	PCL	ND	1.54	2.99	1.45	1.37	ND	ND

Samples Collected During the
Second Half of the Second Monitoring Year

NSHB-ES-G/WP
SUBJECT: Ground-water Monitoring Results for Naval Weapons Support Center (NWSC), Crane, IN

CRANE NWSC
PURGEABLE ORGANIC PRIORITY POLLUTANT
COMPOUNDS DETECTED AND RESULTS (ug/L)
SAMPLES COLLECTED 20 JULY 1983

	Travel Blank	9-1	9-2*	9-3*	9-4	9-5	9-6	9-7	9-8	9-9
Methylene chloride	2	2	2		1	2	3	2	2	2
trichlorofluoromethane	1	1	1		1	1	1	1	1	1
1,1,1-trichloroethane	1			40	1	10	1	1	1	
1,1,2,2-tetrachloroethane	1		1					1	2	
toluene	1							3		
chloroform			1							
trichloroethylene				588	20	24	1	1	7	
trans-1, -dichloroethylene				870	38	13			11	
tetrachlaroethylene					1					
benzene					1		1	2		

* Confirmed by mass spectroscopy.
Note: Blank space indicated not detected.

HSHB-ES-G/WP
SUBJECT: Ground-water Monitoring Results for Naval Weapons Support Center (NWSC), Crane, IN

CRANE NWSC
PURGEABLE ORGANIC PRIORITY POLLUTANTS
COMPOUNDS DETECTED AND RESULTS (ug/L)
SAMPLES COLLECTED ON 31 JULY 1983

	Travel Blank	Bailer Blank	Pump Blank	9-5*	9-6	9-8
Methylene chloride	4		2	3		
trichlorofluoromethane	4			3		
1,1,1-trichloroethane	3		1	8		1
chloroform			1			11
trichloroethylene	1	4	1	9		5
trans-1,2-dichloroethylene				8		3
tetrachloroethylene						5
1,1,2,2-tetrachloroethane		2	4			
1,3-dichlorobenzene		1				

* Confirmed by mass spectroscopy.
Note: Blank Space indicates not detected.

APPENDIX A8

Results of Second-Year Analysis of Groundwater Samples for Group II and Group III Parameters, Explosives at Site 3, and Pesticides at Site 9

First Semi-annual Results

RUN DATE: 21 JUN 83

INSTALLATION: CRANE NWSC, IN

SITE: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-1	9-7	9-4	9-8	9-5	9-3	9-9
WATER LEVELS (A)	23 FEB 83		FT		719.3					
LEVELS (A)	24 FEB 83		FT	723.0		708.3		707.6	705.7	
CHLORIDE	23 FEB 83	1.0	MGL							7.0
CHLORIDE	28 FEB 83	1.0	MGL	3.0	15.0	33.0	19.0	22.0	12.4	
IRON	23 FEB 83	.03	MGL							2.50#
IRON	28 FEB 83	.03	MGL	ND	ND	ND	.15	ND	ND	
MANGANESE	23 FEB 83	.01	MGL							40.00#
MANGANESE	28 FEB 83	.01	MGL	.01	.26#	.44#	2.03#	1.25#	.62#	
PHENOL	23 FEB 83	.01	MGL							ND
PHENOL	28 FEB 83	.01	MGL	.01	ND	ND	ND	ND	ND	
SODIUM	23 FEB 83	1.	MGL							51.
SODIUM	28 FEB 83	1.	MGL	27.	99	24.	43.	28.	30.	
SULFATE	23 FEB 83	5.0	MGL							200.0
SULFATE	28 FEB 83	5.0	MGL	26.0	730.0#	79.0	110.0	120.0	85.0	
PH(FIELD)	23 FEB 83		PH							6.1#
PH(FIELD)	23 FEB 83		PH							6.1#
PH(FIELD)	23 FEB 83		PH							6.1#
PH(FIELD)	23 FEB 83		PH							6.1#
PH(FIELD)	28 FEB 83		PH	7.0	6.4#	6.4#	6.5	6.3#	6.4#	
PH(FIELD)	28 FEB 83		PH	7.0	6.3#	6.5	6.6	6.3#	6.4#	
PH(FIELD)	28 FEB 83		PH	7.0	6.3#	6.4#	6.5	6.3#	6.4#	
PH(FIELD)	28 FEB 83		PH	7.0	6.3#	6.5	6.5	6.3#	6.4#	
SPEC COND	23 FEB 83	1.	UMC							935.
SPEC COND	23 FEB 83	1.	UMC							935.
SPEC COND	23 FEB 83	1.	UMC							935.
SPEC COND	23 FEB 83	1.	UMC							940.
SPEC COND	28 FEB 83	1.	UMC	490.	1340.	760.	825.	695.	620.	
SPEC COND	28 FEB 83	1.	UMC	490.	1340.	760.	825.	700.	623.	
SPEC COND	28 FEB 83	1.	UMC	490.	1345.	765.	825.	700.	620.	
SPEC COND	28 FEB 83	1.	UMC	495.	1340.	765.	820.	695.	625.	
TOC	23 FEB 83	1.0	MGL							27.0
TOC	23 FEB 83	1.0	MGL							27.0
TOC	23 FEB 83	1.0	MGL							26.0
TOC	23 FEB 83	1.0	MGL							26.0
TOC	28 FEB 83	1.0	MGL	17.0	23.0	70.0	46.0	56.0	57.0	
TOC	28 FEB 83	1.0	MGL	17.0	23.0	70.0	46.0	57.0	56.0	
TOC	28 FEB 83	1.0	MGL	16.0	23.0	69.0	47.0	56.0	57.0	
TOC	28 FEB 83	1.0	MGL	17.0	22.0	69.0	47.0	56.0	57.0	
TOX	23 FEB 83	.010	MGL							.058 C
TOX	23 FEB 83	.010	MGL							.059 C

RUN DATE: 21 JUN 83

INSTALLATION: CRANE NWSC, IN

SITE: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-2		9-6	
WATER							
LEVELS (A)	23 FEB 83		FT	717.2		718.9	
CHLORIDE	23 FEB 83	1.0	MGL	8.0		28.0	
IRON	23 FEB 83	.03	MGL	14.10#		9.00#	
MANGANESE	23 FEB 83	.01	MGL	24.00#		1.75#	
PHENOL	23 FEB 83	.01	MGL	ND		ND	
SODIUM	23 FEB 83	1.	MGL	22.		41.	
SULFATE	23 FEB 83	5.0	MGL	56.0		230.0	
PH(FIELD)	23 FEB 83		PH	6.3#		5.8#	
PH(FIELD)	23 FEB 83		PH	6.3#		5.8#	
PH(FIELD)	23 FEB 83		PH	6.3#		5.8#	
PH(FIELD)	23 FEB 83		PH	6.3#		5.8#	
SPEC COND	23 FEB 83	1.	UMC	540.		805.	
SPEC COND	23 FEB 83	1.	UMC	540.		805.	
SPEC COND	23 FEB 83	1.	UMC	540.		800.	
SPEC COND	23 FEB 83	1.	UMC	538.		800.	
TOC	23 FEB 83	1.0	MGL	20.0		23.0	
TOC	23 FEB 83	1.0	MGL	22.0		23.0	
TOC	23 FEB 83	1.0	MGL	21.0		24.0	
TOC	23 FEB 83	1.0	MGL	21.0		24.0	
TOX	23 FEB 83	.010	MGL	.023	C	.032	C
TOX	23 FEB 83	.010	MGL	.029	C	.012	C
TOX	23 FEB 83	.010	MGL	.037	C	ND	
TOX	23 FEB 83	.010	MGL	.042	C	.012	C

RUN DATE: 24 OCT 83

INSTALLATION: CRANE NWSC, IN

SITE: PEST CONTROL STORAGE AREA

SAMPLING SITES RESULTS

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	9-1	9-7	9-4	9-8	9-5	9-3	9-9
WATER										
LEVELS (A)	20 JUL 83		FT	722.4	722.8	706.4		709.0	705.1	
LEVELS (A)	30 JUL 83		FT		718.6					
LEVELS (A)	31 JUL 83		FT	720.4		707.7		706.0		
LEVELS (A)	03 AUG 83		FT						703.6	
ENDRIN	30 JUL 83	.04	UGL		ND					ND
ENDRIN	31 JUL 83	.04	UGL				ND	ND		
ENDRIN	03 AUG 83	.04	UGL	ND		ND			ND	
LINDANE	30 JUL 83	.08	UGL		ND					ND
LINDANE	31 JUL 83	.08	UGL				ND	ND		
LINDANE	03 AUG 83	.08	UGL	ND		ND			ND	
TOXAPHENE	30 JUL 83	1.6	UGL		ND					ND
TOXAPHENE	31 JUL 83	1.6	UGL				ND	ND		
TOXAPHENE	03 AUG 83	1.6	UGL	ND		ND			ND	
METHOXYCHLOR	30 JUL 83	1.6	UGL		ND					ND
METHOXYCHLOR	31 JUL 83	1.6	UGL				ND	ND		
METHOXYCHLOR	03 AUG 83	1.6	UGL	ND		ND			ND	
2,4-D	30 JUL 83	3.8	UGL		ND					ND
2,4-D	31 JUL 83	3.8	UGL				ND	ND		
2,4-D	03 AUG 83	3.8	UGL	ND		ND			ND	
SILVEX	30 JUL 83	.5	UGL		ND					ND
SILVEX	31 JUL 83	.5	UGL				ND	ND		
SILVEX	03 AUG 83	.5	UGL	ND		ND			ND	
PH(FIELD)	30 JUL 83		PH		6.1					6.2
PH(FIELD)	30 JUL 83		PH		6.1					6.3
PH(FIELD)	30 JUL 83		PH		6.1					6.2
PH(FIELD)	30 JUL 83		PH		6.1					6.2
PH(FIELD)	31 JUL 83		PH				6.4	6.3		
PH(FIELD)	31 JUL 83		PH				6.4	6.3		
PH(FIELD)	31 JUL 83		PH				6.5	6.4		
PH(FIELD)	31 JUL 83		PH				6.4	6.4		
PH(FIELD)	03 AUG 83		PH	6.6		5.7			6.1	
PH(FIELD)	03 AUG 83		PH	6.7		5.7			6.1	
PH(FIELD)	03 AUG 83		PH	6.7		5.7			6.1	
PH(FIELD)	03 AUG 83		PH	6.6		5.7			6.1	
SPEC COND	30 JUL 83	1.	UMC		1670.					990.
SPEC COND	30 JUL 83	1.	UMC		1680.					990.
SPEC COND	30 JUL 83	1.	UMC		1680.					1000.
SPEC COND	30 JUL 83	1.	UMC		1670.					1000.
SPEC COND	31 JUL 83	1.	UMC				985.	910.		
SPEC COND	31 JUL 83	1.	UMC				990.	920.		

RUN DATE: 24 OCT 83

INSTALLATION: CRANE NWSC, IN

SITE: PEST CONTROL STORAGE AREA

PARAMETER	SAMPLING DATE	DETECTION LIMIT	UNITS	SAMPLING SITES RESULTS 9-2		9-6
WATER LEVELS (A)	20 JUL 83		FT	717.4		
LEVELS (A)	30 JUL 83		FT	713.4		
LEVELS (A)	31 JUL 83		FT			717.4
ENDRIN	30 JUL 83	.04	UGL	ND		
ENDRIN	31 JUL 83	.04	UGL			ND
LINDANE	30 JUL 83	.08	UGL	ND		
LINDANE	31 JUL 83	.08	UGL			ND
TOXAPHENE	30 JUL 83	1.6	UGL	ND		
TOXAPHENE	31 JUL 83	1.6	UGL			ND
METHOXYCHLOR	30 JUL 83	1.6	UGL	ND		
METHOXYCHLOR	31 JUL 83	1.6	UGL			ND
2,4-D	30 JUL 83	3.8	UGL	ND		
2,4-D	31 JUL 83	3.8	UGL			ND
SILVEX	30 JUL 83	.5	UGL	ND		
SILVEX	31 JUL 83	.5	UGL			ND
PH(FIELD)	30 JUL 83		PH	6.2		
PH(FIELD)	30 JUL 83		PH	6.2		
PH(FIELD)	30 JUL 83		PH	6.2		
PH(FIELD)	30 JUL 83		PH	6.3		
SPEC COND	30 JUL 83	1.	UMC	530.		
SPEC COND	30 JUL 83	1.	UMC	520.		
SPEC COND	30 JUL 83	1.	UMC	530.		
SPEC COND	30 JUL 83	1.	UMC	530.		
SPEC COND	31 JUL 83	1.	UMC			800.
SPEC COND	31 JUL 83	1.	UMC			800.
SPEC COND	31 JUL 83	1.	UMC			800.
SPEC COND	31 JUL 83	1.	UMC			810.
TOC	30 JUL 83	1.0	MGL	21.0		
TOC	30 JUL 83	1.0	MGL	22.0		
TOC	30 JUL 83	1.0	MGL	22.0		
TOC	30 JUL 83	1.0	MGL	20.0		
TOC	31 JUL 83	1.0	MGL			31.0
TOC	31 JUL 83	1.0	MGL			31.0
TOC	31 JUL 83	1.0	MGL			31.0
TOC	31 JUL 83	1.0	MGL			31.0
TOX	30 JUL 83	.010	MGL	ND		
TOX	30 JUL 83	.010	MGL	.021	C	
TOX	30 JUL 83	.010	MGL	ND		
TOX	30 JUL 83	.010	MGL	ND		
TOX	31 JUL 83	.010	MGL			ND
TOX	31 JUL 83	.010	MGL			ND
TOX	31 JUL 83	.010	MGL			ND
TOX	31 JUL 83	.010	MGL			ND

TER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/86

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
1,1,1-TRICHLOROEHTANE	mg/L				0.00300		
1,1,1-TRICHLOROETHANE	mg/L	< 0.00100	0.03900	< 0.00100	0.00250		0.00400
		ND 0.00050	0.12000	0.00086	0.00110		
		< 0.00050	ND 0.00050	0.00060	< 0.01000		
		< 0.01000	0.27000	< 0.01000	< 0.00500		
		< 0.00500	0.26600	< 0.00500	0.01000		
		< 0.00500	0.23700	< 0.00500			
		< 0.00100	0.34000	< 0.00100			
		< 0.01000	0.17900	< 0.01000			
			0.09000				
1,1,2,2-TETRACHLOROETHANE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
1,1,2-TRICHLOROETHANE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
1,1-DICHLOROETHANE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	0.03300	< 0.00500			
			0.06700				
1,1-DICHLOROETHENE	mg/L	< 0.00100	0.04700	< 0.00100			< 0.00500
		< 0.00100		< 0.00500			
		< 0.00500					
1,2-DICHLOROETHANE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
		< 0.00500	< 0.01000	< 0.00500			
1,2-DICHLOROPROPANE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
2-CHLOROETHYL VINYL ETHER	mg/L	< 0.00100	< 0.00100	< 0.00100			
ACROLEIN	mg/L	< 0.10000	< 0.10000	< 0.10000			
ACRYLONITRILE	mg/L	< 0.10000	< 0.10000	< 0.10000			
BENZENE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
BROMODICHLOROMETHANE	mg/L	< 0.00500	< 0.01000	< 0.00500			< 0.00500
[illegible]ORM	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
BROMOMETHANE	mg/L	< 0.01000	< 0.02000	< 0.01000			< 0.01000
CARBON TETRACHLORIDE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
CHLORIDE	mg/L	1.00000	10.00000	28.00000	23.00000		7.00000
		< 1.00000	< 1.00000	< 1.00000	< 1.00000	< 1.00000	< 1.00000
		1.00000	12.00000	24.00000	19.00000	25.00000	5.00000
		1.00000	18.00000	45.00000	51.00000	78.00000	2.00000
CHLOROBENZENE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
CHLORODIBROMOMETHANE	mg/L	< 0.00100	< 0.00100	< 0.00100			

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
CHLOROETHANE	mg/L	< 0.01000	< 0.01000	< 0.01000			< 0.01000
		< 0.01000	< 0.02000	< 0.01000			
CHLOROFORM	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
CHLOROMETHANE	mg/L	< 0.01000	< 0.02000	< 0.01000			< 0.01000
CIS-1,2-DICHLOROETHENE	mg/L		0.04700				
			0.04700				
CIS-1,3-DICHLOROPROPENE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
CTANCE, Field	umho/cm	800.00000	810.00000	1100.00000	1160.00000	900.00000	1230.00000
CONDUCTANCE, Lab	umho/cm	460.00000	560.00000	690.00000	780.00000	570.00000	880.00000
		450.00000	560.00000	860.00000	560.00000	560.00000	820.00000
DIBROMOCHLOROMETHANE	mg/L	< 0.00500	< 0.01000	< 0.00500			< 0.00500
DICHLOROBROMOMETHANE	mg/L	< 0.00100	< 0.00100	< 0.00100			
DICHLORODIFLUOROMETHANE	mg/L	< 0.01000	< 0.01000	< 0.01000			
ETHYL BENZENE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
IRON	mg/L	0.08000	0.13000	0.54000	0.04000	2.82000	0.19000
		0.18000	0.11000	0.09000	< 0.05000	< 0.05000	0.29000
IRON, TOTAL	mg/L	< 0.01000	0.01000	0.20000	0.09000	13.00000	0.06000
		1.30000	0.06000	0.50000	< 0.02000	8.10000	0.82000

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01		09-03		09-04		09-05		09-06		09-09	
MANGANESE	mg/L	ND	0.00500		0.40000		0.90000		2.60000		1.10000		15.00000
			0.38000		0.41000		2.12000		1.98000		1.02000		17.10000
			0.04000		0.33000		1.60000		0.84000		0.94000		19.00000
		<	0.00500		0.18000		0.36000		4.20000		0.52000		3.21000
METHYL BROMIDE	mg/L	<	0.01000	<	0.01000	<	0.01000						
METHYL CHLORIDE	mg/L	<	0.01000	<	0.01000	<	0.01000						
METHYLENE CHLORIDE	mg/L	<	0.00100	<	0.00100	<	0.00100						0.00400
			0.00200		0.01100		0.00300						
ORGANIC BROMINE	mg/L	ND	0.00200	ND	0.00200		0.00700	ND	0.00200	ND	0.00200	ND	0.00200
		ND	0.00200	ND	0.00200	ND	0.00200	ND	0.02000	ND	0.00200	ND	0.00200
		ND	0.01000	ND	0.01000	ND	0.01000	ND	0.01000	ND	0.01000	ND	0.01000
		ND	0.01000	ND	0.01000	ND	0.01000	ND	0.01000	ND	0.01000	ND	0.01000
ORGANIC CARBON, TOTAL	mg/L	ND	2.00000		2.00000		3.00000	ND	2.00000	ND	2.00000	ND	2.00000
		<	2.00000		6.00000		5.00000		4.00000		2.00000		4.00000
			10.00000		5.60000		2.40000		3.00000		3.90000		4.40000
			3.10000		4.40000		5.70000		3.10000		1.00000		5.50000
			3.10000	ND	1.00000	ND	1.00000		1.00000	ND	1.00000	ND	1.00000
		ND	1.00000		3.00000	ND	1.00000	ND	1.00000		2.00000		10.00000
		<	1.00000		3.00000		2.00000		2.00000		5.00000		3.00000
			2.00000										
ORGANIC CHLORINE	mg/L		0.02000	ND	0.01000		0.24000	ND	0.00100	ND	0.01000		0.03000

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01		09-03		09-04		09-05		09-06		09-09	
		ND	0.01000		0.27000		0.04000		0.02000		0.02000		0.02000
		<	0.01000		0.45000	<	0.01000	<	0.01000	<	0.01000	<	0.01000
		<	0.01000		0.49000	<	0.01000		0.02000	<	0.01000	<	0.01000
ORGANIC IODINE	mg/L	ND	0.00200		0.19000		0.03900		0.01400		0.00800		0.05600
		ND	0.00200		0.01500		0.01500		0.02800		0.00400		0.02100
		<	0.01000		0.02000		0.01000		0.02000	<	0.01000		0.06000
		<	0.01000		0.04000		0.01000		0.03000	<	0.01000		0.08000
PCB 1242	mg/L	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020
		ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020				
		ND	0.00020	<	0.00020	<	0.00020	<	0.00020				
		<	0.00020										
PCB 1248	mg/L	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020
		ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020				
		ND	0.00020	<	0.00020	<	0.00020	<	0.00020				
		<	0.00020										
PCB 1254	mg/L	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020
		ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020				
		ND	0.00020	<	0.00020	<	0.00020	<	0.00020				
		<	0.00020										
PCB 1260	mg/L	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020
		ND	0.00020	ND	0.00020	ND	0.00020	ND	0.00020				

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
		ND 0.00020	< 0.00020	< 0.00020	< 0.00020		
		< 0.00020					
PCB, TOTAL	mg/L	ND 0.00020	ND 0.00020	ND 0.00020	ND 0.00020	ND 0.00020	ND 0.00020
		ND 0.00020	ND 0.00020	ND 0.00020	ND 0.00020		
		ND 0.00020	< 0.00020	< 0.00020	< 0.00020		
		< 0.00020	< 0.01000	< 0.01000	< 0.01000		
		< 0.01000	< 0.01000	< 0.01000	< 0.01000		
		< 0.01000	< 0.01000	< 0.01000	< 0.01000		
		< 0.01000	< 0.01000	< 0.01000	< 0.01000		
		< 0.01000					
PHENOLS	mg/L	ND 0.00400	ND 0.00400	ND 0.00400	ND 0.00400	ND 0.00400	ND 0.00400
		< 0.05000	< 0.05000	< 0.05000	< 0.05000	< 0.05000	< 0.05000
		ND 0.01000	0.01000	0.01000	< 0.01000	0.02000	< 0.01000
		< 0.05000	< 0.05000	< 0.05000	< 0.05000	< 0.05000	0.05000
SODIUM	mg/L	22.00000	28.00000	20.00000	25.00000	41.00000	55.00000
		16.00000	24.00000	14.00000	41.00000	42.00000	65.00000
		23.00000	27.00000	24.00000	32.00000	44.00000	54.00000
		30.00000	30.00000	28.00000	34.00000	42.00000	39.00000
SPECIFIC CONDUCTANCE	umho/cm	480.00000	570.00000	870.00000	830.00000	710.00000	970.00000
		530.00000	530.00000	790.00000	630.00000	780.00000	900.00000
		430.00000	480.00000	750.00000	570.00000	560.00000	800.00000

PARAMETER REPORT BY WELLNUMBER(S)

SI : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
		545.00000	540.00000	1045.00000	805.00000	690.00000	1090.00000
		5980.00000	6940.00000	5010.00000	8750.00000	5620.00000	1103.00000
		563.00000	611.00000	760.00000	621.00000		
		563.00000	611.00000	760.00000	621.00000		
SULFATE	mg/L	49.00000	80.00000	120.00000	140.00000	240.00000	250.00000
		130.00000	110.00000	100.00000	210.00000	190.00000	320.00000
		37.00000	53.00000	140.00000	160.00000	39.00000	36.00000
		26.00000	78.00000	52.00000	1450.00000	77.00000	2100.00000
TETRACHLOROETHENE	mg/L	, 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
TETRAHYDROFURAN	mg/L			0.00600			
TOLUENE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
TOTAL ORGANIC HALOGENS	mg/L	< 0.00500	0.55300	0.03100	0.02700	< 0.00500	0.04900
		< 0.00500	0.65500	0.02790	0.03300	< 0.00500	0.02500
		< 0.01000	0.67000	0.05000	0.05900	0.01800	0.02700
TRANS-1,2-DICHLOROETHENE	mg/L	, 0.00100	0.11400	0.01130			< 0.00500
		< 0.00500	0.82000	0.05300			
			0.52000	0.05000			

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
TRANS-1,3-DICHLOROPROPENE	mg/L	< 0.00100	< 0.00100	< 0.00100			< 0.00500
		< 0.00500	< 0.01000	< 0.00500			
TRICHLOROETHENE	mg/L	0.00100	0.05530	0.00290			< 0.00500
		< 0.00500	0.39000	0.01000			
			0.26000	0.01100			
TRICHLOROETHYLENE	mg/L	ND 0.00050	0.32000	0.01100	0.00890		
		< 0.00050	0.18000	0.00860	0.00480		
		< 0.01000	0.21000	0.01000	0.01000		
		0.00700	0.22000	0.01100	0.02700		
		0.00500	0.16800	0.01600	0.00800		
		0.01000	0.11000	0.02000	0.02000		
TRICHLOROFLUOROMETHANE	mg/L	, 0.00100	< 0.00100	< 0.00100			
VINYL CHLORIDE	mg/L	< 0.01000	< 0.01000	< 0.01000			< 0.01000
		< 0.01000	< 0.02000	< 0.01000			
VOLATILES SCAN	mg/L	ND 5.00000	SR 0.00000	SR 0.00000			ND 5.00000
XYLENE, TOTAL	mg/L	< 0.00500	< 0.01000	< 0.00500			< 0.00500
pH	S.U.	7.00000	6.50000	6.60000	6.60000	6.20000	6.40000
		6.90000	6.00000	6.70000	6.40000	5.70000	6.00000
		6.90000	8. 16.00000	6.81000	6.62000	7.05000	6.79000
		7.12000	6.51000	6.82000	6.08000		
		7.10000	6.50000	6.80000	6.10000		

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 02/06/84 TO 10/19/88

PARAMETERS	UNITS	09-01	09-03	09-04	09-05	09-06	09-09
pH, Field	S.U.	7.00000	6.40000	6.30000	6.60000	5.90000	6.20000
		7.50000	6.70000	6.80000	6.70000	6.10000	6.50000
		8.50000	6.70000	8.90000	8.10000	9.20000	8.40000

06/05/91

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/63 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
1,1,1-TRICHLOROETHANE	mg/L	0.00100	0.00100	0.00100			
			< 0.00100	0.00100			
1,1,2,2-TETRACHLOROETHANE	mg/L	0.00100	0.00100	0.00200			
			. 0.00100				
1,1,2-TRICHLOROETHANE	mg/L		< 0.00100				
1,1-DICHLOROETHANE	mg/L		< 0.00100				
1,1-DICHLOROETHENE	mg/L		< 0.00100				
1,2-DICHLOROETHANE	mg/L		< 0.00100				
1,2-DICHLOROPROPANE	mg/L		< 0.00100				
2,4-D	mg/L		ND 0.00380	ND 0.00380			
BROMOETHYL VINYL ETHER	mg/L		< 0.00100				
ACROLEIN	mg/L		< 0.10000				
ACRYLONITRILE	mg/L		< 0.10000				
BENZENE	mg/L		0.00200				
			< 0.00100				
BROMOFORM	mg/L		< 0.00100				
CARBON TETRACHLORIDE	mg/L		< 0.00100				
CHLORIDE	mg/L	8.00000	15.00000	19.00000	< 1.00000	1.00000	< 1.00000
		10.00000	18.00000	26.00000	53.00000	9.00000	6.00000
		< 1.00000	< 1.00000	1.00000	79.00000	11.00000	11.00000
		5.00000	14.00000	22.00000			

06/05/91

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/80 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
		58.00000	< 0.10000	45.00000			
CHLOROBENZENE	mg/L		< 0.00100				
CHLORODIBROMOMETHANE	mg/L		< 1.00000				
CHLOROETHANE	mg/L		< 0.01000				
CHLOROFORM	mg/L	0.00100	< 0.00100	0.01100			
CIS-1,3-DICHLOROPROPENE	mg/L		< 0.00100				
CONDUCTANCE, Field	umho/cm	830.00000	2000.00000	1150.00000	1200.00000	790.00000	1120.00000
CONDUCTANCE, Lab	umho/cm	435.00000	1350.00000	750.00000	750.00000	540.00000	770.00000
		440.00000	1100.00000	880.00000	720.00000	470.00000	730.00000
DICHLOROBROMOMETHANE	mg/L		< 0.00100				
DICHLORODIFLUOROMETHANE	mg/L		< 0.01000				
ENDRIN	mg/L		ND 0.00004	ND 0.00004			
ETHYL BENZENE	mg/L		< 0.00100				
IRON	mg/L	14.50000	ND 0.03000	15.00000	0.12000	0.08000	0.36000
		14.10000	0.23000	0.23000	< 0.05000	< 0.05000	2.50000
		21.30000	< 0.05000	0.08000			
		24.60000					
IRON, TOTAL	mg/L	10.00000	0.02000	0.05000	< 0.02000	< 0.02000	< 0.02000
		28.00000	0.16000	< 0.02000			
LINDANE	mg/L		ND 0.00008	ND 0.00008			
MANGANESE	mg/L	33.00000	0.67000	2.07000	1.05000	0.15000	2.16000

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
: 01/01/83 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
		24.00000	0.26000	2.03000	0.28000	0.12000	1.40000
		20.00000	0.21000	1.20000	0.08000	0.03000	0.57000
		25.80000	0.53000	1.23000			
		23.00000	0.21000	0.14000			
		16.40000	0.42000	< 0.00500			
METHOXYCHLOR	mg/L		ND 0.00160	ND 0.00160			
METHYL BROMIDE	mg/L		< 0.01000				
METHYL CHLORIDE	mg/L		< 0.01000				
METHYLENE CHLORIDE	mg/L	0.00200	0.00200	0.00200			
			< 0.00100				
TIC BROMINE	mg/L	ND 0.00200	ND 0.00200	ND 0.00200	ND 0.01000	ND 0.00200	ND 0.01000
		ND 0.00200	ND 0.00200	ND 0.00200	< 0.01000	ND 0.01000	ND 0.01000
		ND 0.01000	ND 0.01000	ND 0.01000		ND 0.01000	
		ND 0.01000	ND 0.01000	ND 0.01000			
ORGANIC CARBON, TOTAL	mg/L	20.00000	23.00000	46.00000	6.40000	4.00000	2.10000
		22.00000	23.00000	46.00000			
		21.00000	23.00000	47.00000			
		21.00000	22.00000	47.00000			
		4.00000	20.00000	44.00000	2.00000	2.70000	< 1.00000
			20.00000	45.00000			
			20.00000	44.00000			
			20.00000	45.00000			
		7.00000	4.00000	ND 2.00000	ND 1.00000	5.70000	2.00000
		8.20000	< 2.00000	3.00000	ND 1.00000	< 1.00000	2.00000

06/05/91

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/83 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
		5.10000	5.00000	7.60000	2.00000	1.00000	
		ND 1.00000	2.30000	1.90000		2.00000	
		5.00000	< 1.00000	2.00000			
		3.00000	11.00000	3.00000			
			4.00000	3.00000			
ORGANIC CHLORINE	mg/L	ND 0.01000	0.30000	0.13000	< 0.01000	0.02000	0.03000
		0.06000	ND 0.01000	0.03000	< 0.01000	< 0.01000	< 0.01000
		< 0.01000	0.01000	< 0.01000		< 0.01000	
		< 0.01000	< 0.01000	< 0.01000			
ORGANIC IODINE	mg/L	0.23000	0.02900	ND 0.00200	0.02000	0.02800	< 0.01000
		0.28000	0.02700	0.01200	0.02000	0.02000	< 0.01000
		0.06000	0.01000	0.02000		0.02000	
		0.01000	0.03000	0.03000			
PCB 1242	mg/L	ND 0.00020	ND 0.00020	ND 0.00020		ND 0.00020	
PCB 1248	mg/L	ND 0.00020	ND 0.00020	ND 0.00020		ND 0.00020	
PCB 1254	mg/L	ND 0.00020	ND 0.00020	ND 0.00020		ND 0.00020	
PCB 1260	mg/L	ND 0.00020	ND 0.00020	ND 0.00020		ND 0.00020	
PCB, TOTAL	mg/L	ND 0.00020	ND 0.00020	ND 0.00020		ND 0.00020	
PHENOLS	mg/L	ND 0.01000	ND 0.01000	ND 0.01000	< 0.05000	< 0.05000	< 0.05000
		ND 0.00400	ND 0.00400	0.00400	0.01000	0.01000	ND 0.01000
		< 0.05000	< 0.05000	< 0.05000	< 0.05000	< 0.05000	< 0.05000

