DATE OF SUBMISSION: OCTOBER 31, 1997

REVISED
Closure Plan
for the Open Burning Grounds (OBG)
Hazardous Waste Treatment Unit
Ravenna Army Ammunition Plant
Ravenna, Ohio

Prepared for:
United States Army Corps of Engineers
Nashville District
Nashville, Tennessee 37202

Prepared by:

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~~September, 1996~~
OCTOBER 1997

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

~~ABS~~	~~absorption factor~~
AMSL	above mean sea level
~~ARAR~~	~~applicable or relevant and appropriate requirement~~
BGS	below ground surface
COC	Chain of Custody
COPC	constituent of potential concern
DOT	Department of Transportation
DNT	Dinitrotoluene
~~ELCR~~	~~Excess Lifetime Cancer Risk~~
EPA	Environmental Protection Agency
EP Toxicity	Extraction Procedure Toxicity
GPD/ft	gallons per day per foot
GPM	gallons per minute
HASP	Health and Safety Plan
~~HEAST~~	~~Health Effects Summary Tables~~
HI	Hazard` Index
HMX	1,3,5,7-Hexahydro-1,3,5,7-tetranitrotriazine
HSWA	Hazardous and Solid Waste Amendments
~~IRIS~~	~~Integrated Risk Information System~~
LPD/m	liters per day per meter
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg/L	milligram per liter
NPDES	National Pollutant Discharge Elimination System
OAC	Ohio Administrative Code
OB	open burning
OBG	Open Burning Grounds
OD	open detonation
OEPA	Ohio Environmental Protection Agency
PCB's	polychlorinated biphenyls
~~PEF~~	~~Particulate Emission Factor~~
POTW	Publicly Owned Treatment Works
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-Hexahydro-1,3,5-trinitrohydrazine
~~RME~~	~~Reasonable Maximum Exposure~~
~~RfC~~	~~reference concentration~~
~~RfD~~	~~reference dose~~
RVAAP	Ravenna Army Ammunition Plant

SAP	Sampling and Analysis Plan
~~Sf~~	~~slope factor~~
SOP	standard operating procedure
TCLP	Toxicity Characteristic Leaching Procedure
TNT	2,4,6-Trinitrotoluene
TSDF	Treatment Storage and Disposal Facility
UCL	Upper Confidence Limit
ug/L	microgram per liter
U.S.	United States
USAEHA	United States Army Environmental Hygiene Agency
USGS	United States Geological Survey
UXO	Unexploded Ordnance
~~VF~~	~~volatilization factor~~

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Closure Plan for the Open Burning (OB) Grounds Hazardous Waste Treatment Unit

1.0 FACILITY DESCRIPTION

1.1 GENERAL DESCRIPTION

The Ravenna Army Ammunition Plant (RVAAP) is located in the northeastern portion of the State of Ohio, within Portage and Trumbull Counties. The location of the facility is shown in Figure 1-1. The installation covers approximately 8668.3 hectares (21,419 acres), and is approximately 17.7 kilometers (11 miles) long and 5.6 kilometers (3.5 miles) wide as shown in Figure 1-2. During operation, the primary purpose of the facility was to load explosives into medium and major caliber artillery ammunition, bombs, mines, fuzes and boosters, primers, and percussion elements. Currently, the munitions facilities are in an inactive status. The plant operated a RCRA permitted open burn unit in conjunction with its demilitarization operations.

The open burning unit consists of a level area approximately 30.5 meters (100 feet) square. The OBG is identified as Pad 37 ~~38 (WBGss-038)~~, and is located along Road C East, approximately 305 meters (1,000 feet) north of Sand Creek as shown in Figure 1-3. The southern portion of the OBG is bordered by a shallow drainage way that flows to the east. The RVAAP burned bulk PROPELLANTS ~~propellents~~, explosives, and explosive-contaminated material at the OBG. Materials that were contaminated with PROPELLANTS ~~propellents~~ and explosives were also burned. Burns were conducted in metal trays from 1980 until operations ceased. The trays are constructed of 1/4-inch boiler plate and are 4.85 meters (15 feet 11-1/2 inches) long by 1.22 meters (4 feet) wide. The trays are 0.3 meters (11-3/4 inches) deep and refractory-lined. The trays are arranged in two lines of four trays each, set end-to-end. The trays are set on rails atop a pad of crushed slag.

In the past, the area surrounding the current OBG has been used for the thermal treatment of fuses, boosters, aluminum caps, bulk explosives, sump waste, and motor oil. Wastes treated at the OBG carried the EPA hazardous waste numbers D003 and K044 (listed only due to reactivity). Treatment by OB removed the reactivity characteristic. Wastes were not chemically characterized by analysis prior to OB since adequate physical and chemical data are obtained from process knowledge. THE ASH PRODUCED FROM THIS TREATMENT WAS A HAZARDOUS WASTE, AND ANALYSIS INDICATED THAT IT CONTAINED METALS (ARSENIC, BARIUM, CADMIUM, CHROMIUM, LEAD, AND SILVER) AND A

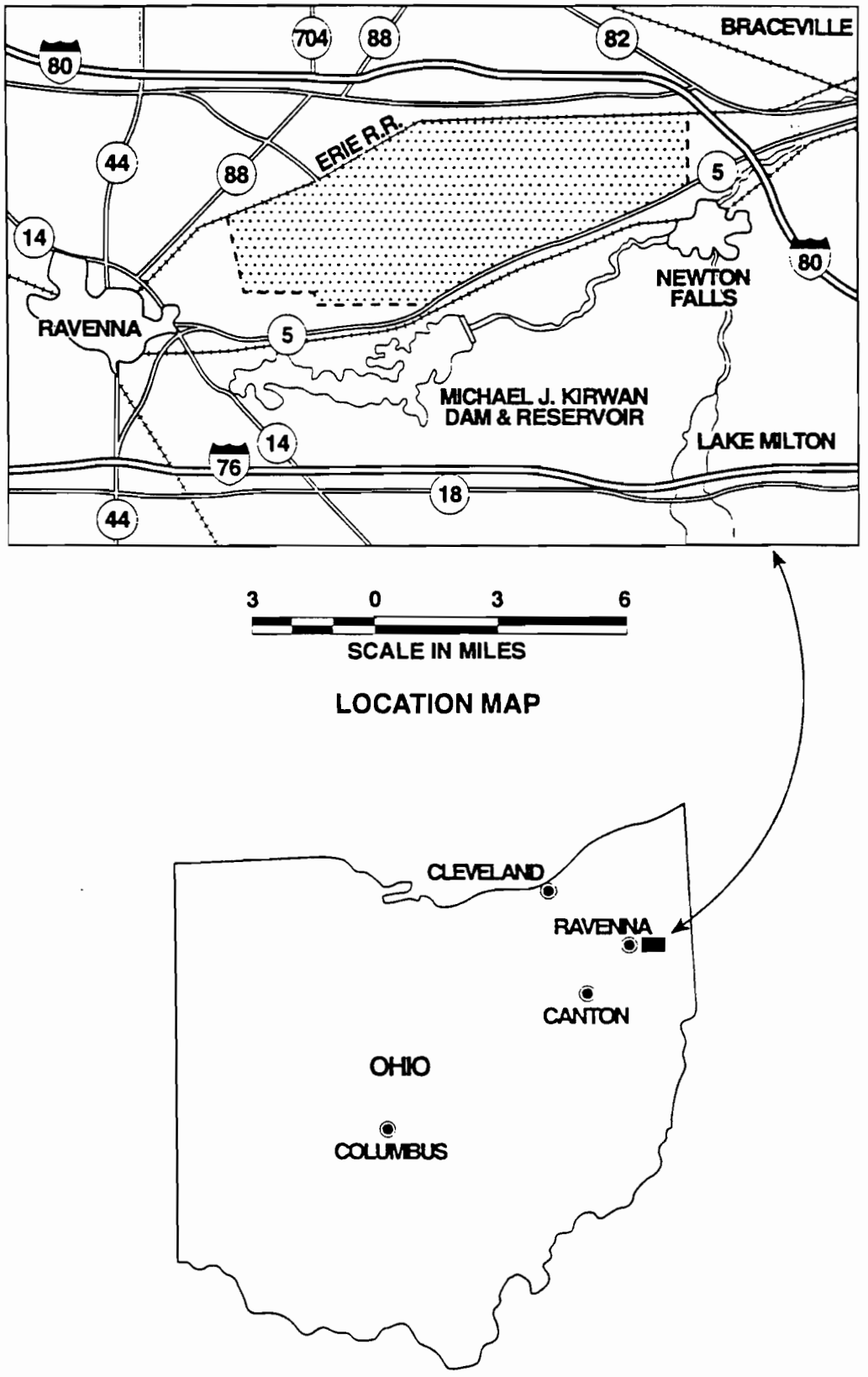
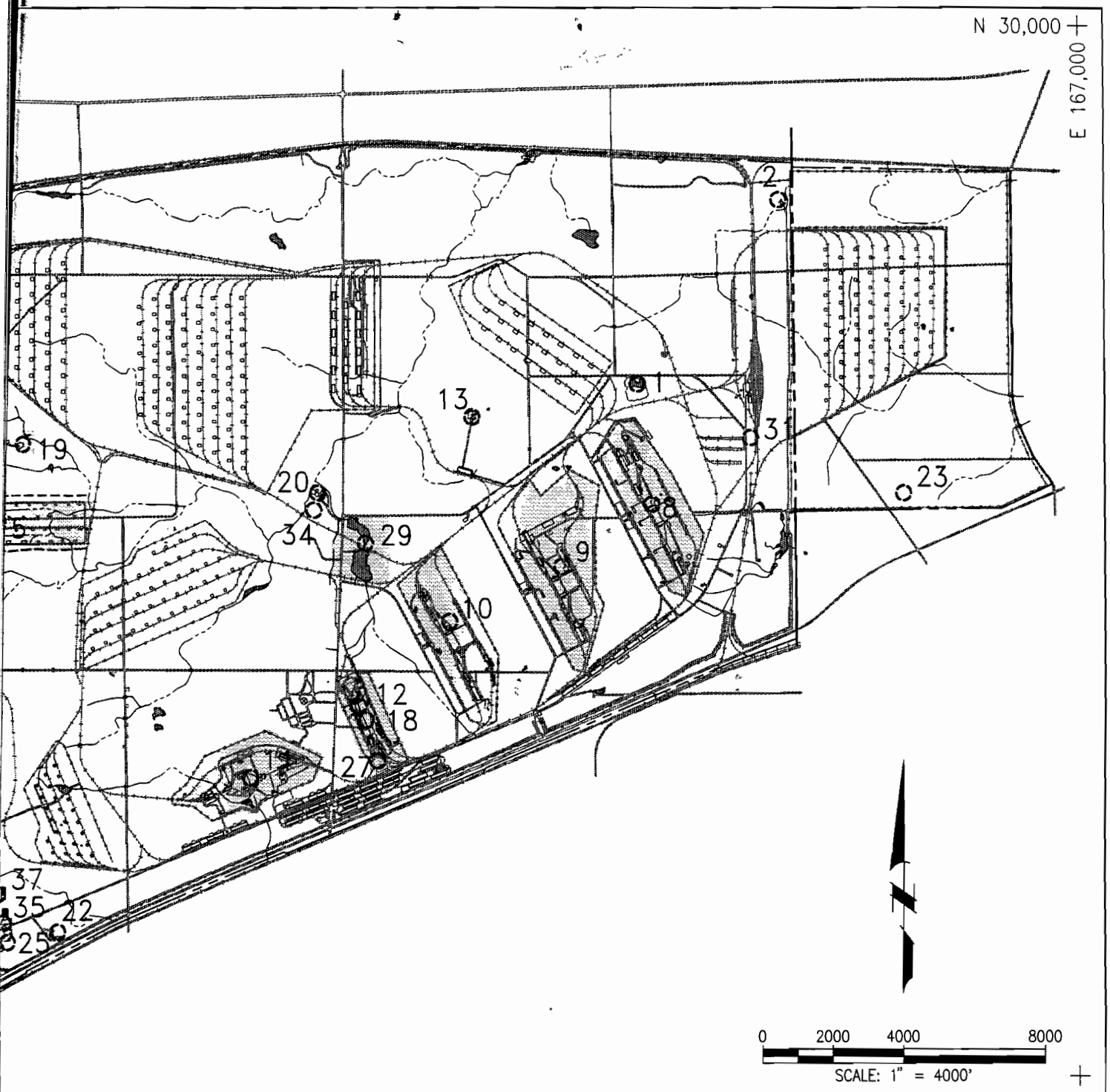


Figure 1-1. General Location and Orientation of RVAAP

LEGEND OF SITES:

1 ..... RAMSDELL QUARRY LANDFILL
2 ..... ERIE BURNING GROUNDS
3 ..... DEMOLITIONS AREA #1
4 ..... DEMOLITIONS AREA #2
5 ..... WINKLEPECK BURNING GROUNDS
6 ..... C BLOCK QUARRY
7 ..... BLDG 1601 HAZARDOUS WASTE STORAGE
8 ..... LOAD LINE 1 AND DILUTION/SETTLING POND
9 ..... LOAD LINE 2 AND DILUTION/SETTLING POND
10 ..... LOAD LINE 3 AND DILUTION/SETTLING POND
11 ..... LOAD LINE 4 AND DILUTION/SETTLING POND
12 ..... LOAD LINE 12 AND DILUTION/SETTLING POND
13 ..... BLDG 1200 AND DILUTION/SETTLING POND
14 ..... LOAD LINE 6, EVAPORATION UNIT
15 ..... LOAD LINE 6, TREATMENT PLANT
16 ..... QUARRY LANDFILL/FORMER FUZE & BOOSTER BURNING PITS
17 ..... DEACTIVATION FURNACE
18 ..... LOAD LINE 12 PINK WASTE WATER TREATMEN
19 ..... LANDFILL NORTH OF WINKLEPECK BURNING GROUN
20 ..... SAND CREEK SEWAGE TREATMENT PLAN
21 ..... DEPOT SEWAGE TREATMENT PLAN
22 ..... GEORGE ROAD SEWAGE TREATMENT PLAN
23 ..... UNIT TRAINING SITE WASTE OIL TAN
24 RESERVE UNIT MAINTENANCE AREA WASTE OIL TAN
25 ..... BLDG 1034 MOTOR POOL WASTE OIL TAN
26 ..... FUZE BOOSTER AREA SETTLING TANK



27 .....BLDG 854–PCB STORAGE
28 .....MUSTARD AGENT BURIAL SITE
29 ....UPPER AND LOWER COBBS POND COMPLEX
30 ...LOAD LINE 7 PINK WATER TREATMENT PLANT
31 ..... ORE PILE RETENTION POND
32 .....40 AND 60 MM FIRING RANGE
33 .....FIRESTONE TEST FACILITY
34 ..... SAND CREEK DISPOSAL ROAD LANDFILL
35 ...1037 BUILDING–LAUNDRY WASTEWATER SUMP
36 ..... PISTOL RANGE
37 ..... PESTICIDE BUILDING S–44S2
38 ..... NACA TEST AREA

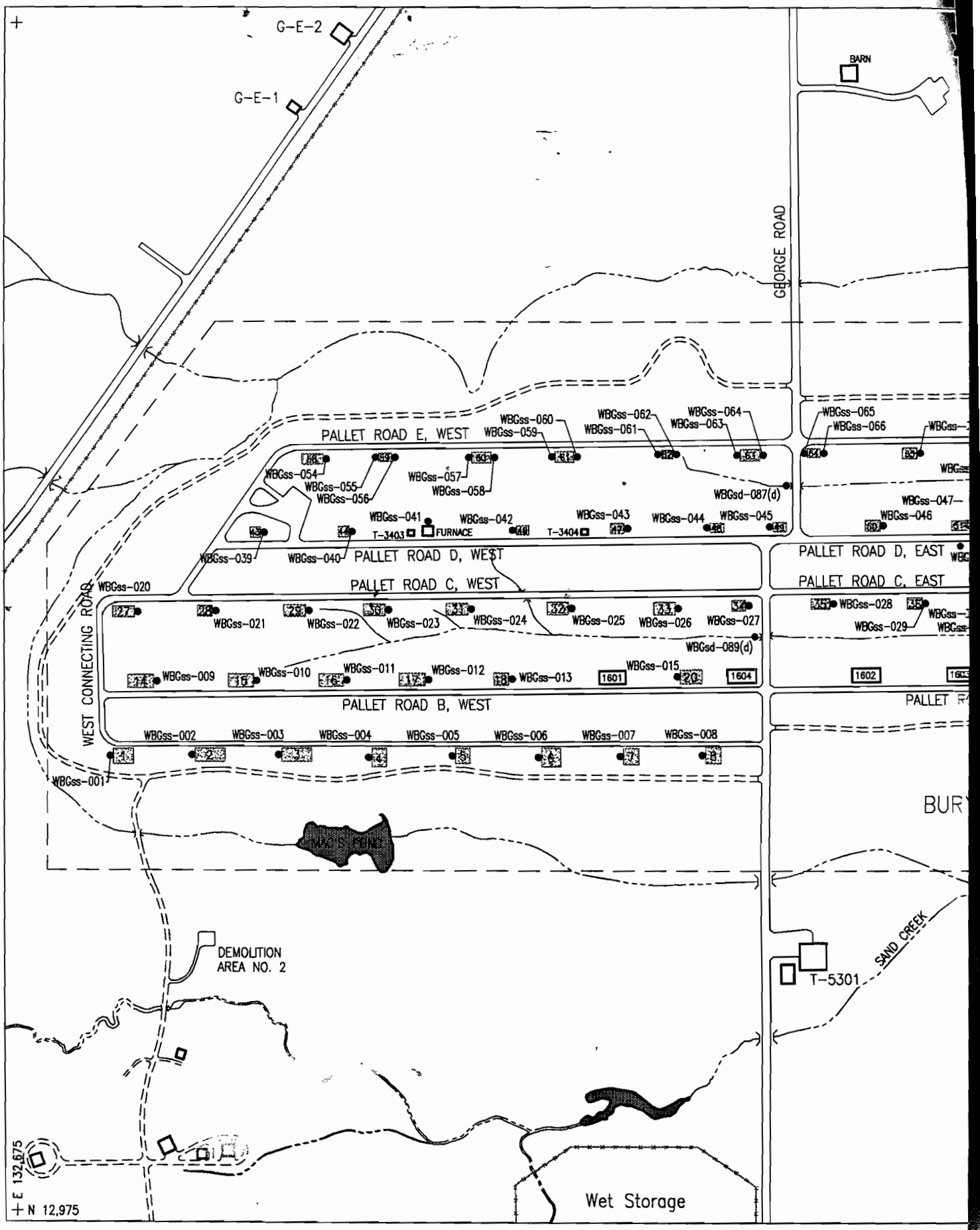
US Army Corps of Engineers Nashville District

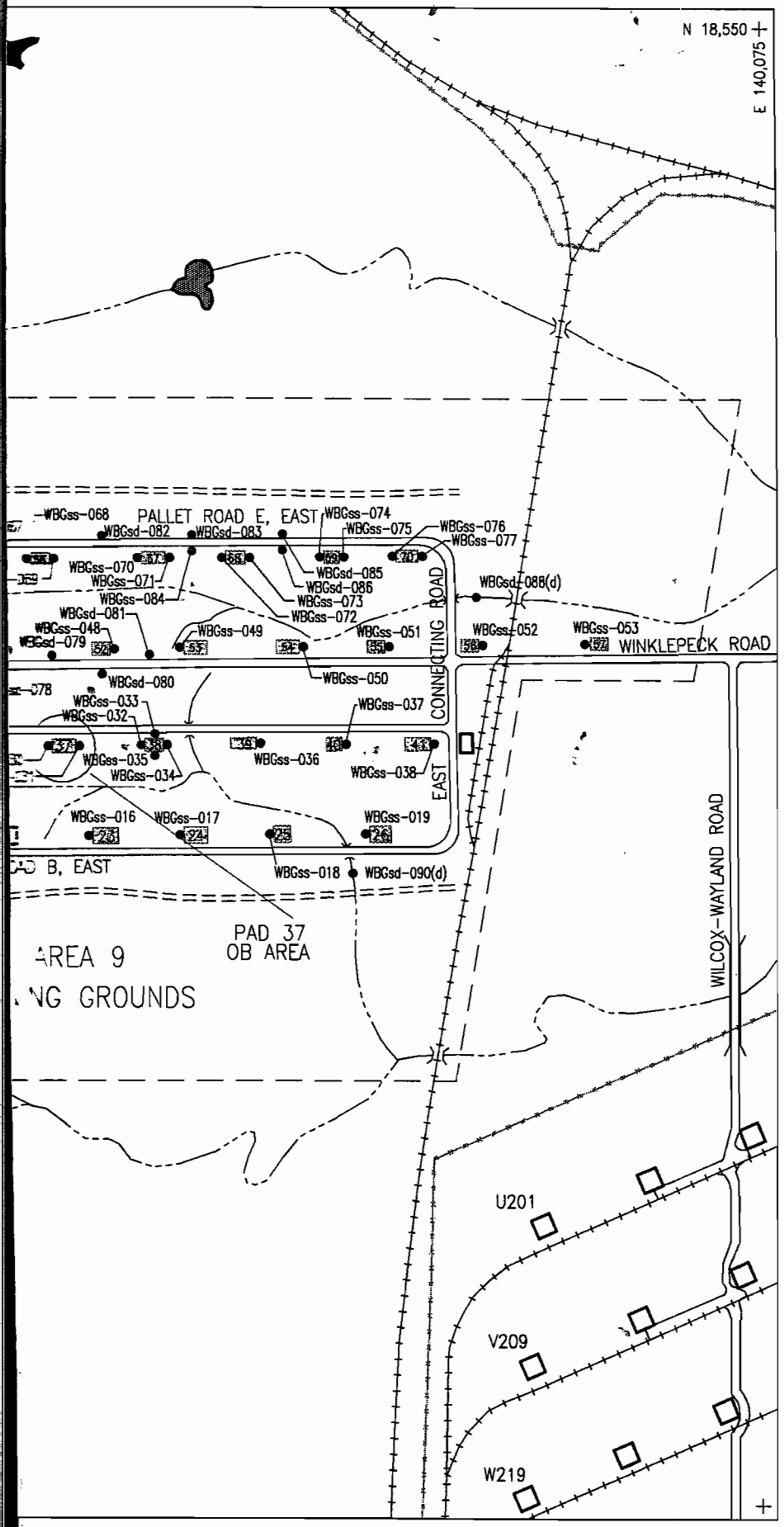
U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
NASHVILLE, TENNESSEE

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
FACILITY MAP

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	REV. B/04–09–97	95021/DWGS/19111X17

Figure 1-2. Facility Map


G-E-2
G-E-1
BARN
GEORGE ROAD
PALLET ROAD E, WEST
WBGss-060
WBGss-059
WBGss-062
WBGss-061
WBGss-064
WBGss-063
WBGss-065
WBGss-066
WBGss-054
WBGss-055
WBGss-056
WBGss-057
WBGss-058
WBGsd-087(d)
WBGss-047
WBGss-046
WBGss-041
WBGss-042
WBGss-043
WBGss-044
WBGss-045
T-3403
FURNACE
T-3404
WBGss-039
WBGss-040
PALLET ROAD D, WEST
PALLET ROAD D, EAST
PALLET ROAD C, WEST
PALLET ROAD C, EAST
WBGss-020
WEST CONNECTING ROAD
WBGss-021
WBGss-022
WBGss-023
WBGss-024
WBGss-025
WBGss-026
WBGss-027
WBGss-028
WBGss-029
WBGsd-089(d)
WBGss-009
WBGss-010
WBGss-011
WBGss-012
WBGss-013
WBGss-015
1601
1602
1604
PALLET ROAD B, WEST
WBGss-002
WBGss-003
WBGss-004
WBGss-005
WBGss-006
WBGss-007
WBGss-008
WBGss-001
DEMOLITION
AREA NO. 2
T-5301
SAND CREEK
Wet Storage
E 132,675
N 12,975



LEGEND:

- BUILDING
- ASPHALT ROAD
- RAILROAD TRACKS
- FENCE LINE
- POND
- STREAM
- GRID TIC
- SAMPLE STATION

0 300 600 1200

SCALE: 1" = 600'

US Army Corps of Engineers Nashville District

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NASHVILLE, TENNESSEE

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
WINKLEPECK BURNING GROUNDS
(RVAAP-05)

DRAWN BY:	PCP:	CAD FILE:
R. BEELER	260BURN	S:\RAVENNA\260BURN

Figure 1-3. Winklepeck Burning Grounds

CONSTITUENT OF EXPLOSIVES, 2,4-DINITROTOLUENE. VISUAL INSPECTION AND EXTENSIVE FIELD WORK CONDUCTED AT WINKLEPECK BURNING GROUNDS DURING THE PHASE I CERCLA REMEDIAL INVESTIGATIONS INDICATES THAT NO UNEXPLODED ORDNANCE (UXO) IS PRESENT AT THE OPEN BURNING GROUNDS.