06/05/91

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
: 01/01/83 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
		0.01000	0.01000	0.01000			
		< 0.05000	< 0.05000	< 0.05000			
SILVEX	mg/L		ND 0.00050	ND 0.00050			
SODIUM	mg/L	22.00000	99.00000	43.00000	34.00000	19.00000	39.00000
		14.00000	110.00000	27.00000	34.00000	25.00000	29.00000
		14.00000	100.00000	35.00000	40.00000	24.00000	25.00000
		14.00000	97.00000	49.00000			
		17.00000	15.00000	55.00000			
SPECIFIC CONDUCTANCE	umho/cm	540.00000	1340.00000	825.00000	460.00000	530.00000	680.00000
		540.00000	1340.00000	825.00000			
		540.00000	1345.00000	825.00000			
		538.00000	1340.00000	820.00000			
		490.00000	1670.00000	950.00000	660.00000	540.00000	900.00000
			1650.00000	985.00000			
			1680.00000	990.00000			
			1670.00000	980.00000			
		460.00000	1700.00000	690.00000	8230.00000	775.00000	7350.00000
		430.00000	1400.00000	760.00000		6370.00000	
		620.00000	1200.00000	720.00000			
		5980.00000	1670.00000	9220.00000			
			1176.00000	8040.00000			
SULFATE	mg/L	56.00000	730.00000	110.00000	34.00000	55.00000	230.00000
		54.00000	680.00000	81.00000	71.00000	38.00000	38.00000
		78.00000	610.00000	110.00000	64.00000	55.00000	1800.00000

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/83 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
		39.00000	570.00000	76.00000			
		23.00000	14.00000	68.00000			
TETRACHLOROETHENE	mg/L		< 0.00100	0.00500			
TOLUENE	mg/L		0.00300				
			< 0.00100				
TOTAL ORGANIC HALOGENS	mg/L	0.02300	0.01200	0.01300	0.01200	0.01400	< 0.00500
		0.02900	ND 0.01000	0.01900			
		0.03700	ND 0.01000	0.01500			
		0.04200	0.01100	0.01700			
		0.01900	D 0.02200	D 0.01600	0.00780	0.01310	< 0.00500
			ND 0.01000	D 0.01500			
			ND 0.01000	D 0.01900			
			ND 0.01000	D 0.01800			
		< 0.00500	0.00940	0.01900	0.01500	0.01700	< 0.01000
		< 0.01000	0.02010	0.02750			
			< 0.01000	0.04000			
TOXAPHENE	mg/L		ND 0.00160	ND 0.00160			
TRANS-1,2-DICHLOROETHENE	mg/L		< 0.00100	0.01100			
				0.00300			
TRANS-1,3-DICHLOROPROPENE	mg/L		< 0.00100				
TRICHLOROETHENE	mg/L		< 0.00100				
TRICHLOROETHYLENE	mg/L	0.00100	0.00100	0.00100			
				0.00700			
				0.00500			

06/05/91

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/83 TO 01/01/89

PARAMETERS	UNITS	09-02	09-07	09-08	09-10	09-11	09-12
TRICHLOROFLUOROMETHANE	mg/L	0.00100	0.00100	0.00100			
			< 0.00100				
VINYL CHLORIDE	mg/L		< 0.01000				
pH	S.U.	6.30000	6.30000	6.70000	6.70000	6.80000	7.10000
		6.10000	6.00000	7.51000	6.40000	6.30000	6.30000
		6.90000	6.50000		7 0.17000	6.87000	7.80000
pH, Field	S.U.	5.10000	6.10000	5.10000	8.80000	7.20000	9.80000
		5.90000	6.10000	6.00000			
		5.90000	6.10000	5.90000			
		5.90000	6.00000	6.10000			
		6.30000	6.40000	6.50000		6.60000	
		6.30000	6.30000	6.60000			
		6.30000	6.30000	6.50000			
		6.30000	6.30000	6.50000			
		6.40000	6.10000	6.40000			
			6.10000	6.50000			
			6.10000	6.40000			
			6.10000	6.40000			
		6.60000	6.40000	6.40000			
		7.90000	6.70000	7.00000			
			9.40000	8.90000			

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/83 TO 01/01/89

PARAMETERS	UNITS		09-13
CHLORIDE	mg/L		2.00000
			5.00000
			12.00000
CONDUCTANCE, Field	umho/cm		750.00000
CONDUCTANCE, Lab	umho/cm		570.00000
			580.00000
IRON	mg/L		0.02000
		<	0.05000
IRON, TOTAL	mg/L		0.13000
MANGANESE	mg/L		0.95000
			1.20000
			1.35000
ORGANIC BROMINE	mg/L	ND	0.00200
		ND	0.01000
		ND	0.01000
ORGANIC CARBON, TOTAL	mg/L		5.00000
			3.60000
			1.90000
		ND	1.00000
			3.00000
			4.00000

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/83 TO 01/01/89

PARAMETERS	UNITS		09-13
ORGANIC CHLORINE	mg/L		0.14000
		<	0.01000
		<	0.01000
ORGANIC IODINE	mg/L		0.03700
		<	0.01000
			0.02000
PCB 1242	mg/L	ND	0.00020
PCB 1248	mg/L	ND	0.00020
PCB 1254	mg/L	ND	0.00020
PCB 1260	mg/L	ND	0.00020
PCB, TOTAL	mg/L	ND	0.00020
[illegible]	mg/L	<	0.05000
		ND	0.01000
		<	0.05000
SODIUM	mg/L		25.00000
			29.00000
			28.00000
SPECIFIC CONDUCTANCE	umho/cm		480.00000
			650.00000
			750.00000
			8110.00000

PARAMETER REPORT BY WELLNUMBER(S)

SITE : 09 PEST CONTROL AREA
DATE : 01/01/83 TO 01/01/89

PARAMETERS	UNITS	09-13
SULFATE	mg/L	150.00000
		80.00000
		1450.00000
TOTAL ORGANIC HALOGENS	mg/L	< 0.00500
		< 0.00500
		< 0.01000
pH	S.U.	7.10000
		6.80000
		7.33000
pH, Field	S.U.	7.20000
		0.00000
		0.00000
		0.00000
		8.60000

APPENDIX E

PROPOSED GROUND-WATER ASSESSMENT PLAN FOR R-150 TANK STORAGE CLOSURE PEST CONTROL AREA

Presnell Garver Garver • A Joint Venture
ENGINEERS • PLANNERS • LANDSCAPE ARCHITECTS • ARCHITECTS

517 West Ormsby • Louisville, Kentucky 40203
502 • 637-2505

October 2, 1984

Division Engineer
U. S. Army Engineer Division, Huntsville
Attn: HNDED-PM/Stan Lee
106 Wynn Drive
Huntsville, Alabama 35807

Re: Closure Plan for the R-150
Tank Site, NWSC Crane
Crane, Indiana
Contract No. DACA87-84-C-0050

Gentlemen:

In compliance with paragraph 3.12 Appendix A, Annex B of the Scope of Work concerning closure of the R-150 site, the following attachments are submitted with this letter.

Attachment 1: Plan For The Closure of The R-150 Tank Site, NWSC Crane, By The Interim Status Standards of 40CFR 265.

Attachment 2: Synopsis Of Actions Taken By NWSC Crane To Close The R-150 Tank Site.

Closure of a "tank" under 40CFR 265 consists only of removing all hazardous wastes and hazardous waste residues from the tank, any discharge control equipment, and any discharge control structures. Attachment 2 suggests that the requirements of 40CFR 265 have been met and exceeded due to complete removal of the tank itself. Furthermore, all removed wastes, etc., appear to have been managed as hazardous wastes elsewhere.

Since the R-150 tank no longer exists, compliance with all of the closure requirements of 40CFR 265 would be "after the fact."

P.O. Box C-50 Eleventh & Battery • Little Rock, Arkansas • 501/376-3633
5725 Buford Highway, NE • Suite 116 • Atlanta, Georgia 30341 • 404/455-9375
No. 11 Kroger Executive Center • Norfolk, Virginia 23502 • 804/461-7090
Glen-Ed Professional Park • Edwardsville, Illinois 62025 • 618/656-4448

The provisions of this letter and attachments reflect an amendment to the existing NWSC Crane Center-Wide Closure Plan.

Sincerely,

PRESNELL GARVER GARVER

Jack Brashear

Jack Brashear, P.E.

JNB/lw
84-1480-000
Attachments
cc: CO, NavSeaSysCom
CO, NoDivNavFacEngCom/Wiese
CO, NWSC Crane/Andrews
DRCIS-A
DRCIS-RI-IC
DRSMC-ISE(R)
HSHB-ES/HSHB-EA

ATTACHMENT 1

PLAN FOR THE CLOSURE OF THE R-150 TANK SITE, NWSC CRANE, BY THE INTERIM STATUS STANDARDS OF 40CFR 265.

PLAN FOR THE CLOSURE OF THE R-150 TANK SITE, NWSC CRANE, BY THE INTERIM STATUS STANDARDS OF 40CFR 265.

CLOSURE.

[265.110]. Applicability.

(a) This closure plan pertains to the tank at Storage Lot R-150 on the premises of NWSC Crane.

(b) Post-closure requirements do not apply because the tank is not a disposal facility.

[265.111]. Closure Performance Standard.

(a) Closure of the tank will negate the need for further maintenance because the tank will be removed and transported to a RCRA permitted facility off-NWSC Crane for final management.

(b) Human health and the environment will be protected from the effects of the tank because the tank site will be decontaminated and will be certified "clean" by sampling and analysis.

[265.112]. Amendment of the Plan.

(a) NWSC Crane will keep this closure plan and all revisions on the facility until closure is completed and certified.

(1) The tank will be finally closed upon its removal. The term "partial closure" does not apply. The maximum extent which will be unclosed during the operating life of the tank is the tank only. In accordance with 40CFR 265.197, Closure of Tanks, all wastes and waste residues will be removed from the tank and appurtenances at the time of closure.

(2) The estimated maximum amount of wastes in the tank is 37,000 gallons.

(3) The tank and appurtenances will be removed. The tank is below ground; therefore, soil around the tank will be sampled and analyzed for the presence of hazardous waste constituents. Soil will be removed and managed as a hazardous waste, if necessary, to the extent that testing and analysis indicates that the site is "clean."

(4) It is estimated that closure will begin in 1983. Closure operations will be completed within 180 days from the onset.

(b) NWSC Crane will amend this plan within 60 days if any changes in the plan occur.

(c) NWSC Crane will submit this plan to the US EPA Regional Administrator at least 180 days prior to the onset of closure operations.

(d) NWSC Crane will modify this plan or submit a new plan if so directed by the Regional Administrator.

[265.113]. Time Allowed for Closure.

(a) NWSC Crane will remove the tank, all appurtenances, wastes, waste residues, and all other contaminated soils or materials within 90 days from the time the tank is last operated.

(b) Closure will be completed within 180 days after such operations begin.

[265.114]. Disposal or Decontamination of Equipment.

When closure is complete, the tank, all appurtenances, wastes, waste residues, and all other contaminated soils or materials will be transported off-NWSC Crane for management as hazardous waste. All equipment used during closure operations will be decontaminated by an appropriate method. Any decontamination solution or wastes will be containerized and managed as hazardous wastes.

[265.115]. Certificate of Closure.

NWSC Crane will submit to the Regional Administrator certification by both NWSC Crane and a registered professional engineer that the tank has been closed in accordance with the approved closure plan.

POST-CLOSURE.

[265.117]. Post-Closure Care and Use of the Property.

This paragraph and related paragraphs 265.118 through 265.120 do not apply to this closure plan because the tank is not a disposal facility.

[265.197]. Closure of Tanks.

The requirements of this paragraph are addressed in paragraph 265.114 of this closure plan.

ATTACHMENT 2

SYNOPSIS OF ACTIONS TAKEN BY NWSC CRANE TO CLOSE THE R-150 TANK SITE

The following synopsis represents information available concerning the actual closure of the R-150 tank site at NWSC Crane. These actions occurred between May 9, 1983, and January 25, 1984.

May 9 and 10, 1983. NWSC Crane shipped 27,245 gallons of PCB contaminated oil sludge/water from the R-150 tank via DPDO contractor.

August 31, 1983. Collected two soil samples adjacent to the R-150 tank. These two samples were collected around fill pipe and manhole, which should have been the most contaminated areas. These samples were sent to Chemical Waste Management laboratory for analysis.

September 23, 1983. NWSC Crane shipped 4,300 gallons of PCB liquid (greater than 550 PPM) contaminated with 1,1,1 trichloroethane (12 percent for incineration only) to Emelle, Alabama. (Reference Chemical Waste Management Company, Manifest No. 76346).

September 27, 1983. An itemized account follows:

(a) Began excavation to remove R-150 tank.
(b) Shipped 38 c.y. in two loads to Emelle, Alabama. (Manifest Nos. 76347 and 55161)
(c) Stockpiled remainder of R-150 excavation soil in the area adjacent to the tank site.
(d) Collected soil samples around the tank during excavation.

Due to sides of hole caving in, collected soil samples from 3 places.

September 28, 1983. An itemized account follows:

(a) Removed 1,000 gallons of PCB (greater than 500 PPM) contaminated oil (containing 1,1,1 trichloroethane). Shipped to Emelle, Alabama, for incineration.

(b) Replaced excavated material into the hole.

September 29, 1984. Shipped tank by lowboy semitrailer to Chemical Waste Management, Emelle Facility, Emelle, Alabama. Manifest No. 76348.

November 3, 1983. Sampled water in the hole at R-150 where the tank had been.

November 9, 1983. Received "ok" from Illinois EPA on disposal of soil. The Illinois EPA gave approval for disposal of the soil from around the tank at Chemical Waste Management Landfill CID located Calumet City, Illinois. This approval based on analytical results. Illinois EPA Waste Stream #831808.

December 19, 20, and 21, 1983. An itemized account follows:

(a) Pumped approximately 25,000 gallons of water out of hole and hauled to a NWSC Crane sanitary sewer.

(b) Began to remove contaminated dirt from the hole and placed into a bermed area adjacent to the hole.

(c) Approximately 25,000 gallons of water were hauled to a sanitary sewer.

December 21, 1983. Shipped five loads of contaminated soil. Total weight = 116.58 tons. (95 c.y.)

December 22, 1983. Shipped 13 loads of contaminated soil. Total weight = 236.65 tons. (246 c.y.)

December 23, 1983. Shipped two loads of contaminated soil. Total weight = 34.87 tons. (38 c.y.)

January 5, 1984. Shipped three loads of contaminated soil. Total weight = 50 tons. (63 c.y.)

January 6, 1984. Shipped two loads of contaminated soil. Total weight = 20.4 tons. (36 c.y.)

January 9, 1984. Shipped two loads of contaminated soil. Total weight = 43.62 tons. (40 c.y.)

January 25, 1984. Shipped one load of contaminated soil. Total weight = 7.8 tons. (5 c.y.)

Manifests to show "Waste Contaminated Soil -- Hazardous Waste Nos. F001, F002; Hazardous Waste Solids No. ORM-E."

The preceeding synopsis was composed from notes furnished by NWSC Crane.

Fill dirt was obtained on-site and used for fill where contaminated dirt has been excavated.

Visual inspection of soil around tank when excavating site on September 27, 1983, showed very little if any indication of contamination. Areas that showed some indication of contamination were two soil samples. It was felt by Crane and Chemical Waste Management representatives that worst area of contamination was around fill pipes and manhole. Samples were taken there for analysis.

DEPARTMENT OF THE NAVY
NAVAL WEAPONS SUPPORT CENTER
CRANE, INDIANA 47522-5000

5090/GWI.0
0924

APR 2 7 1989

Indiana Department of Environmental Management
Office of Solid and Hazardous Waste Management
Plan Review and Permit Section
ATTN: Mr. Tom Linson
105 South Meridian Street
Indianapolis, IN 46225

Gentlemen: R-150 TANK SITE CLOSURE PLAN: GROUND WATER ASSESSMENT PL

As requested in your correspondence dated January 9, 1989, Naval Weapons Support Center (NWSC) Crane is submitting a proposed Ground-Water Assessment Plan for R-150 Tank Site. This assessment plan was due in your office on April 10, 1989. On April 5, 1989, Mr. Jim Hunsicker in a telephone conversation with Ms. Debbie Dubenetzky requested a sixteen day extension on the aforementioned date which would make it now due April 26, 1989.

NWSC Crane requests that deficiencies or comments regarding the R-150 Ground-Water Assessment Plan be forwarded to Mr. Jim Hunsicker by June 1, 1989.

NWSC Crane point of contact is Mr. Jim Hunsicker, Code 0924, telephone 812-854-3114.

Sincerely,

[illegible] USN
[illegible]
Commanding Officer

Encl:
(1) R-150 Tank Storage Ground-Water Assessment Plan

Copy to:
Region V EPA (C. Witt)
Indiana Department of Environmental Management (T. Miller)
NORTHNAVFACENGCOM, Philadelphia (Code 14)

Proposed Ground-Water Assessment Plan
for R-150 Tank Storage Closure,
Pest Control Area

1. The Indiana Department of Environmental Management (IDEM) (reference letter of January 9, 1989 to James Hunsicker) requests an assessment plan to determine the rate and extent of the "plume" of contamination issuing from the vicinity of the tank excavation at the Pesticide Control Area, NWSC Crane. The project is identified as the "R-150 Tank Site Closure Plan" in earlier correspondence between NWSC Crane and IDEM. The tank was removed from its position on 27-28 September, 1983. The excavated contaminated soil was placed back into the excavation and removed for disposal in a secure landfill off-site in December of 1983. The tank was 11 ft wide by 35 ft long. The base of the tank was reportedly 15 ft deep. IDEM suggests using as indicators the compounds trichloroethylene (TCE) and trichloroethane. IDEM also requires that the source of the contamination "plume" be determined. Figures 1 and 2 show the locations of NWSC Crane and the Pest Control Area.

2. Figures 3 and 4 are contaminant concentration maps for TCE and trichloroethane, resp. for Apr. 19-20, 1988, the latest available water monitoring period. Figures 3A and 4A show concentrations of the compounds in each well for January, 1988 sampling. The concentration levels are contoured in Figures 5 through 8. WT1P through WT6P are wells emplaced by Hunt in summer of 1986 (Hunt's data is presented in Appendix 1 and include boring location maps, geologic cross sections and a water level contour map). Tabulations of TCE and trichloroethane and for all analyzed compounds and parameters are presented in Appendix 2. WT5P is near the center of the tank excavation. Well WT3P, located 40 ft south of the tank excavation, has the highest concentration of TCE and a relatively high concentration of trichloroethane among the monitoring wells. Well WT4P is also relatively high in concentration of the two compounds. Hunt's piezometric surface contour map (Appendix 1) shows a mounding in the tank excavation and a general gradient to the WNW. The mounding possibly has driven contaminants locally to the south and east toward wells WT3P and WT4P. Concentrations generally decrease to the west. Well WT6P, 182 ft to the east and up-gradient, is clean (no indicator compounds detected). Hunt's hydrogeologic cross sections and the well logs (Appendix 1) indicate that ground-water flow occurs in an approximately 1 ft thick coal bed. The piezometric surface is artesian near the excavation site.

3. Well 9-3-81, located approximately 400 ft SW of WT5P (Figures 3 and 4) also shows concentrations of the indicator compounds higher than most of the other wells. An approximate "plume" boundary around well 9-3-81 was determined from limited well data by Dunbar in 1984. There is some question concerning the source of the contamination in well 9-3-81. I.e. is the well near

another source or is there a hydrogeological connection between it and the tank excavation area ? Measured levels of the indicator compounds historically have been relatively high in the well, which indicates that the well probably samples a source other than that at the tank excavation site.

4. Additional wells should be installed to adequately define the contaminant "plume" or distribution, especially around the zone of high-concentration defined by wells WT3P and WT4P. Figure 9 presents suggested locations for six additional wells. Proposed wells 1-4 will provide information on the extent of contamination in the aquifer around WT3P. Well 5 will better define the geology and the degree of contamination toward well 9-3-81. Well 6 will confirm or refute the assumption that contamination does not extend up-gradient toward WT6P. All existing wells will also be monitored and sampled. Proposed wells 1-3 are approximately 50 ft and wells 4 and 5 approximately 100 ft from well WT3P. Well 6 is to be placed midway between WT4P and WT6P.

Do we need more cores?

5. All proposed wells should be cored and should extend 5 ft into the shale below the water-bearing coal bed and sandstone (the screened zone in existing wells WT1P-WT6P). The upper aquifer (sandstone and coal) should be cased and the casing grouted into the upper 1/2 ft of shale before the drill is advanced the required 5 ft into the shale, in case the shale is less than 5 ft thick.

6. A map will be prepared from monitoring data of all wells after the first sampling round to show contoured contaminant concentrations and "plume" geometry. Hydrogeologic cross sections will also be prepared.

7. A tentative schedule for beginning installation of these wells would be July 1, 1989.

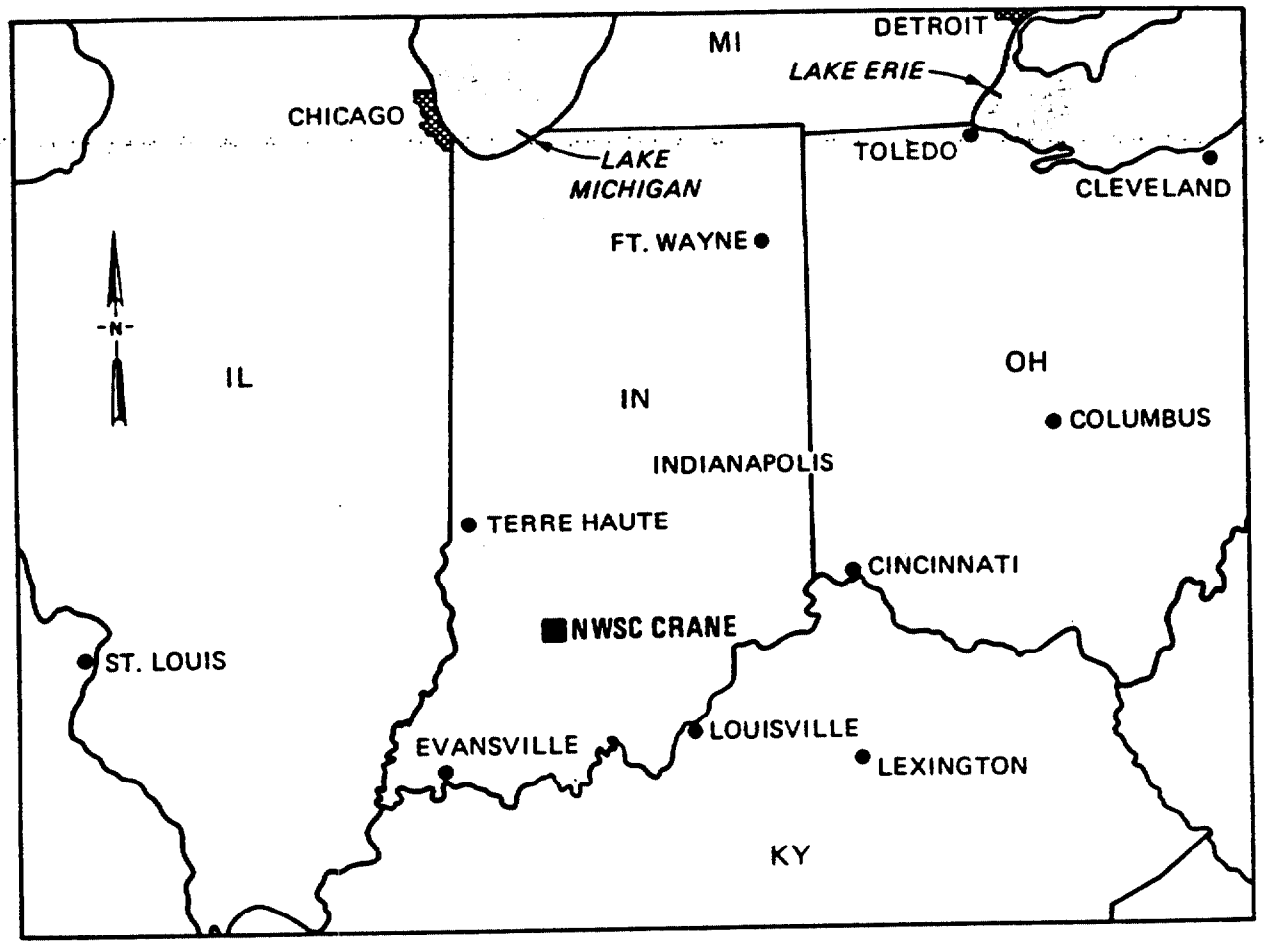


Figure 1. Location of Crane Naval Weapons Support Center.

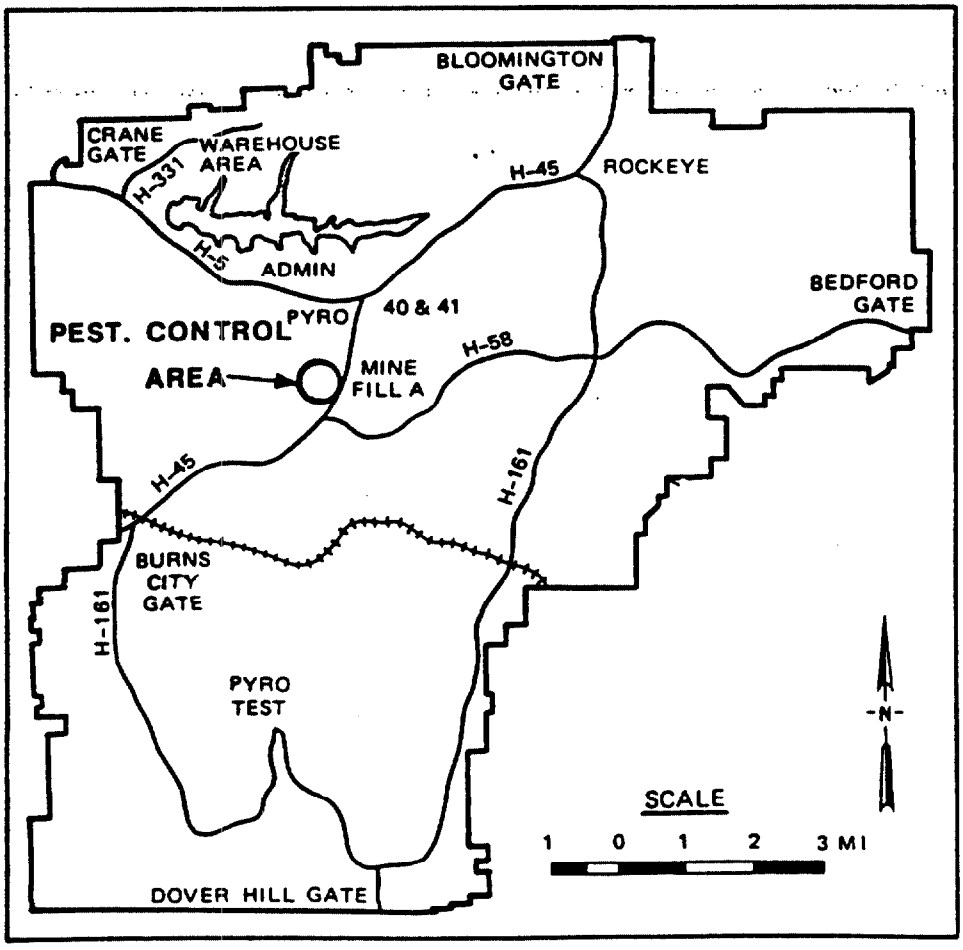


Figure 2. Location of Pest Control Area.

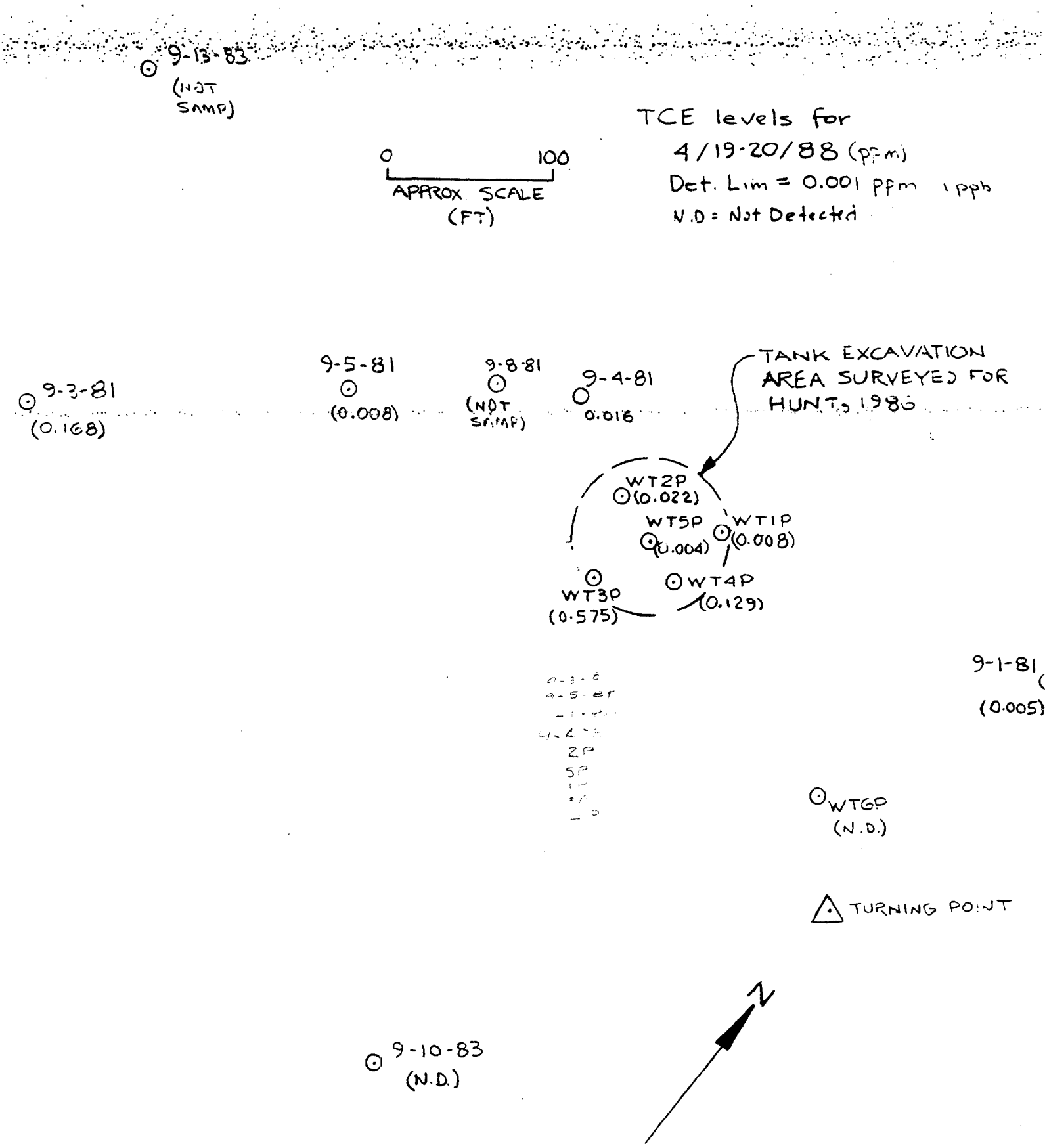


FIGURE 3. TCE levels in Pest Control Area wells for 4/19-20/88.

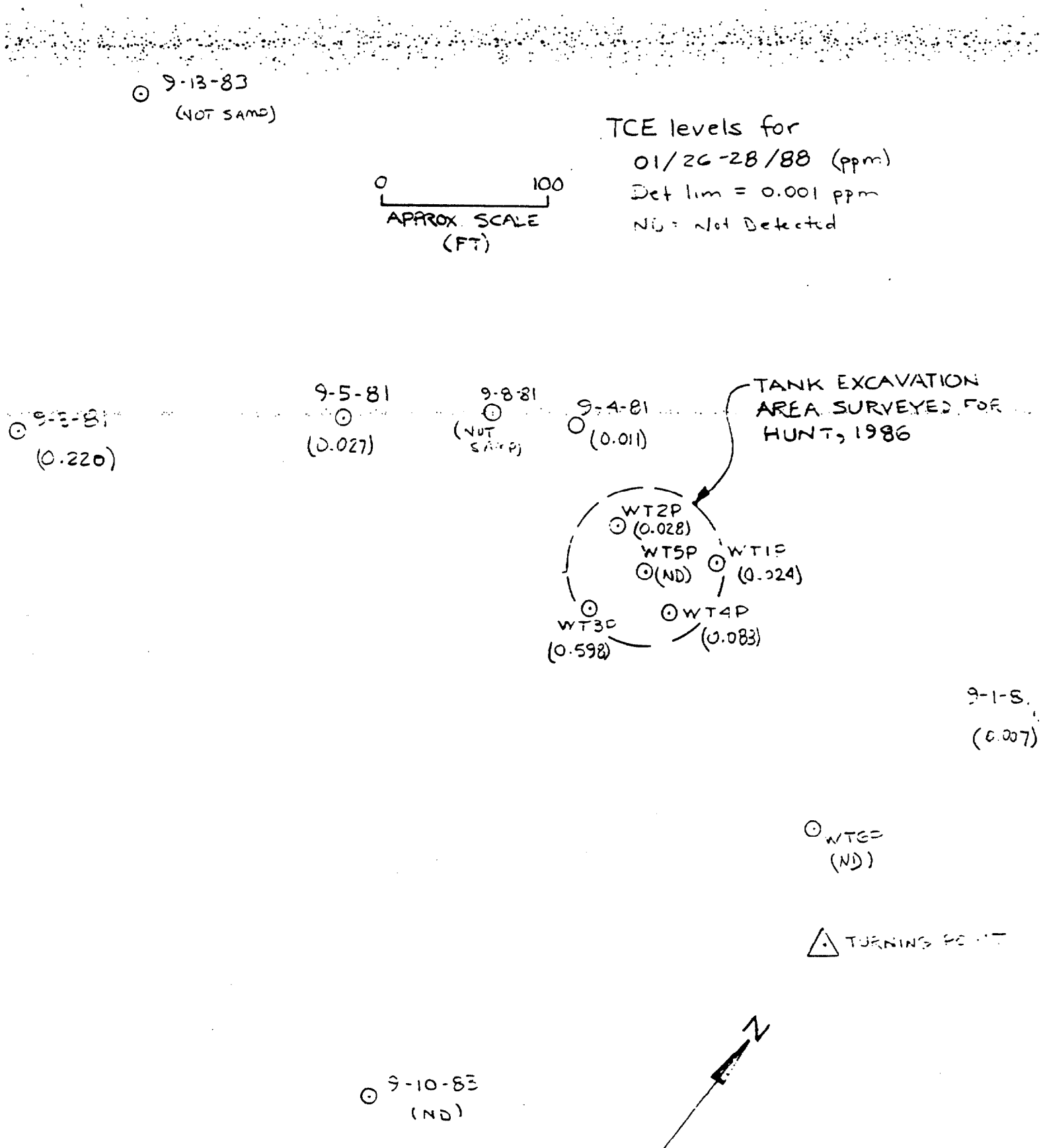


Figure 3A. TCE levels in Pest Control Area wells for 1/26-28/88

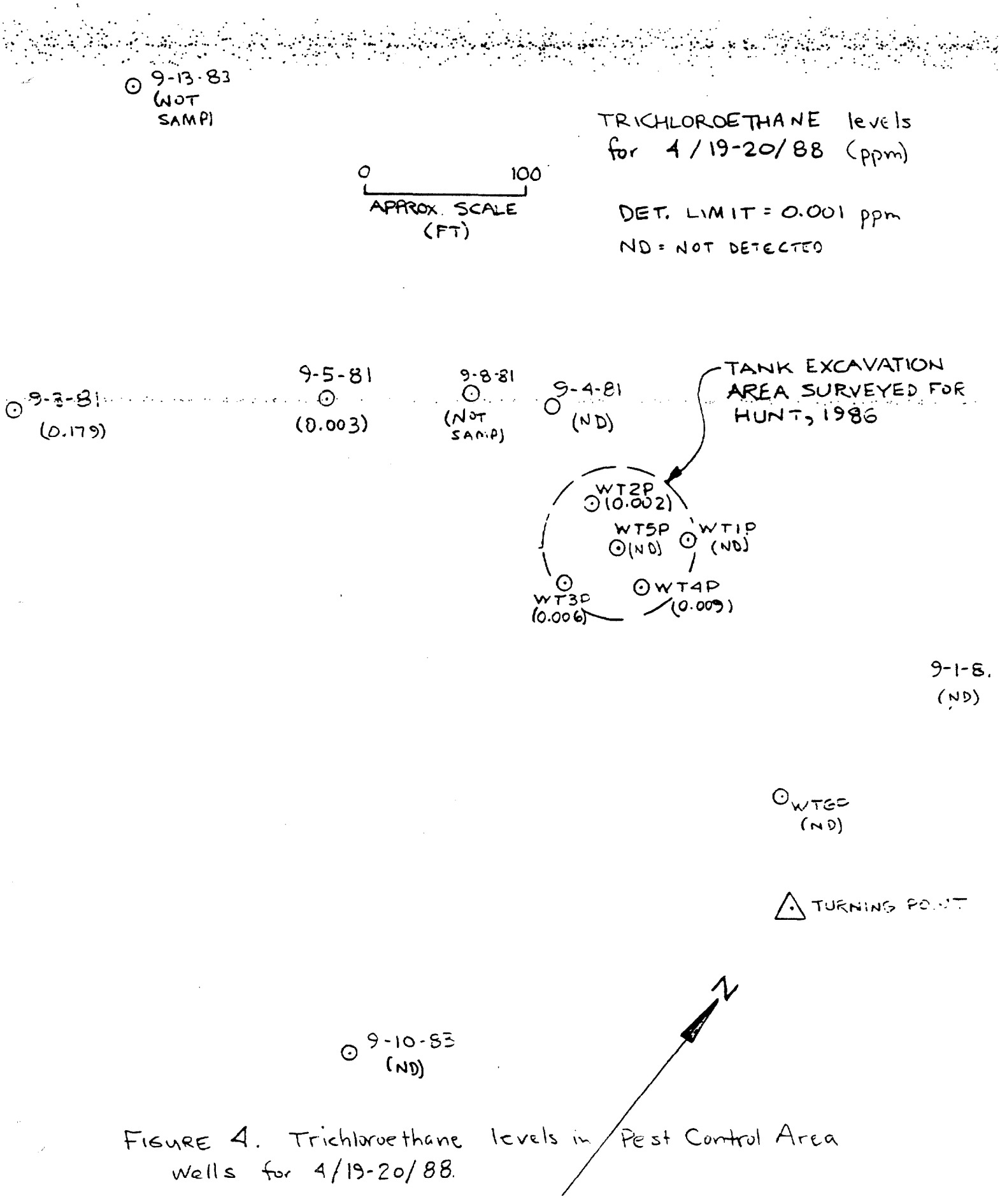


FIGURE 4. Trichloroethane levels in Pest Control Area wells for 4/19-20/88.

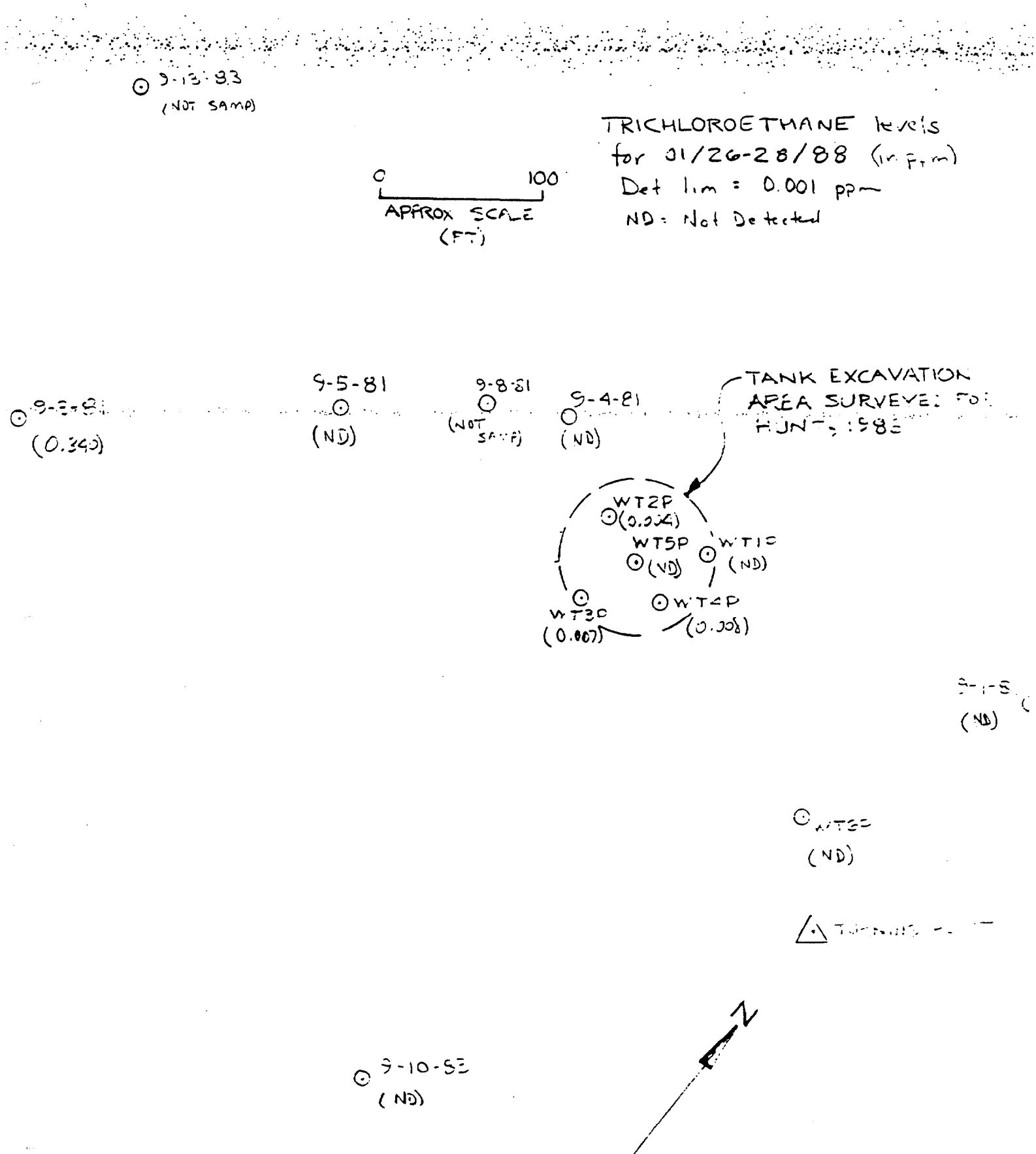
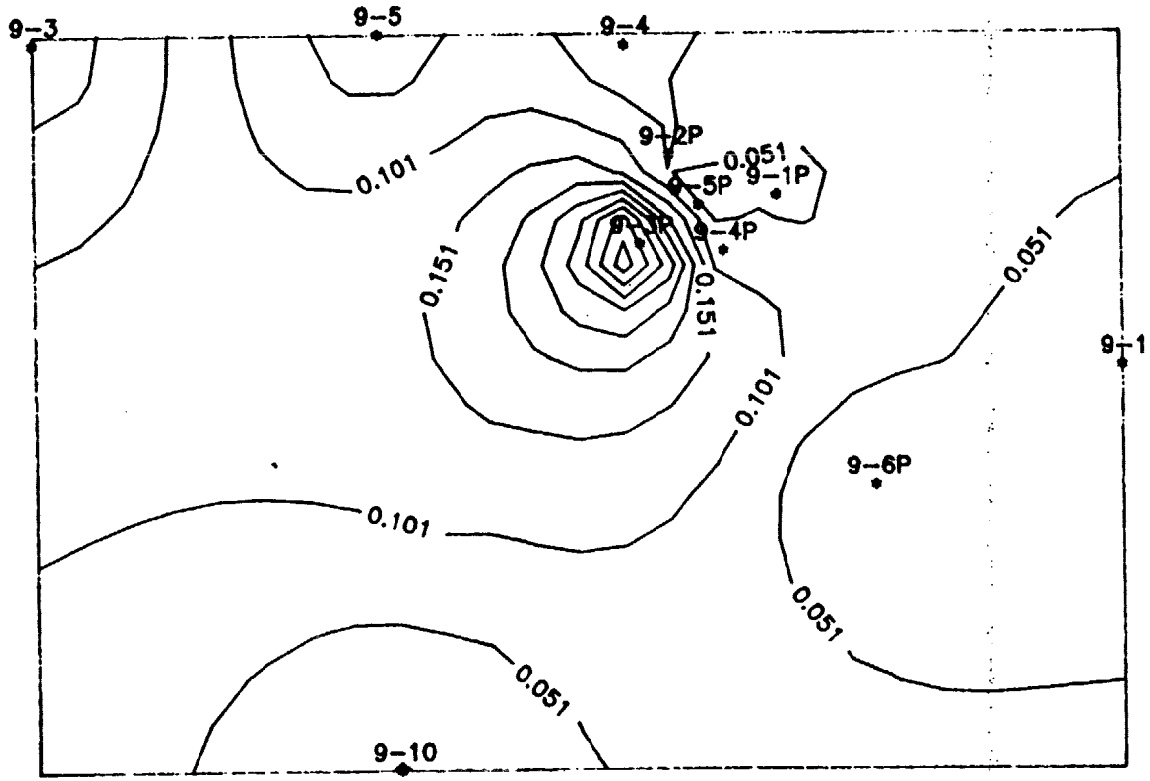


Figure 4A Trichloroethane levels in Pest Control Area wells for 1/26-29/88.

PEST CONTROL AREA, TCE LEVELS, JAN '88

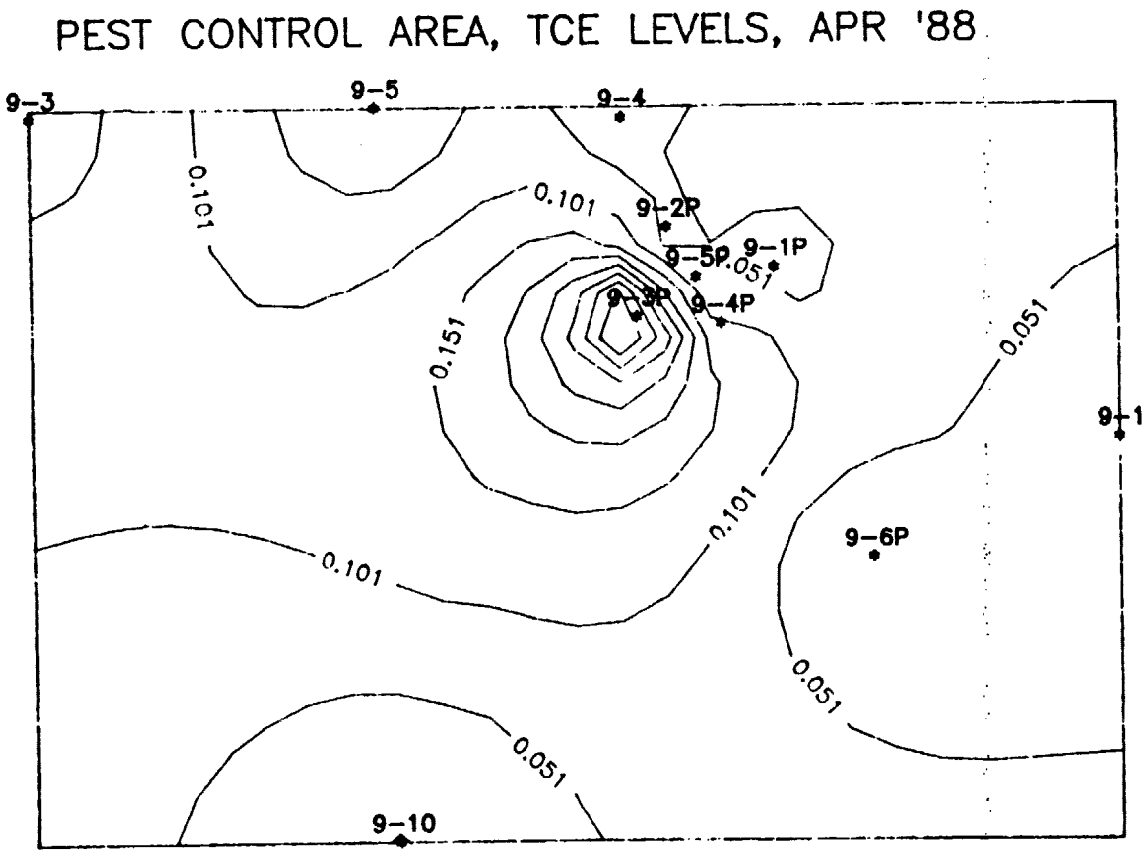


Contour Interval = 0.05 ppm
50 ppb

TCE levels (in ppm)

9-1	0.007
9-3	0.220
9-4	0.011
9-5	0.027
9-10	0
9-1P	0.024
9-2P	0.028
9-3P	0.598
9-4P	0.083
9-5P	0
9-6P	0

Figure 5. Contoured TCE levels for Jan 26-29, 1988. Pest Control Area (Inverse Distance Squared algorithm).



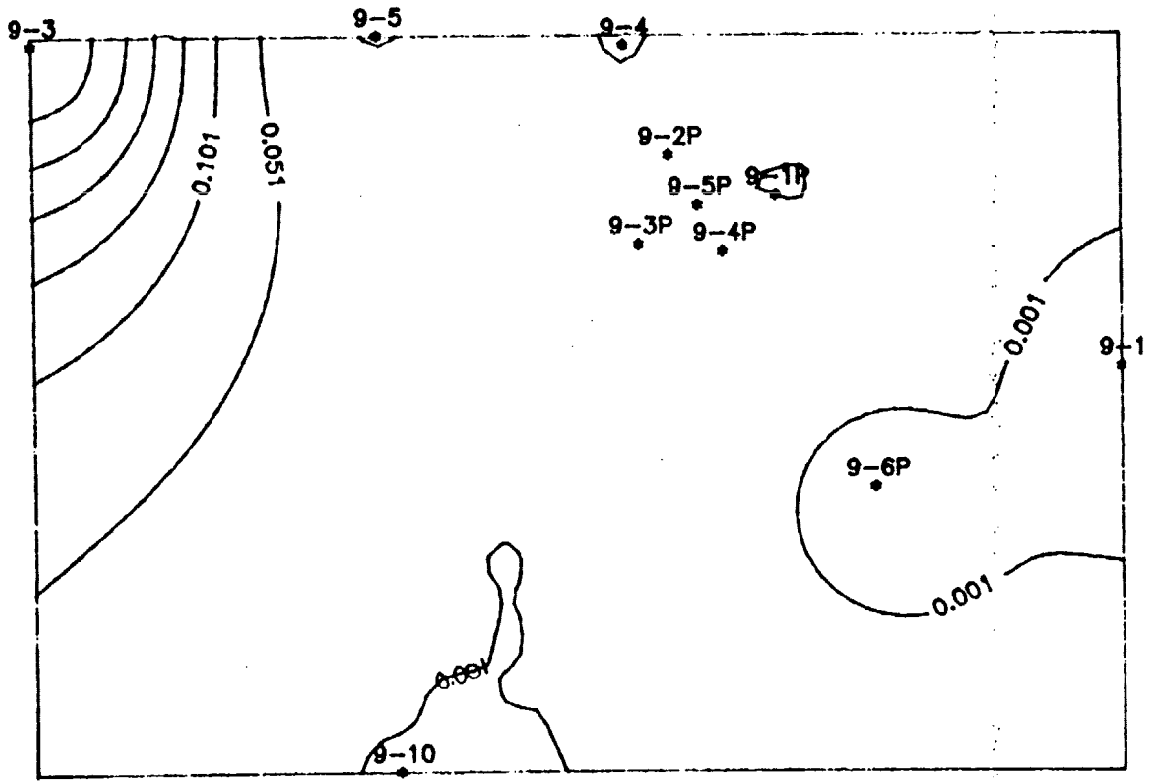
Contour Interval = 0.05 ppm

TCE levels (in ppm)

9-1	0.005
9-3	0.168
9-4	0.016
9-5	0.008
9-10	0
9-1P	0.008
9-2P	0.022
9-3P	0.575
9-4P	0.129
9-5P	0.004
9-6P	0

Figure 6. Contoured TCE levels for April 19-20, 1988 in Pest Control Area (Inverse Distance Squared algorithm)

PEST CONTROL AREA, TRICHLOROETHANE LVLS, 01/88



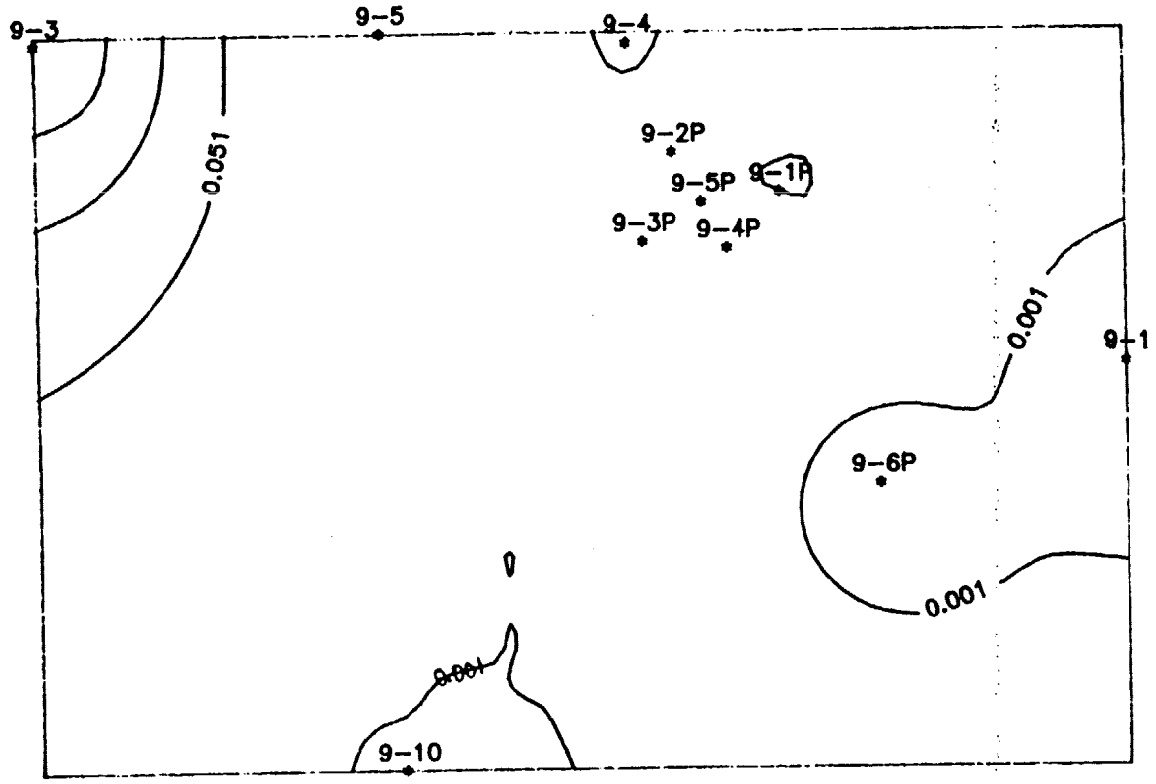
Contour Interval = 0.05 ppm

Trichloroethane levels:

9-1	0	ppm
9-3	0.340	
9-4	0	
9-5	0	
9-10	0	
9-1P	0	
9-2P	0.004	
9-3P	0.007	
9-4P	0.008	
9-5P	0	
9-6P	0	

Figure 7 Contoured 1,1,1-Trichloroethane levels, Pest Control Area (Inverse Distance Squared algorithm).

PEST CONTROL AREA, TRICHLOROETHANE LVLS, 04,88



Contour Interval = 0.05 ppm

Trichloroethane levels:

9-1	0	ppm
9-3	0.179	
9-4	0	
9-5	0.003	
9-10	0	
9-1P	0	
9-2P	0.002	
9-3P	0.006	
9-4P	0.009	
9-5P	0	
9-6P	0	

Figure 8. Contoured 1,1,1-Trichloroethane levels, Pest Control Area (Inverse Distance Squared Algorithm)

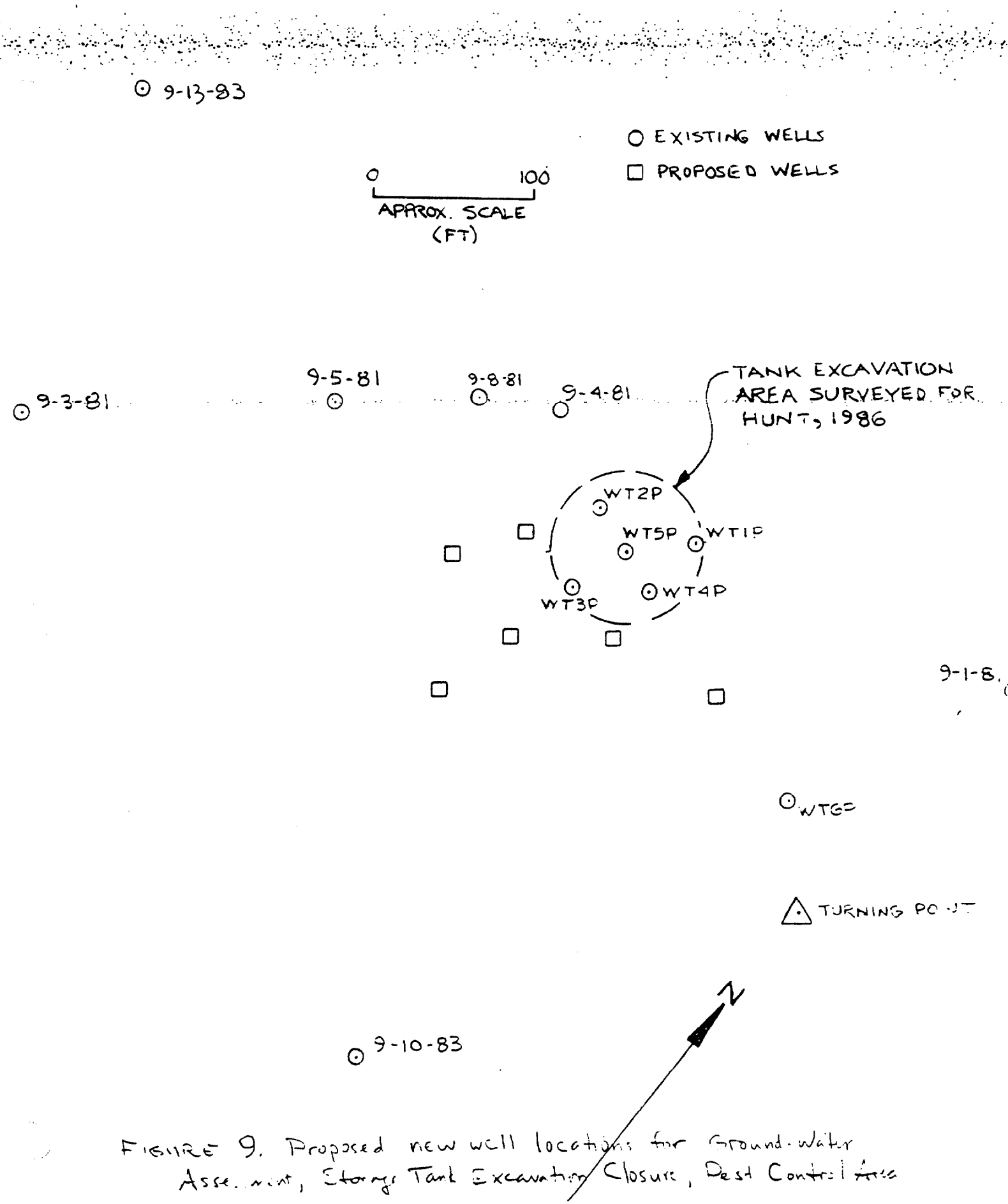
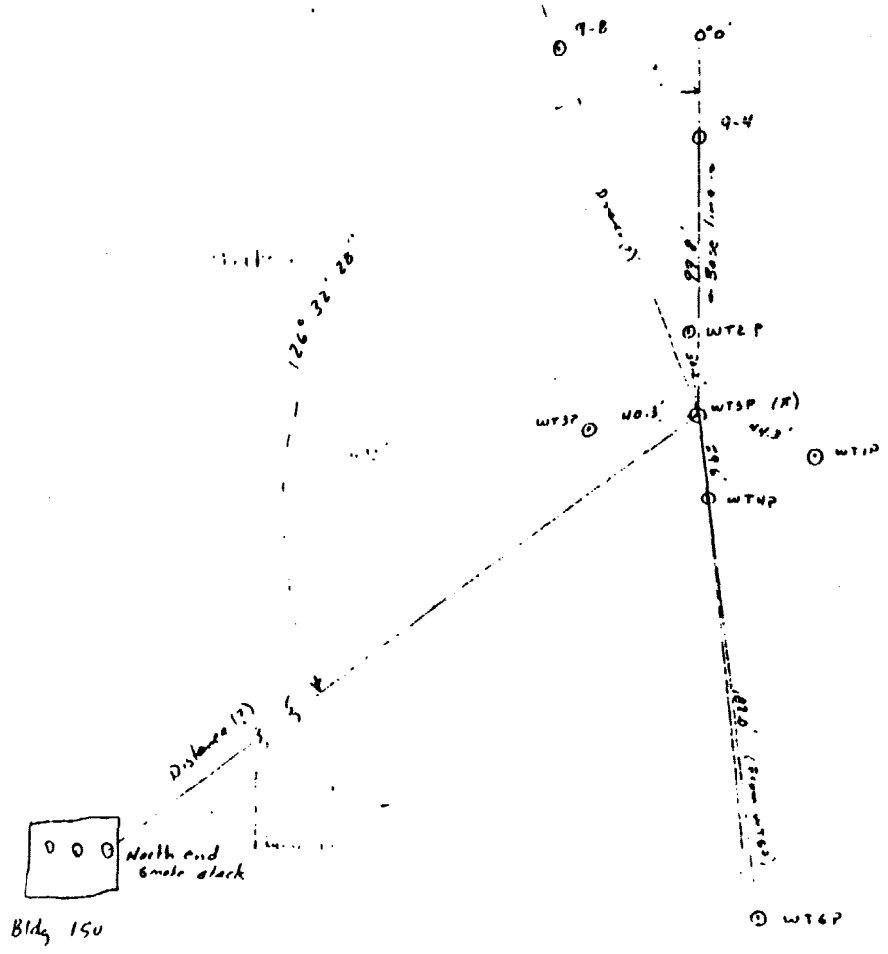


FIGURE 9. Proposed new well locations for Ground-Water Assessment, Storage Tank Excavation Closure, Pest Control Area

Appendix 1. Data from Hunt's Storage Tank Ground-Water Evaluation, Pest Control Area.