USE OF THE OBG FOR TREATMENT OF WASTE BEGAN IN 1980. The open burning of munitions has ceased at RVAAP, and the last residue from that operation was removed AND TAKEN TO THE 1601 BUILDING IN 1993. ~~and transported to an off-site disposal facility~~.

~~Prior to closure of the OBG, interim measures will be completed. The interim measures plan submitted to OEPA in August 1996 proposed removal, storage, and characterization of the refractory material in the burn trays and removing the burn trays and other equipment to temporary storage in Building 1601.~~

1.2 TOPOGRAPHIC MAP

The U.S. Geologic Survey (USGS) topographic map for the portion of the facility upon which this unit is located is shown on Figure 1-4. The layout of the OBG Hazardous Waste Treatment Unit area is shown on Figure 1-5.

1.3 SOLID WASTE MANAGEMENT UNITS

Other RCRA-regulated units that exist at RVAAP that have not yet been certified as closed include:

1. The Building 1601 Container Storage Unit, a 6.1 meter by 6.71 meter (20 feet by 22 feet) reinforced concrete structure that was used to store up to 72 55-gallon drums of ash residue from open burning and spent activated carbon from the pink water treatment plant until this material was disposed of off site. This building is to be closed in accordance with a closure plan that is anticipated to be submitted to Ohio Environmental Protection Agency (OEPA) at the same time as this closure plan. The Building 1601 Container Storage Unit was listed in the RVAAP RCRA Part B Permit Application, which was subsequently withdrawn.

2. The Open Detonation AREA ~~Grounds~~, an area approximately 61.0 meter by 76.2 meter (200 feet by 250 feet) identified on Figure 1-2 as the RCRA-regulated portion of the Demolitions Area #2 (map reference #4). This area is to be closed in accordance with a closure plan that is anticipated to be submitted to Ohio EPA at the same time as this closure plan. As in the case of Building 1601, the Open DETONATION AREA ~~Demolition Grounds~~ was listed in the RVAAP RCRA Part B Permit Application, which was subsequently withdrawn.

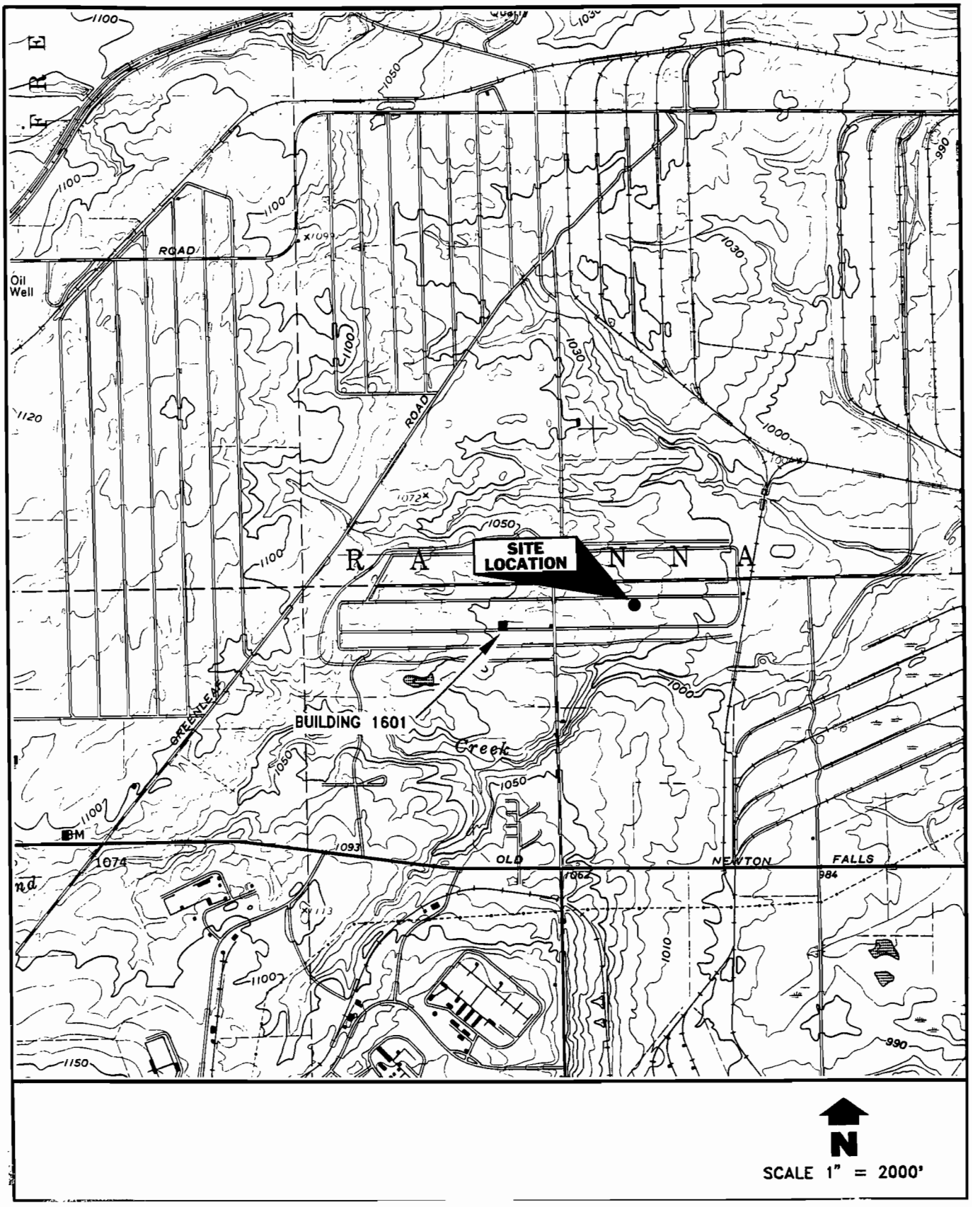


Figure 1-4. Topographic Location Map

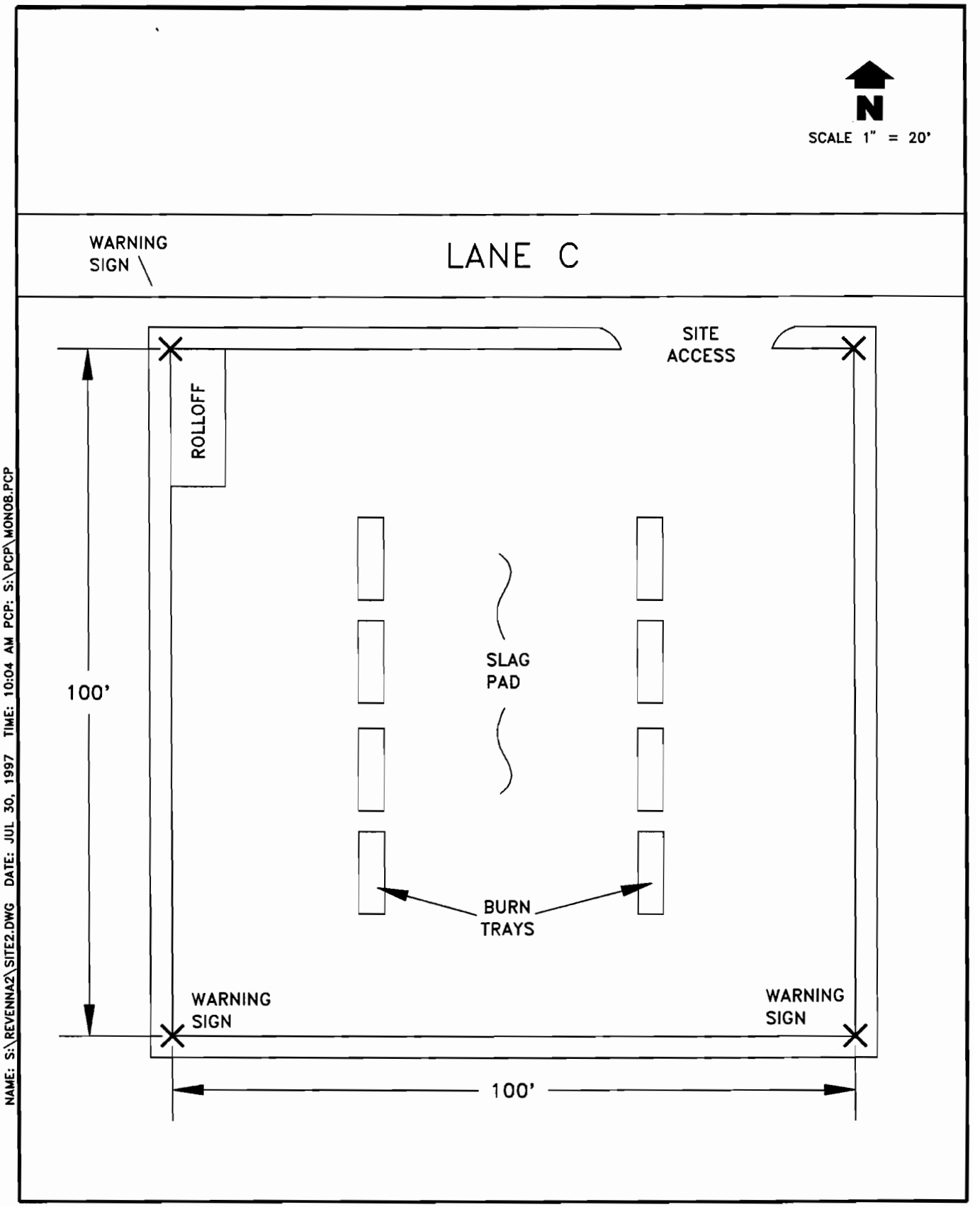


Figure 1-5. Open Burning Grounds Layout

3. The Deactivation Furnace, a thermal treatment device used to remove the characteristic of reactivity from certain off-specification or waste items produced when the facility was in operation. Some closure activity has taken place at this unit, identified in Figure 1-2 as the Deactivation Furnace (map reference #17). However, some soil contamination was discovered that has indicated that this unit can not be closed "clean", and A REVISED CLOSURE PLAN IS IN PREPARATION ~~discussions on future activities at this unit continue with Ohio EPA~~. As with the other units discussed, the Deactivation Furnace was listed in the RVAAP RCRA Part B Permit Application, which was subsequently withdrawn.

~~Other units of concern (not RCRA regulated) that exist at RVAAP include:~~

~~1. The Load Line 12 Pink Waste Water Treatment Plant, identified in Figure 1-2, is an active facility with an active NPDES Permit No. 3I000000BD. The unit consists of dual mode activated carbon filters used in the treatment of pink water. Twin 2000-pound carbon units are enclosed in a steel girder metal sided building set on a concrete floor.~~

~~2. Building U-202 is an earth covered concrete building within Group 5, identified in Figure 1-2. The building was never used for storage of potentially hazardous waste.~~

~~3. Building W-221 is an earth covered concrete building within Group 5, identified in Figure 1-2. The building was used as a 90 day storage area for potentially reactive waste.~~

~~4. Building U-202 is an earth covered concrete building within Group 5, identified in Figure 1-2. The building was used as a 90 day storage area for potentially reactive waste.~~

1.4 HYDROGEOLOGY INFORMATION

1.4.1 Geologic and Hydrogeologic Settings

1.4.1.1 Geologic Setting

Two glacial advances during the Wisconsin Age of the Pleistocene Epoch resulted in the deposition of a veneer of glacial till over the entire RVAAP installation. The first glacial advance deposited the Kent Till over the facility. The Kent Till consists mostly of sand and silt with a few cobbles and sporadic boulders, and ranges in depth from 6.1 to 12.2 meters (20 to 40 feet) below ground surface (BGS). ALTHOUGH THE KENT TILL MAY BE PRESENT AT THE SITE, IT IS OBSCURED BY THE OVERLYING LAVERY TILL. THE LAVERY CONSISTS MOSTLY OF CLAYEY SILT WITH SPARSE COBBLES AND PEBBLES, AND HAS AN AVERAGE THICKNESS OF 4 FT. GLACIAL MATERIAL IN THE WESTERN PORTION OF RVAAP ARE LAVERY TILL. ~~The second glacial advance deposited t~~The Hiram Till WAS DEPOSITED over

the eastern two-thirds of the facility only, which includes the Building 1601 area. The Hiram Till consists of approximately 12 percent sand, 41 percent silt, and 47 percent illite and chlorite clay minerals, and ranges in depth from 1.5 to 4.6 meters (5 to 15 feet) BGS. The Hiram Till overlies thin beds of sandy outwash material in the far northeastern corner of the facility. Field observations indicate that overall till thickness is less than 0.6 meters (2 feet) in some areas of RVAAP. The reduced thickness may be due to natural erosion or construction grading operations and is not necessarily the result of deposition.