Scale 1" = 40'

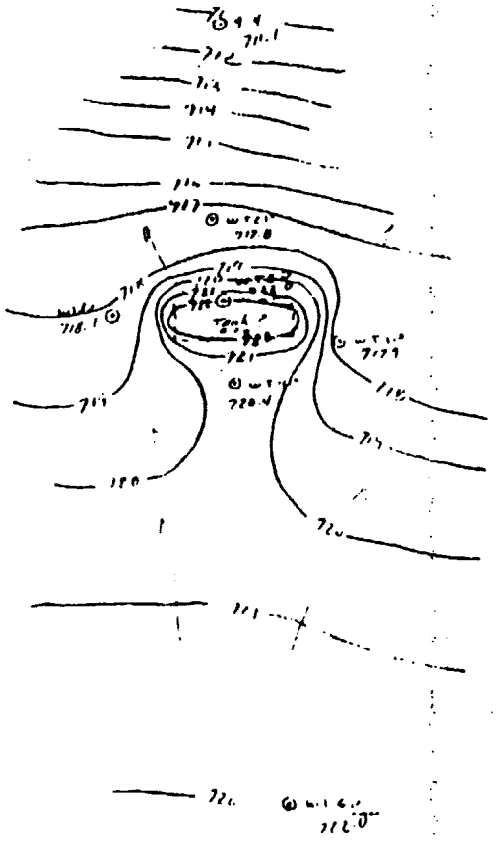
Angles turned with
(π) set up on WT5P
and 0°0' on line with WES-9-4

Well No	Angle	Distance (FT)	Riser EL	Ground EL (From Riser 9-4) (EL = 724.93)
WES-WT1P	126° 18'	44.3'	729.5	727.0
WT6P	175° 24'	182.0'	736.0	733.5
WT4P	173° 58'	29.6'	729.4	726.9
WT3P	261° 33'	40.3'	727.5	725.0
WT2P	353° 07'	30.2'	727.1	724.5
WT5P	—	—	727.9	725.4

Elev. Top of Riser
WES-9-4 (724.93')

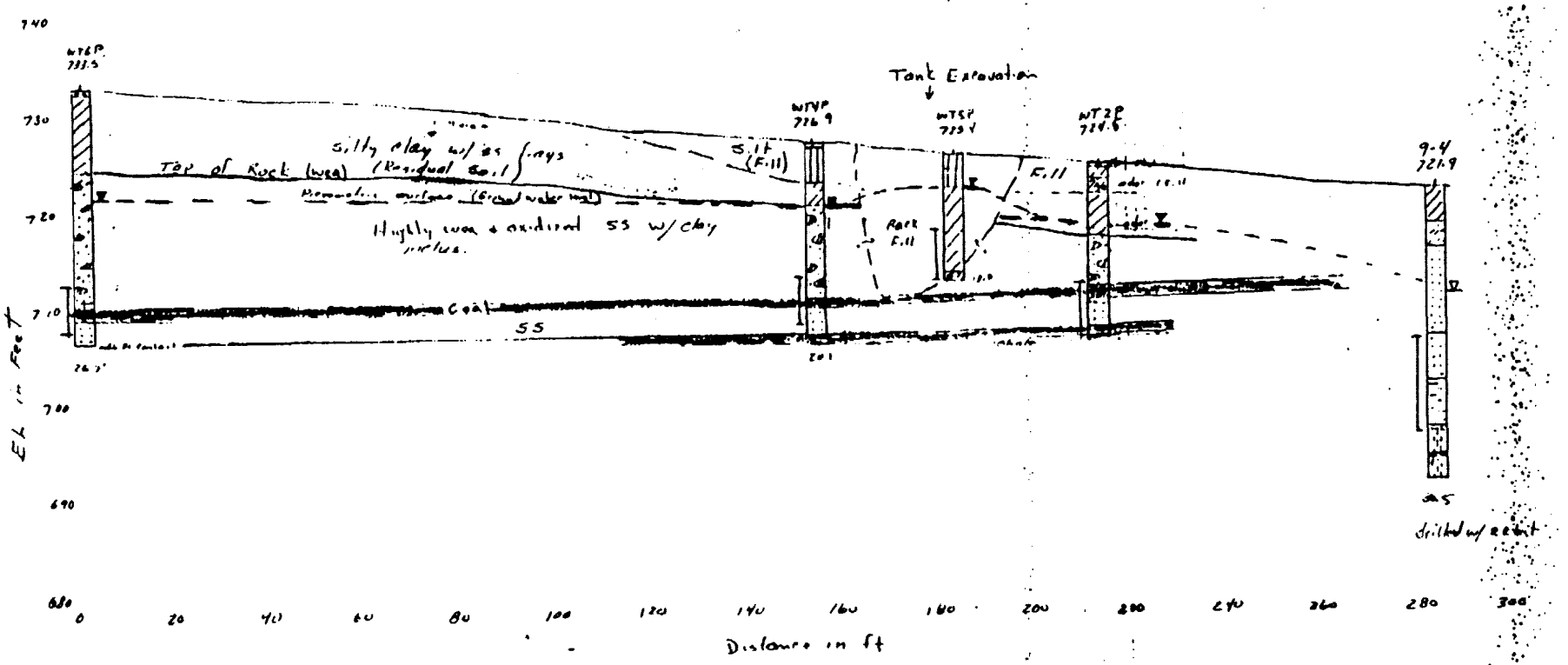
Preliminary Plan of Piezometers
at Peat Control Waste Storage Tank

Note: 77% of orig.

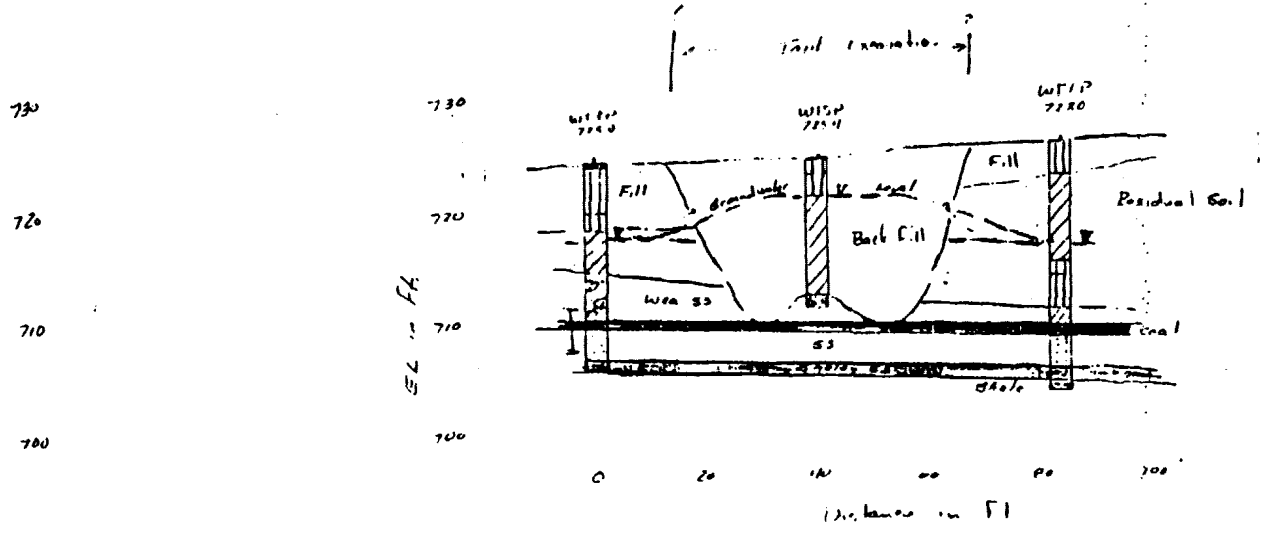


Pest Control-
waste storage Tank site
Groundwater Contours
Scale 1" = 90'

77% of ori


Tank Excavation
WT6P
WT1P
WT5P
WT2P
9-4
Silty clay w/ as lays
Top of Rock (wea)
Highly wea & oxidized SS w/ clay
Coal
SS
Silt (F.11)
F.11
Rock F.11
drilled w/ recent
EL in Feet
Distance in ft

77% of Ori


Fill
Back Fill
Residual Coal
Coal
730
720
710
700
0
20
40
60
80
100

DRILLING LOG	DIVISION US Navy	INSTALLATION Crane In	SHEET 1 OF 3 SHEETS

1. PROJECT: NWSC Groundwater study
2. LOCATION (Coordinates or Station): Site 9 Post Control-Waste Storage Tank
3. DRILLING AGENCY: WES
4. HOLE NO. (As shown on drawing title and file number): WES-9-WT1P-86
5. NAME OF DRILLER: Dan Taylor
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 16.5
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 22.2'
10. SIZE AND TYPE OF BIT: 5 1/2
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED ____ UNDISTURBED ____
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED 7/18/86 COMPLETED 7/19/86
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Geologist Richard W. Hunt

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Silt (ML), l-d Tan, v firm, sl. moist, occ Ls frags (Fill)		Jar #1	(0.0 to 9.1) Advancing well and sampling with a 5" Failing Auger. The equipment used for drilling was steam cleaned prior to use.
	1					
	2					
	3		(3.0-10.6') Silty Clay clayey silt, l Tan-Br, v firm, sl. moist, becomes sdy w/depth rootlets, occ. wea ss frags, (Residual soil) (ML-CL)			
	4				Jar #2	
	5					
	6					
	7					
	8					
	9				Jar #3	(9.1 to 10.6') Sampled w/o 2" dia split spoon drive tube
	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG	DIVISION	INSTALLATION	SHEET 2 OF 3 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number) WES-9-WTIP-86	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE: STARTED / COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		ML-CL (cont)		Jar #3 (Cont.)	
	11		Silt (ML), lBr, mass, v firm, sli moist-dry			(10.6 to 15.4) Advancing well and sampling w/5" dia. folding auger.
	12		Silt (ML), lBr, w/ vf sand pts + thin lens lin stn along bd, v firm, sli moist-dry			
	13					
	14					
	15		Silty clay (CL), yBr, sandy, w/occ ss frags v firm, sli moist			
	16				Jar #4	(15.4 to 16.7) - 2" dia split spoon drive tube
	17	+ + + + + + + + + +	Coal, blk, blocky, brittle (water zone)	17.5'		(16.7-17.5') 5" auger Refusal at 17.5'
	18		Sandstone, lbr Gr, vf grained, mass, hard, sli friable, abundant carbonized plant inclus, that give an effect to the core like blk rootlets extending downward from the overlying coal bed.			Set up to drill w/water - no sur casing. Attempted to sample w/pitcher tube, however rk to hard for penetration. Changed to 4x5½" diamond core bbl + cored from 17.5 to 22.2'
	19	s		4.7 / 4.7 100%	(Run) Rec	
	20					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO

Hole No.

DRILLING LOG	DIVISION US Navy	INSTALLATION Crane In	SHEET 3 OF 3 SHEETS

1. PROJECT: NWSC Ground Water Study
2. LOCATION (Coordinates or Station): Site 9 Pest Control - Waste Storage Tank
3. DRILLING AGENCY: WES
4. HOLE NO. (As shown on drawing title and file number): WES-WTIP-86
5. NAME OF DRILLER:
6. DIRECTION OF HOLE: ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN:
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE:
10. SIZE AND TYPE OF BIT:
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED:
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED: COMPLETED:
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR:

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20	5	SS (Cont.)		Jar # 5	
	21		Sandstone, Shaley, lGr, vf, hd, sl. friable, occ irreg vugs ½" to 1" size that are open or filled w/hd B- Claystone nodules			Set well screen between 16.2 & 21.2' (See well drawing)
	22		Shale, m-dGr, sdy, thbd, hard			
			Bottom Depth:- 22.2'			

DRILLING LOG	DIVISION	INSTALLATION	SHEET OF SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			WES-WTIP-86			Piezometer plan
			2.5' (Approx El - 729.5') Riser Pipe			
			0.0' - Ground surface			
			Grout mixture			Note: PVC Pipe to a depth of 6.2'. Teflon pipe below 6.2'
			water level - 11.6' 8/14/86 (From Top Riser)			Set well screen on 7/18/86. water level 7/29/86 16.29' (From Top Riser) Developed well 7/30/86
			12.2'			
			Bentonite pellets			
			14.2'			
			Filter Gravel (Pea size)			The procedure for developing the well included blowing out the original drilling water with filtered air, followed by surgeing w/a stainless steel surge block. The procedure was repeated several times until the water blown from the well was clear. The development time took approx 2 hours. The equipment used was steam cleaned prior to use.
			16.2'			
			Well Screen			
			21.2'			
			Trap			
			22.2'			

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PROJECT | HOLE NO.

DRILLING LOG	DIVISION US Navy	INSTALLATION Crane In	SHEET OF SHEETS
1. PROJECT NWSC Groundwater study		10. SIZE AND TYPE OF BIT 5 1/2" hole	
2. LOCATION (Coordinates or Station) Site 9 - Pest Control - West Storage Tank		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
3. DRILLING AGENCY WES		12. MANUFACTURER'S DESIGNATION OF DRILL Failing 1500	
4. HOLE NO. (As shown on drawing title and file number)	WES-WT 2P-86	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED / UNDISTURBED
5. NAME OF DRILLER Dan Taylor		14. TOTAL NUMBER CORE BOXES	
		15. ELEVATION GROUND WATER	
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.		16. DATE HOLE	STARTED 7/23/86 / COMPLETED 7/23/86
7. THICKNESS OF OVERBURDEN 7.5		17. ELEVATION TOP OF HOLE	
8. DEPTH DRILLED INTO ROCK		18. TOTAL CORE RECOVERY FOR BORING %	
9. TOTAL DEPTH OF HOLE 18.4		19. SIGNATURE OF INSPECTOR Geologist Richard W. Hunt	

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Parking lot surface rk. (Crushed Ls)			Drilled to 3.0' w/ 5" Folding Auger
	1		(CL) silty-sd. clay, w/small ak frags. Br-yBr sl. moist-dry, v firm th bd? w/ alter v/sd pts.		Jar #1	The equipment was steam cleaned prior to drilling operations
	2		(CL), silty clay with num. angular Ls frags, olive Gr, v moist, soft, definite strong chem odor. (Fill material)			
	3		Base of fill (~3.0')		Jar #2	
	4		(CL-SC) silty-sdy clay, moss, yBr w/ minor mGr mottling, occ dk Red rounded iron mineral concretions, sl. moist-moist, firm-v firm, slight chem odor? (Residual Soil)			3.0 to 5.4 3" dia Shelby Push Tube. Cleaned hole to 5.4' w/ 5" Auger
	5				Jar #3	
	6					5.4 - 7.8 3" Shelby Tube, cleaned hole w/ 5" Auger
	7		Soil zone w/dk Gr mottling - strong chemical odor. occ small wea SS frags tentat bot.			Reamed Hole w/ 6" Auger and set 6" steel casing to 6.2. Seated casing dry & Seated hole at Top.
	8		Top highly wea SS. 7.5 Sandstone, yBr-rBr, vf-f, highly wea + oxid, mod hd, friable, num. largely flattened soft to firm clay inclus + occ sub-angular clay + th bd clayshale inclus (Rip-up clast?). The clay inclus range from <1" to >4" in size, (Cont on next sh)	Run 1		3" Shelby Tube Refusal. Started Coring at 8.0' w/ 4 x 5 1/2 dia core bbl, using clean water as drilling fluid.
	9			4.8 / 5.2' (.04')	(Run)	
	10				Jar #3	

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PROJECT | HOLE NO.

DRILLING LOG

1. PROJECT	
2. LOCATION (Coordinates or Station)	
3. DRILLING AGENCY	
4. HOLE NO. (As shown on drawing title and file number)	WES4-WT 2P-86
5. NAME OF DRILLER	
6. DIRECTION OF HOLE ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	
7. THICKNESS OF OVERBURDEN	
8. DEPTH DRILLED INTO ROCK	
9. TOTAL DEPTH OF HOLE	

		OF SHEETS
10. SIZE AND TYPE OF BIT		
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
12. MANUFACTURER'S DESIGNATION OF DRILL		
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN	DISTURBED	UNDISTURBED
14. TOTAL NUMBER CORE BOXES		
15. ELEVATION GROUND WATER		
16. DATE HOLE	STARTED	COMPLETED
17. ELEVATION TOP OF HOLE		
18. TOTAL CORE RECOVERY FOR BORING		%
19. SIGNATURE OF INSPECTOR		

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		are lim incrusted and are isolated within the ss matrix at random (produces a conglomeratic appearance). The clay inclus represent from 30 to 50% of the rk mass vol.	Run 1 (cont.)		
	11					
	12					
			Base of zone			
	13		Coal Blk, hard, blocky, brittle. (water zone)	13.2 Run 2		
	14					
	15		Sandstone, lbr Gr, vf, mass, hard, sli friable, abundant carbonized plant inclus that give an effect to the core like Blk rootlets extending downward from the overlying Coal bed. 80° Jt is 1/8" open at top, lim stained; becomes tight + fades out w/depth	4.4 / 5.2 (0.8)		
	16					
	17		SS shaley, Gr, vf, hd, sli friable, occ vugs 1/2 to 1' size that are either open or filled w/Br hd clst nodules.			Set well screen between 12.4 + 17.4 ft. (see well drawing for details)
	18		Shale, sdy, m-d Gr, thbd, hd			
			Bot Depth - 18.4 ft.			

PROJECT | HOLE NO.

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

(TRANSLUCENT)

2

DRILLING LOG

DIVISION

OF SHEETS

1. PROJECT
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number)
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			WES-WTZP-86			Piezometer Plan
			2.6' (Approx. EL - 727.1')			
			0.0' Ground surface			PVC Pipe to a depth of 7.4'
						Teflon Pipe below 2.4'
						Set well screen on 7/23/86
			Grout mixture			
						Water level on 7/29/86 - 9.54' (From Top Riser)
			water level - 9.3' 8/14/86 (From top Riser)			Developed well on 7/30/86
						The procedure for developing the well is shown on the plan for WES-WTIP-86.
			8.4'			
			Bentonite Pellets			
			10.4'			
			Filter Gravel (Pea size)			The equipment was steam cleaned prior to use.
			12.4'			
			well screen			
			17.4'			
			Trap			
			18.4'			

PROJECT | HOLE NO

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE.

(TRANSLUCENT)

DRILLING LOG	DIVISION US Navy	INSTALLATION Crane In	SHEET 1 OF 2 SHEETS

1. PROJECT: NWSC Groundwater Study
2. LOCATION (Coordinates or Station): Site 9 - Pest Control - Waste Storage Tank
3. DRILLING AGENCY: WES
4. HOLE NO. (As shown on drawing title and file number): WES-WT3P-86
5. NAME OF DRILLER: Dan Taylor
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN: 9.9'
8. DEPTH DRILLED INTO ROCK:
9. TOTAL DEPTH OF HOLE: 18.7'
10. SIZE AND TYPE OF BIT: 5½"
11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
12. MANUFACTURER'S DESIGNATION OF DRILL:
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED: UNDISTURBED:
14. TOTAL NUMBER CORE BOXES:
15. ELEVATION GROUND WATER:
16. DATE HOLE: STARTED 7/25/86 COMPLETED 7/25/86
17. ELEVATION TOP OF HOLE:
18. TOTAL CORE RECOVERY FOR BORING: %
19. SIGNATURE OF INSPECTOR: Geologist Richard W. Hunt

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		LS Rk (Parking lot)			0.0 - 7.7' Drilled w/a 5" folding auger. Took some spl's w/a 3" push tube.
	1		Silt (ML) Gr, w/LS frags, sli petro odor. (Fill)		Jar spl #1	
	2					Steam cleaned equipment prior to drilling well
	3					
	4		Silt (ML), dGr, clayey, moss, soft, sli moist-moist, sli petro odor			
	5		clayey Silt (ML), olive Gr, soft-v soft, v moist, occ small Fe incrusted nodules.		Jar spl #2	
	6		silty clay - clayey silt (CL-ML) yBr w/Gr mottling, firm-v firm, sli moist occ highly wea + oxidized SS frags			Reamed hole w/8" folding auger + set 7.7' of 6" o.d. steel casing (Temporary)
	7					
	8			Run 1		Started Coring w/a 4 x 5½" core bbl at 7.7'. Drilling w/ clear water.
	9			4.2 (Rec) / 5.1 (Run) = 0.9 (core loss or gain)		
	10		Sandstone (Next sheet)		Jar Spl #3	

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PROJECT | HOLE NO.

DRILLING LOG

DIVISION

INSTALLATION

OF SHEETS

1. PROJECT
2. LOCATION (Coordinates or Station)
3. DRILLING AGENCY
4. HOLE NO. (As shown on drawing title and file number) WES-WT3P-86
5. NAME OF DRILLER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE
10. SIZE AND TYPE OF BIT
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN | DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE | STARTED | COMPLETED
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		Sandstone, yBr-rBr, vf-f, highly wea + oxid, mod hd friable, num largely flattened soft to firm clay inclus + occ sub-angular clay and th bd claystone inclus (Rip-up clst?). The clay inclus range from <1" to >4" in size, are limonite incrusted and are isolated within the SS matrix at random. (produces a conglomeratic appearance) The clay inclus represent from 30 to 50% of the rk mass vol.	12.7 / Run 2		
	11					
	12					
	13					
	14		Coal, Blk, hd, blocky, brittle	4.6 / 5.0 0.4	Jar Sel #4	
	15		Sandstone, lt Gr, vf grained, mass, hd, sli friable, abundant carbonized plant inclus that give an effect to the core like Blk rootlets extending downward from the overlying Coal bed			
	16		vert, lim stained, discont jts.	16.7 / Run 3		
	17		discontinuous jt			
	18		SS, shaley, Gr, vf, hd, sli friable, occ irreg vugs ½ to 1" size that are either open or filled w/Br claystone nodules	2.3 / 2.3		Set well screen between 12.6 + 17.6. (See well drawing for details)
	19		Bot. Depth - 18.7'			
	20					

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PROJECT

HOLE NO

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			WES-WTSP-86			Piezometer Pair
			2.5' (Approx. El - 727.5') Riser Pipe			PVC Pipe to a depth of 2.6' Teflon Pipe below 2.6'
			0.0' Ground surface			Set well screen on 7/25/86
			Grout mixture			water level on 7/25/86 - 9.40 (From Top Riser)
			water level - 9.3' 8/14/86 (from Top Riser)			Developed well on 7/30/86
						The procedure for developing the well is shown on the plan for well WES-WTIP-86.
			8.6' Bentonite Pellets			
			10.6' Filter Gravel (Pea size)			The equipment was steam cleaned prior to use
			12.6' well screen			
			17.6' Trap			
			18.6'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG	US Navy	Crane In	1 OF 2 SHEETS

1. PROJECT: NWSC Groundwater Study	10. SIZE AND TYPE OF BIT: 5 1/2"
2. LOCATION (Coordinates or Station): Site 9, Pest Control-Waste Storage Tank	11. DATUM FOR ELEVATION SHOWN (TBM or MSL):
3. DRILLING AGENCY: WES	12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
4. HOLE NO. (As shown on drawing title and file number): WES-WTYP-86	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER: Dan Taylor	14. TOTAL NUMBER CORE BOXES:
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER:
7. THICKNESS OF OVERBURDEN: 6.4'	16. DATE HOLE: STARTED 7/24/86 COMPLETED 7/24/86
8. DEPTH DRILLED INTO ROCK:	17. ELEVATION TOP OF HOLE:
9. TOTAL DEPTH OF HOLE: 20.1'	18. TOTAL CORE RECOVERY FOR BORING: %
	19. SIGNATURE OF INSPECTOR: Geologist Richard W. Hunt

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Ls Rk (Parking Lot			Drilled from 0.0 to 6.4' w/ 5" dia Folding Auger
	1		Clayey Silt (ML), Gr, w/occ Ls frags, firm, sl. moist-dry (F.11)		Jar Spl #1	
	2					Steam cleaned equip. Prior to drilling well
	3					
	4					
	5		Silty Clay, (CL) yBr w/Gr mottling, firm sl. moist, w/ highly wea + oxid friable ss frags, mun rounded Fe nodules 1/8 to 1/4" dia		Jar Spl #2	
	6					Set 6" dia steel casing to 7.0 (Temporary)
						CL-7.0 - RRB.T
	7		Sandstone, yBr - rBr, yt. F, highly wea + oxid, mod hd, friable mun largely flattened soft to firm clay inclus + occ sub-angular clay + th bd claystone inclus (R.p. up clast?). The clay inclus range from <1" to >4" in size, are lim incrusted + are isolated within the ss matrix at random (produces a conglomeratic appearance). The clay inclus represent from 30 to 50% of the rk mass vol.	Run 1		Started drilling w/ 4 X 5 1/2" Core bbl w/ clean water
	8					
	9			4.6 / 5.0 = -0.4	(Red) (Run) (Core lost or ground)	
	10				Jar Spl #3	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		SS (Cont)			
	11					
	12			12.0 Run 2		
	13			3.7/4.0		
	14			-0.3		
	15				Jar sp @ 4	
	16			16.0		
	17		Coal, Blk, hard, blocky, brittle			
	18		Sandstone, lt-br-gr, v f, mass, hd, sl. friable, abundant carbonized plant inclus that give an effect to the core like Blk rootlets extending downward from the overlying coal bed	4.1/4.1		
	19		(Core bot at top of shaley ss w/ vugs)			Set well screen between 14.1 + 19.1 ft. (see well drawing for details)
	20		Bot of Hole 20.1'		Jar Spl #5	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
	15. ELEVATION GROUND WATER
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	16. DATE HOLE — STARTED — COMPLETED
7. THICKNESS OF OVERBURDEN	17. ELEVATION TOP OF HOLE
8. DEPTH DRILLED INTO ROCK	18. TOTAL CORE RECOVERY FOR BORING %
9. TOTAL DEPTH OF HOLE	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			WES-WT4P-86			Piezometer Plan
			2.5 Riser Pipe			PVC Pipe to a depth of 4.1'
			0.0 Ground Surface			Teflon pipe below 4.1'
			Grout mixture			Set well screen on 7/24/86
			water level - 9.0' 8/14/86 (From Top Riser)			water level on 7/29/86 - 8.94' (From Top Riser) Developed well on 7/31/86
			10.1' Bentonite pellets			The procedure for developing well is shown on the plan for WES-WTIP-86
			12.1' Filter Gravel (Pea Size)			The equipment was steam cleaned prior to use.
			14.1' Well screen			
			19.1' Trap			
			20.1'			

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PROJECT HOLE NO.

DRILLING LOG | US Army

1. PROJECT: Nuse Groundwater Study	10. SIZE AND TYPE OF BIT: 5" folding auger
2. LOCATION (Coordinates or Station): Site 9: Pest Control-Waste Storage Tank	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY: WES	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number): WES-WTSP-86	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER: Dan Taylor	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE: ☒ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN: 13.3'	16. DATE HOLE: STARTED July 21 1986; COMPLETED July 21, 1986
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE: 13.3'	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR: Geologist Richard W. Hunt

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Silt (ML) Tan + Gr, w/occ rk frags, moist (surface ponding) (Fill)		Jar Spl #1	Drilling w/ 5" d.o Folding Auger
	1					
	2		clayey Silt - silty clay, yBr + lGr, sdy, num lim crusted ss frags firm, moist (Fill) (ML-CL)			
	3					
	4		silty clay - clayey silt, (CL-ML), sdy, olive Gr, num small rk frags, rootlets, occ wood branch frags, v soft, v moist - wet, musty odor (Back fill in Tank excavation)			water seeping in hole at 4.5'
	5				Jar Spl #2	
	6					
	7					
	8					
	9					
	10				Jar Spl #3	

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO

DRILLING LOG

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		Silty Clay - Clayey Silt (cont.)			
	11					
	12					Base of fill 12.3'
			Silty Clay (CL) yBr-rBr, sdy, w/ wea ss frags. (Highly wea SS)			Set well screen From 8.0 to 13.0' (See well drawing for Details)
	13					
			Bot. of Hole 13.3'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			WES-WTSP-86			Piezometer Plan
			2.5' (Approx EL. 729.4') Riser pipe			PVC Pipe to a depth of 3.0'.
			0.0' Ground surface			Teflon pipe below 3.0'
						Set well screen on 7/21/86
			Grout mixture			water level on 7/29/86 - 5.36' (From Top Riser)
			water level - 5.9' 8/14/86 (From Top Riser)			Developed well on 7/30/86.
			4.0' Bentonite Pellets			The procedure for developing the well is described on plan for WES-WTIP-86.
			6.0' Filter Gravel (Fac 5.20)			The equip. was steam cleaned prior to use.
			8.0' well screen			
			13.0' Trap (No Trap)			
			13.3'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG | US Navy

1. PROJECT: NWSC Groundwater Study
2. LOCATION (Coordinates or Station): S. to 9' Pest. Control - Waste Storage Tank
3. DRILLING AGENCY: WES
4. HOLE NO. (As shown on drawing title and file number): WES-WT6P-86
5. NAME OF DRILLER: Dan Taylor
6. DIRECTION OF HOLE: ☑ VERTICAL ☐ INCLINED _____ DEG. FROM VERT.
7. THICKNESS OF OVERBURDEN
8. DEPTH DRILLED INTO ROCK
9. TOTAL DEPTH OF HOLE: 26.7'
10. SIZE AND TYPE OF BIT: 5½
11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
12. MANUFACTURER'S DESIGNATION OF DRILL: Failing 1500
13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED | UNDISTURBED
14. TOTAL NUMBER CORE BOXES
15. ELEVATION GROUND WATER
16. DATE HOLE: STARTED 7/26/86 | COMPLETED 7/28/86
17. ELEVATION TOP OF HOLE
18. TOTAL CORE RECOVERY FOR BORING %
19. SIGNATURE OF INSPECTOR: Geologist Richard W. Hunt

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	0		Ls Rk, (Parking Lot Surface)			Started drilling w/an 8" dia hollow auger. Took spl's where possible w/ a 3" push tube & cleaned hole w/ 8" auger.
	1		Silty clay (CL) yBr w/ Gr mottling, v firm, sl. moist, num Fe incrusted nodules (1/4" dia) in upper zone occ wea ss frags, sdy w/depth		Jar Spl #1	
	2					
	3					
	4					
	5				Jar Spl #2	
	6					
	7					
	8					
	9		← Top of highly wea SS (see Next sheet)			Set 9.8' of Temporary 6" steel casing, & cleaned hole to 10.2' w/RFGT
	10					

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

DRILLING LOG

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	10		Sandstone, yBr-rBr, vf-f, highly wea, oxid, mod hd, friable, num largely flattened soft to firm clay inclus + occ sub-angular clay + ft bd claystone inclus (Rip-up clast?). The clay inclus range from <1" to >4" in size, are lim incrusted + are isolated within the SS matrix at random (produces a conglomeratic appearance). The clay inclus represent from 30 to 50% of the rk mass vol	10.2 Run 1	Jar 5.7.1 #3	Started coring w/a 4 x 5½" core bbl at 10.2'
	11			1.5/2.3	Red Run	
				-0.8		
	12			12.5 Run 2		
	13					
	14			4.3/4.3		
	15				Jar 5.7.4	
	16			16.8		
	17					
	18			5.0/5.0		
	19					
	20					

PROJECT | HOLE NO

NG FORM 1836 PREVIOUS EDITIONS ARE OBSOLETE.
AR 71

(TRANSLUCENT)

DRILLING LOG

DIVISION

SHEET OF 3 SHEETS

1. PROJECT	10. SIZE AND TYPE OF BIT
2. LOCATION (Coordinates or Station)	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)
3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN — DISTURBED — UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE — STARTED — COMPLETED
8. DEPTH DRILLED INTO ROCK	17. ELEVATION TOP OF HOLE
9. TOTAL DEPTH OF HOLE	18. TOTAL CORE RECOVERY FOR BORING %
	19. SIGNATURE OF INSPECTOR

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	20		SS, highly wea (Cont.)			
					Jar Spl 5	
	21					
				21.8		
				Run 3		
	22					
	23		Coal, Blk, hd, blocky, brittle.	4.9/4.9		
	24		Sandstone, lt Gr, vf mass, hd, sl. friable, abundant carbonized plant inclus that give an effect to the core like rootlets extending downward from the overlying coal bed. 80° Jt is 1/4" open at top, lim stn; becomes tight and fades out w/depth. Bot of hole is at top of sh ss w/vugs.			
	25				Jar Spl 6	Set well screen between 20.7 + 25.7 ft. (See well drawing for details)
	26			26.7		
	27		Bot. Depth 26.7'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT

HOLE NO.

DRILLING LOG

1. PROJECT	10. SIZE AND TYPE OF BIT
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3. DRILLING AGENCY	12. MANUFACTURER'S DESIGNATION OF DRILL
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN: DISTURBED / UNDISTURBED
5. NAME OF DRILLER	14. TOTAL NUMBER CORE BOXES
6. DIRECTION OF HOLE ☐ VERTICAL ☐ INCLINED ____ DEG. FROM VERT.	15. ELEVATION GROUND WATER
7. THICKNESS OF OVERBURDEN	16. DATE HOLE: STARTED / COMPLETED
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ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOVERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			WES-WT67-86			Piezometer Plan (Background well)
			2.5' (Approx El-736.0)			PVC Pipe to a Depth of 8.7' Teflon Pipe below 8.7'
			0.0' Ground surface			Set well screen on 7/28/86
			Grout mixture			water level on 7/29/86 - 13.9' (from Top Riser)
			water level - 14.0' 8/14/86 (From Top Riser)			Developed well on 7/31/86
			16.7' Bentonite Pellets			The procedure for developing the well is described on Plan for WES-WT1P-86.
			18.7' Filter Gravel (Pea 5.20)			The equipment was steam cleaned prior to use.
			20.7' well screen			
			25.7' Trap			
			26.7'			

ENG FORM 1836 MAR 71 PREVIOUS EDITIONS ARE OBSOLETE. (TRANSLUCENT)

PROJECT | HOLE NO.

Appendix 2. Measured contamination levels in Pest Control Area wells, TCE and Trichloroethane and all analyzed compounds/parameters.

WELLNUMBER	DATESAMPLE	PARAMETER	AMTDET_A	UNIT
09-01	01/26/88	TRICHLOROETHYLENE	0.00700	mg/L
09-01	04/20/88	TRICHLOROETHYLENE	0.00500	mg/L
09-03	09/16/86	TRICHLOROETHYLENE	0.32000	mg/L
09-03	02/21/87	TRICHLOROETHYLENE	0.18000	mg/L
09-03	12/04/87	TRICHLOROETHYLENE	0.21000	mg/l
09-03	01/26/88	TRICHLOROETHYLENE	0.22000	mg/L
09-03	04/20/88	TRICHLOROETHYLENE	0.16800	mg/L
09-04	09/16/86	TRICHLOROETHYLENE	0.01100	mg/L
09-04	02/21/87	TRICHLOROETHYLENE	0.00860	mg/L
09-04	12/04/87	TRICHLOROETHYLENE	0.01000	mg/l
09-04	01/26/88	TRICHLOROETHYLENE	0.01100	mg/L
09-04	04/19/88	TRICHLOROETHYLENE	0.01600	mg/L
09-05	09/16/86	TRICHLOROETHYLENE	0.00890	mg/L
09-05	02/21/87	TRICHLOROETHYLENE	0.00480	mg/L
09-05	12/04/87	TRICHLOROETHYLENE	0.01000	mg/l
09-05	01/26/88	TRICHLOROETHYLENE	0.02700	mg/L
09-05	04/20/88	TRICHLOROETHYLENE	0.00800	mg/L
09-WT1P	09/16/86	TRICHLOROETHYLENE	0.00310	mg/L
09-WT1P	02/21/87	TRICHLOROETHYLENE	0.00610	mg/L
09-WT1P	12/04/87	TRICHLOROETHYLENE	0.01000	mg/l
09-WT1P	01/26/88	TRICHLOROETHYLENE	0.02400	mg/L
09-WT1P	04/19/88	TRICHLOROETHYLENE	0.00800	mg/L
09-WT2P	09/16/86	TRICHLOROETHYLENE	0.01200	mg/L
09-WT2P	02/21/87	TRICHLOROETHYLENE	0.02300	mg/L
09-WT2P	12/04/87	TRICHLOROETHYLENE	0.02000	mg/l
09-WT2P	01/26/88	TRICHLOROETHYLENE	0.02800	mg/L
09-WT2P	04/19/88	TRICHLOROETHYLENE	0.02200	mg/L
09-WT3P	09/16/86	TRICHLOROETHYLENE	0.74000	mg/L
09-WT3P	02/21/87	TRICHLOROETHYLENE	0.11000	mg/L
09-WT3P	12/04/87	TRICHLOROETHYLENE	0.92000	mg/l
09-WT3P	01/26/88	TRICHLOROETHYLENE	0.59800	mg/L
09-WT3P	04/19/88	TRICHLOROETHYLENE	0.57500	mg/L
09-WT4P	09/16/86	TRICHLOROETHYLENE	0.40000	mg/L
09-WT4P	02/21/87	TRICHLOROETHYLENE	0.28000	mg/L
09-WT4P	12/04/87	TRICHLOROETHYLENE	0.13000	mg/l
09-WT4P	01/28/88	TRICHLOROETHYLENE	0.08300	mg/L
09-WT4P	04/19/88	TRICHLOROETHYLENE	0.12900	mg/L
09-WT5P	04/19/88	TRICHLOROETHYLENE	0.00400	mg/L

WELLNUMBER	DATESAMPLE	PARAMETER	AMTDET_A	UNIT
09-03	01/16/85	1,1,1-TRICHLOROETHANE	0.03900	mg/L
09-03	02/05/86	1,1,1-TRICHLOROETHANE	0.12000	mg/L
09-03	02/21/87	1,1,1-TRICHLOROETHANE	0.27000	mg/L
09-03	12/04/87	1,1,1-TRICHLOROETHANE	0.26600	mg/L
09-03	01/26/88	1,1,1-TRICHLOROETHANE	0.23700	mg/L
09-03	01/26/88	1,1,1-TRICHLOROETHANE	0.34000	mg/L
09-03	04/20/88	1,1,1-TRICHLOROETHANE	0.17900	mg/L
09-04	09/16/86	1,1,1-TRICHLOROETHANE	0.00086	mg/L
09-04	02/21/87	1,1,1-TRICHLOROETHANE	0.00060	mg/L
09-05	09/16/86	1,1,1-TRICHLOROETHANE	0.00250	mg/L
09-05	02/21/87	1,1,1-TRICHLOROETHANE	0.00110	mg/L
09-05	04/20/88	1,1,1-TRICHLOROETHANE	0.00300	mg/L
09-09	01/28/88	1,1,1-TRICHLOROETHANE	0.00400	mg/L
09-WT1P	02/21/87	1,1,1-TRICHLOROETHANE	0.00180	mg/L
09-WT2P	09/16/86	1,1,1-TRICHLOROETHANE	0.00200	mg/L
09-WT2P	02/21/87	1,1,1-TRICHLOROETHANE	0.00310	mg/L
09-WT2P	01/26/88	1,1,1-TRICHLOROETHANE	0.00400	mg/L
09-WT2P	04/19/88	1,1,1-TRICHLOROETHANE	0.00200	mg/L
09-WT3P	02/21/87	1,1,1-TRICHLOROETHANE	0.00650	mg/L
09-WT3P	01/26/88	1,1,1-TRICHLOROETHANE	0.00700	mg/L
09-WT3P	04/19/88	1,1,1-TRICHLOROETHANE	0.00600	mg/L
09-WT4P	09/16/86	1,1,1-TRICHLOROETHANE	0.00950	mg/L
09-WT4P	02/21/87	1,1,1-TRICHLOROETHANE	0.00130	mg/L
09-WT4P	12/04/87	1,1,1-TRICHLOROETHANE	0.01000	mg/l
09-WT4P	01/28/88	1,1,1-TRICHLOROETHANE	0.00800	mg/L
09-WT4P	04/19/88	1,1,1-TRICHLOROETHANE	0.00900	mg/L

Trichloroethylene (TCE) and 1,1,1-trichloroethane measured in Test Control Area (Site 9) wells.

WELLNUMBER	DATESAMPLE	PARAMETER	UNIT	VALUE_A	AMTDET_A
09-01	01/16/85	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-01	01/16/85	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.00100
09-01	01/16/85	1,1,2-TRICHLOROETHANE	mg/L	<	0.00100
09-01	01/16/85	1,1-DICHLOROETHANE	mg/L	<	0.00100
09-01	01/16/85	1,1-DICHLOROETHENE	mg/L	<	0.00100
09-01	01/16/85	1,1-DICHLOROETHENE	mg/L	<	0.00100
09-01	01/16/85	1,2-DICHLOROETHANE	mg/L	<	0.00100
09-01	01/16/85	1,2-DICHLOROPROPANE	mg/L	<	0.00100
09-01	01/16/85	2-CHLOROETHYL VINYL ETHER	mg/L	<	0.00100
09-01	01/16/85	ACROLEIN	mg/L	<	0.10000
09-01	01/16/85	ACRYLONITRILE	mg/L	<	0.10000
09-01	01/16/85	BENZENE	mg/L	<	0.00100
09-01	01/16/85	BROMOFORM	mg/L	<	0.00100
09-01	01/16/85	CARBON TETRACHLORIDE	mg/L	<	0.00100
09-01	01/16/85	CHLORIDE	mg/L	<	1.00000
09-01	01/16/85	CHLOROBENZENE	mg/L	<	0.00100
09-01	01/16/85	CHLORODIBROMOMETHANE	mg/L	<	0.00100
09-01	01/16/85	CHLOROETHANE	mg/L	<	0.01000
09-01	01/16/85	CHLOROFORM	mg/L	<	0.00100
09-01	01/16/85	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.00100
09-01	01/16/85	CONDUCTANCE, Field	umho/cm		800.00000
09-01	01/16/85	CONDUCTANCE, Lab	umho/cm		460.00000
09-01	01/16/85	DICHLOROBROMOMETHANE	mg/L	<	0.00100
09-01	01/16/85	DICHLORODIFLUOROMETHANE	mg/L	<	0.01000
09-01	01/16/85	ETHYL BENZENE	mg/L	<	0.00100
09-01	01/16/85	IRON	mg/L		0.08000
09-01	01/16/85	MANGANESE	mg/L		0.38000
09-01	01/16/85	METHYL BROMIDE	mg/L	<	0.01000
09-01	01/16/85	METHYL CHLORIDE	mg/L	<	0.01000
09-01	01/16/85	METHYLENE CHLORIDE	mg/L	<	0.00100
09-01	01/16/85	ORGANIC CARBON, TOTAL	mg/L		10.00000
09-01	01/16/85	PHENOLS	mg/L	<	0.05000
09-01	01/16/85	SODIUM	mg/L		16.00000
09-01	01/16/85	SULFATE	mg/L		130.00000
09-01	01/16/85	TETRACHLOROETHENE	mg/L	,	0.00100
09-01	01/16/85	TOLUENE	mg/L	<	0.00100
09-01	01/16/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-01	01/16/85	TRANS-1,2-DICHLOROETHENE	mg/L	,	0.00100
09-01	01/16/85	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00100
09-01	01/16/85	TRICHLOROETHENE	mg/L		0.00100
09-01	01/16/85	TRICHLOROFLUOROMETHANE	mg/L	,	0.00100
09-01	01/16/85	VINYL CHLORIDE	mg/L	<	0.01000
09-01	01/16/85	pH, Lab	S.U.		7.50000
09-01	06/18/85	CONDUCTANCE, Lab	umho/cm		450.00000
09-01	06/18/85	ORGANIC CARBON, TOTAL	mg/L		3.10000
09-01	06/18/85	ORGANIC CARBON, TOTAL	mg/L		3.10000
09-01	06/18/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-01	06/18/85	pH, Field	S.U.		8.50000
09-01	06/18/85	pH, Lab	S.U.		7.70000
09-01	02/04/86	CHLORIDE	mg/L		1.00000
09-01	02/04/86	IRON, TOTAL	mg/L		1.30000
09-01	02/04/86	MANGANESE	mg/L		0.04000
09-01	02/04/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-01	02/04/86	PHENOLS	mg/L	ND	0.01000
09-01	02/04/86	SODIUM	mg/L		23.00000
09-01	02/04/86	SPECIFIC CONDUCTANCE	umho/cm		430.00000
09-01	02/04/86	SULFATE	mg/L		37.00000
09-01	02/04/86	VOLATILES SCAN	mg/L	ND	5.00000
09-01	02/04/86	pH	S.U.		7.00000
09-01	02/04/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-01	02/04/86	ORGANIC CHLORINE	mg/L	<	0.01000

09-01	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		545.00000
09-01	06/17/86	pH	S.U.		6.90000
09-01	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-01	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-01	06/17/86	ORGANIC IODINE	mg/L	<	0.01000
09-01	09/16/86	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-01	09/16/86	TRICHLOROETHYLENE	mg/L	<	0.00050
09-01	09/16/86	PCB 1242	mg/L	ND	0.00020
09-01	09/16/86	PCB 1248	mg/L	ND	0.00020
09-01	09/16/86	PCB 1254	mg/L	ND	0.00020
09-01	09/16/86	PCB 1260	mg/L	ND	0.00020
09-01	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-01	02/21/87	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-01	02/21/87	TRICHLOROETHYLENE	mg/L	<	0.00050
09-01	02/21/87	PCB 1242	mg/L	<	0.00020
09-01	02/21/87	PCB 1248	mg/L	<	0.00020
09-01	02/21/87	PCB 1254	mg/L	<	0.00020
09-01	02/21/87	PCB 1260	mg/L	<	0.00020
09-01	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-01	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-01	12/04/87	TRICHLOROETHYLENE	mg/l	<	0.01000
09-01	12/04/87	1,1,1-TRICHLOROETHANE	mg/l	<	0.01000
09-01	01/26/88	pH	S.U.		6.90000
09-01	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		5980.00000
09-01	01/26/88	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-01	01/26/88	TOTAL ORGANIC HALOGENS	mg/L	<	0.01000
09-01	01/26/88	IRON	mg/L		0.18000
09-01	01/26/88	MANGANESE	mg/L	<	0.00500
09-01	01/26/88	SODIUM	mg/L		30.00000
09-01	01/26/88	SULFATE	mg/L		26.00000
09-01	01/26/88	CHLORIDE	mg/L		1.00000
09-01	01/26/88	PHENOL	mg/L	<	0.05000
09-01	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-01	01/26/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-01	01/26/88	TRICHLOROETHYLENE	mg/L		0.00700
09-01	01/26/88	CHLOROMETHANE	mg/L	<	0.01000
09-01	01/26/88	BROMOMETHANE	mg/L	<	0.01000
09-01	01/26/88	VINYLCHLORIDE	mg/L	<	0.01000
09-01	01/26/88	CHLOROETHANE	mg/L	<	0.01000
09-01	01/26/88	METHYLENE CHLORIDE	mg/L		0.00200
09-01	01/26/88	1,1-DICHLOROETHENE	mg/L	<	0.00500
09-01	01/26/88	1,1-DICHLOROETHANE	mg/L	<	0.00500
09-01	01/26/88	TRANS-1,2-DICHLOROETHENE	mg/L	<	0.00500
09-01	01/26/88	CHLOROFORM	mg/L	<	0.00500
09-01	01/26/88	1,2-DICHLOROETHANE	mg/L	<	0.00500
*09-01	01/26/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-01	01/26/88	CARBON TETRACHLORIDE	mg/L	<	0.00500
09-01	01/26/88	BROMODICHLOROMETHANE	mg/L	<	0.00500
09-01	01/26/88	1,2-DICHLOROPROPANE	mg/L	<	0.00500
09-01	01/26/88	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00500
09-01	01/26/88	TRICHLOROETHENE	mg/L	<	0.00500
09-01	01/26/88	DIBROMOCHLOROMETHANE	mg/L	<	0.00500
09-01	01/26/88	1,1,2-TRICHLOROETHANE	mg/L	<	0.00500
09-01	01/26/88	BENZENE	mg/L	<	0.00500
09-01	01/26/88	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.00500
09-01	01/26/88	BROMOFORM	mg/L	<	0.00500
09-01	01/26/88	TETRACHLOROETHENE	mg/L	<	0.00500
09-01	01/26/88	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.00500
09-01	01/26/88	TOLUENE	mg/L	<	0.00500
09-01	01/26/88	CHLOROBENZENE	mg/L	<	0.00500
09-01	01/26/88	ETHYLBENZENE	mg/L	<	0.00500
09-01	01/26/88	XYLENE (TOTAL)	mg/L	<	0.00500
09-01	04/20/88	pH	S.U.		7.12000
09-01	04/20/88	SPECIFIC CONDUCTANCE	umho/cm		563.00000

09-01	04/20/88	TRICHLOROETHYLENE	mg/L		0.00500
09-02	01/16/85	CHLORIDE	mg/L	<	1.00000
09-02	01/16/85	CONDUCTANCE, Field	umho/cm		830.00000
09-02	01/16/85	CONDUCTANCE, Lab	umho/cm		435.00000
09-02	01/16/85	IRON	mg/L		21.30000
09-02	01/16/85	MANGANESE	mg/L		25.80000
09-02	01/16/85	ORGANIC CARBON, TOTAL	mg/L		8.20000
09-02	01/16/85	PHENOLS	mg/L	<	0.05000
09-02	01/16/85	SODIUM	mg/L		14.00000
09-02	01/16/85	SULFATE	mg/L		78.00000
09-02	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.01900
09-02	01/16/85	pH, Lab	S.U.		6.60000
09-02	06/19/85	CONDUCTANCE, Lab	umho/cm		440.00000
09-02	06/19/85	ORGANIC CARBON, TOTAL	mg/L		5.10000
09-02	06/19/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-02	06/19/85	pH, Field	S.U.		7.90000
09-02	06/19/85	pH, Lab	S.U.		6.80000
09-02	02/05/86	CHLORIDE	mg/L		9.00000
09-02	02/05/86	IRON, TOTAL	mg/L		28.00000
09-02	02/05/86	MANGANESE	mg/L		23.00000
09-02	02/05/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-02	02/05/86	PHENOLS	mg/L		0.01000
09-02	02/05/86	SODIUM	mg/L		14.00000
09-02	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		430.00000
09-02	02/05/86	SULFATE	mg/L		39.00000
09-02	02/05/86	pH	S.U.		6.30000
09-02	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-02	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-02	02/05/86	ORGANIC IODINE	mg/L		0.06000
09-02	06/17/86	ORGANIC CARBON, TOTAL	mg/L		5.00000
09-02	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		620.00000
09-02	06/17/86	pH	S.U.		6.10000
09-02	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-02	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-02	06/17/86	ORGANIC IODINE	mg/L		0.01000
09-02	01/28/88	pH	S.U.		6.90000
09-02	01/28/88	SPECIFIC CONDUCTANCE	umho/cm		5980.00000
09-02	01/28/88	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-02	01/28/88	TOTAL ORGANIC HALOGENS	mg/L	<	0.01000
09-02	01/28/88	IRON	mg/L		24.60000
09-02	01/28/88	MANGANESE	mg/L		16.40000
09-02	01/28/88	SODIUM	mg/L		17.00000
09-02	01/28/88	SULFATE	mg/L		23.00000
09-02	01/28/88	CHLORIDE	mg/L		58.00000
09-02	01/28/88	PHENOL	mg/L	<	0.05000
09-03	01/16/85	1,1,1-TRICHLOROETHANE	mg/L		0.03900
09-03	01/16/85	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.00100
09-03	01/16/85	1,1,2-TRICHLOROETHANE	mg/L	<	0.00100
09-03	01/16/85	1,1-DICHLOROETHANE	mg/L	<	0.00100
09-03	01/16/85	1,2-DICHLOROETHANE	mg/L	<	0.00100
09-03	01/16/85	1,2-DICHLOROPROPANE	mg/L	<	0.00100
09-03	01/16/85	2-CHLOROETHYL VINYL ETHER	mg/L	<	0.00100
09-03	01/16/85	ACROLEIN	mg/L	<	0.10000
09-03	01/16/85	ACRYLONITRILE	mg/L	<	0.10000
09-03	01/16/85	BENZENE	mg/L	<	0.00100
09-03	01/16/85	BROMOFORM	mg/L	<	0.00100
09-03	01/16/85	CARBON TETRACHLORIDE	mg/L	<	0.00100
09-03	01/16/85	CHLORIDE	mg/L	<	1.00000
09-03	01/16/85	CHLOROBENZENE	mg/L	<	0.00100
09-03	01/16/85	CHLORODIBROMOMETHANE	mg/L	<	0.00100
09-03	01/16/85	CHLOROETHANE	mg/L	<	0.01000
09-03	01/16/85	CHLOROFORM	mg/L	<	0.00100
09-03	01/16/85	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.00100
09-03	01/16/85	CONDUCTANCE, Field	umho/cm		810.00000

09-03	01/16/85	DICHLORODIFLUOROMETHANE	mg/L	<	0.01000
09-03	01/16/85	ETHYL BENZENE	mg/L	<	0.00100
09-03	01/16/85	IRON	mg/L		0.13000
09-03	01/16/85	MANGANESE	mg/L		0.41000
09-03	01/16/85	METHYL BROMIDE	mg/L	<	0.01000
09-03	01/16/85	METHYL CHLORIDE	mg/L	<	0.01000
09-03	01/16/85	METHYLENE CHLORIDE	mg/L	<	0.00100
09-03	01/16/85	ORGANIC CARBON, TOTAL	mg/L		5.60000
09-03	01/16/85	PHENOLS	mg/L	<	0.05000
09-03	01/16/85	SODIUM	mg/L		24.00000
09-03	01/16/85	SULFATE	mg/L		110.00000
09-03	01/16/85	TETRACHLOROETHENE	mg/L	<	0.00100
09-03	01/16/85	TOLUENE	mg/L	<	0.00100
09-03	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.55300
09-03	01/16/85	TRANS-1,2-DICHLOROETHENE	mg/L		0.11400
09-03	01/16/85	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00100
09-03	01/16/85	TRICHLOROETHENE	mg/L		0.05530
09-03	01/16/85	TRICHLOROFLUOROMETHANE	mg/L	<	0.00100
09-03	01/16/85	VINYL CHLORIDE	mg/L	<	0.01000
09-03	01/16/85	pH, Lab	S.U.		6.80000
09-03	06/18/85	CONDUCTANCE, Lab	umho/cm		560.00000
09-03	06/18/85	ORGANIC CARBON, TOTAL	mg/L		4.40000
09-03	06/18/85	TOTAL ORGANIC HALOGENS	mg/L		0.65500
09-03	06/18/85	pH, Field	S.U.		6.70000
09-03	06/18/85	pH, Lab	S.U.		7.10000
09-03	02/05/86	1,1,1-TRICHLOROETHANE	mg/L		0.12000
09-03	02/05/86	1,1-DICHLOROETHANE	mg/L		0.03300
09-03	02/05/86	CHLORIDE	mg/L		12.00000
09-03	02/05/86	CIS-1,2-DICHLOROETHENE	mg/L		0.04700
09-03	02/05/86	IRON, TOTAL	mg/L		0.06000
09-03	02/05/86	MANGANESE	mg/L		0.33000
09-03	02/05/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-03	02/05/86	PHENOLS	mg/L		0.01000
09-03	02/05/86	SODIUM	mg/L		27.00000
09-03	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		480.00000
09-03	02/05/86	SULFATE	mg/L		53.00000
09-03	02/05/86	TRANS-1,2-DICHLOROETHENE	mg/L		0.82000
09-03	02/05/86	TRICHLOROETHENE	mg/L		0.39000
09-03	02/05/86	VOLATILES SCAN	mg/L	SR	0.00000
09-03	02/05/86	pH	S.U.		6.50000
09-03	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-03	02/05/86	ORGANIC CHLORINE	mg/L		0.45000
09-03	02/05/86	ORGANIC IODINE	mg/L		0.02000
09-03	06/17/86	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-03	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		540.00000
09-03	06/17/86	pH	S.U.		6.00000
09-03	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-03	06/17/86	ORGANIC CHLORINE	mg/L		0.49000
09-03	06/17/86	ORGANIC IODINE	mg/L		0.04000
09-03	09/16/86	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-03	09/16/86	TRICHLOROETHYLENE	mg/L		0.32000
09-03	09/16/86	PCB 1242	mg/L	ND	0.00020
09-03	09/16/86	PCB 1248	mg/L	ND	0.00020
09-03	09/16/86	PCB 1254	mg/L	ND	0.00020
09-03	09/16/86	PCB 1260	mg/L	ND	0.00020
09-03	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-03	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.27000
09-03	02/21/87	TRICHLOROETHYLENE	mg/L		0.18000
09-03	02/21/87	PCB 1242	mg/L	<	0.00020
09-03	02/21/87	PCB 1248	mg/L	<	0.00020
09-03	02/21/87	PCB 1254	mg/L	<	0.00020
09-03	02/21/87	PCB 1260	mg/L	<	0.00020
09-03	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-03	12/04/87	PCB, TOTAL	mg/l	<	0.01000

09-03	01/26/88	pH	S.U.	8.	16.00000
09-03	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		6940.00000
09-03	01/26/88	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-03	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.67000
09-03	01/26/88	IRON	mg/L		0.11000
09-03	01/26/88	MANGANESE	mg/L		0.18000
09-03	01/26/88	SODIUM	mg/L		30.00000
09-03	01/26/88	SULFATE	mg/L		78.00000
09-03	01/26/88	CHLORIDE	mg/L		18.00000
09-03	01/26/88	PHENOL	mg/L	<	0.05000
09-03	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-03	01/26/88	1,1,1-TRICHLOROETHANE	mg/L		0.23700
09-03	01/26/88	TRICHLOROETHYLENE	mg/L		0.22000
09-03	01/26/88	CHLOROMETHANE	mg/L	<	0.02000
09-03	01/26/88	BROMOMETHANE	mg/L	<	0.02000
09-03	01/26/88	VINYLCHLORIDE	mg/L	<	0.02000
09-03	01/26/88	CHLOROETHANE	mg/L	<	0.02000
09-03	01/26/88	METHYLENE CHLORIDE	mg/L		0.01100
09-03	01/26/88	1,1-DICHLOROETHENE	mg/L		0.04700
09-03	01/26/88	1,1-DICHLOROETHANE	mg/L		0.06700
09-03	01/26/88	TRANS-1,2-DICHLOROETHENE	mg/L		0.52000
09-03	01/26/88	CHLOROFORM	mg/L	<	0.01000
09-03	01/26/88	1,2-DICHLOROETHANE	mg/L	<	0.01000
09-03	01/26/88	1,1,1-TRICHLOROETHANE	mg/L		0.34000
09-03	01/26/88	CARBON TETRACHLORIDE	mg/L	<	0.01000
09-03	01/26/88	BROMODICHLOROMETHANE	mg/L	<	0.01000
09-03	01/26/88	1,2-DICHLOROPROPANE	mg/L	<	0.01000
09-03	01/26/88	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.01000
09-03	01/26/88	TRICHLOROETHENE	mg/L		0.26000
09-03	01/26/88	DIBROMOCHLOROMETHANE	mg/L	<	0.01000
09-03	01/26/88	1,1,2-TRICHLOROETHANE	mg/L	<	0.01000
09-03	01/26/88	BENZENE	mg/L	<	0.01000
09-03	01/26/88	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.01000
09-03	01/26/88	BROMOFORM	mg/L	<	0.01000
09-03	01/26/88	TETRACHLOROETHENE	mg/L	<	0.01000
09-03	01/26/88	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.01000
09-03	01/26/88	TOLUENE	mg/L	<	0.01000
09-03	01/26/88	CHLOROBENZENE	mg/L	<	0.01000
09-03	01/26/88	ETHYLBENZENE	mg/L	<	0.01000
09-03	01/26/88	XYLENE (TOTAL)	mg/L	<	0.01000
09-03	04/20/88	pH	S.U.		6.51000
09-03	04/20/88	SPECIFIC CONDUCTANCE	umho/cm		611.00000
09-03	04/20/88	PCB, TOTAL	mg/L	<	0.01000
09-03	04/20/88	1,1,1-TRICHLOROETHANE	mg/L		0.17900
09-03	04/20/88	TRICHLOROETHYLENE	mg/L		0.16800
09-04	01/16/85	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-04	01/16/85	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.00100
09-04	01/16/85	1,1,2-TRICHLOROETHANE	mg/L	<	0.00100
09-04	01/16/85	1,1-DICHLOROETHANE	mg/L	<	0.00100
09-04	01/16/85	1,1-DICHLOROETHENE	mg/L	<	0.00100
09-04	01/16/85	1,2-DICHLOROETHANE	mg/L	<	0.00100
09-04	01/16/85	1,2-DICHLOROPROPANE	mg/L	<	0.00100
09-04	01/16/85	2-CHLOROETHYL VINYL ETHER	mg/L	<	0.00100
09-04	01/16/85	ACROLEIN	mg/L	<	0.10000
09-04	01/16/85	ACRYLONITRILE	mg/L	<	0.10000
09-04	01/16/85	BENZENE	mg/L	<	0.00100
09-04	01/16/85	BROMOFORM	mg/L	<	0.00100
09-04	01/16/85	CARBON TETRACHLORIDE	mg/L	<	0.00100
09-04	01/16/85	CHLORIDE	mg/L	<	1.00000
09-04	01/16/85	CHLOROBENZENE	mg/L	<	0.00100
09-04	01/16/85	CHLORODIBROMOMETHANE	mg/L	<	0.00100
09-04	01/16/85	CHLOROETHANE	mg/L	<	0.01000
09-04	01/16/85	CHLOROFORM	mg/L	<	0.00100
09-04	01/16/85	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.00100

09-04	01/16/85	DICHLOROBROMOMETHANE	mg/L	<	0.00100
09-04	01/16/85	DICHLORODIFLUOROMETHANE	mg/L	<	0.01000
09-04	01/16/85	ETHYL BENZENE	mg/L	<	0.00100
09-04	01/16/85	IRON	mg/L		0.54000
09-04	01/16/85	MANGANESE	mg/L		2.12000
09-04	01/16/85	METHYL BROMIDE	mg/L	<	0.01000
09-04	01/16/85	METHYL CHLORIDE	mg/L	<	0.01000
09-04	01/16/85	METHYLENE CHLORIDE	mg/L	<	0.00100
09-04	01/16/85	ORGANIC CARBON, TOTAL	mg/L		2.40000
09-04	01/16/85	PHENOLS	mg/L	<	0.05000
09-04	01/16/85	SODIUM	mg/L		14.00000
09-04	01/16/85	SULFATE	mg/L		100.00000
09-04	01/16/85	TETRACHLOROETHENE	mg/L	<	0.00100
09-04	01/16/85	TOLUENE	mg/L	<	0.00100
09-04	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.03100
09-04	01/16/85	TRANS-1,2-DICHLOROETHENE	mg/L		0.01130
09-04	01/16/85	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00100
09-04	01/16/85	TRICHLOROETHENE	mg/L		0.00290
09-04	01/16/85	TRICHLOROFLUOROMETHANE	mg/L	<	0.00100
09-04	01/16/85	VINYL CHLORIDE	mg/L	<	0.01000
09-04	01/16/85	pH, Lab	S.U.		7.10000
09-04	06/19/85	CONDUCTANCE, Lab	umho/cm		860.00000
09-04	06/19/85	ORGANIC CARBON, TOTAL	mg/L		5.70000
09-04	06/19/85	TOTAL ORGANIC HALOGENS	mg/L		0.02790
09-04	06/19/85	pH, Field	S.U.		8.90000
09-04	06/19/85	pH, Lab	S.U.		7.30000
09-04	02/05/86	CHLORIDE	mg/L		24.00000
09-04	02/05/86	IRON, TOTAL	mg/L		0.50000
09-04	02/05/86	MANGANESE	mg/L		1.60000
09-04	02/05/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-04	02/05/86	PHENOLS	mg/L		0.01000
09-04	02/05/86	SODIUM	mg/L		24.00000
09-04	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		750.00000
09-04	02/05/86	SULFATE	mg/L		140.00000
09-04	02/05/86	TETRAHYDROFURAN	mg/L		0.00600
09-04	02/05/86	TRANS-1,2-DICHLOROETHENE	mg/L		0.05300
09-04	02/05/86	TRICHLOROETHENE	mg/L		0.01000
09-04	02/05/86	VOLATILES SCAN	mg/L	SR	0.00000
09-04	02/05/86	pH	S.U.		6.60000
09-04	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-04	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-04	02/05/86	ORGANIC IODINE	mg/L		0.01000
09-04	06/17/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-04	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		1045.00000
09-04	06/17/86	pH	S.U.		6.70000
09-04	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-04	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-04	06/17/86	ORGANIC IODINE	mg/L		0.01000
09-04	09/16/86	1,1,1-TRICHLOROETHANE	mg/L		0.00086
09-04	09/16/86	TRICHLOROETHYLENE	mg/L		0.01100
09-04	09/16/86	PCB 1242	mg/L	ND	0.00020
09-04	09/16/86	PCB 1248	mg/L	ND	0.00020
09-04	09/16/86	PCB 1254	mg/L	ND	0.00020
09-04	09/16/86	PCB 1260	mg/L	ND	0.00020
09-04	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-04	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.00060
09-04	02/21/87	TRICHLOROETHYLENE	mg/L		0.00860
09-04	02/21/87	PCB 1242	mg/L	<	0.00020
09-04	02/21/87	PCB 1248	mg/L	<	0.00020
09-04	02/21/87	PCB 1254	mg/L	<	0.00020
09-04	02/21/87	PCB 1260	mg/L	<	0.00020
09-04	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-04	12/04/87	PCP, TOTAL	mg/l	<	0.01000
09-04	12/04/87	TRICHLOROETHYLENE	mg/l		0.01000