A buried glacial valley, oriented in a southwest-northeast direction, is located in the central portion of the facility. This valley is filled with glacial outwash consisting of poorly sorted clay, till, gravel, and silty sand. Depths of unconsolidated sediments in the valley range from 30.5 to 60.7 meters (100 to 200 feet) BGS.

The bedrock geology of RVAAP consists of Carboniferous Age sedimentary rocks that lie stratigraphically beneath the glacial deposits of the LAVERY ~~Kent~~ and Hiram Tills. The oldest bedrock that outcrops within the facility is the Cuyahoga Formation of the Mississippian Age. Three members comprise this formation: (1) the Orangeville Shale, (2) the Sharpsville Sandstone, and (3) the Meadville Shale. The Cuyahoga outcrops in the far northeastern corner of the facility, and generally consists of a blue-gray silty shale with interbedded sandstone. The regional dip of the Cuyahoga strata is between 1.5 to 3 meters (5 to 10 feet) per mile to the south.

The remainder of the facility is underlain by bedrock associated with the Pottsville Formation of the Pennsylvanian Age. The Pottsville Formation, which lies unconformably on an erosional surface of the Cuyahoga Formation, is divided into four members: (1) the Sharon, (2) the Connoquenessing Sandstone, (3) the Mercer, and (4) the Homewood Sandstone. The Sharon Member consists of two individual units: the Sharon Conglomerate and the Sharon Shale. The Sharon Conglomerate is a porous, coarse-grained, gray-white sandstone that often exhibits thin layers of milky white quartz pebbles. The Sharon Conglomerate also has locally occurring thin shale lenses in the upper portion of the unit. Due to the differences in lithology between the Sharon Conglomerate and the underlying shales of the Cuyahoga Formation, the contact between the Pottsville and Cuyahoga Formations usually is quite distinct. The Sharon Shale overlies the Sharon Conglomerate and consists of sandy, gray-black, fissile shale with some plant fragments and thin flagstone beds.

The Connoquenessing Sandstone member of the Pottsville Formation unconformably overlies the Sharon Member and is a medium-to-coarse grained, gray-white sandstone with more feldspar and clay than the Sharon Conglomerate. Thin interbeds and partings of sandy shale also are common in the Connoquenessing. The Mercer member of the Pottsville Formation overlies the Connoquenessing and consists of silty to carbonaceous shale with abundant thin, discontinuous sandstone lenses in the upper portion. Regionally, the Mercer also has been noted to contain interbeds of coal. The

Homewood Member of the Pottsville Formation unconformably overlies the Mercer member and consists of coarse-grained crossbedded sandstones that contain discontinuous shale lenses.

The Connoquenessing, Mercer, and Homewood members are present only in the western half of the RVAAP facility. The Sharon Conglomerate unit is the upper bedrock surface in most of the eastern half of the RVAAP facility. The regional dip of the Pottsville Formation strata is between 1.5 and 3 meters (5 and 10 feet) per mile to the south.

1.4.1.2 Hydrologic Setting

The largest ground water supplies within Portage County come from two buried valleys that underlie Franklin, Brimfield, and Suffield Townships; and Streetsboro, Shaersville, and Mantua Townships, respectively. The sand and gravel within these buried valleys are favorably situated to receive discharge from surface streams and surface infiltration. The water bearing characteristics for the sand and gravel aquifers in the vicinity of the RVAAP facility are poorly documented. Wells that penetrate these aquifers can yield up to 6080 liters per minute (1600 gallons per minute (GPM)). However, yields from wells penetrating silty or clay till materials are significantly lower in yield. WATER FROM THESE FORMATIONS IS SUFFICIENT FOR USE BY BUSINESS AND RESIDENTIAL CONSUMERS LOCATED IN THE VICINITY OF RVAAP. AT MANY LOCATIONS, HOWEVER, ~~In general,~~ the LAVERY ~~Kent~~ and Hiram Tills are too thin and impermeable to produce useful quantities of water.

The most important bedrock sources of ground water in the vicinity of the RVAAP facility are the sandstone/conglomerate members of the Pottsville Formation. These aquifers, together with two other deeper Mississippian/Devonian sandstone aquifers, represent the most important bedrock sources of ground water in Northeastern Ohio.

The Sharon Conglomerate is the primary source of ground water at RVAAP and maintains the most significant well yields of the Pottsville Formation members with hydraulic conductivity values of 62.1 to 24,839.0 LPD/m (5 to 2000 gallons per day per foot (GPD/ft)) (USAEHA 1992). Past studies of the Sharon Conglomerate indicate that the highest yields are associated with the true conglomerate phase (coarse-grained sandstone with abundant quartz pebbles) and with joints and fractures in the bedrock; however, there is no facility-specific information available regarding variations in aquifer properties due to these factors. Where present, the overlying Sharon Shale acts as a relatively impermeable confining layer for the Sharon Conglomerate. Several flowing artesian wells have been noted at the facility.

The Connoquenessing Sandstone and the Homewood Sandstone are the remaining aquifers of the Pottsville Formation and exhibit hydraulic conductivities of 62.1 to 3,725.8 LPD/m (5 to 300 GPD/ft), and 62.1 to 2,483.9 LPD/m (5 to 200 GPD/ft), respectively (USAEHA 1992). Well yields in the Connoquenessing and Homewood Sandstones, although lower than the Sharon Conglomerate,

are high enough to provide significant quantities of water. Several wells at the RVAAP facility have penetrated both the Sharon Conglomerate and the Connoquenessing Sandstone and reportedly produced water from both units.

In general, hydraulic conductivities for the shales of the Sharon and Mercer Members of the Pottsville Formation are low and result in insignificant ground water yields. WHERE GROUND WATER YIELDS ARE GREATER, HOWEVER, WATER FROM THESE FORMATIONS ARE SUFFICIENT FOR USE BY RESIDENTIAL AND COMMERCIAL CONSUMERS. The primary porosity of the shales is likely secondary, owing to joints and fractures in the bedrock; however, there is no facility-specific information available regarding the occurrence of joints and fractures in these units.

1.4.2 Ground Water Monitoring System

Four ground water monitoring wells were installed at this unit in 1992. These wells, identified as OBG-1 through OBG-4, are indicated on Figure 1-6. OBG-1 is installed as the up gradient well (ground water level measured at approximately 1013.99 feet AMSL) and OBG-2 is located as the most down gradient well with the ground water surface measured at approximately 1008 feet AMSL, with some seasonal variation. OBG-3 IS ALSO DOWNGRADIENT, and WHILE OBG-4 (1010.34 FT AMSL) IS ~~are~~ not directly down gradient, IT IS ~~but are potentially~~ close enough to the burning activity to MAKE IT AN ACCEPTABLE SAMPLING POINT. ~~detect contamination impact~~. The well locations, depths, and construction details were approved by Ohio EPA as part of the U.S. Army Environmental Hygiene Agency's *Geohydrologic Study No. 38-26-KF95-92; Soils, Ground Water, and Surface Water Characterization for the Open Burning and Open Detonation Areas, Ravenna Army Ammunition Plant, Ravenna, Ohio.*

All four wells encountered mixtures of clay and silt with an occasional interbedded sand layer. All four wells were completed on top of the bedrock, a weathered shale and sandstone. The wells were completed with a single 5-foot section well screen set at the bottom of the well. Generally, sand was placed around the well screen to a level of several feet above the top of the well screen. The well annulus from the sand pack to the surface was sealed with bentonite pellets.

Copies of the drilling logs from the above-referenced study are included as Appendix B, and the copies of details of individual well construction and a diagram of generalized monitoring well construction are provided in Appendix C.

1.4.2.1 Site Hydrogeology

All four monitoring wells encountered mixtures of clay and silt with occasional sand layers. The depth to ground water varied from approximately 5 ½ feet below the surface in OBG-3 to about 3 feet below the surface in OBG-4. The uppermost aquifer is contained within the clayey silts above

the bedrock. The confining layer under the uppermost aquifer is the top of the bedrock, the depth of which being determined by auger or spoon refusal. The top of bedrock elevations are shown in Figure 1-6, reproduced from the above-referenced study, as is ground water flow direction.

1.4.2.2 Ground Water Monitoring Results

Ground water monitoring results are available from 15 rounds of well sampling from the four wells at the OBG. TWO ~~One~~ sampling eventS WERE ~~was~~ conducted in 1992, and quarterly sampling events conducted each year thereafter. The most recent available analytical results are from the June, 1996 sampling event. The analytical data from these sampling events are presented in Appendix D. Table 1-1, below, summarizes ~~certain of~~ the data for constituents found in the ground water that underlies the OBG. ~~The maximum results for the constituents of concern are presented in the table with the results above MCL's in bold.~~

The data indicate a potential impact to ground water quality by activities at the OBG. However, careful review of the analytical results show inconsistencies and possible sampling or laboratory errors. The following bullets highlight some of the possible inconsistencies and/or errors:

- 1,2 Dichloroethane was detected in three wells during the 10/5/1995 sampling event and has not since been detected.

- RDX was detected in two wells during the 11/11/1993 sampling event and has not since been detected.

- Selenium was detected in only once in OBG-4 (43.0 mg/l) during the 10/5/1995 sampling event, detected at concentrations of 1.0 and 2.0 mg/l in the 9/23/1994 sampling event in OBG-2 and 3 respectively, and also detected at concentrations of 2, 4, and 3 mg/l in the 3/21/96 sampling event in OBG-1, 2, and 3 respectively.

- Cadmium was only detected in OBG-3 during the 4/29/1992 and 12/22/1994 sampling events with results of 8.0 and 1.0 mg/l respectively.

- The arsenic and lead detected during the 12/22/1994 sampling event in OBG-4 at 110.0 and 59.0 mg/l respectively were two to ten times higher than any results collected prior or subsequent to that sampling event. In addition, a duplicate sample was reported for the sampling event with both arsenic and lead at a concentration of 15 mg/l.