09-04	01/26/88	pH			
09-04	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		5010.00000
09-04	01/26/88	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-04	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.05000
09-04	01/26/88	IRON	mg/L		0.09000
09-04	01/26/88	MANGANESE	mg/L		0.36000
09-04	01/26/88	SODIUM	mg/L		28.00000
09-04	01/26/88	SULFATE	mg/L		52.00000
09-04	01/26/88	CHLORIDE	mg/L		45.00000
09-04	01/26/88	PHENOL	mg/L	<	0.05000
09-04	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-04	01/26/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-04	01/26/88	TRICHLOROETHYLENE	mg/L		0.01100
09-04	01/26/88	CHLOROMETHANE	mg/L	<	0.01000
09-04	01/26/88	BROMOMETHANE	mg/L	<	0.01000
09-04	01/26/88	VINYLCHLORIDE	mg/L	<	0.01000
09-04	01/26/88	CHLOROETHANE	mg/L	<	0.01000
09-04	01/26/88	METHYLENE CHLORIDE	mg/L		0.00300
09-04	01/26/88	1,1-DICHLOROETHENE	mg/L	<	0.00500
09-04	01/26/88	1,1-DICHLOROETHANE	mg/L	<	0.00500
09-04	01/26/88	TRANS-1,2-DICHLOROETHENE	mg/L		0.05000
09-04	01/26/88	CHLOROFORM	mg/L	<	0.00500
09-04	01/26/88	1,2-DICHLOROETHANE	mg/L	<	0.00500
09-04	01/26/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-04	01/26/88	CARBON TETRACHLORIDE	mg/L	<	0.00500
09-04	01/26/88	BROMODICHLOROMETHANE	mg/L	<	0.00500
09-04	01/26/88	1,2-DICHLOROPROPANE	mg/L	<	0.00500
09-04	01/26/88	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00500
09-04	01/26/88	TRICHLOROETHENE	mg/L		0.01100
09-04	01/26/88	DIBROMOCHLOROMETHANE	mg/L	<	0.00500
09-04	01/26/88	1,1,2-TRICHLOROETHANE	mg/L	<	0.00500
09-04	01/26/88	BENZENE	mg/L	<	0.00500
09-04	01/26/88	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.00500
09-04	01/26/88	BROMOFORM	mg/L	<	0.00500
09-04	01/26/88	TETRACHLOROETHENE	mg/L	<	0.00500
09-04	01/26/88	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.00500
09-04	01/26/88	TOLUENE	mg/L	<	0.00500
09-04	01/26/88	CHLOROBENZENE	mg/L	<	0.00500
09-04	01/26/88	ETHYLBENZENE	mg/L	<	0.00500
09-04	01/26/88	XYLENE (TOTAL)	mg/L	<	0.00500
09-04	04/19/88	pH	S.U.		6.82000
09-04	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		760.00000
09-04	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-04	04/19/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-04	04/19/88	TRECHLOROETHYLENE	mg/L		0.01600
09-05	01/16/85	CHLORIDE	mg/L	<	1.00000
09-05	01/16/85	CONDUCTANCE, Field	umho/cm		1160.00000
09-05	01/16/85	CONDUCTANCE, Lab	umho/cm		780.00000
09-05	01/16/85	IRON	mg/L		0.04000
09-05	01/16/85	MANGANESE	mg/L		1.98000
09-05	01/16/85	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-05	01/16/85	PHENOLS	mg/L	<	0.05000
09-05	01/16/85	SODIUM	mg/L		41.00000
09-05	01/16/85	SULFATE	mg/L		210.00000
09-05	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.02700
09-05	01/16/85	pH, Lab	S.U.		7.10000
09-05	06/19/85	CONDUCTANCE, Lab	umho/cm		560.00000
09-05	06/19/85	ORGANIC CARBON, TOTAL	mg/L		3.10000
09-05	06/19/85	TOTAL ORGANIC HALOGENS	mg/L		0.03300
09-05	06/19/85	pH, Field	S.U.		8.10000
09-05	06/19/85	pH, Lab	S.U.		6.90000
09-05	02/05/86	CHLORIDE	mg/L		19.00000
09-05	02/05/86	IRON, TOTAL	mg/L	<	0.02000
09-05	02/05/86	MANGANESE	mg/L		0.84000
09-05	02/05/86	ORGANIC CARBON, TOTAL	mg/L		1.00000

09-05	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		570.00000
09-05	02/05/86	SULFATE	mg/L		160.00000
09-05	02/05/86	pH	S.U.		6.60000
09-05	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-05	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-05	02/05/86	ORGANIC IODINE	mg/L		0.02000
09-05	06/17/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-05	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		805.00000
09-05	06/17/86	pH	S.U.		6.40000
09-05	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-05	06/17/86	ORGANIC CHLORINE	mg/L		0.02000
09-05	06/17/86	ORGANIC IODINE	mg/L		0.03000
09-05	09/16/86	1,1,1-TRICHLOROETHANE	mg/L		0.00250
09-05	09/16/86	TRICHLOROETHYLENE	mg/L		0.00890
09-05	09/16/86	PCB 1242	mg/L	ND	0.00020
09-05	09/16/86	PCB 1248	mg/L	ND	0.00020
09-05	09/16/86	PCB 1254	mg/L	ND	0.00020
09-05	09/16/86	PCB 1260	mg/L	ND	0.00020
09-05	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-05	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.00110
09-05	02/21/87	TRICHLOROETHYLENE	mg/L		0.00480
09-05	02/21/87	PCB 1242	mg/L	<	0.00020
09-05	02/21/87	PCB 1248	mg/L	<	0.00020
09-05	02/21/87	PCB 1254	mg/L	<	0.00020
09-05	02/21/87	PCB 1260	mg/L	<	0.00020
09-05	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-05	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-05	12/04/87	TRICHLOROETHYLENE	mg/l		0.01000
09-05	12/04/87	1,1,1-TRICHLOROETHANE	mg/l	<	0.01000
09-05	01/26/88	pH	S.U.		6.62000
09-05	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		8750.00000
09-05	01/26/88	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-05	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.05900
09-05	01/26/88	IRON	mg/L	<	0.05000
09-05	01/26/88	MANGANESE	mg/L		4.20000
09-05	01/26/88	SODIUM	mg/L		34.00000
09-05	01/26/88	SULFATE	mg/L		1450.00000
09-05	01/26/88	CHLORIDE	mg/L		51.00000
09-05	01/26/88	PHENOL	mg/L	<	0.05000
09-05	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-05	01/26/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-05	01/26/88	TRICHLOROETHYLENE	mg/L		0.02700
09-05	04/20/88	pH	S.U.		6.08000
09-05	04/20/88	SPECIFIC CONDUCTANCE	umho/cm		621.00000
09-05	04/20/88	PCB, TOTAL	mg/L	<	0.01000
09-05	04/20/88	1,1,1-TRICHLOROEHTANE	mg/L		0.00300
09-05	04/20/88	TRICHLOROETHYLENE	mg/L		0.00800
09-06	01/16/85	CHLORIDE	mg/L	<	1.00000
09-06	01/16/85	CONDUCTANCE, Field	umho/cm		900.00000
09-06	01/16/85	CONDUCTANCE, Lab	umho/cm		570.00000
09-06	01/16/85	IRON	mg/L		2.82000
09-06	01/16/85	MANGANESE	mg/L		1.02000
09-06	01/16/85	ORGANIC CARBON, TOTAL	mg/L		3.90000
09-06	01/16/85	PHENOLS	mg/L	<	0.05000
09-06	01/16/85	SODIUM	mg/L		42.00000
09-06	01/16/85	SULFATE	mg/L		190.00000
09-06	01/16/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-06	01/16/85	pH, Lab	S.U.		6.40000
09-06	06/18/85	CONDUCTANCE, Lab	umho/cm		560.00000
09-06	06/18/85	ORGANIC CARBON, TOTAL	mg/L		1.00000
09-06	06/18/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-06	06/18/85	pH, Field	S.U.		9.20000
09-06	06/18/85	pH, Lab	S.U.		6.90000
09-06	02/04/86	CHLORIDE	mg/L		25.00000

09-06	02/04/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-06	02/04/86	PHENOLS	mg/L		0.02000
09-06	02/04/86	SODIUM	mg/L		44.00000
09-06	02/04/86	SPECIFIC CONDUCTANCE	umho/cm		560.00000
09-06	02/04/86	SULFATE	mg/L		39.00000
09-06	02/04/86	pH	S.U.		6.20000
09-06	02/04/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-06	02/04/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-06	02/04/86	ORGANIC IODINE	mg/L	<	0.01000
09-06	06/17/86	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-06	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		690.00000
09-06	06/17/86	pH	S.U.		5.70000
09-06	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-06	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-06	06/17/86	ORGANIC IODINE	mg/L	<	0.01000
09-06	01/28/88	pH	S.U.		7.05000
09-06	01/28/88	SPECIFIC CONDUCTANCE	umho/cm		5620.00000
09-06	01/28/88	ORGANIC CARBON, TOTAL	mg/L		5.00000
09-06	01/28/88	TOTAL ORGANIC HALOGENS	mg/L		0.01800
09-06	01/28/88	IRON	mg/L	<	0.05000
09-06	01/28/88	MANGANESE	mg/L		0.52000
09-06	01/28/88	SODIUM	mg/L		42.00000
09-06	01/28/88	SULFATE	mg/L		77.00000
09-06	01/28/88	CHLORIDE	mg/L		78.00000
09-06	01/28/88	PHENOL	mg/L	<	0.05000
09-07	01/16/85	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-07	01/16/85	1,1,2,2-TETRACHLOROETHANE	mg/L	,	0.00100
09-07	01/16/85	1,1,2-TRICHLOROETHANE	mg/L	<	0.00100
09-07	01/16/85	1,1-DICHLOROETHANE	mg/L	<	0.00100
09-07	01/16/85	1,1-DICHLOROETHENE	mg/L	<	0.00100
09-07	01/16/85	1,2-DICHLOROETHANE	mg/L	<	0.00100
09-07	01/16/85	1,2-DICHLOROPROPANE	mg/L	<	0.00100
09-07	01/16/85	2-CHLOROETHYL VINYL ETHER	mg/L	<	0.00100
09-07	01/16/85	ACROLEIN	mg/L	<	0.10000
09-07	01/16/85	ACRYLONITRILE	mg/L	<	0.10000
09-07	01/16/85	BENZENE	mg/L	<	0.00100
09-07	01/16/85	BROMOFORM	mg/L	<	0.00100
09-07	01/16/85	CARBON TETRACHLORIDE	mg/L	<	0.00100
09-07	01/16/85	CHLORIDE	mg/L	<	1.00000
09-07	01/16/85	CHLOROBENZENE	mg/L	<	0.00100
09-07	01/16/85	CHLORODIBROMOMETHANE	mg/L	<	1.00000
09-07	01/16/85	CHLOROETHANE	mg/L	<	0.01000
09-07	01/16/85	CHLOROFORM	mg/L	<	0.00100
09-07	01/16/85	CIS-1,3-DICHLOROPROPENE	mg/L	,	0.00100
09-07	01/16/85	CONDUCTANCE, Field	umho/cm		2000.00000
09-07	01/16/85	CONDUCTANCE, Lab	umho/cm		1350.00000
09-07	01/16/85	DICHLOROBROMOMETHANE	mg/L	<	0.00100
09-07	01/16/85	DICHLORODIFLUOROMETHANE	mg/L	<	0.01000
09-07	01/16/85	ETHYL BENZENE	mg/L	<	0.00100
09-07	01/16/85	IRON	mg/L		0.23000
09-07	01/16/85	MANGANESE	mg/L		0.53000
09-07	01/16/85	METHYL BROMIDE	mg/L	<	0.01000
09-07	01/16/85	METHYL CHLORIDE	mg/L	<	0.01000
09-07	01/16/85	METHYLENE CHLORIDE	mg/L	<	0.00100
09-07	01/16/85	ORGANIC CARBON, TOTAL	mg/L		5.00000
09-07	01/16/85	PHENOLS	mg/L	<	0.05000
09-07	01/16/85	SODIUM	mg/L		100.00000
09-07	01/16/85	SULFATE	mg/L		610.00000
09-07	01/16/85	TETRACHLOROETHENE	mg/L	<	0.00100
09-07	01/16/85	TOLUENE	mg/L	<	0.00100
09-07	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.00940
09-07	01/16/85	TRANS-1,2-DICHLOROETHENE	mg/L	<	0.00100
09-07	01/16/85	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00100
09-07	01/16/85	TRICHLOROETHENE	mg/L	<	0.00100

09-07	01/16/85	[illegible]	[illegible]		[illegible]
09-07	01/16/85	pH, Lab	S.U.		6.70000
09-07	06/19/85	CONDUCTANCE, Lab	umho/cm		1100.00000
09-07	06/19/85	ORGANIC CARBON, TOTAL	mg/L		2.30000
09-07	06/19/85	TOTAL ORGANIC HALOGENS	mg/L		0.02010
09-07	06/19/85	pH, Field	S.U.		9.40000
09-07	06/19/85	pH, Lab	S.U.		6.90000
09-07	02/04/86	CHLORIDE	mg/L		14.00000
09-07	02/04/86	IRON, TOTAL	mg/L		0.16000
09-07	02/04/86	MANGANESE	mg/L		0.21000
09-07	02/04/86	ORGANIC CARBON, TOTAL	mg/L	<	1.00000
09-07	02/04/86	PHENOLS	mg/L		0.01000
09-07	02/04/86	SODIUM	mg/L		97.00000
09-07	02/04/86	SPECIFIC CONDUCTANCE	umho/cm		1200.00000
09-07	02/04/86	SULFATE	mg/L		570.00000
09-07	02/04/86	pH	S.U.		6.30000
09-07	02/04/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-07	02/04/86	ORGANIC CHLORINE	mg/L		0.01000
09-07	02/04/86	ORGANIC IODINE	mg/L		0.01000
09-07	06/17/86	ORGANIC CARBON, TOTAL	mg/L		11.00000
09-07	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		1670.00000
09-07	06/17/86	pH	S.U.		6.00000
09-07	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-07	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-07	06/17/86	ORGANIC IODINE	mg/L		0.03000
09-07	01/29/88	pH	S.U.		6.50000
09-07	01/29/88	SPECIFIC CONDUCTANCE	umho/cm		1176.00000
09-07	01/29/88	ORGANIC CARBON, TOTAL	mg/L		4.00000
09-07	01/29/88	TOTAL ORGANIC HALOGENS	mg/L	<	0.01000
09-07	01/29/88	IRON	mg/L	<	0.05000
09-07	01/29/88	MANGANESE	mg/L		0.42000
09-07	01/29/88	SODIUM	mg/L		15.00000
09-07	01/29/88	SULFATE	mg/L		14.00000
09-07	01/29/88	CHLORIDE	mg/L	<	0.10000
09-07	01/29/88	PHENOL	mg/L	<	0.05000
09-08	01/16/85	CHLORIDE	mg/L		1.00000
09-08	01/16/85	CONDUCTANCE, Field	umho/cm		1150.00000
09-08	01/16/85	CONDUCTANCE, Lab	umho/cm		750.00000
09-08	01/16/85	IRON	mg/L		0.23000
09-08	01/16/85	MANGANESE	mg/L		1.23000
09-08	01/16/85	ORGANIC CARBON, TOTAL	mg/L		7.60000
09-08	01/16/85	PHENOLS	mg/L	<	0.05000
09-08	01/16/85	SODIUM	mg/L		55.00000
09-08	01/16/85	SULFATE	mg/L		110.00000
09-08	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.01900
09-08	01/16/85	pH, Lab	S.U.		7.20000
09-08	06/19/85	CONDUCTANCE, Lab	umho/cm		880.00000
09-08	06/19/85	ORGANIC CARBON, TOTAL	mg/L		1.90000
09-08	06/19/85	TOTAL ORGANIC HALOGENS	mg/L		0.02750
09-08	06/19/85	pH, Field	S.U.		8.90000
09-08	06/19/85	pH, Lab	S.U.		7.10000
09-08	02/05/86	CHLORIDE	mg/L		22.00000
09-08	02/05/86	IRON, TOTAL	mg/L	<	0.02000
09-08	02/05/86	MANGANESE	mg/L		0.14000
09-08	02/05/86	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-08	02/05/86	PHENOLS	mg/L		0.01000
09-08	02/05/86	SODIUM	mg/L		49.00000
09-08	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		720.00000
09-08	02/05/86	SULFATE	mg/L		76.00000
09-08	02/05/86	pH	S.U.		6.70000
09-08	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-08	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-08	02/05/86	ORGANIC IODINE	mg/L		0.02000
09-08	06/17/86	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-08	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		9220.00000

09-08	06/17/86	ORGANIC IODINE	mg/L		0.03000
09-08	01/26/88	pH	S.U.		7.51000
09-08	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		8040.00000
09-08	01/26/88	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-08	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.04000
09-08	01/26/88	IRON	mg/L		0.08000
09-08	01/26/88	MANGANESE	mg/L	<	0.00500
09-08	01/26/88	SODIUM	mg/L		55.00000
09-08	01/26/88	SULFATE	mg/L		68.00000
09-08	01/26/88	CHLORIDE	mg/L		45.00000
09-08	01/26/88	PHENOL	mg/L	<	0.05000
09-09	01/16/85	CHLORIDE	mg/L	<	1.00000
09-09	01/16/85	CONDUCTANCE, Field	umho/cm		1230.00000
09-09	01/16/85	CONDUCTANCE, Lab	umho/cm		880.00000
09-09	01/16/85	IRON	mg/L		0.19000
09-09	01/16/85	MANGANESE	mg/L		17.10000
09-09	01/16/85	ORGANIC CARBON, TOTAL	mg/L		4.40000
09-09	01/16/85	PHENOLS	mg/L	<	0.05000
09-09	01/16/85	SODIUM	mg/L		65.00000
09-09	01/16/85	SULFATE	mg/L		320.00000
09-09	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.04900
09-09	01/16/85	pH, Lab	S.U.		6.40000
09-09	06/19/85	CONDUCTANCE, Lab	umho/cm		820.00000
09-09	06/19/85	ORGANIC CARBON, TOTAL	mg/L		5.50000
09-09	06/19/85	TOTAL ORGANIC HALOGENS	mg/L		0.02500
09-09	06/19/85	pH, Field	S.U.		8.40000
09-09	06/19/85	pH, Lab	S.U.		6.80000
09-09	02/05/86	CHLORIDE	mg/L		5.00000
09-09	02/05/86	IRON, TOTAL	mg/L		0.82000
09-09	02/05/86	MANGANESE	mg/L		19.00000
09-09	02/05/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-09	02/05/86	PHENOLS	mg/L	<	0.01000
09-09	02/05/86	SODIUM	mg/L		54.00000
09-09	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		800.00000
09-09	02/05/86	SULFATE	mg/L		36.00000
09-09	02/05/86	VOLATILES SCAN	mg/L	ND	5.00000
09-09	02/05/86	pH	S.U.		6.40000
09-09	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-09	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-09	02/05/86	ORGANIC IODINE	mg/L		0.06000
09-09	06/17/86	ORGANIC CARBON, TOTAL	mg/L		10.00000
09-09	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		1090.00000
09-09	06/17/86	pH	S.U.		6.00000
09-09	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-09	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-09	06/17/86	ORGANIC IODINE	mg/L		0.08000
09-09	01/28/88	pH	S.U.		6.79000
09-09	01/28/88	SPECIFIC CONDUCTANCE	umho/cm		1103.00000
09-09	01/28/88	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-09	01/28/88	TOTAL ORGANIC HALOGENS	mg/L		0.02700
09-09	01/28/88	IRON	mg/L		0.29000
09-09	01/28/88	MANGANESE	mg/L		3.21000
09-09	01/28/88	SODIUM	mg/L		39.00000
09-09	01/28/88	SULFATE	mg/L		2100.00000
09-09	01/28/88	CHLORIDE	mg/L		2.00000
09-09	01/28/88	PHENOL	mg/L		0.05000
09-09	01/28/88	CHLOROMETHANE	mg/L	<	0.01000
09-09	01/28/88	BROMOMETHANE	mg/L	<	0.01000
09-09	01/28/88	VINYLCHLORIDE	mg/L	<	0.01000
09-09	01/28/88	CHLOROETHANE	mg/L	<	0.01000
09-09	01/28/88	METHYLENE CHLORIDE	mg/L		0.00400
09-09	01/28/88	1,1-DICHLOROETHENE	mg/L	<	0.00500
09-09	01/28/88	1,1-DICHLOROETHANE	mg/L	<	0.00500
09-09	01/28/88	TRANS-1,2-DICHLOROETHENE	mg/L	<	0.00500

09-09	01/28/88	1,2-DICHLOROETHANE	mg/L	<	0.00500
09-09	01/28/88	1,1,1-TRICHLOROETHANE	mg/L		0.00400
09-09	01/28/88	CARBON TETRACHLORIDE	mg/L	<	0.00500
09-09	01/28/88	BROMODICHLOROMETHANE	mg/L	<	0.00500
09-09	01/28/88	1,2-DICHLOROPROPANE	mg/L	<	0.00500
09-09	01/28/88	TRANS-1,3-DICHLOROPROPENE	mg/L	<	0.00500
09-09	01/28/88	TRICHLOROETHENE	mg/L	<	0.00500
09-09	01/28/88	DIBROMOCHLOROMETHANE	mg/L	<	0.00500
09-09	01/28/88	1,1,2-TRICHLOROETHANE	mg/L	<	0.00500
09-09	01/28/88	BENZENE	mg/L	<	0.00500
09-09	01/28/88	CIS-1,3-DICHLOROPROPENE	mg/L	<	0.00500
09-09	01/28/88	BROMOFORM	mg/L	<	0.00500
09-09	01/28/88	TETRACHLOROETHENE	mg/L	<	0.00500
09-09	01/28/88	1,1,2,2-TETRACHLOROETHANE	mg/L	<	0.00500
09-09	01/28/88	TOLUENE	mg/L	<	0.00500
09-09	01/28/88	CHLOROBENZENE	mg/L	<	0.00500
09-09	01/28/88	ETHYLBENZENE	mg/L	<	0.00500
09-09	01/28/88	XYLENE (TOTAL)	mg/L	<	0.00500
09-10	01/16/85	CHLORIDE	mg/L	<	1.00000
09-10	01/16/85	CONDUCTANCE, Field	umho/cm		1200.00000
09-10	01/16/85	CONDUCTANCE, Lab	umho/cm		750.00000
09-10	01/16/85	IRON	mg/L		0.12000
09-10	01/16/85	MANGANESE	mg/L		1.05000
09-10	01/16/85	ORGANIC CARBON, TOTAL	mg/L		6.40000
09-10	01/16/85	PHENOLS	mg/L	<	0.05000
09-10	01/16/85	SODIUM	mg/L		34.00000
09-10	01/16/85	SULFATE	mg/L		84.00000
09-10	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.01200
09-10	01/16/85	pH, Lab	S.U.		7.20000
09-10	06/18/85	CONDUCTANCE, Lab	umho/cm		720.00000
09-10	06/18/85	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-10	06/18/85	TOTAL ORGANIC HALOGENS	mg/L		0.00780
09-10	06/18/85	pH, Field	S.U.		8.80000
09-10	06/18/85	pH, Lab	S.U.		7.20000
09-10	02/05/86	CHLORIDE	mg/L		53.00000
09-10	02/05/86	IRON, TOTAL	mg/L	<	0.02000
09-10	02/05/86	MANGANESE	mg/L		0.28000
09-10	02/05/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-10	02/05/86	PHENOLS	mg/L		0.01000
09-10	02/05/86	SODIUM	mg/L		34.00000
09-10	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		460.00000
09-10	02/05/86	SULFATE	mg/L		71.00000
09-10	02/05/86	pH	S.U.		6.70000
09-10	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-10	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-10	02/05/86	ORGANIC IODINE	mg/L		0.02000
09-10	06/17/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-10	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		660.00000
09-10	06/17/86	pH	S.U.		6.40000
09-10	06/17/86	ORGANIC BROMINE	mg/L	<	0.01000
09-10	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-10	06/17/86	ORGANIC IODINE	mg/L		0.02000
09-10	01/25/88	pH	S.U.	7	0.17000
09-10	01/25/88	SPECIFIC CONDUCTANCE	umho/cm		8280.00000
09-10	01/25/88	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-10	01/25/88	TOTAL ORGANIC HALOGENS	mg/L		0.01500
09-10	01/25/88	IRON	mg/L	<	0.05000
09-10	01/25/88	MANGANESE	mg/L		0.08000
09-10	01/25/88	SODIUM	mg/L		40.00000
09-10	01/25/88	SULFATE	mg/L		64.00000
09-10	01/25/88	CHLORIDE	mg/L		79.00000
09-10	01/25/88	PHENOL	mg/L	<	0.05000
09-11	01/16/85	CHLORIDE	mg/L		1.00000
09-11	01/16/85	CONDUCTANCE, Field	umho/cm		790.00000
09-11	01/16/85	CONDUCTANCE, Lab	umho/cm		540.00000

09-11	01/16/85	MANGANESE	mg/L		[illegible]
09-11	01/16/85	ORGANIC CARBON, TOTAL	mg/L		2.70000
09-11	01/16/85	PHENOLS	mg/L	<	0.05000
09-11	01/16/85	SODIUM	mg/L		19.00000
09-11	01/16/85	SULFATE	mg/L		55.00000
09-11	01/16/85	TOTAL ORGANIC HALOGENS	mg/L		0.01400
09-11	01/16/85	pH, Lab	S.U.		7.40000
09-11	06/18/85	CONDUCTANCE, Lab	umho/cm		470.00000
09-11	06/18/85	ORGANIC CARBON, TOTAL	mg/L		5.70000
09-11	06/18/85	TOTAL ORGANIC HALOGENS	mg/L		0.01310
09-11	06/18/85	pH, Field	S.U.		6.60000
09-11	06/18/85	pH, Lab	S.U.		7.60000
09-11	02/05/86	CHLORIDE	mg/L		9.00000
09-11	02/05/86	IRON, TOTAL	mg/L	<	0.02000
09-11	02/05/86	MANGANESE	mg/L		0.12000
09-11	02/05/86	ORGANIC CARBON, TOTAL	mg/L	<	1.00000
09-11	02/05/86	PHENOLS	mg/L		0.01000
09-11	02/05/86	SODIUM	mg/L		25.00000
09-11	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		540.00000
09-11	02/05/86	SULFATE	mg/L		38.00000
09-11	02/05/86	pH	S.U.		6.80000
09-11	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-11	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-11	02/05/86	ORGANIC IODINE	mg/L		0.02000
09-11	06/17/86	ORGANIC CARBON, TOTAL	mg/L		1.00000
09-11	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		775.00000
09-11	06/17/86	pH	S.U.		6.30000
09-11	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-11	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-11	06/17/86	ORGANIC IODINE	mg/L		0.02000
09-11	01/26/88	pH	S.U.		6.87000
09-11	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		6370.00000
09-11	01/26/88	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-11	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.01700
09-11	01/26/88	IRON	mg/L	<	0.05000
09-11	01/26/88	MANGANESE	mg/L		0.03000
09-11	01/26/88	SODIUM	mg/L		24.00000
09-11	01/26/88	SULFATE	mg/L		55.00000
09-11	01/26/88	CHLORIDE	mg/L		11.00000
09-11	01/26/88	PHENOL	mg/L	<	0.05000
09-12	01/16/85	CHLORIDE	mg/L	<	1.00000
09-12	01/16/85	CONDUCTANCE, Field	umho/cm		1120.00000
09-12	01/16/85	CONDUCTANCE, Lab	umho/cm		770.00000
09-12	01/16/85	IRON	mg/L		0.36000
09-12	01/16/85	MANGANESE	mg/L		2.16000
09-12	01/16/85	ORGANIC CARBON, TOTAL	mg/L		2.10000
09-12	01/16/85	PHENOLS	mg/L	<	0.05000
09-12	01/16/85	SODIUM	mg/L		39.00000
09-12	01/16/85	SULFATE	mg/L		230.00000
09-12	01/16/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-12	01/16/85	pH, Lab	S.U.		7.10000
09-12	06/18/85	CONDUCTANCE, Lab	umho/cm		730.00000
09-12	06/18/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-12	06/18/85	pH, Field	S.U.		9.80000
09-12	06/18/85	pH, Lab	S.U.		7.30000
09-12	02/05/86	CHLORIDE	mg/L		6.00000
09-12	02/05/86	IRON, TOTAL	mg/L	<	0.02000
09-12	02/05/86	MANGANESE	mg/L		1.40000
09-12	02/05/86	ORGANIC CARBON, TOTAL	mg/L	<	1.00000
09-12	02/05/86	PHENOLS	mg/L	ND	0.01000
09-12	02/05/86	SODIUM	mg/L		29.00000
09-12	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		680.00000
09-12	02/05/86	SULFATE	mg/L		38.00000
09-12	02/05/86	pH	S.U.		7.10000
09-12	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000

09-12	06/17/86	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-12	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		900.00000
09-12	06/17/86	pH	S.U.		6.30000
09-12	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-12	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-12	06/17/86	ORGANIC IODINE	mg/L	<	0.01000
09-12	01/26/88	pH	S.U.		7.80000
09-12	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		7350.00000
09-12	01/26/88	ORGANIC CARBON, TOTAL	mg/L		2.00000
09-12	01/26/88	TOTAL ORGANIC HALOGENS	mg/L	<	0.01000
09-12	01/26/88	IRON	mg/L		2.50000
09-12	01/26/88	MANGANESE	mg/L		0.57000
09-12	01/26/88	SODIUM	mg/L		28.00000
09-12	01/26/88	SULFATE	mg/L		1800.00000
09-12	01/26/88	CHLORIDE	mg/L		11.00000
09-12	01/26/88	PHENOL	mg/L	<	0.05000
09-13	01/16/85	CHLORIDE	mg/L		2.00000
09-13	01/16/85	CONDUCTANCE, Field	umho/cm		750.00000
09-13	01/16/85	CONDUCTANCE, Lab	umho/cm		570.00000
09-13	01/16/85	IRON	mg/L		0.02000
09-13	01/16/85	MANGANESE	mg/L		0.95000
09-13	01/16/85	ORGANIC CARBON, TOTAL	mg/L		3.60000
09-13	01/16/85	PHENOLS	mg/L	<	0.05000
09-13	01/16/85	SODIUM	mg/L		25.00000
09-13	01/16/85	SULFATE	mg/L		150.00000
09-13	01/16/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-13	01/16/85	pH, Lab	S.U.		7.70000
09-13	06/18/85	CONDUCTANCE, Lab	umho/cm		580.00000
09-13	06/18/85	ORGANIC CARBON, TOTAL	mg/L		1.90000
09-13	06/18/85	TOTAL ORGANIC HALOGENS	mg/L	<	0.00500
09-13	06/18/85	pH, Field	S.U.		8.60000
09-13	06/18/85	pH, Lab	S.U.		7.40000
09-13	02/05/86	CHLORIDE	mg/L		5.00000
09-13	02/05/86	IRON, TOTAL	mg/L		0.13000
09-13	02/05/86	MANGANESE	mg/L		1.20000
09-13	02/05/86	ORGANIC CARBON, TOTAL	mg/L	ND	1.00000
09-13	02/05/86	PHENOLS	mg/L	ND	0.01000
09-13	02/05/86	SODIUM	mg/L		29.00000
09-13	02/05/86	SPECIFIC CONDUCTANCE	umho/cm		650.00000
09-13	02/05/86	SULFATE	mg/L		80.00000
09-13	02/05/86	pH	S.U.		7.10000
09-13	02/05/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-13	02/05/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-13	02/05/86	ORGANIC IODINE	mg/L	<	0.01000
09-13	06/17/86	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-13	06/17/86	SPECIFIC CONDUCTANCE	umho/cm		750.00000
09-13	06/17/86	pH	S.U.		6.80000
09-13	06/17/86	ORGANIC BROMINE	mg/L	ND	0.01000
09-13	06/17/86	ORGANIC CHLORINE	mg/L	<	0.01000
09-13	06/17/86	ORGANIC IODINE	mg/L		0.02000
09-13	01/26/88	pH	S.U.		7.33000
09-13	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		8110.00000
09-13	01/26/88	ORGANIC CARBON, TOTAL	mg/L		4.00000
09-13	01/26/88	TOTAL ORGANIC HALOGENS	mg/L	<	0.01000
09-13	01/26/88	IRON	mg/L	<	0.05000
09-13	01/26/88	MANGANESE	mg/L		1.35000
09-13	01/26/88	SODIUM	mg/L		28.00000
09-13	01/26/88	SULFATE	mg/L		1450.00000
09-13	01/26/88	CHLORIDE	mg/L		12.00000
09-13	01/26/88	PHENOL	mg/L	<	0.05000
09-WT1P	09/16/86	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-WT1P	09/16/86	TRICHLOROETHYLENE	mg/L		0.00310
09-WT1P	09/16/86	PCB 1242	mg/L	ND	0.00020
09-WT1P	09/16/86	PCB 1248	mg/L	ND	0.00020