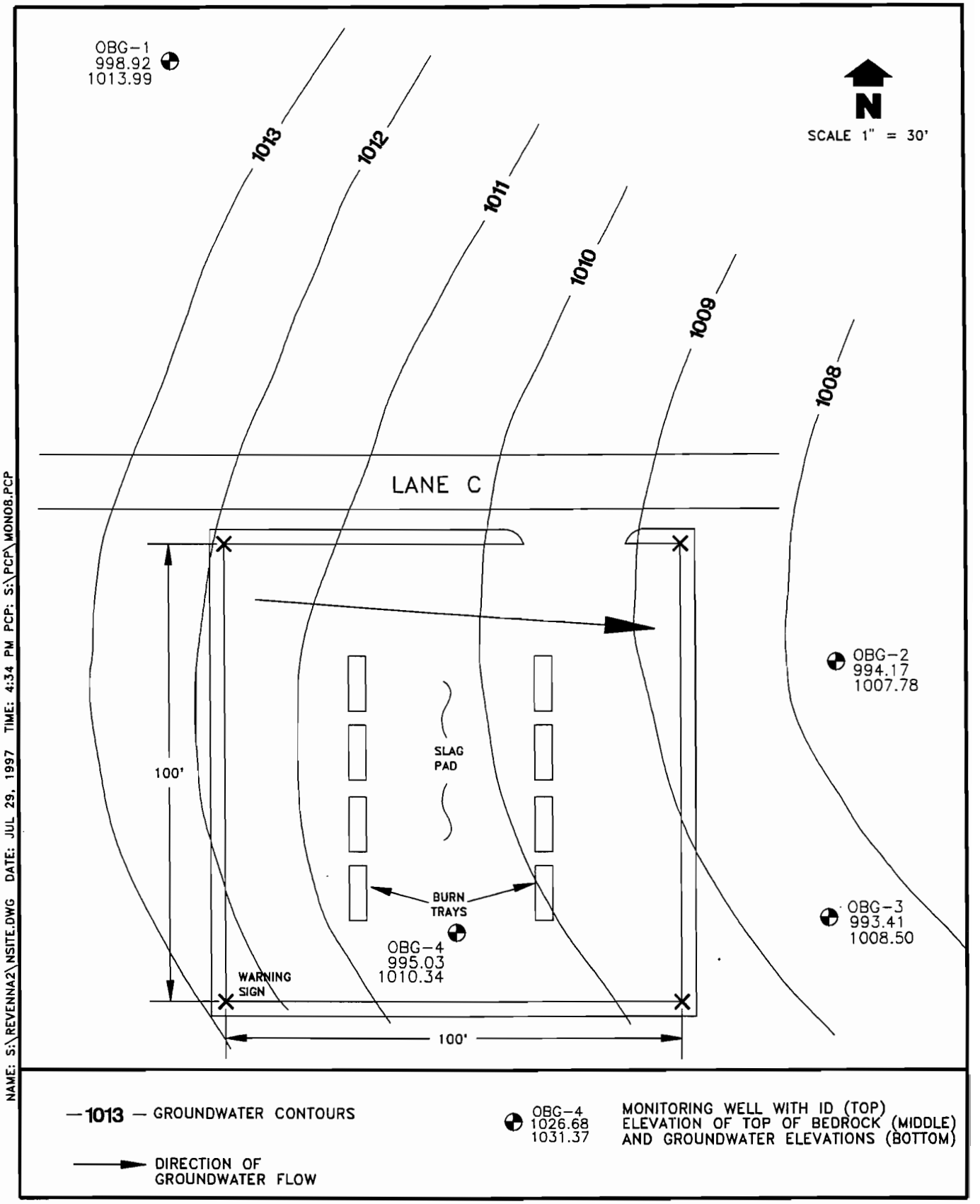


Figure 1-6. Open Burning Grounds with Monitoring Well Locations, Ground Water Elevations, and Top-of-Bedrock Data

Table 1-1. MAXIMUM CONCENTRATIONS OF SELECTED ANALYTES DETECTED IN GROUND WATER SAMPLES (MICROGRAMS/LITER)

	OBG-1		OBG-2		OBG-3		OBG-4	
	dissolved	total	dissolved	total	dissolved	total	dissolved	total
Arsenic	5	38	4	20	8	40	10	110
Antimony	ND	ND	ND	ND	7	ND	ND	20
Cadmium	1	ND	ND	4	ND	8	ND	1
Chromium	2	9	2	32	2	42	3	32
Lead	ND	ND	ND	ND	ND	ND	ND	59
Nickel	13	38	1	41	1	59	1	84
RDX	NA	2	NA	1.2	NA	ND	NA	ND
HMX	NA	ND	NA	ND	NA	ND	NA	1.7
1,2-DCA	NA	ND	NA	0.66	NA	0.66	NA	0.7
1,3,5-TNB	NA	2.4	NA	8	NA	ND	NA	15

NA = NOT APPLICABLE
ND = NOT DETECTED

Table 1-1 Maximum Concentrations Detected in Ground Water

Parameter	MCL ug/l	OBG-1	DATE	OBG-2	DATE	OBG-3	DATE	OBG-4	DATE
1,1-Dichloropropene(propylene)	NA	-	-	8.00	6/20/96	-	-	-	-
1,2-Dichloroethane	NA	-	-	0.66	10/5/95	0.66	10/5/95	0.70	10/5/95
1,3,5-Trinitrobenzene	NA	2.40	12/30/92	8.00	6/20/96	-	-	15.00	11/11/93
2,6-Dinitrotoluene	NA	-	-	-	-	-	-	2.10	2/25/93
2,4,6-Trinitrotoluene	NA	1.90	12/30/92	-	-	-	-	3.90	12/30/92
HMX	NA	-	-	-	-	-	-	1.70	2/25/93
RDX	NA	2.00	11/11/93	1.20	11/11/93	-	-	-	-
arsenic	50	38.00	8/31/96	20.00	10/5/95	40.00	11/11/93	**110.00**	12/22/94
barium	2000	39.00	3/9/94	110.00	9/23/94	150.00	6/28/94	210.00	2/25/93
cadmium	5	1.00	6/20/96	4.00	10/5/95	**8.00**	4/29/92	1.00	2/22/94
chromium	100	9.00	9/23/94	32.00	8/31/93	42.00	8/31/93	32.00	12/22/94
lead	50	10.00	9/23/94	30.00	12/22/94	16.00	11/11/93	**59.00**	12/22/94
mercury	2	-	-	-	-	-	-	-	-
selenium	10	2.00	3/21/96	4.00	9/23/94	3.00	3/21/96	**43.00**	10/5/95
silver	NA	4.00	6/20/96	3.00	6/20/96	3.00	6/20/96	3.00	6/20/96
GWL MIN		1008.600	12/14/95	1001.670	8/31/93	1003.110	8/31/93	1004.830	8/31/93
GWL MAX		1015.090	6/20/96	1008.890	6/20/96	1008.500	4/29/92	1010.340	4/29/92

IN DECEMBER 1995 RVAAP BEGAN TO FILTER ITS GROUNDWATER SAMPLES PRIOR TO ANALYSIS. THE METALS RESULTS FROM THE LAST QUARTER OF 1995 AND ALL QUARTERS SINCE HAVE BEEN FOR DISSOLVED-METALS. ALL PRECEDING ANALYTICAL RESULTS FOR METALS HAVE BEEN FOR TOTAL METALS.

GROUNDWATER SAMPLING, ANALYSIS, AND REPORTING IS ONGOING AT THE OBG UNDER THE RCRA PART B PERMIT. STATISTICAL ANALYSIS OF INDICATOR PARAMETERS HAS SHOWN SOME LOCAL IMPACT ON THE GROUNDWATER. HOWEVER, AS DESCRIBED ABOVE, EVIDENCE OF THESE IMPACTS HAS BEEN SPORADIC, SHOWING NO DEFINITE TREND. INTERPRETATION OF GROUNDWATER DATA IS CONFOUNDED BY THE APPARENT PRESENCE OF WASTE CONSTITUENTS IN THE UPGRADIENT WELL (OBG-1). CONSEQUENTLY, THE EVALUATION OF GROUNDWATER DATA HAS PRODUCED INCONCLUSIVE RESULTS TO DATE. FURTHER EVALUATION OF THE GROUNDWATER AT THE OBG WILL BE INCORPORATED INTO THE ONGOING CERCLA INVESTIGATION OF WINKLEPECK BURNING GROUNDS. THE RATIONALE FOR THIS APPROACH IS DESCRIBED IN SECTION 1.5.

1.4.3 Corrective Actions

There are suspected releases of hazardous wastes or constituents from this unit. POTENTIAL RELEASES TO ENVIRONMENTAL MEDIA ARE BEING EVALUATED AND, IF NECESSARY, REMEDIATED UNDER THE ONGOING CERCLA PROGRAM ON SITE AS DESCRIBED IN SECTION 1.5. ~~However, the interim measures plan and this closure plan details the actions to be taken to eliminate unacceptable risk that may be posed to human health or the environment from those releases~~. Therefore, no corrective action (under HSWA) is anticipated.

1.5 OPEN BURNING GROUNDS UNIT DESCRIPTION

THE WINKLEPECK BURNING GROUNDS (WBG) IS A LARGE REGION LOCATED NEAR THE CENTER OF RVAAP THAT MEASURES OVER A MILE ACROSS AND IS APPROXIMATELY ONE-QUARTER MILE WIDE. WBG CONTAINS 70 BURN PADS. THE OPEN BURNING GROUND (OBG) THAT IS THE SUBJECT OF THIS CLOSURE PLAN IS DESIGNATED AS PAD 38 OF WBG. WHILE IT WAS OPERATIONAL, WBG WAS USED TO BURN BULK PROPELLANTS, EXPLOSIVES, AND EXPLOSIVE-CONTAMINATED MATERIAL. THESE OPERATIONS OCCURRED AT PAD 38 (I.E., THE OBG) AND AT THE MANY PADS IN ITS IMMEDIATE VICINITY.

WBG IS BEING INVESTIGATED UNDER THE ONGOING CERCLA PROGRAM ON SITE. DURING THE CERCLA PHASE I RI, 79 SURFACE SOILS AND 13 DRAINAGE DITCH SEDIMENT SAMPLES WERE COLLECTED FROM WBG. SAMPLING SHOWED THAT, IN GENERAL, THE ABUNDANCES AND CONCENTRATIONS OF EXPLOSIVE AND INORGANIC ANALYTES SURROUNDING THE OBG WERE SIMILAR TO THE OTHER IMPACTED PORTIONS OF WBG. BECAUSE THE NATURE OF THE CONTAMINATION AT OBG IS SIMILAR TO THAT OF THE LARGER WBG AND THE WBG IS BEING EVALUATED AND, IF NECESSARY, REMEDIATED UNDER THE EXISTING CERCLA PROGRAM, THE FURTHER EVALUATION OF THE SOILS AT THE OBG WILL BE CONDUCTED UNDER THAT PROGRAM. IN ADDITION, ANY GROUNDWATER CONTAMINATION WOULD MOST PROBABLY BE RELATED TO THE BURNING THAT TOOK PLACE ON THE GROUND SURFACE (AND THUS TO CONTAMINATED SOILS) RATHER THAN THE BURNING THAT WAS CONDUCTED ON THE BURN TRAYS. REMEDIATION OF ANY GROUNDATER CONTAMINATION WOULD PROBABLY NOT BE SUCCESSFUL UNLESS THE CONTAMINATED SOILS WERE ALSO ADDRESSED. THUS, THE INVESTIGATION OF POSSIBLE GROUNDWATER CONTAMINATION AS WELL AS ITS REMEDIATION, IF NECESSARY, IS ALSO BEING ADDRESSED IN THE LARGER CERCLA PROJECT INVOLVING THE ENTIRE BURNING GROUNDS AREA. RCRA CLOSURE OF THE OBG IS THEREFORE LIMITED TO DEMOLITION AND DECONTAMINATION OF THE BURN TRAYS.

1.5.1 Waste Managed

The RVAAP burned bulk propellAents, explosives, and explosive-contaminated material at the OBG. Materials that were contaminated with propellAents and explosives were also burned.

Burns were conducted in metal trays from 1980 until operations ceased. In the past, the area surrounding the current OBG has been used for the thermal treatment of fuses, boosters, aluminum caps, bulk explosives, sump waste, and motor oil. Wastes treated at the OBG carried the EPA hazardous waste numbers D003 and K044 (listed only due to reactivity). Treatment by OB removed the reactivity characteristic, AND THERE IS NO EVIDENCE OF UXO IN THE AREA. Wastes were not chemically characterized by analysis prior to OB since adequate physical and chemical data are obtained from process knowledge.

~~The open burning and open demolition of munitions has ceased at RVAAP. In accordance with the Interim Measures Plan for the OBG, the burn trays and associated equipment will be removed from the unit and decontaminated and/or disposed during closure activities.~~

Although the only RCRA wastes treated at this unit were characteristic for reactivity and the process of burning removed that characteristic, it is possible that incomplete burning occurred. FURTHER, THE BURNING OF THESE MATERIALS PRODUCED HAZARDOUS WASTE ASH. ANALYSIS OF THIS ASH INDICATED THAT IT WAS CHARACTERISTICALLY TOXIC FOR SEVERAL METALS AND 1,2-DINITROTOLUENE. The constituents found remaining in the ash after open burning of explosives, and the constituents in the pre-burned explosives, are included in the constituent of concern list for the OBG. ~~Any contaminated media found through sampling to be conducted at the OBG may prove to be characteristically hazardous wastes for several of the constituents, to be determined by TCLP analyses. The other constituents listed, although not TCLP analytes, may be present above risk-based cleanup standards and may therefore require removal.~~ The constituents OF CONCERN FOR THE OBG are listed in Table 1-2.

Table 1-2. Constituents of Concern for the Open Burning Area

Waste	Potential Waste Code	Constituents
Waste Explosives	D003	Reactivity characteristic
SOIL	NONE	ALUMINUM
	D004	Arsenic
	D005	Barium
	D006	Cadmium
	D007	Chromium
	D008	Lead
	NONE	MANGANESE
	D009	Mercury

	NONE	SELENIUM
	D011	SILVER
	NONE	ZINC
	D030	2,4-dinitrotoluene
	None, ~~potential risk-based removal required~~	2,4,~~6~~5-trinitrotoluene (TNT) 1,3,5-hexahydro-1,3,5-trinitrohydazine (RDX) 1,3,5,7-hexahydro-1,3,5,7-tetranitrohydrazine (HMX)
	NONE	1,3,5-TRINITROBENZENE
	NONE	1,3-DINITROBENZENE
	NONE	TETRYL
	NONE	NITROBENZENE
	NONE	2,6-DINITROTOLUENE
	NONE	O-NITROTOLUENE
	NONE	M-NITROTOLUENE
	NONE	P-NITROTOLUENE

1.5.2 Capacity

The maximum possible capacity for hazardous wastes that were managed at the OBG before burning was limited to the daily treatment capacity of 12,800 pounds. THEREFORE, THE MAXIMUM INVENTORY OF HAZARDOUS WASTE EVER ON-SITE DURING THE ACTIVE LIFE OF THE FACILITY IS 12,800 POUNDS.

1.6 REFERENCES TO OTHER ENVIRONMENTAL PERMITS

The RVAAP facility has ceased all operations. The only permit currently held is the pink water discharge permit, NPDES # 3I00000 Outfall 006. The RCRA Part B Permit application has been withdrawn, which has required the closure of all formerly-operated RCRA-regulated units.

WHILE THE OBG WAS IN USE AND UNDER THE AUTHORITY OF RCRA, A NUMBER OF EMERGENCY PERMITS WERE ISSUED TO ALLOW THE TREATMENT OF WASTE MUNITIONS. THE WASTE MUNITIONS BURNED UNDER THESE PERMITS WERE SIMILAR IN NATURE TO THOSE PREVIOUSLY MANAGED AT OBG. NO PREVIOUSLY UNIDENTIFIED HAZARDOUS CONSTITUENTS WOULD HAVE BEEN INTRODUCED TO OBG BY ACTIVITIES CONDUCTED UNDER THESE EMERGENCY PERMITS. IN ADDITION, THE SAMPLING AND ANALYSIS PROPOSED UNDER THE

CERCLA PHASE II RI IS CAPABLE OF FULLY DELINEATING THE NATURE AND EXTENT OF CONTAMINATION AT THE UNIT. CONSEQUENTLY, INCOMPLETE KNOWLEDGE OF THE WASTE MUNITIONS TREATED UNDER THE EMERGENCY PERMITS WILL NOT JEOPARDIZE THE ADEQUACY OF THIS CLOSURE.

1.7 ANTICIPATED WAIVERS OR EXEMPTIONS

No waivers or exemptions are anticipated to be requested or required for the closure of this facility. The RVAAP facility, including Open Burning Grounds Hazardous Waste Treatment Unit, is owned by the U.S. Department of Defense, a Federal Agency.

1.8 CLOSURE AND POST-CLOSURE COST ESTIMATES

In accordance with Ohio Administrative Code (OAC) 3745-55-40(C), closure and post-closure cost estimates are not required for this Federal Facility.

1.9 FINANCIAL ASSURANCE

In accordance with OAC 3745-55-40(C), financial assurance is not required for this Federal Facility.

Production based support funds have been identified as the type of funds which will fund the closure. However, the funds have not been identified at this time.

1.10 LIABILITY COVERAGE

In accordance with OAC 3745-55-40(C), liability coverage is not required for this Federal Facility.

2.0 CLOSURE PROCEDURES

Closure of the Open Burning Grounds consistS of the removal, decontamination, and disposition of the burn trays and ancillary equipment. GROUNDWATER WILL BE EVALUATED UNDER THE ONGOING CERCLA INVESTIGATION. ~~followed by the risk-based closure of the OBG proper. The interim measures plan for the OBG and Section 2.1 describe the procedures for the handling of the equipment and Section 2.2 describes the approach to be taken for the risk-based closure of the unit.~~

2.1 OBG BURN TRAY CLOSURE PROCEDURES

THE FOLLOWING SECTIONS DESCRIBE THE METHODS AND PROCEDURES PROPOSED TO REMOVE, DECONTAMINATE, AND DISPOSE OF THE BURN TRAYS AT THE OBG.

2.1.1 SITE PREPARATION

SITE PREPARATION WILL INCLUDE ESTABLISHMENT OF SITE CONTROLS, LOCATING A TEMPORARY WASTE STORAGE AREA, CONSTRUCTION OF A CONTAINED WORK AREA, AND SITING A PERSONNEL AND EQUIPMENT DECONTAMINATION STATION. THE PROPOSED SITE LAYOUT IS SHOWN IN FIGURE 2-1.

2.1.1.1 SITE CONTROLS

SITE CONTROLS WILL BE ESTABLISHED TO DISCOURAGE ACCESS TO THE SITE BY PASSERSBY (UNDERSTANDING THE SITE IS WITHIN A SECURED INSTALLATION) AND LIMIT THE AMOUNT OF VEHICLE AND EQUIPMENT TRAFFIC ON THE CRUSHED SLAG PAD. TEMPORARY POSTS WILL BE PLACED AROUND THE PERIMETER OF THE 30 METERS (100 FEET) SQUARE PAD AND YELLOW CAUTION TAPE WILL BE USED TO DELINEATE THE AREA. THE FOLLOWING SIGNS WILL BE DISPLAYED ON THE POST AT THE CORNERS OF THE PAD: "CAUTION - HAZARDOUS WASTE STORAGE AREA," "CAUTION - HARD HATS REQUIRED," AND "DANGER - NO SMOKING."

2.1.1.2 TEMPORARY WASTE STORAGE

TEMPORARY WASTE STORAGE WILL INCLUDE TWO AREAS. AREA ONE WILL BE A LINED ROLL-OFF CONTAINER FOR THE STORAGE AND TRANSPORTATION

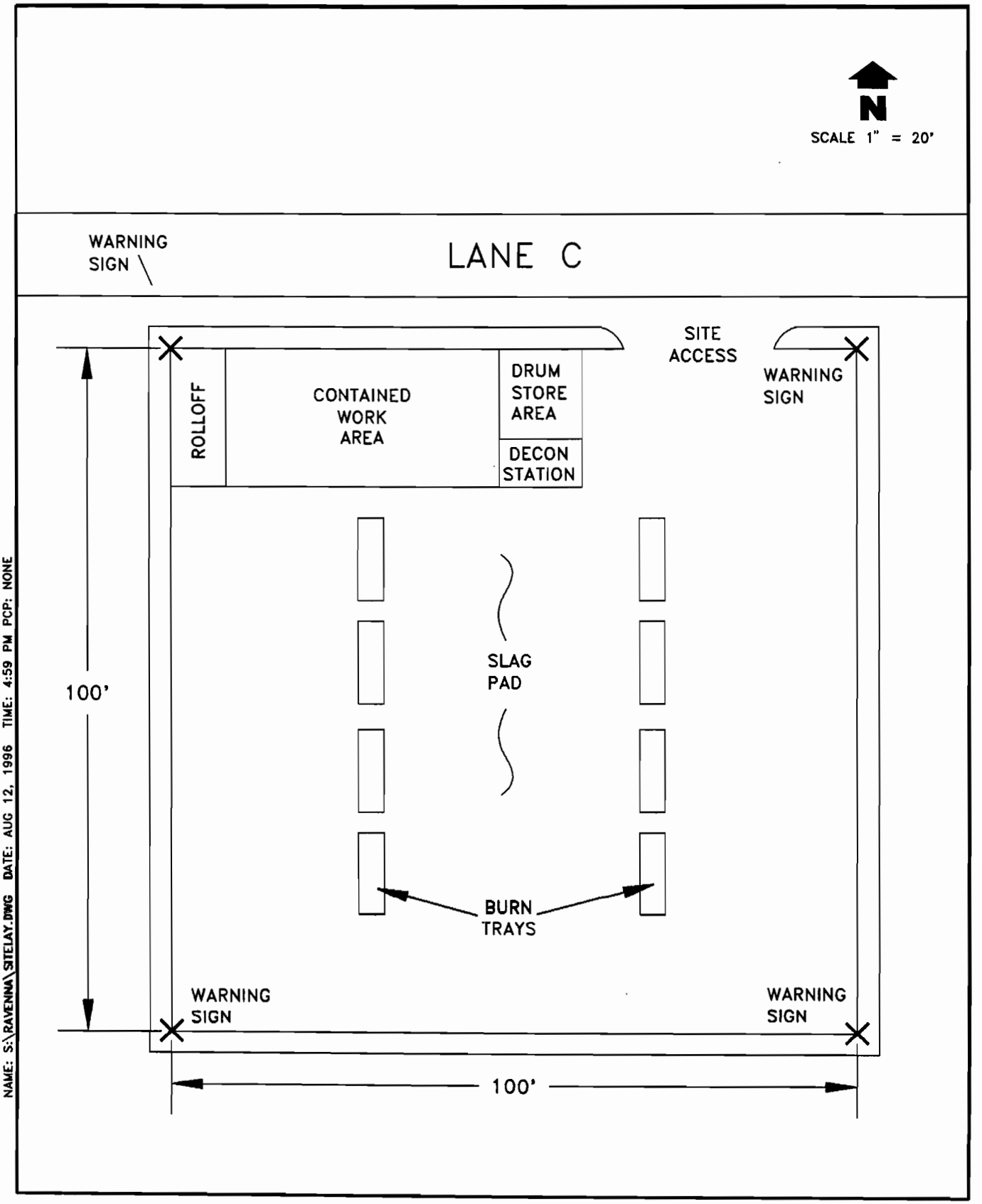


FIGURE 2-1. PROPOSED SITE LAYOUT FOR CLOSURE OF OBG

OF THE REFRACTORY LINING MATERIAL, EQUIPMENT, OR HAND TOOLS THAT CANNOT BE DECONTAMINATED, AND PERSONAL PROTECTIVE CLOTHING. AREA TWO WILL BE FOR THE SAFE STORAGE OF 55-GALLON DRUMS OF DECONTAMINATION WATER AND POTENTIALLY CONTAMINATED STORM WATER. THE ROLL-OFF CONTAINER WILL BE PLACED DIRECTLY ON THE SLAG PAD ADJACENT TO THE CONTAINED WORK AREA. THE 55-GALLON DECONTAMINATION WATER STORAGE DRUMS WILL BE PLACED ON AN IMPERMEABLE LINER ADJACENT TO THE PERSONNEL AND EQUIPMENT DECONTAMINATION STATION. THE LINER WILL BE BERMED TO ENSURE ANY LIQUID THAT SPLASHES OR SPILLS DURING THE FILLING OF THE DRUMS CAN BE RECOVERED AND PLACED BACK IN THE DRUMS.

2.1.1.3 CONTAINED WORK AREA

A CONTAINED WORK AREA WILL BE PREPARED TO ALLOW FOR THE HANDLING OF THE REFRACTORY MATERIAL IN THE BURN TRAYS, THE CUTTING OF THE BURN TRAYS AND STANDS, AND THE DISMANTLING OF THE COVERS. THE CONTAINED WORK AREA WILL BE A BERMED AREA APPROXIMATELY 6.1 METERS (20 FEET) BY 12.2 METERS (40 FEET). THE AREA WILL BE COVERED WITH AN IMPERMEABLE LINER TO INSURE MATERIAL WHICH IS DROPPED OR SPILLED CAN BE COLLECTED AT THE END OF EACH WORK SHIFT AND PLACED IN THE COVERED ROLL-OFF CONTAINER. THE LINED AREA WILL BE BERMED SO THAT ANY RAIN WATER (IN THE EVENT THE LINER IS NOT ROLLED-UP PRIOR TO A RAIN EVENT) CAN BE COLLECTED AND PLACED IN 55-GALLON DRUMS. MEASURES WILL BE TAKEN TO PREVENT PUNCTURING OF THE IMPERMEABLE LINER BY HEAVY EQUIPMENT.

2.1.1.4 EQUIPMENT AND PERSONNEL DECONTAMINATION STATION

A BERMED AND LINED EQUIPMENT AND PERSONNEL DECONTAMINATION STATION WILL BE SET UP NEAR THE CONTAINED WORK AREA TO ALLOW FOR DAILY PERSONNEL DECONTAMINATION AND TOOL AND EQUIPMENT DECONTAMINATION PRIOR TO REMOVAL FROM THE SITE. THE AREA WILL BE CONSTRUCTED SO WATER SPILLED DURING DECONTAMINATION OPERATIONS CAN BE RECOVERED AND PLACED IN 55-GALLON DRUMS.