09-WT1P	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-WT1P	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.00180
09-WT1P	02/21/87	TRICHLOROETHYLENE	mg/L		0.00610
09-WT1P	02/21/87	PCB 1242	mg/L	<	0.00020
09-WT1P	02/21/87	PCB 1248	mg/L	<	0.00020
09-WT1P	02/21/87	PCB 1254	mg/L	<	0.00020
09-WT1P	02/21/87	PCB 1260	mg/L	<	0.00020
09-WT1P	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-WT1P	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-WT1P	12/04/87	TRICHLOROETHYLENE	mg/l		0.01000
09-WT1P	12/04/87	1,1,1-TRICHLOROETHANE	mg/l	<	0.01000
09-WT1P	01/26/88	pH	S.U.		6.45000
09-WT1P	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		9600.00000
09-WT1P	01/26/88	ORGANIC CARBON, TOTAL	mg/L		3.00000
09-WT1P	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.02100
09-WT1P	01/26/88	IRON	mg/L		1.20000
09-WT1P	01/26/88	MANGANESE	mg/L		0.72000
09-WT1P	01/26/88	SODIUM	mg/L		1000.00000
09-WT1P	01/26/88	SULFATE	mg/L		1150.00000
09-WT1P	01/26/88	CHLORIDE	mg/L		7.00000
09-WT1P	01/26/88	PHENOL	mg/L	<	0.05000
09-WT1P	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-WT1P	01/26/88	ARSENIC	mg/L	<	0.05000
09-WT1P	01/26/88	BARIUM	mg/L		0.06000
09-WT1P	01/26/88	CADMIUM	mg/L	<	0.02000
09-WT1P	01/26/88	CHROMIUM	mg/L	<	0.05000
09-WT1P	01/26/88	LEAD	mg/L	<	0.03000
09-WT1P	01/26/88	MERCURY	mg/L	<	0.00200
09-WT1P	01/26/88	SELENIUM	mg/L	<	0.05000
09-WT1P	01/26/88	SILVER	mg/L	<	0.00300
09-WT1P	01/26/88	FLUORIDE	mg/L		0.20000
09-WT1P	01/26/88	NITRATE-N	mg/L		0.07000
09-WT1P	01/26/88	ENDRIN	mg/L	<	0.00020
09-WT1P	01/26/88	LINDANE	mg/L	<	0.00400
09-WT1P	01/26/88	METHOXYCHLOR	mg/L	<	0.10000
09-WT1P	01/26/88	TOXAPHENE	mg/L	<	0.00500
09-WT1P	01/26/88	2,4-D	mg/L	<	0.10000
09-WT1P	01/26/88	2,4,5-TP	mg/L	<	0.01000
09-WT1P	01/26/88	RADIUM	pCi/l		0.50000
09-WT1P	01/26/88	GROSS ALPHA	pCi/l		0.00000
09-WT1P	01/26/88	GROSS BETA	mlrem/y		0.50000
09-WT1P	01/26/88	COLIFORM	#/100ml		0.00000
09-WT1P	01/26/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-WT1P	01/26/88	TRICHLOROETHYLENE	mg/L		0.02400
09-WT1P	04/19/88	pH	S.U.		6.36000
09-WT1P	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		665.00000
09-WT1P	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-WT1P	04/19/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-WT1P	04/19/88	TRICHLOROETHYLENE	mg/L		0.00800
09-WT2P	09/16/86	1,1,1-TRICHLOROETHANE	mg/L		0.00200
09-WT2P	09/16/86	TRICHLOROETHYLENE	mg/L		0.01200
09-WT2P	09/16/86	PCB 1242	mg/L	ND	0.00020
09-WT2P	09/16/86	PCB 1248	mg/L	ND	0.00020
09-WT2P	09/16/86	PCB 1254	mg/L	ND	0.00020
09-WT2P	09/16/86	PCB 1260	mg/L	ND	0.00020
09-WT2P	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-WT2P	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.00310
09-WT2P	02/21/87	TRICHLOROETHYLENE	mg/L		0.02300
09-WT2P	02/21/87	PCB 1242	mg/L	<	0.00020
09-WT2P	02/21/87	PCB 1248	mg/L	<	0.00020
09-WT2P	02/21/87	PCB 1254	mg/L	<	0.00020
09-WT2P	02/21/87	PCB 1260	mg/L	<	0.00020
09-WT2P	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-WT2P	12/04/87	PCB, TOTAL	mg/l	<	0.01000

09-WT2P	01/26/88	pH	S.U.		6.46000
09-WT2P	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		9350.00000
09-WT2P	01/26/88	ORGANIC CARBON, TOTAL	mg/L		4.00000
09-WT2P	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.08000
09-WT2P	01/26/88	IRON	mg/L		0.95000
09-WT2P	01/26/88	MANGANESE	mg/L		0.50000
09-WT2P	01/26/88	SODIUM	mg/L		61.00000
09-WT2P	01/26/88	SULFATE	mg/L		53.00000
09-WT2P	01/26/88	CHLORIDE	mg/L		43.00000
09-WT2P	01/26/88	PHENOL	mg/L	<	0.05000
09-WT2P	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-WT2P	01/26/88	ARSENIC	mg/L	<	0.05000
09-WT2P	01/26/88	BARIUM	mg/L	<	0.05000
09-WT2P	01/26/88	CADMIUM	mg/L	<	0.01000
09-WT2P	01/26/88	CHROMIUM	mg/L	<	0.05000
09-WT2P	01/26/88	LEAD	mg/L	<	0.05000
09-WT2P	01/26/88	MERCURY	mg/L	<	0.00200
09-WT2P	01/26/88	SELENIUM	mg/L	<	0.01000
09-WT2P	01/26/88	SILVER	mg/L	<	0.05000
09-WT2P	01/26/88	FLUORIDE	mg/L		0.12000
09-WT2P	01/26/88	NITRATE-N	mg/L		0.08000
09-WT2P	01/26/88	ENDRIN	mg/L	<	0.00020
09-WT2P	01/26/88	LINDANE	mg/L	<	0.00400
09-WT2P	01/26/88	METHOXYCHLOR	mg/L	<	0.10000
09-WT2P	01/26/88	TOXAPHENE	mg/L	<	0.00500
09-WT2P	01/26/88	2,4-D	mg/L	<	0.10000
09-WT2P	01/26/88	2,4,5-TP	mg/L	<	0.01000
09-WT2P	01/26/88	RADIUM	pCi/l		0.50000
09-WT2P	01/26/88	GROSS ALPHA	pCi/l		0.00000
09-WT2P	01/26/88	GROSS BETA	mlrem/y		0.80000
09-WT2P	01/26/88	COLIFORM	#/100ml		0.00000
09-WT2P	01/26/88	1,1,1-TRICHLOROETHANE	mg/L		0.00400
09-WT2P	01/26/88	TRICHLOROETHYLENE	mg/L		0.02800
09-WT2P	04/19/88	pH	S.U.		5.98000
09-WT2P	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		596.00000
09-WT2P	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-WT2P	04/19/88	1,1,1-TRICHLOROETHANE	mg/L		0.00200
09-WT2P	04/19/88	TRICHLOROETHYLENE	mg/L		0.02200
09-WT3P	09/16/86	1,1,1-TRICHLOROETHANE	mg/L	<	0.00500
09-WT3P	09/16/86	TRICHLOROETHYLENE	mg/L		0.74000
09-WT3P	09/16/86	PCB 1242	mg/L	ND	0.00020
09-WT3P	09/16/86	PCB 1248	mg/L	ND	0.00020
09-WT3P	09/16/86	PCB 1254	mg/L	ND	0.00020
09-WT3P	09/16/86	PCB 1260	mg/L	ND	0.00020
09-WT3P	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-WT3P	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.00650
09-WT3P	02/21/87	TRICHLOROETHYLENE	mg/L		0.11000
09-WT3P	02/21/87	PCB 1242	mg/L	<	0.00020
09-WT3P	02/21/87	PCB 1248	mg/L	<	0.00020
09-WT3P	02/21/87	PCB 1254	mg/L	<	0.00020
09-WT3P	02/21/87	PCB 1260	mg/L	<	0.00020
09-WT3P	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-WT3P	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-WT3P	12/04/87	TRICHLOROETHYLENE	mg/l		0.92000
09-WT3P	12/04/87	1,1,1-TRICHLOROETHANE	mg/l	<	0.01000
09-WT3P	01/26/88	pH	S.U.		6.45000
09-WT3P	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		1140.00000
09-WT3P	01/26/88	ORGANIC CARBON, TOTAL	mg/L		4.00000
09-WT3P	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.50000
09-WT3P	01/26/88	IRON	mg/L		3.50000
09-WT3P	01/26/88	MANGANESE	mg/L		0.74000
09-WT3P	01/26/88	SODIUM	mg/L		65.00000
09-WT3P	01/26/88	SULFATE	mg/L		95.00000
09-WT3P	01/26/88	CHLORIDE	mg/L		30.00000

09-WT3P	01/26/88	ARSENIC	mg/L	<	0.05000
09-WT3P	01/26/88	BARIUM	mg/L		0.05000
09-WT3P	01/26/88	CADMIUM	mg/L	<	0.01000
09-WT3P	01/26/88	CHROMIUM	mg/L	<	0.05000
09-WT3P	01/26/88	LEAD	mg/L	<	0.05000
09-WT3P	01/26/88	MERCURY	mg/L	<	0.00200
09-WT3P	01/26/88	SELENIUM	mg/L	<	0.01000
09-WT3P	01/26/88	SILVER	mg/L	<	0.05000
09-WT3P	01/26/88	FLUORIDE	mg/L		0.18000
09-WT3P	01/26/88	NITRATE-N	mg/L		2.50000
09-WT3P	01/26/88	ENDRIN	mg/L	<	0.00020
09-WT3P	01/26/88	LINDANE	mg/L	<	0.00400
09-WT3P	01/26/88	METHOXYCHLOR	mg/L	<	0.10000
09-WT3P	01/26/88	TOXAPHENE	mg/L	<	0.00500
09-WT3P	01/26/88	2,4-D	mg/L	<	0.10000
09-WT3P	01/26/88	2,4,5-TP	mg/L	<	0.01000
09-WT3P	01/26/88	RADIUM	pCi/l		0.40000
09-WT3P	01/26/88	GROSS ALPHA	pCi/l		0.00000
09-WT3P	01/26/88	GROSS BETA	mlrem/y		0.30000
09-WT3P	01/26/88	COLIFORM	#/100ml		0.00000
09-WT3P	01/26/88	1,1,1-TRICHLOROETHANE	mg/L		0.00700
09-WT3P	01/26/88	TRICHLOROETHYLENE	mg/L		0.59800
09-WT3P	04/19/88	pH	S.U.		6.00000
09-WT3P	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		598.00000
09-WT3P	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-WT3P	04/19/88	1,1,1-TRICHLOROETHANE	mg/L		0.00600
09-WT3P	04/19/88	TRICHLOROETHYLENE	mg/L		0.57500
09-WT4P	09/16/86	1,1,1-TRICHLOROETHANE	mg/L		0.00950
09-WT4P	09/16/86	TRICHLOROETHYLENE	mg/L		0.40000
09-WT4P	09/16/86	PCB 1242	mg/L	ND	0.00020
09-WT4P	09/16/86	PCB 1248	mg/L	ND	0.00020
09-WT4P	09/16/86	PCB 1254	mg/L	ND	0.00020
09-WT4P	09/16/86	PCB 1260	mg/L	ND	0.00020
09-WT4P	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-WT4P	02/21/87	1,1,1-TRICHLOROETHANE	mg/L		0.00130
09-WT4P	02/21/87	TRICHLOROETHYLENE	mg/L		0.28000
09-WT4P	02/21/87	PCB 1242	mg/L	<	0.00020
09-WT4P	02/21/87	PCB 1248	mg/L	<	0.00020
09-WT4P	02/21/87	PCB 1254	mg/L	<	0.00020
09-WT4P	02/21/87	PCB 1260	mg/L	<	0.00020
09-WT4P	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-WT4P	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-WT4P	12/04/87	TRICHLOROETHYLENE	mg/l		0.13000
09-WT4P	12/04/87	1,1,1-TRICHLOROETHANE	mg/l		0.01000
09-WT4P	01/28/88	pH	S.U.		6.78000
09-WT4P	01/28/88	SPECIFIC CONDUCTANCE	umho/cm		1141.00000
09-WT4P	01/28/88	ORGANIC CARBON, TOTAL	mg/L		5.00000
09-WT4P	01/28/88	TOTAL ORGANIC HALOGENS	mg/L		0.19700
09-WT4P	01/28/88	IRON	mg/L	<	0.01000
09-WT4P	01/28/88	MANGANESE	mg/L		0.77000
09-WT4P	01/28/88	SODIUM	mg/L		67.00000
09-WT4P	01/28/88	SULFATE	mg/L		95.00000
09-WT4P	01/28/88	CHLORIDE	mg/L		41.00000
09-WT4P	01/28/88	PHENOL	mg/L	<	0.05000
09-WT4P	01/28/88	PCB, TOTAL	mg/L	<	0.01000
09-WT4P	01/28/88	ARSENIC	mg/L	<	0.05000
09-WT4P	01/28/88	BARIUM	mg/L		0.05000
09-WT4P	01/28/88	CADMIUM	mg/L	<	0.01000
09-WT4P	01/28/88	CHROMIUM	mg/L	<	0.05000
09-WT4P	01/28/88	LEAD	mg/L	<	0.05000
09-WT4P	01/28/88	MERCURY	mg/L	<	0.00200
09-WT4P	01/28/88	SELENIUM	mg/L	<	0.01000
09-WT4P	01/28/88	SILVER	mg/L	<	0.05000
09-WT4P	01/28/88	FLUORIDE	mg/L		0.18000

09-WT4P	01/28/88	ENDRIN	mg/L	<	[illegible]
09-WT4P	01/28/88	LINDANE	mg/L	<	0.00400
09-WT4P	01/28/88	METHOXYCHLOR	mg/L	<	0.10000
09-WT4P	01/28/88	TOXAPHENE	mg/L	<	0.00500
09-WT4P	01/28/88	2,4-D	mg/L	<	0.10000
09-WT4P	01/28/88	2,4,5-TP	mg/L	<	0.01000
09-WT4P	01/28/88	RADIUM	pCi/l		0.40000
09-WT4P	01/28/88	GROSS ALPHA	pCi/l		0.00000
09-WT4P	01/28/88	GROSS BETA	mlrem/y		0.30000
09-WT4P	01/28/88	COLIFORM	#/100ml		0.00000
09-WT4P	01/28/88	1,1,1-TRICHLOROETHANE	mg/L		0.00800
09-WT4P	01/28/88	TRICHLOROETHYLENE	mg/L		0.08300
09-WT4P	04/19/88	pH	S.U.		6.38000
09-WT4P	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		1086.00000
09-WT4P	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-WT4P	04/19/88	1,1,1-TRICHLOROETHANE	mg/L		0.00900
09-WT4P	04/19/88	TRICHLOROETHYLENE	mg/L		0.12900
09-WT5P	09/16/86	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-WT5P	09/16/86	TRICHLOROETHYLENE	mg/L	<	0.00050
09-WT5P	09/16/86	PCB 1242	mg/L	ND	0.00020
09-WT5P	09/16/86	PCB 1248	mg/L	ND	0.00020
09-WT5P	09/16/86	PCB 1254	mg/L	ND	0.00020
09-WT5P	09/16/86	PCB 1260	mg/L	ND	0.00020
09-WT5P	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-WT5P	02/21/87	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-WT5P	02/21/87	TRICHLOROETHYLENE	mg/L	<	0.00050
09-WT5P	02/21/87	PCB 1242	mg/L	<	0.00020
09-WT5P	02/21/87	PCB 1248	mg/L	<	0.00020
09-WT5P	02/21/87	PCB 1254	mg/L	<	0.00020
09-WT5P	02/21/87	PCB 1260	mg/L	<	0.00020
09-WT5P	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-WT5P	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-WT5P	12/04/87	TRICHLOROETHYLENE	mg/l	<	0.01000
09-WT5P	12/04/87	1,1,1-TRICHLOROETHANE	mg/l	<	0.01000
09-WT5P	01/26/88	pH	S.U.		7.12000
09-WT5P	01/26/88	SPECIFIC CONDUCTANCE	umho/cm		720.00000
09-WT5P	01/26/88	ORGANIC CARBON, TOTAL	mg/L		6.00000
09-WT5P	01/26/88	TOTAL ORGANIC HALOGENS	mg/L		0.11000
09-WT5P	01/26/88	IRON	mg/L		0.07000
09-WT5P	01/26/88	MANGANESE	mg/L		0.08000
09-WT5P	01/26/88	SODIUM	mg/L		65.00000
09-WT5P	01/26/88	SULFATE	mg/L		53.00000
09-WT5P	01/26/88	CHLORIDE	mg/L		28.00000
09-WT5P	01/26/88	PHENOL	mg/L	<	0.05000
09-WT5P	01/26/88	PCB, TOTAL	mg/L	<	0.01000
09-WT5P	01/26/88	ARSENIC	mg/L	<	0.05000
09-WT5P	01/26/88	BARIUM	mg/L	<	0.05000
09-WT5P	01/26/88	CADMIUM	mg/L	<	0.01000
09-WT5P	01/26/88	CHROMIUM	mg/L	<	0.05000
09-WT5P	01/26/88	LEAD	mg/L	<	0.05000
09-WT5P	01/26/88	MERCURY	mg/L	<	0.00200
09-WT5P	01/26/88	SELENIUM	mg/L	<	0.01000
09-WT5P	01/26/88	SILVER	mg/L	<	0.05000
09-WT5P	01/26/88	FLUORIDE	mg/L		0.20000
09-WT5P	01/26/88	NITRATE-N	mg/L		0.08000
09-WT5P	01/26/88	ENDRIN	mg/L	<	0.00020
09-WT5P	01/26/88	LINDANE	mg/L	<	0.00400
09-WT5P	01/26/88	METHOXYCHLOR	mg/L	<	0.10000
09-WT5P	01/26/88	TOXAPHENE	mg/L	<	0.00500
09-WT5P	01/26/88	2,4-D	mg/L	<	0.10000
09-WT5P	01/26/88	2,4,5-TP	mg/L	<	0.01000
09-WT5P	01/26/88	RADIUM	pCi/l		0.70000
09-WT5P	01/26/88	GROSS ALPHA	pCi/l		0.50000
09-WT5P	01/26/88	GROSS BETA	mlrem/y		0.90000
09-WT5P	01/26/88	COLIFORM	#/100ml		5.00000

09-WT5P	04/19/88	pH	S.U.		6.87000
09-WT5P	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		763.00000
09-WT5P	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-WT5P	04/19/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-WT5P	04/19/88	TRICHLOROETHYLENE	mg/L		0.00400
09-WT6P	09/16/86	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-WT6P	09/16/86	TRICHLOROETHYLENE	mg/L	<	0.00050
09-WT6P	09/16/86	PCB 1242	mg/L	ND	0.00020
09-WT6P	09/16/86	PCB 1248	mg/L	ND	0.00020
09-WT6P	09/16/86	PCB 1254	mg/L	ND	0.00020
09-WT6P	09/16/86	PCB 1260	mg/L	ND	0.00020
09-WT6P	09/16/86	PCB, TOTAL	mg/L	ND	0.00020
09-WT6P	02/21/87	1,1,1-TRICHLOROETHANE	mg/L	<	0.00050
09-WT6P	02/21/87	TRICHLOROETHYLENE	mg/L	<	0.00050
09-WT6P	02/21/87	PCB 1242	mg/L	<	0.00020
09-WT6P	02/21/87	PCB 1248	mg/L	<	0.00020
09-WT6P	02/21/87	PCB 1254	mg/L	<	0.00020
09-WT6P	02/21/87	PCB 1260	mg/L	<	0.00020
09-WT6P	02/21/87	PCB, TOTAL	mg/L	<	0.00020
09-WT6P	12/04/87	PCB, TOTAL	mg/l	<	0.01000
09-WT6P	12/04/87	TRICHLOROETHYLENE	mg/l	<	0.01000
09-WT6P	12/04/87	1,1,1-TRICHLOROETHANE	mg/l	<	0.01000
09-WT6P	04/19/88	pH	S.U.		6.92000
09-WT6P	04/19/88	SPECIFIC CONDUCTANCE	umho/cm		860.00000
09-WT6P	04/19/88	PCB, TOTAL	mg/L	<	0.01000
09-WT6P	04/19/88	1,1,1-TRICHLOROETHANE	mg/L	<	0.00100
09-WT6P	04/19/88	TRICHLOROETHYLENE	mg/L	<	0.00100

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ANALYTICAL AND CONSULTING LABORATORIES
Environmental, Chemical, and Petroleum

SAMPLE ANALYSIS RESULTS
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NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9-1 SAMPLE DATE 9-27-91 WATER LEVEL 15.59

TEST RESULTS:

pH	6.95
Sp.Cond,umhos/cm	376
TOC	
TOX	

Fe		As	Endrin
Mn		Ba	Lindane
Na		Cd	Methoxychlor
Ca		Cr	Toxaphene
Mg		Pb	2,4-D
K		Hg	2,4,5-TP
Sulfate		Se	Radium,pCi/L
Chloride		Ag	Gross a,pCi/L
Phenol		Fluoride	Gross b,pCi/L
Bicarbonate		Nitrate-N	Coliform
Ammonia-N			
TNT		1,1,1-Trichloroethane	<0.001
RDX		Trichloroethylene	<0.001
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

SUBMITTED BY J. K. Lee
JAMES K. LEE, LAB DIRECTOR

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Environmental, Chemical, and Petroleum

SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9-3 SAMPLE DATE 9-27-91 WATER LEVEL 5.41

TEST RESULTS:

pH	6.19
Sp.Cond,umhos/cm	453
TOC	
TOX	

Fe	As	Endrin
Mn	Ba	Lindane
Na	Cd	Methoxychlor
Ca	Cr	Toxaphene
Mg	Pb	2,4-D
K	Hg	2,4,5-TP
Sulfate	Se	Radium,pCi/L
Chloride	Ag	Gross a,pCi/L
Phenol	Fluoride	Gross b,pCi/L
Bicarbonate	Nitrate-N	Coliform
Ammonia-N		

TNT		1,1,1-Trichloroethane	0.108
RDX		Trichloroethylene	0.130
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9-4 SAMPLE DATE 9-27-91 WATER LEVEL 16.05

TEST RESULTS:

pH	5.32
Sp.Cond,umhos/cm	335
TOC	
TOX	

Fe	As	Endrin
Mn	Ba	Lindane
Na	Cd	Methoxychlor
Ca	Cr	Toxaphene
Mg	Pb	2,4-D
K	Hg	2,4,5-TP
Sulfate	Se	Radium,pCi/L
Chloride	Ag	Gross a,pCi/L
Phenol	Fluoride	Gross b,pCi/L
Bicarbonate	Nitrate-N	Coliform
Ammonia-N		

TNT		1,1,1-Trichloroethane	0.001
RDX		Trichloroethylene	0.016
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9-5 SAMPLE DATE 9-27-91 WATER LEVEL 12.99

TEST RESULTS:

pH	6.85
Sp.Cond,umhos/cm	864
TOC	
TOX	

Fe	As	Endrin
Mn	Ba	Lindane
Na	Cd	Methoxychlor
Ca	Cr	Toxaphene
Mg	Pb	2,4-D
K	Hg	2,4,5-TP
Sulfate	Se	Radium,pCi/L
Chloride	Ag	Gross a,pCi/L
Phenol	Fluoride	Gross b,pCi/L
Bicarbonate	Nitrate-N	Coliform
Ammonia-N		

TNT		1,1,1-Trichloroethane	0.001
RDX		Trichloroethylene	0.004
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9WT1P SAMPLE DATE 9-27-91 WATER LEVEL 12.50

TEST RESULTS:

pH	6.57				
Sp.Cond,umhos/cm	790				
TOC					
TOX					
Fe		As		Endrin	
Mn		Ba		Lindane	
Na		Cd		Methoxychlor	
Ca		Cr		Toxaphene	
Mg		Pb		2,4-D	
K		Hg		2,4,5-TP	
Sulfate		Se		Radium,pCi/L	
Chloride		Ag		Gross a,pCi/L	
Phenol		Fluoride		Gross b,pCi/L	
Bicarbonate		Nitrate-N		Coliform	
Ammonia-N					
TNT		1,1,1-Trichloroethane			0.004
RDX		Trichloroethylene			0.019
HMX		D-N-Butyl phthalate			
PCB	<0.001	Bis(2-Ethylhexyl)phthalate			

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9WT2P SAMPLE DATE 9-27-91 WATER LEVEL 10.42

TEST RESULTS:

pH	6.13
Sp.Cond,umhos/cm	556
TOC	
TOX	

Fe		As	Endrin
Mn		Ba	Lindane
Na		Cd	Methoxychlor
Ca		Cr	Toxaphene
Mg		Pb	2,4-D
K		Hg	2,4,5-TP
Sulfate		Se	Radium,pCi/L
Chloride		Ag	Gross a,pCi/L
Phenol		Fluoride	Gross b,pCi/L
Bicarbonate		Nitrate-N	Coliform
Ammonia-N			
TNT		1,1,1-Trichloroethane	<0.001
RDX		Trichloroethylene	0.081
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9WT3P SAMPLE DATE 9-27-91 WATER LEVEL 10.21

TEST RESULTS:

pH	6.15
Sp.Cond,umhos/cm	592
TOC	
TOX	

Fe	As	Endrin
Mn	Ba	Lindane
Na	Cd	Methoxychlor
Ca	Cr	Toxaphene
Mg	Pb	2,4-D
K	Hg	2,4,5-TP
Sulfate	Se	Radium,pCi/L
Chloride	Ag	Gross a,pCi/L
Phenol	Fluoride	Gross b,pCi/L
Bicarbonate	Nitrate-N	Coliform
Ammonia-N		
TNT		
RDX		
HMX		
PCB <0.001		

1,1,1-Trichloroethane	<0.001
Trichloroethylene	0.768
D-N-Butyl phthalate	
Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9WT4P SAMPLE DATE 9-27-91 WATER LEVEL 9.26

TEST RESULTS:

pH	6.28
Sp.Cond,umhos/cm	712
TOC	
TOX	

Fe		As	Endrin
Mn		Ba	Lindane
Na		Cd	Methoxychlor
Ca		Cr	Toxaphene
Mg		Pb	2,4-D
K		Hg	2,4,5-TP
Sulfate		Se	Radium,pCi/L
Chloride		Ag	Gross a,pCi/L
Phenol		Fluoride	Gross b,pCi/L
Bicarbonate		Nitrate-N	Coliform
Ammonia-N			
TNT		1,1,1-Trichloroethane	<0.001
RDX		Trichloroethylene	0.247
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9WT5P SAMPLE DATE 9-27-91 WATER LEVEL 4.35

TEST RESULTS:

pH	6.74
Sp.Cond,umhos/cm	806
TOC	
TOX	

Fe		As	Endrin
Mn		Ba	Lindane
Na		Cd	Methoxychlor
Ca		Cr	Toxaphene
Mg		Pb	2,4-D
K		Hg	2,4,5-TP
Sulfate		Se	Radium,pCi/L
Chloride		Ag	Gross a,pCi/L
Phenol		Fluoride	Gross b,pCi/L
Bicarbonate		Nitrate-N	Coliform
Ammonia-N			
TNT		1,1,1-Trichloroethane	0.005
RDX		Trichloroethylene	0.010
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

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SAMPLE ANALYSIS RESULTS
****

NAVWPNSUPPCEN, BLDG 2516
CRANE, INDIANA 47522
ATTN: JO BELCHER

ANACON# 8224
DATE 11-15-91

SAMPLE DESCRIPTION: 9WT6P SAMPLE DATE 9-27-91 WATER LEVEL 15.35

TEST RESULTS:

pH	6.73
Sp.Cond,umhos/cm	669
TOC	
TOX	

Fe		As	Endrin
Mn		Ba	Lindane
Na		Cd	Methoxychlor
Ca		Cr	Toxaphene
Mg		Pb	2,4-D
K		Hg	2,4,5-TP
Sulfate		Se	Radium,pCi/L
Chloride		Ag	Gross a,pCi/L
Phenol		Fluoride	Gross b,pCi/L
Bicarbonate		Nitrate-N	Coliform
Ammonia-N			
TNT		1,1,1-Trichloroethane	<0.001
RDX		Trichloroethylene	<0.001
HMX		D-N-Butyl phthalate	
PCB	<0.001	Bis(2-Ethylhexyl)phthalate	

All results are in mg/l

SUBMITTED BY J. K. Lee
JAMES K. LEE, LAB DIRECTOR

APPENDIX F
EPA COMMENTS AND RESPONSES

EPA COMMENTS AND REPLIES TO DRAFT, RFI PHASE III GROUNDWATER PHASE II SOILS WORK PLAN FOR NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA, PESTICIDE CONTROL AREA/R-150 TANK SITE, SWMU #09/05.

A. General Comments

1. The necessary elements of a workplan and a sampling and analysis plan are represented in this document. However, the organization of the document leads to confusion and redundancy. The main cause of the problem is that sampling and analysis information, which according to the main headings in the Table of Contents should be in Section 3.0, is actually spread out through Sections 2.0, 3.0, and 4.0. This causes the same, or nearly the same, material to be rehashed at as many as three locations. Section 3.0 should contain all the sampling and analysis plans and procedures. This would eliminate all of Section 2.2.0 (Technical Approach) from Section 2.0 (Management Plan). Then Section 2.0 could focus on its topic of Project Objectives and Project Management. All the contents of Section 4.0 (Well Construction) are plans and procedures for the investigation and logically belong within Section 3.0.

Answer. The workplan is revised as requested. Section 2.2.0 Technical Approach has been removed from Section 2.0 Management Plan and incorporated into Section 3.0. Sampling and Analysis Plan. Section 4.0 Well Construction Plan is now Section 3.3.0 of the Sampling and Analysis Plan.

2. The Introduction section of the document does an ineffective job of presenting what is known about the site, and does not promote the evolution of a preliminary conceptual model which should be its purpose. There is little discussion about the hydrostatigraphy at the site and nothing on what, if anything is known about the hydraulic characteristics of the units that may be encountered. Also missing is a potential surface map of the area and a table containing the existing monitoring well construction details, both of which are basic to such a document.

Answer. Section 1.1.3.1, 1.1.3.2 and 1.1.3.3 present all available information about the site. Section 1.2.0 presents all known information about previous investigations. A potential surface map is not available at this time because not all existing wells have been surveyed in. Table 1.2.8 contains monitoring well construction details for six wells (WT1P-WT6P). Construction details were not available for all other wells.

3. Determining the lateral and vertical extent of ground water contamination requires a three-dimensional perspective. That perspective does not seem to be a part of the decision making process on the placement of wells and the depth of the well screens. (Discussed further in Specific Comments).

Answer. The placement and number of proposed wells will be dependent upon the analysis of the proposed soil samples and existing monitoring wells. The depth of the well screens will be dependent upon the depth of the aquifer.

B. Specific Comments

1. Page 5

a. Paragraph 3

The closure plan procedures for the R-150 Tank must be included. This data is critical in determining how much contaminated soil was already removed, and what the current ground water monitoring program is. The closure activities also establish where the tank was and what material was backfilled.

Answer. The Closure Plan procedures for the R-150 Tank is Appendix E of the workplan. The amount of contaminated soil removed is not mentioned in the Closure Plan. The current ground water monitoring program is given.

The reference to the secure landfill should be changed to the specific type of landfill where the material will be disposed of. Will it go to the on-site solid waste landfill or somewhere else?

Answer. The excavated soil from the R-150 Tank was disposed of at the Chemical Waste Management Landfill, Calumet City, Illinois.

b. Section 1.1.4

This Site Hydrogeology section is very sparse. Data about the hydraulic characteristics of the overburden and the bedrock should be included, if known. Are any units, likely to be encountered, used for a water supply? Describe if there are any low conductivity units which might exist to form the bottom of the upper aquifer. Describe all potential aquifers and aquitards for the area. Describe if there is a link between ground water and surface water at the site.

Answer. Any information concerning the hydraulic characteristics and low conductivity is not known. Ground water elevations range from 720 ft msl to 695 ft msl. From available information, there does not appear to be a link between ground water and surface water.

2. Page 7

a. Paragraph 1, Last Sentence

The data from the ground water assessment should be used to determine further ground water studies for this area. Describe any seasonal changes. A potentiometric map should be included from the previous data, and current conditions at the site.