2.1.2 EQUIPMENT DISMANTLING

THE EIGHT BURN TRAYS, LIDS, RACKS, AND ANCILLARY EQUIPMENT ARE TO BE REMOVED FROM THE SITE AND TEMPORARILY STORED IN BUILDING 1601 WHERE THEY WILL ULTIMATELY BE DECONTAMINATED AND PREPARED FOR PROPER DISPOSAL OR RECYCLING. PRIOR TO RELOCATION AND STORAGE IN BUILDING 1601,

THE TRAYS, LIDS, AND RAILS WILL BE SEPARATED AND HANDLED AS OUTLINED IN THIS SECTION.

TO MINIMIZE THE RISK OF EXPOSING THE CONTENTS OF THE BURN TRAYS TO ADVERSE WEATHER CONDITIONS (RAIN, SNOW, HIGH WINDS, ETC.) THE PROCEDURES INVOLVED IN THE DISMANTLING AND REMOVAL OF THE BURN TRAYS WILL BE CARRIED OUT COMPLETELY ON ONE TRAY PRIOR TO COMMENCING ACTIVITIES ON THE NEXT TRAY.

THE LIDS WILL BE REMOVED (TWO LIDS PER EACH TRAY) AND HAND CARRIED TO THE CONTAINED WORK AREA. THE LIDS WILL BE VISUALLY INSPECTED FOR GROSS CONTAMINATION, LOOSE TAPE OR CAULKING (USED TO SEAL THE TWO LIDS TOGETHER AND SEAL HOLES OR CRACKS IN THE LIDS), OR ANY OTHER MATERIAL WHICH MAY "FALL OFF" IN TRANSIT AND IS EASILY REMOVED WITHOUT THE NEED FOR SCRAPING OR SCRUBBING. SUBSEQUENT TO INSPECTION AND REMOVAL OF LOOSE ITEMS, THE LIDS WILL BE TEMPORARILY STORED IN THE CONTAINED WORK AREA OR ON THE TRANSPORT VEHICLE PRIOR TO BEING MOVED TO BUILDING 1601. THE MATERIAL WHICH IS REMOVED FROM THE LIDS WILL BE PLACED DIRECTLY INTO THE ROLL-OFF CONTAINER.

THE TRAY, AND A SECTION OF RAIL IF ATTACHED TO THE TRAY, WILL BE PLACED IN THE CONTAINED WORK AREA. IF THE TRAYS AND RAILS ARE SECURELY ATTACHED THEY WILL BE HANDLED, TRANSPORTED AND STORED AS A UNIT. IF THE TRAYS AND RAILS ARE EASILY SEPARATED, THE TRAYS WILL BE HANDLED INDEPENDENTLY AS OUTLINED BELOW AND THE RAILS WILL BE CUT INTO MANAGEABLE LENGTHS OF APPROXIMATELY 2.4 METERS (8 FEET) AND HANDLED USING THE SAME PROCEDURES OUTLINED FOR THE LIDS.

THE REFRACTORY MATERIAL WILL BE REMOVED FROM THE BURN TRAYS AND PLACED IN THE LINED ROLL-OFF CONTAINER. THE BEST METHOD FOR EXTRACTION OF THE REFRACTORY MATERIAL WILL BE DETERMINED IN THE FIELD, BASED ON EXPERIENCE OBTAINED WHILE HANDLING THE FIRST TRAY. THE PREFERED METHOD OF EXTRACTION WILL BE DETERMINED BY CONSIDERING SEVERAL FACTORS, SUCH AS SAFETY OF THE WORKERS, REDUCTION OF REFRACTORY MATERIAL HANDLING REQUIREMENTS, ABILITY TO CONTROL CHIPS AND DUST TO ELIMINATE THE SPREAD CONTAMINATION, AND THE MAINTENANCE OF THE ROLL-OFF LINER'S INTEGRITY. POSSIBLE METHODS OF EXTRACTION INCLUDE (1) BREAKING THE MATERIAL INTO MANAGEABLE PIECES WITHIN THE TRAY AND PLACING THE MATERIAL INTO THE ROLL-OFF CONTAINER, (2) "DUMPING" OF THE CONTENTS OF THE TRAY DIRECTLY INTO THE ROLL-OFF, OR (3) A COMBINATION OF THE TWO. IF THE MATERIAL REQUIRES MECHANICAL OR

MANUAL REMOVAL FROM THE TRAYS, THE METHOD FOR PLACING THE MATERIAL INTO THE ROLL-OFF BOX WILL BE BY HAND SHOVELING, LOADING INTO A SKID LOADER AND DUMPING, OR DUMPING THE ENTIRE TRAY AT ONE TIME AFTER THE MATERIAL WAS LOOSE INSIDE THE TRAY. WHERE NECESSARY, SMALL QUANTITIES OF WATER MAY BE USED TO CONTROL FUGITIVE DUST EMISSIONS. UPON COMPLETION OF THE REMOVAL OF THE REFRACTORY MATERIAL, THE TRAYS WILL BE CUT IN APPROXIMATELY 2.4 METER (8 FOOT) LENGTHS TO FACILITATE TRANSPORTATION, STORAGE AND HANDLING.

CUTTING OF THE TRAYS WILL BE COMPLETED USING AN ACETYLENE CUTTING TORCH OR SUITABLE EQUIVALENT. THE TRAYS AND RAILS WILL BE CUT AFTER THE REMOVAL OF THE REFRACTORY MATERIAL AND GROSS CONTAMINATION. UPON REMOVAL OF THE REFRACTORY MATERIAL, POTENTIAL RISK DUE TO REACTIVITY OF THE RESIDUAL EXPLOSIVE WILL BE ELIMINATED. THE PIECES TO BE CUT WILL BE PLACED ON A FLAME RESISTANT WORK SURFACE (METAL PLATE, WELDING PAD, ETC.) TO KEEP SPARKS AND SLAG OFF OF THE IMPERMEABLE LINER. A CUTTING/OPEN FLAME PERMIT WILL BE OBTAINED PRIOR TO ANY ACTIVITIES WHICH CAUSE SPARKING OR HAVE OPEN FLAME.

2.1.3 TRANSPORTATION TO TEMPORARY STORAGE IN BUILDING 1601

2.1.3.1 SCRAP STEEL AND ALUMINUM

UPON COMPLETION OF THE REMOVAL OF THE REFRACTORY MATERIAL AND GROSS CONTAMINATION FROM THE BURN TRAYS, LIDS, AND RAILS, THE STEEL AND ALUMINUM SCRAP WILL BE PLACED ON A SUITABLE VEHICLE AND TRANSPORTED TO BUILDING 1601.

A FLAT BED TRUCK OR FLAT BED TRAILER WILL BE USED TO TRANSPORT THE SCRAP. THE BED OF THE TRUCK OR TRAILER AND THE LOADS WILL BE COVERED WITH PLASTIC SHEETING PRIOR TO LOADING AND TRANSPORT. THE DISTANCE FROM THE OB GROUNDS TO BUILDING 1601, LESS THAN ONE MILE AND ON SECURED RVAAP ROADS, WILL ALLOW FOR TRANSPORTATION OF THE SCRAP WITHOUT THE RISK OF THE SPREAD OF CONTAMINATION. THE LOADS OF SCRAP WILL NOT BE TRANSPORTED DURING ADVERSE WEATHER CONDITIONS, AND TRAVEL SPEEDS WILL BE SUCH THAT THE INTEGRITY OF THE PLASTIC SHEETING WILL BE MAINTAINED.

2.1.4 WASTE STORAGE

2.1.4.1 SCRAP STEEL AND ALUMINUM

THE SCRAP STEEL AND ALUMINUM FROM THE BURN TRAYS, LIDS, AND RAILS WILL BE STORED IN BUILDING 1601 PRIOR TO DECONTAMINATION OF THE PIECES. THE PIECES OF STEEL AND ALUMINUM, MEASURING LESS THAN EIGHT FEET IN ANY ONE DIRECTION, WILL BE STORED IN THE BUILDING ON PALLETS OR TIMBERS. CARE WILL BE TAKEN TO ENSURE THE PIECES ARE STACKED SAFELY, COMPACTLY, AND WILL ALLOW FOR THE CONSTRUCTION OF A DECONTAMINATION STATION WITHOUT THE NEED TO RE-LOCATE THE STACKS.

2.1.4.2 CONTAINERIZED LIQUID

THE DRUMS OF LIQUID WASTE WILL BE STORED ON SITE PENDING RECEIPT OF WASTE ACCEPTANCE AND TRANSPORTATION TO AN APPROVED PUBLICLY OWNED TREATMENT WORKS (POTW) OR TREATMENT STORAGE AND DISPOSAL FACILITY (TSDF). THE DRUMMED WATER WILL BE LABELED AND STORED IN ACCORDANCE WITH RCRA STANDARDS.

2.1.4.3 ROLL-OFF CONTAINER(S)

THE ROLL-OFF CONTAINER(S) WILL REMAIN STORED ON THE OB PAD UNTIL SUCH TIME DISPOSITION OF THE MATERIAL IS EVALUATED UNDER THE GUIDANCE ESTABLISHED IN THE APPROVED CLOSURE PLAN. THE CONTENTS OF THE ROLL-OFF(S) WILL BE PROTECTED FROM THE ELEMENTS BY A TARPAULIN COVER PROVIDED BY THE MANUFACTURER/SUPPLIER OF THE ROLL-OFF(S). WEEKLY INSPECTION OF THE ROLL-OFF CONTAINER WILL BE CONDUCTED BY RVAAP PERSONELL TO ENSURE THE DOOR AND COVER REMAIN IN PLACE AND IN GOOD CONDITION. THE TIME, DATE, CONDITION OF THE CONTAINER(S), AND INSPECTOR'S NAME WILL BE RECORDED ON A LOG WHICH WILL BE KEPT IN BOTH THE MAINTENANCE OFFICE AND THE ENVIRONMENTAL CONTROL OFFICE.

2.1.5 SAMPLING AND ANALYSIS

2.1.5.1 CONTAINERIZED LIQUID

LIQUID WASTE RESULTING FROM PERSONNEL AND EQUIPMENT DECONTAMINATION, COLLECTION OF RAINWATER, AND COLLECTION OF WATER USED TO SUPPRESS DUST WHILE HANDLING THE REFRACTORY MATERIAL WILL BE CHARACTERIZED FOR DISPOSAL. THE LIQUID WILL BE SAMPLED FOLLOWING SW-

846 PROTOCOL AND WILL BE ANALYZED FOR CONSTITUENTS IDENTIFIED BASED ON PROCESS KNOWLEDGE AND THE REQUIREMENTS OF THE APPROVED POTW OR TSDF.

2.1.5.2 ROLL-OFF CONTENTS - REFRACTORY MATERIAL AND OTHER SOLIDS

REFRACTORY MATERIALS AND OTHER CONTAMINATED MATERIALS THAT ARE REMOVED FROM THE BURN TRAYS AND EQUIPMENT WILL BE STORED IN A LINED AND COVERED ROLL-OFF CONTAINER ON THE SLAG PAD WITHIN THE UNIT.

THE REFRACTORY MATERIAL WASTES WILL BE ANALYZED FOR THE TOXICITY CHARACTERISTIC FOR THE SUITE OF HEAVY METALS (ARSENIC, BARIUM, CADMIUM, CHROMIUM, MERCURY, LEAD, SELENIUM, AND SILVER) AND 2,4-DNT. THE CHARACTERISTIC OF REACTIVITY IS NOT PRESENT, AS ALL REACTIVE MATERIAL WAS BURNED IN THE TRAYS, AND THE RESIDUE OF THAT OPERATION HAS BEEN PREVIOUSLY REMOVED FROM THE TRAYS. WASTES ASSOCIATED WITH OB DO NOT EXHIBIT THE CHARACTERISTICS OF IGNITABILITY OR CORROSIVITY.

ONE COMPOSITE SAMPLE WILL BE COLLECTED FROM CHIPS AND SCRAPINGS OF THE REFRACTORY MATERIAL AND RESIDUE FROM THREE SEPARATE LOCATIONS WITHIN EACH BURN TRAY. A TOTAL OF 18 LOCATIONS WILL BE COMPOSITED INTO ONE SAMPLE. THE SCRAPINGS AND CHIPS WILL BE COLLECTED IN SUCH A MANNER AS TO ENSURE THAT THE LABORATORY RECEIVES A SAMPLE REPRESENTATIVE OF THE WASTE STREAM.