Answer. Data from the 1986 ground water study was used to determine the six proposed monitoring well locations as stated in Section 3.1.2, paragraph 3, line 13. A potentiometric map is included from the 1986 study. Monitoring wells placed in 1981 and 1983 have not been surveyed in.

b. Paragraph 2

1) A table should be included that summarizes the construction details of existing monitoring wells such as date of completion, depth drilled, screened zone, casing diameter, screen slot size, etc.

Answer. Table 1.2.1B, Page 10, summarized the construction details of existing monitoring wells as requested. Only available information was for monitoring wells WT1P-WT6P as shown on the table.

2) The location of monitoring wells WT1P, WT2, WT3P, WT4P, WT5P, and WT6P should be shown on Figure 1.2.1. since they are discussed in the test. (Their locations are shown in Appendix E but they should be mentioned here also).

Answer. Monitoring wells WT1P, WT2P, WT3P, WT4P, WT5P and WT6P are shown on Figure 1.2.1B as requested.

3) Well designations should be consistent between the text and Figure 1.2.1. (e.g., well 9-3-81 in text is WES-9-3-81 in the figure). It is potential and unnecessary confusion.

Answer. Well designations corrected to show consistency between the text and the figures.

c. Paragraph 2, Line 5

Is monitoring well "WTIP-4P" referring to wells WT1P, WT2P, WT3P and WT4P If so, then the "I" in WTIP should be replace with "1", and this sentence would be redundant with the sentence that follows. If not, then where is the well WTIP?

Answer. WTIP-4P was referring to wells WT1P, WT2P, WT3P, and WT4P. This sentence was deleted due to its redundancy.

d. Paragraph 2, Line 1

Well WT40 should be WT4P.

Answer. Typo corrected.

e. Paragraph 2, Last Sentence

Complete the sentence by adding the underlined words as follows. "Trichloromethane in excess of the detection limit of 0.001 ppm was observed in wells 9-3-81, WT2P, WT3P, and WT4P."

Answer. Paragraph 3, Line 7, underlined words added as requested.

3. Section 2.2.0.

As stated in the general comments, this section presents material which belongs in Section 3.0 (Sampling and Analysis Plan).

Answer.

Previous Section	Current Section
Section 2.2.1	Section 3.1.3
Section 2.2.2	Section 3.1.2
Section 2.2.3	Section 3.1.2
Section 2.2.4	Section 3.1.2
Section 2.2.5	Section 3.2.2
Section 2.2.6	Section 3.2.3
Section 2.2.7	Section 3.2.5
Section 2.2.8	Section 3.1.5
Table 2.2.2	Table 3.2.6A & B

4. Page 10, Paragraph 2, Line 5

The plan states that one boring will be taken at the R-150 tank site in order to determine leakage. The closure activities have already determined leakage, and soil was removed down to bedrock. The closure data must be used to determine if further soil sampling is necessary to define the rate and extent of contamination.

Answer. Three borings are proposed at the R-150 Tank Site to confirm that all contaminated soil was removed.

5. Page 1, Section 2.2.1.

Explain the meaning of the acronym NGVD.

Answer. Section 2.2.1 is now Section 3.1.3. Acronym NGVD - National Geodetic Vertical Datum is the reference to which elevations are measured.

6. Page 10, Section 2.2.3.

Check for the missing text in line 8 and 9.

Answer. Text from Section 2.2.3 is now found in Section 3.1.2. Missing text in line 8 and 9 was a typo. The "t" in taking should have been capitalized.

7. Page 11, Paragraph 6; Table 2.2.2. and Diagram 2.3.2

The text indicates that five rounds of ground water sampling will be conducted, but Table 2.2.2 seems to indicate only one set of ground water samples is to be collected (36 samples), and Diagram 2.3.2 indicates only one round of ground water sampling. When are the remainder of the ground water samples to be collected, analyzed, and reported?

Are field blanks appropriate for soil samples? What type of blanks will be taken?

Schedules should normally reference sampling activities from Day 1, where Day 1 is the date that the workplan is approved.

Answer. Section 2.2.4 is now located in Section 3.1.2 Paragraph revised to indicate samples per round and total samples. Table 2.2.2 is now Table 3.2.6A and B. Table 3.2.6A shall be used for the first round of ground water sampling and soil sampling. Table 3.2.6B will be used for the second through the fifth round of ground water sampling. Diagram 2.3.2 is now Diagram 2.2.2. Diagram 2.2.2 revised to reflect five rounds of ground water sampling.

Field blanks are appropriate for soil samples. Field blanks and trip blanks will be taken along with equipment rinsates and duplicates. Definition of each are given in Section 3.2.7.

Schedule revised to show field work beginning after work plan approval.

8. Page 12, Paragraph 1

How is the sampling order of the new wells to be established?

Answer. Sampling of the new wells will be contingent upon the results of the first round of ground water and soil analysis.

9. Page 12, Paragraph 2

In the last line, detection should be analysis.

Answer. See Section 3.2.2, first paragraph, revised as requested.

10. Page 12, Paragraph 4, Lines 1-5

This is not a sentence.

Answer. See Section 3.2.6, first sentence, revised to state "Soil testing for the presence of ... will be done".

11. Table 2.2.2

Define the term "NR" in the table.

Answer. Table 2.2.2 is now Table 3.2.6A and B. Defined as requested: NR - Not Required.

12. Page 15

a. Line 1

Were should be where.

Answer. See Section 3.1.2, line 1, sentence is correct as is.

b. Section 3.1.2, Line 3

Exist should be exists.

Answer. See Section 3.1.2, paragraph 1, last sentence, revised as requested.

c. Second from Last Sentence

References to the surface soil sampling and the boring at the tank site should be modified taking into account the previous closure data.

Answer. After review of soil sampling data, it is proporsed that three soil borings be drilled at the R-150 Tank Site to positively confirm that all contaminated soil has been removed.

13. Figure 3.1.2

All the well symbols are not defined in the legend.

Answer. Figure 3.1.2A and B have been revised. All wells symbols are defined.

14. Page 17

The locations of the borings and the well locations should be reconsidered after the discussions at the last TRC meeting, in going out to the site and establishing locations. The Pest Control buildings should have soil sampling to determine if there is any soil contamination from spillage on the ground, looking at worst case areas. The ground water sampling is a Phase III sampling to determine the rate and extent of contamination at the R-150 tank area.

Answer. Although a quantity and the location of wells has been stated, this is only a proposed number dependent upon results of ground water and soil analysis. Three borings will be drilled at Building 2189 and six at Building 55 in an attempt to determine if there is any soil contamination from spillage. Three surface samples will be taken at well WES 9-3-81 to determine if any contamination is still present at this well. Three borings will be drilled at the R-150 Tank Site to confirm that all contaminated soil has been removed.

15. Page 18, Paragraph 3

The test states that TCE and 1,2-trans DCE were detected at concentrations above a detection limit of 1 ug/L. Since the water quality criteria for these constituents are also above the detection limit of 1 ug/L, the text could be improved by specifying the actual concentrations at which TCE and 1,2-trans DCE were detected.

Answer. Concentration levels detected for the 1986 study are listed in Table 1.2.1A.

16. Page 18, Last Paragraph

The figure referred to several times in this paragraph should be Figure 3.1.2a.

Answer. Revised as requested.

17. Page 19

a. First Sentence

Section 3.0 (Sampling and Analysis Plan) should not have to refer to Section 2.0 for sampling plan information. It should all be in Section 3.0.

Answer. All sampling and analysis information is located in Section 3.0 Sampling and Analysis Plan as requested.

b. Second Paragraph

1) The sentence that begins on Line 7, should be modified by the addition of the underlined words as follows: "Samples will be taken from the least to most contaminated locations as determined from prior ground water analysis.";

Answer. Page 18, second paragraph, line 7, included as requested.

2) The scope of the monitoring well installation plans at Buildings 55 and 2189, as described in this paragraph seem premature. Generally, an investigator would wait for the result of the soil sampling and analysis to decide whether and where to monitor the ground water. Oftentimes the decision to complete a soil sampling borehole as a well can be based on visual, olfactory, or instrumental evidence during the borehole drilling and sampling process. The investigators should consider being guided in their monitoring well placement decisions by field observations and soil sampling analytical data. The workplan states that "...it is known that pesticide containers were rinsed in these areas...". With this in mind, it might be prudent to install one monitoring well at each building to see if any indication of ground water contamination exists. The placement of that well can be as previously described. But the 10 wells proposed for these two areas, at this point, seem to be overkill;

Answer. The first round of ground water analysis will be performed before any wells will be placed. Although a quantity is specified, the actual number will depend upon the ground water and soil analysis. One monitoring well will not adequately define any ground water contaminants. Therefore, three wells are proposed at each building in an attempt to adequately define any contaminants.

3) The sentence that begins on Line 10 of this paragraph, states that "...six wells will be installed near the R-150 Tank Site to adequately define the contaminant plume." The comment here is that "adequate" characterization of a plume can only be determined after studying the data provided by the new and existing wells. The sentence would be more realistic if it were rewritten as "...six wells will be installed near the R-150 Tank Site in an attempt to define the contaminant plume."; and

Answer. Revised as requested.

4) Spelling correction in Line 6, "plume".

Answer. Typo revised as requested.

18. <u>Page 19, Section 3.1.3</u>

The last three sentences in the first paragraph of this section, and the last four sentences in the second paragraph of this section, say the same thing. There is no need for this information to appear twice. To aid in identification, both groups of sentences begin with "The list of analytical test parameters..."

Explain the relationship of the soil samples to the fill from the closure of the tank.

Answer. Section 3.1.3 is now Section 3.1.4. The last four sentences in the second paragraph have been deleted to prevent redundancy. After review of the soil sampling data (Tables 1.2.1, 2, 3, and 4 worplan), three soil borings are proposed at the R-150 Tank to positively confirm that all contaminated soil has been removed.

19. Paragraph 4

a. First Sentence

The underlined words are suggested to replace those in the text as follows. "...Ground water sampling will be done at the site using existing and proposed monitoring wells."

Answer. Replaced the existing words with the underlined words as suggested. See Section 3.1.4, second paragraph for revision.

b. Line 2

"The results of these analyses will be..."

Answer. Replaced the existing words with the underline words as suggested. See Section 3.1.4, second sentence for revision.

c. Line 5

The word basis should be used. How was the probability of occurrence determined?

Answer. See Section 3.1.4, line 8. Replaced bases with basis. The probability of occurrence is explained in Section 3.1.4 as follows: The 8240 and 8270 organics are selected because of the common industrial usage and their detected presence in the ground water surrounding the R-150 tank site. Because of past operations (pesticide usage) pesticides, herbicides and inorganics associated with pesticides will also be conducted.

20. Pages 15-18

a. Top

We would recommend that consideration be given to dropping the use of TOX for Corrective Action Sampling. First, it has yet to be shown that this is a reliable screening technique, the method has been deleted from the proposed RCRA Subtitle D (Sanitary Landfill monitoring requirements), and it is to be deleted from the revised Subtitle C monitoring requirements in the

near future. The logic that the contaminants of interest contain chloride, and therefore should be detected with a TOX procedure, is valid. However, the TOX procedure is 10 to 50 times less sensitive than routine GC/MS procedures such as Method 8240.

If TOX is to be performed, it should be added to Table 3.1.3.

Answer. Deleted TOX as recommended.

b. Table 3.1.3

The Table does not clarify whether the ground water samples to be analyzed for inorganics are to be filtered or not filtered.

Answer. Table 3.1.3 is now Table 3.1.4. Inorganics will be filtered as stated in Section 3.2.5.

c. Paragraph 3.1.4

How close do the "defining parameters" have to be to reality in order for the results to be acceptable? Or conversely, at what level are the results unacceptable? What are these defining parameters? How will they be measured?

Answer. Paragraph 3.1.4 is now 3.1.6. Sentence revised to state "The validity of the derived results is dependent on certain assumptions being met". These assumptions have to be made in order to obtain results for transmissivity, hydraulic conductivity, and storativity.

21. Pages 18-19

a. Table 3.1.4a

Strictly speaking, "Extraction" should be "Digestion". Also, "G" following arsenic should be "GF".

Answer. Should be Table 3.1.5a instead of Table 3.1.4a as stated above. Table 3.1.5a is now Table 3.1.7a. Revisions made as requested.

b. Paragraph 3.1.5

"Physical" should be "physically".

Answer. Revision made in Section 3.1.6, not 3.1.5 as stated above. Section 3.1.6 is now Section 3.1.8

22. Page 19, Paragraph 3.2.1, Line 3

This sentence should read: "To minimize cross contamination between samples..."

Answer. Sentence revised as requested.

23. Page 21

a. Second Paragraph

In this paragraph, and also on Page 23, Section 3.2.5, it is stated that the purge water and the excess sample water "...will be discharged to the ground surface no closer than 10 feet from the well." This practice is incompatible with the waste containment plans for water, as identified in Detection 3.5.2. Section 3.5.2 indicates that possibly contaminated water will be stored in drums and left on-site for later disposal. This section identifies these waste waters as resulting from decontamination pad construction, drilling, well installation, and decontamination operations. Surely, potentially contaminated ground water resulting from purging and sampling should be treated in the same manner. If analyses show waste waters not to be of an environmental concern, they can then be discharged in an appropriate manner.

Answer. The draft work plan was inconsistent with its handling of Investigation-Derived Wastes (IDW). The RFI will produce a number of types of IDW during the field activities. But generally, the RFI activities will leave conditions essentially unchanged. The removal of IDW which does not pose any immediate threat to human health or the environment is not recommended. The site manager, using best professional judgement, will render an IDW as hazardous or non-hazardous. Fluids and soils generated during the field work will be disposed of at the ground surface in a non-nuisance manner. The work plan is now consistent with the revised section 3.4.2. Section 3.6 has been incorporated into Section 3.4.2

b. Section 3.2.3

Describe if the samples will be iced, and how.

Answer. Samples will be placed on ice with sufficient packing material to prevent breakage as stated in Section 3.2.3.

Describe how the paperwork will be enclosed in the cooler. Usually it is sealed in a plastic bag and taped to the inner lid.

Answer. Stated in Section 3.2.3.as follows: "...forms will be sealed in the plastic bags and taped to the inside lid of the cooler...".

Describe how plastic will be used to protect the ground during sampling in order to protect the ground from contamination.

Answer. Protective plastic will be placed on the ground in sample areas during sampling in order to protect the area as stated in Section 3.2.2.

24. Page 22

a. Section 3.2.5

The text states that ground water parameters (pH, conductivity, and temperature) must be stable before samples can be collected. What is the definition of "stable" for the purpose of this investigation?

Answer. Section 3.2.5 is now Section 3.2.4. Stable for the purpose of this investigation is purging the well to remove any stagnant water which might produce inaccurate analysis of the sample.

b. Section 3.3.2, Step 3

Rinse with 0.1 N nitric acid

Answer. Revised as requested. Section 3.3.2 is now Section 3.4.2.

c. Section 3.3.2, Step 5

If the rinsate will be tested for pesticides, a pesticide reagent should not be used.

Answer. Hexane is an approved reagent (SW-846). Hexane will not interfere with the rinsate blanks, it does not contain any pesticides.

25. Page 23, Table 3.3.3

The table should list that the jars are wide mouth glass.

Answer. Stated as requested. Table 3.3.3 is now Table 3.4.3.

26. Page 24, Figure 3.4.2

The custody form should include a space for airbill numbers, container type (e.g., 40ml), and a dedicated sheet number that can be cross referenced with the rest of the paperwork.

Answer. See Figure 3.5.2, airbill numbers and container type can be placed in the "Remarks" section as stated in the text. It would seem that the four forms (Chain of Custody, Sample Tag, Field Notebook and Field Log) would be sufficient for cross referencing.

27. Page 25, Section 3.4.3, Step 7

Sample preservative used.

Answer. See Section 3.5.3, Step 7, typo corrected as requested.

28. Page 26, Figure 3.4.3

The sample analyses planned during the site investigation are specified on Tables 3.1.5a and 3.1.5b. These analyses are not all represented on the sample tag. These analyses should be added to the tag.

Answer. See Figure 3.5.3, sample analyses added as requested.

29. Data Management Plans

A copy of the field notes must be included as attachments. A discussion must be included on how the data will be evaluated (i.e., comparison to background, etc.).

Answer. A copy of the field notes will be added as an appendix to the report as stated in Section 3.5.5, Field Notebook. A discussion of data evaluation is given in Section 5.5.0. and is stated as follows: The data will be evaluated with respect to: (1)detection limits, (2)control limits for duplicates, spikes, blanks and surrogates, (3)data control within control limits and corrective actions, and (4)flagging of consistently out of control data.

30. Page 39, Section 3.5.1

What is the definition of "contaminated material" versus "uncontaminated material"? We recognize that this will depend on the analytical results, but the definition of "contaminated" should be clearly stated before the study is initiated.

Answer. Reference to "contaminated material" revised to "Investigation-Derived Waste". IDW is define as any cuttings from borings not used for sampling, ground water from purging and well development, decontamination water, etc.

31. Page 40

a. Section 4.0

Section 4.0 contains information which should all be included within the Sampling and Analysis Plan, Section 3.0 (see General Comment).

Answer. Well Construction Procedures are Section 3.3.0 of Section 3.0 Sampling and Analysis Plan as requested.

b. Section 4.1.1

The use of the word "adequately" in the second sentence draws the same comment as provided earlier on Page 19, first full paragraph.

Answer. The word "adequately" replaced with "...in an attempt" as requested. Section 4.1.1 is now Section 3.3.1.

This paragraph indicates that 26 ground water samples will be collected. However, Table 2.2.2 indicates that 36 samples will be collected, and Diagram 2.3.2 indicates that 20 existing wells will be sampled and 16 new wells installed. This difference must be resolved.

Answer. Paragraph revised to indicate that 20 ground water samples will be collected for the first round of samples, 28 ground water samples will be collected per round for the second through the fifth rounds, for a total of 116 samples collected for the ground water analysis.

32. Page 43

a. Section 4.1.3, First Paragraph

What site specific observations have gone into the determination to use the 0.100-inch slot screen size? It is becoming the state-of-the-art practice that well screen slot sizes are determined in the field on the basis of a field sieve analysis of geologic materials retrieved from the zone to be monitored.

Answer. Note that these wells are established within the rock aquifer. The 0.020 inch slot is used as a standard screen size throughout all previous monitoring wells in rock on this site. Screen slot sizes are determined only for monitoring wells in which the screen will be in a soil or sediment horizon. Section 4.1.3 is now Section 3.3.3.

b. Section 4.1.3, Second Paragraph

No method is presented which will be used to determine the size grading of the filter pack material. This information should be included.

This paragraph says that the monitoring wells will be 40 feet in length (30 feet casing and 10 feet screen). How can the wells be 40 feet long, when it is proposed to extend the top of the well screen 5 feet above the ground water level, and the depth to water, as described in Section 1.1.4, is about 14 feet? This discrepancy must be corrected.

Answer. Section 4.1.3 is now Section 3.3.3. This paragraph has been revised. The size grading of the filter pack material will be dependent upon the size of the sand in the aquifer being screened. Length of monitoring wells is dependent upon the depth to the aquifer.

33. Page 43, Section 4.1.3, Last Paragraph

The ground water investigation and monitoring well installation plans, up to this point, do not contain any three-dimensional perspective. This paragraph gives token attention to this perspective and implies that monitoring wells may be placed at different levels, which is appropriate because the vertical extent of contamination is also of concern. However, there is no indication that the three-dimensional perspective goes beyond this short paragraph. It is surely not evident in the well installation plans. There should be more attention paid to the characterization of the vertical extent of contamination. The plans must take into consideration data from the R-150 Tank closure and define the rate and extent of the plume three-dimensionally.

Something appears to be missing from the text in Lines 3 and 4.

Answer.

34. Page 46, Second Paragraph

If compressed air development is determined not to be appropriate by the site investigators for the proposed monitoring wells, why is the method proposed to be used if redevelopment of existing monitoring wells is required, as indicated on Page 19, second paragraph, second sentence.

Answer. Paragraph revised to state "Development and redevelopment of wells will be done by surge block.

35. Page 48

a. Paragraph 6.1.0, Line 5

"Chemical and physical data are reduced."

Answer. Typo corrected as requested. Section 6.1.0 is now Section 5.1.0.

b. Paragraph 6.5.0, Line 1

"Characteristics of a release are dependent on..."

Answer. Typo corrected as requested. Section 6.5.0 is now Section 5.5.0.

EPA COMMENTS AND REPLIES TO DRAFT, RFI PHASE III GROUNDWATER PHASE II SOILS QAPP PLAN FOR NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA, PESTICIDE CONTROL AREA/R-150 TANK SITE, SWMU #09/05.

A. General Comments

1. The PCA/R-150 Quality Assurance (QA) Plan generally follows the topical outline presented in the "Region V Model RCRA Quality Assurance Project Plan" (QAPjP), dated May 1991.

2. The document does not provide any explicit Data Quality Objectives (DQOs) for the project. Duplicate samples, spiked sample analysis, and trip blanks, will be performed at an adequate frequency, but quantitative DQOs have not been presented. There are several references to the use of CLP criteria. However, CLP criteria change with time, and the specific CLP criteria to be used have not been identified. In addition, the use of laboratory criteria can only be applied to laboratory analyses. A laboratory cannot compare field duplicates without knowing the sample codes, but if a laboratory knows the sample codes, then independent analyses of the samples becomes suspect.

It would be acceptable to use CLP criteria but they should be explicitly stated as project DQOs.

Answer. DQOs and CLP criteria have been included

3. The draft QAPP does not address completeness as a DQO. Since the document indicates that some samples may not be rerun if holding times are exceeded, and CLP does not address completeness, a project DQO should be established for this parameter.

Answer. Completeness is addressed as requested and a DQO has been established for this parameter.

4. There is no discussion of the detection limits that are to be achieved. We would assume that the intended detection limit for VOCs in the ground water samples is on the order of 1 ug/L but no information was provided on the necessary detection limits for semi-volatile organics, pesticides, herbicides, and metals. Specific detection limits for each parameter to be measured in both soil and water matrices should be tabulated. Perhaps it could be specified that detection limits equal to one-half the established water quality criteria will be used. For the soil samples, it may be necessary to specify the minimum sample size that will be analyzed.

It will be necessary to specify detection limits in order to make a judgment on the acceptability of trip blanks and reagent blanks.

Answer. Detection limits are listed as requested.

5. The topic of comparability was not addressed. This can be remedied by defining project detection limits as suggested above.

Answer. Project detection limits are defined as requested.

6. There was no discussion as to whether the ground water samples to be analyzed for trace metals are to be filtered or not. If "toxicity" issues are important, we would recommend that the samples be filtered prior to analysis (0.45 u pore-size filters). If ground water mapping is the important issue, analysis of unfiltered samples may be sufficient (but it should be recognized that increased data variability could be induced to the presence of particulate matter from the well casings or the borings).

Answer. Ground water samples will be filtered. "Toxicity" isssues are not important.

7. The program outlined in the draft QAPP may be sufficient to define the quality of project data after the fact but we have reservations as to whether it is adequate to control the quality of the data being generated.

B. Specific Comments

1. Page 1, Paragraph 3, Line 6

24D and 24T should be 2,4-D and 2,4-T.

Answer. Corrected as requested.

2. Page 3, Paragraph 3, Line

Figure 1.2.1, does not show that contamination was detected, what the contaminants were, what their concentrations were, or the orientation of the plume.

Answer. Sentence revised, figure inadvertently included.

3. Page 8, Paragraph 2, Lines 7-8

This statement is inappropriate. first, Cd would be considered a "toxic" metal yet, it is not included in any of the discussions in the text (i.e., the list of inorganic substances considered in the text is not a complete list of "toxic" inorganic substances). Second, if toxicity is a point of concern, it will be necessary to distinguish between the "dissolved" and "total portion of a substance in ground water samples because the "dissolved" fraction will give a reasonable estimate of "toxicity" but the "total" fraction will only estimate potential "toxicity". This has not been addressed in the text. Third, if toxicity is the point of concern, some explicit toxicity threshold should be stated (i.e., chemicals with a "toxicity" greater than x mg/l).

Answer. Statement referring to TOX metals deleted from list of parameters.

4. Page 12, Paragraph 2, Lines 3-4

Holding times, in and of themselves, cannot and do not assure the quality of analytical data. If holding times are violated, the data are suspect. However, if holding time criteria satisfied, this does not assure the quality of analytical data. We believe the text should be modified to indicate that holding times are a necessary part of an effective data quality control program.

Answer. Revised as requested.

5. Page 12, Table 1

a. For completeness and correctness, the preservation column should indicate degrees C.

Answer. Page 13, Table 1, the preservation column indicates degrees as requested.

b. These holding times are for water samples. What holding times will be used with soil samples?

Answer. Page 13, Table 1, holding times for soils and water stated in the text as requested. Reference NEESA Guidance.

6. Page 19, Table 2 and Page 20, Table 3

Neither listing of methods identifies the detection limits that will be needed for the study. Also, this type of listing does not differentiate between detection limits for soil samples and water samples. In addition, this listing does not identify the sample size necessary to achieve a specific detection limit.

Answer. Detection limits included in Attachment 1 of QAPP as requested. Container size indicates sample size required.

7. Page 21, Paragraph 1, Line 4

The text states that method blanks for metals and other wet chemical analyses should be below the method detection limit. However, the text does not define required detection limits for these parameters. Also, the way the present text is written, method blanks for organic analytes are not addressed.

Answer. Page 22, paragraph 1, Detection limits included as requested. Text rewritten to include method blanks for organic analytes.

8. Page 22

a. Paragraph 2, Line 4

Aloquotes should be aliquots.

Answer. Page 23, paragraph 2, line 4, typo corrected corrected as requested.

b. Paragraph 2, Line 11

Recover should be recovery.

Answer. Page 23, paragraph 2, typo corrected as requested.

c. Paragraph 3, Line 1

Aliquote should be aliquot.

Answer. Page 23, paragraph 3, typo corrected as requested.

d. Paragraph 4, Line 1

Aliquote should be aliquot.

Answer. Page 23, paragraph 4, typo corrected as requested.

9. Pages 21-22

No project Data Quality Objectives are given in the internal quality control checks section. It specifies what the individual quality control mechanisms are, but no limits are provided (i.e., there are no stated limits for replicate reproductivity, spike recovery, analytical detection limits, and there is no mention of using any mechanism to check accuracy).

Answer. DQOs are included as requested. Limits are provided in Attachment 1 of the QAPP.

10. Page 23

a. Paragraph 1, Lines 2-3

The following is a description of the data reduction and reporting procedures that will be used.

Answer. Element 11, paragraph 1, sentence revised as requested.

b. Paragraph 1, Line 4

Chemical detection data? The procedures should be described and, at a minimum, properly referenced.

Answer. The chemical detection data are the results of the analysis. The CLP procedures follow the SW-846 Methods.

c. Table 4

Example of the forms to be used for tabulating the data should be included.

Answer. Forms required for tabulating data are located in Attachment 2 of the QAPP.

11. Page 24, Table 4

It might be more correct to state a duplicate sample will be collected daily for every set of 20 samples or less.

Answer. Page 24, Table 4, revised as requested.

12. Page 26, Paragraph 1

Since the CLP criteria changes with time, the criteria to be used with this project should be clearly stated.

Answer. Page 28, paragraph 1, the CLP criteria is the SW-846 Methods for volatile organic analysis.

13. Page 27

a. Paragraph 1, Line

What CLP criteria?

Answer. Page 29, paragraph 1, the CLP criteria is the range that the recoveries shall fall within as listed in Attachment 1 of the QAPP.

b. Paragraph 7, Lines 1-2

This states that any results which exceed internal QC limits set by the laboratory... The purpose of a QAPP is to establish project specific data quality objectives.

Answer. Reference to laboratory setting limits is deleted.

14. Page 28

a. Paragraph 2

What are the CLP limits?

Answer. Page 30, paragraph 2, CLP limits are the spike surrogate recovery limits. Limits located in Attachment 1 of the QAPP.

b. Paragraph 4

What are the CLP criteria?

Answer. Page 30, paragraph 4, the CLP criteria is the range that the recoveries shall fall within as listed in Attachment 1 of the QAPP.

15. Pages 29-31

There are no established DQOs for completeness and the frequency of performance audits is not specified.

Answer. DQOs for completeness stated in #9 on page 31 as follows: (1)ensure that all samples and analyses have been processed, (2)complete records including chain of Custody for each analysis and associated QC samples were used, (3)procedures specified in project planning were followed, and (4)all calibrations were performed.

Performance audits are performed twice a year.

EPA COMMENTS AND REPLIES TO DRAFT, RFI PHASE III GROUNDWATER PHASE II SOILS SAFETY AND HEALTH PLAN AND SPILL CONTINGENCY PLAN FOR NAVAL WEAPONS SUPPORT CENTER, CRANE, INDIANA, PESTICIDE CONTROL AREA/R-150 TANK SITE, SWMU #09/05.

1. The plan is very generic. It contains too many "boiler plate" paragraphs and not enough site-specific information. It does not appear to have been carefully reviewed for content, spelling, organization, etc.

Answer. In certain instances some of the plan is generic, however, it has been reviewed and specifically addresses the pertinent project, PCA/R-150 Tank Site.

2. A number of training topics are specified by 29 CFR 1910.120(e)(2)2. The training topic outline on Pages 6 and 7 of the subject plan does not include the following required topics: the names of personnel and alternates responsible for site safety and health; the safe use of engineering controls and equipment at the site; and medical surveillance requirements.

Answer. Since this project is being done by a variety of individuals, I'm not certain at this time who will be the IH, SSC, etc. These individuals will be announced when we have a full understanding when this project will commence. These names will include an alternate for the Site Safety Coordinator on the job.

The use of engineering controls on the project will be the extensive use of PPE and good general work practices. This coupled with an air-monitoring program will be the available engineering control as it relates to this particular project, Paragraph 10.0, and 12.0.

3. Reference the Medical Surveillance program, Page 8. a termination physical is a mandatory requirement of the medical surveillance criteria of 29 CFR 1920.120(f). A termination physical is not mentioned in subject document.

Answer. Medical requirements are described in Paragraph 10.14, and 15.0. Annual physicals will be our designated termination physicals. Special circumstances, are mentioned in Section 15.1.

4. Reference Page 13, Paragraph 10.2.3.1. The last sentence of this paragraph is incomplete.

Answer. Paragraph 10.2.3.1 has been revised and is now incorporated into Section 12.0, Air Monitoring.

5. Title 29 CFR 1910.120(a)(4) requires that the site-specific safety and health plan include specific information on the frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used. The plan contains some very general information on these subjects on Page 13; however, the published information is not adequate enough to satisfy the above requirement.

Answer. The specific air-monitoring protocol is in Section 12.0, Air Monitoring. Calibration requirements are addressed as well as the Model of instruments to be used on this project.

6. Title 29 CFR 1910.120(d) requires appropriate site control procedures to be implemented. The subject plan appears to cover some required items, but does not address some others such as a buddy system, site communications, and standard operating procedures. According to 29 CFR 1910.120, these topics can be covered in other documents and need not be repeated in the plan; however, it is suggested that some reference be included in the plan on where to locate information on the topics in question.

Answer. Site controls measures are addressed in Section 9.4. Also referenced throughout the Safety and Health Plan is the U.S. Army Corps of Engineers Safety and Health Manual (EM-385-1-1).

7. Pages 17 and 18 appear to be out of place. Page 19 should follow Page 16.

8. The Contingency Plan, Section 11.0, does not appear to include all the topics required by 29 CFR 1910.120(l). For example, it appears that the topics of emergency recognition and prevention, safe distances and places of refuge, site security and control, evacuation routes and procedures (evacuation route diagrams are mentioned), and critique of response and follow-up have not been addressed.

Answer. The contingency plan for evacuation will be addressed further when the Site Safety Coordinator procures the evacuation diagram. However, the overall plan is in Section 13.0.

9. Confined space entry procedures are not included. Based on the description of work, confined space entries should not be necessary, however, it may be appropriate to mention this fact in the plan.

Answer. Confined space is addressed in Section 12.2 and in the attached District Confined Space Regulation.

10. While the Spill Contingency Plan contains a great deal of information, it is poorly organized, is very difficult to follow, and has limited applicability to the drill site operations. It does not appear to adequately cover the topics required by 29 CFR 191.120(j), and contains very little information that would be useful to any of the drill site employees.

Answer. The information that is in this plan is useful, and if followed will provide a safe and healthy worksite for this project.