BACKGROUND SAMPLING IS NOT REQUIRED BECAUSE THE PURPOSE OF THIS ANALYSIS IS TO DETERMINE WASTE DISPOSITION, NOT WHETHER "CLEAN" LEVELS HAVE BEEN ATTAINED.

THE SAMPLES WILL BE EXTRACTED USING THE TCLP (APPENDIX II OF 40 CFR 261) AND ANALYZED FOR THE TOXICITY CHARACTERISTIC PARAMETERS ASSOCIATED WITH RVAAP WASTES. THESE INCLUDE ARSENIC, BARIUM, CADMIUM, CHROMIUM, MERCURY, LEAD, SELENIUM, SILVER, AND 2,4-DNT. THE ANALYTICAL METHODS ARE THE SAME AS PRESENTED FOR SOIL AND RINSEATE.

RVAAP QA/QC PROCEDURES WILL BE ADHERED TO DURING ALL CLOSURE ACTIVITIES. THESE PROCEDURES WILL BE SUBMITTED WITH THE DOCUMENTATION ACCOMPANYING FINAL CERTIFICATION OF CLOSURE.

THE TCLP ANALYTICAL RESULTS WILL DETERMINE THE DISPOSITION OF THE CONTAINERIZED REFRACTORY MATERIAL. IF THE ANALYTICAL RESULTS INDICATE

THAT THE MATERIAL IS CHARACTERISTICALLY TOXIC, THE MATERIAL WILL BE MANAGED AND DISPOSED IN ACCORDANCE WITH THE APPROVED CLOSURE PLAN.

2.2 ~~1~~ Closure Performance Standard for Equipment

Upon approval of the closure plan, the trays will be ~~decontaminated and~~ removed TO THE 1601 CONTAINER STORAGE BUILDING as described in the PREVIOUS ~~following~~ sections. ~~By removing and disposing all waste and residues from the equipment and meeting the closure performance standards for clean closure set forth in OAC 3745-55-11, the need for post-closure care and maintenance of the equipment will be eliminated. Section 2.1.2.2 describes the procedures for decontamination of the equipment.~~ The following rinseate standards, as contained in the Ohio EPA Closure Plan Review Guidance, will be met before the DECONTAMINATED equipment is considered "clean":

- No more than fifteen (15) times the public drinking water standard maximum contaminant level (MCL) for hazardous waste constituents.
- If an MCL is not available for a particular contaminant, then no more than 15 times the maximum contaminant level goal (MCLG). HOWEVER, IF THE MCLG FOR ANY CONTAMINANT IS ZERO, THE RINSATE STANDARD SHALL BE 15 TIMES THE CONTAMINANT'S PRACTICAL QUANTITATION LIMIT FOR THE ANALYTE.
- If the product of 15 times the MCL or MCLG exceeds 1 mg/l or if neither an MCL or MCLG is available, 1 mg/l will be used as the clean standard.

THESE STANDARDS ARE PROVIDED IN SECTION 2.4 FOR THE SITE-SPECIFIC CONSTITUENTS IDENTIFIED FOR DECONTAMINATION OF THE BURN TRAYS.

2.3 ~~1.1~~ Estimates of the Quantity of Inventory to Be Removed

Their was no waste stored at the OBG, however, the burn trays, ancillary equipment, and the refractory material will be treated as potentially hazardous until decontamination and confirmatory sampling is complete.

The refractory lining removed from the burn trays (along with other solids such as PPE, disposable tools, and loose material from the trays) during CLOSURE WILL BE ~~the interim measures activities will be stored on-site from the completion of the interim measures until the implementation of closure. Upon approval of the closure plan, the material will be characterized and~~

disposed in accordance with all applicable regulatory requirements. The estimated quantity of material is 5 cubic yards.

The burn trays and ancillary equipment removed to Building 1601 during CLOSURE ~~the interim measures~~ activities will be decontaminated and characterized for disposal or salvage following the procedures below.

2.4 ~~1.2~~ Procedures for ~~Inventory Removal, Disposal, and~~ Decontamination OF THE BURN TRAYS AT 1601

~~2.2.1 Waste Inventory Removal and Disposal~~

~~The stored solids will be removed and disposed in accordance with applicable regulatory requirements. The material, based on characterization results, will be handled as a solid or hazardous waste and transported to the proper facility for treatment and/or disposal.~~

~~During closure activities, decontamination materials (e.g., protective clothing, disposable sampling equipment, and other "disposables") will be generated. These items will be containerized and managed off site as hazardous waste, if contaminated.~~

~~2.1.2.2 Equipment Decontamination~~

Prior to PERFORMING decontamination of the DISMANTLED BURN TRAYS ~~equipment~~ in Building 1601, a lined decontamination area will be constructed to ensure the wash and rinse water used in the decontamination process are contained. THE DECONTAMINATION AREA WILL BE LINED WITH TWO LAYERS OF 30-MIL GEOMEMBRANE LINER (OR EQUIVALENT). The area will be bermed and will have an abrasion resistant work surface to place the equipment on without jeopardizing the integrity of the liner. THE BERM WILL BE CONSTRUCTED OF WOOD, PVC, OR OTHER STRUCTURALLY COMPETENT MATERIAL. THE LINER WILL EXTEND OVER THE BERM AND WILL BE SECURED TO ENSURE RINSEATE WATER IS RETAINED WITHIN THE DECONTAMINATION AREA. THE DECONTAMINATION AREA WILL BE APPROXIMATELY 400 SQUARE FEET AND THE BERM WILL BE HIGH ENOUGH TO ENSURE A CAPACITY OF 650 GALLONS WITHIN THE LINED AREA.

All decontamination procedures will strictly adhere to the health and safety requirements outlined in the Open Burning Grounds closure Health and Safety Plan (HASP) contained in Appendix A of this closure plan.

The surface of each piece of equipment will be triple washed and the final rinseate sample collected to verify the absence of contamination above the standard. Minimal detergent solutions

will be used to facilitate the proposed treatment of any generated liquid waste. As the equipment is cleaned, the liquid spray will be collected in the bermed decontamination area. Brooms, squeegees, and a vacuum or pump will be used to direct and collect the liquid. The liquid effluent will be placed into a polyethylene storage tank. It is estimated a maximum of 1893 liters (500 gallons) of liquid waste will be generated by this process.

A final ambient temperature rinse of the equipment will be conducted for the collection of the rinseate sample. Based on the three distinctly different pieces of equipment that will be decontaminated (burn trays, lids, and rails), three final rinseate samples will be collected. The trays, lids, and rails will be segregated for cleaning and confirmation purposes. Upon completion of the washing and triple rinse of each piece (or group of pieces if they can be handled effectively within the decontamination area) a temporary liner will be place over the decontamination area and the ambient tempeture rinse will be allowed to fall onto the clean liner material where it can be collected and composited for sampling. The collection equipment, brooms, squeegees, and vacuum will be decontaminated prior to use and between collection of individual samples. The final rinseate sample will be collected from the three drums of water following SW-846 guidelines.

The constituents for which each sample is analyzed will be based on the applicable RCRA waste codes and hazardous constituents associated with the hazardous waste which were treated at the OBG. MCLS ARE AVAILABLE FOR ALL METALS, EXCEPT SILVER. NONE OF THE EXPLOSIVE CONSTITUENTS HAVE CORRESPONDING MCLS. THE CONSTITUENTS ARE LISTED IN TABLE 2-1.

~~The hazardous constituents of concern are arsenic, barium, cadmium, chromium, lead, mercury, 2,4-dinitrotoluene, trinitrotoluene, RDX, and HMX. MCLs are available for all of the metals. There is no MCL or MCLG for 2,4-dinitrotoluene, trinitrotoluene, RDX, or HMX. The rinseate standards that will be used to indicate that decontamination is complete are as listed in Table 2-1.~~

The methods used to conduct the analysis will be those indicated in Table 2-2. The analytical results will be used to evaluate the effectiveness of the decontamination, determine the need for additional decontamination, and determine appropriate treatment/disposal methods for the rinsewaters. The equipment will be washed until the "clean" levels for rinsewater are attained.

If analysis indicates contamination still exists on the equipment surfaces, the decontamination procedures will be duplicated. If analysis indicate contamination still exists, the contaminated equipment surfaces will be subjected to acid or solvent washes and/or more aggressive pressure washing to remove the contamination.

Table 2-1 Performance Standards

Constituent	Performance Standard
ALUMINUM	1.0 MG/L
arsenic	0.75 mg/L
barium	1.0 mg/L
cadmium	0.075 mg/L
chromium	1.0 mg/L
lead	0.75 mg/L
MANGANESE	1.0 MG/L
mercury	0.03 mg/L
SELENIUM	0.75 MG/L
SILVER	1.0 MG/L
ZINC	1.0 MG/L
2,4-dinitrotoluene	1.0 mg/L
2,4,6-trinitrotoluene	1.0 mg/L
RDX	1.0 mg/L
HMX	1.0 mg/L
1,3,5-TRINITROBENZENE	1.0 MG/L
1,3-DINITROBENZENE	1.0 MG/L
TETRYL	1.0 MG/L
NITROBENZENE	1.0 MG/L
2,6-DINITROTOLUENE	1.0 MG/L
O-NITROTOLUENE	1.0 MG/L
M-NITROTOLUENE	1.0 MG/L
P-NITROTOLUENE	1.0 MG/L

TABLE 2-2 Chemical Analyses of Rinseate Samples for Selected Compounds of Interest

EXPLOSIVES		
Compound	**Method Number (SW-846)**	**Method Detection Limit**
HMX	8330 (SPE)	0.88 ug/L
RDX	8330 (SPE)	0.73 ug/L
2,4 Dinitrotoluene	8330 (SPE)	0.08 ug/L
2,4,6 Trinitrotoluene	8330 (SPE)	0.12 ug/L
1,3,5-TRINITROBENZENE	8330	0.26 UG/L
1,3-DINITROBENZENE	8330	0.11 UG/L
TETRYL	8330	0.25 UG/L
NITROBENZENE	8330	0.30 UG/L
2,6-DINITROTOLUENE	8330	0.31 UG/L
O-NITROTOLUENE	8330	0.78 UG/L
M-NITROTOLUENE	8330	0.65 UG/L
P-NITROTOLUENE	8330	0.65 UG/L
METALS		
Compound	**Method Number (SW-846)**	**Method Detection Limit**
ALUMINUM	6010	45 UG/L
Arsenic	6010 (Low Level ICP)	5 ug/L
Barium	6010 (Low Level ICP)	1 ug/L
Cadmium	6010 (Low Level ICP)	1 ug/L
Chromium	6010 (Low Level ICP)	1 ug/L
Lead	6010 (Low Level ICP)	3 ug/L
MANGANESE	6010	2 UG/L
Mercury	7470 (CVAA)	0.02 ug/L

SELENIUM	6010	75 UG/L
SILVER	6010	7 UG/L
ZINC	6010	2 UG/L

All disposal equipment and supplies generated during equipment decontamination will be placed into 55-gallon DOT 17C open-top drums or other structurally competent DOT-approved containers on a daily basis. At project completion, all containers with disposable equipment/supplies will be disposed of according to applicable RCRA requirements.

At completion of decontamination of the equipment, all non-disposable equipment including power tools, hand tools, hoses, and other miscellaneous equipment will be decontaminated in the previously constructed decontamination area.

Rinseate water will be disposed of in accordance with all local, state, and federal laws at either an approved TSDF or POTW.

2.5 GROUNDWATER MONITORING

GROUNDWATER MONITORING AND REPORTING IS CURRENTLY BEING PERFORMED AT THE OBG IN ACCORDANCE WITH THE GROUNDWATER MONITORING PLAN PREPARED TO COMPLY WITH OAC 3745-54-90 THROUGH 99 AND SUBMITTED AS PART OF THE PART B PERMIT APPLICATION, WHICH WAS EVENTUALLY WITHDRAWN. SAMPLES HAVE BEEN COLLECTED QUARTERLY SINCE 1992. A REPORT HAS BEEN PREPARED AND SUBMITTED ANNUALLY THAT COMPARES THE ANALYTICAL RESULTS FOUND IN THE DOWNGRADIENT WELLS WITH THOSE IN THE UPGRADIENT WELL AND DETERMINES IF THERE IS A STATISTICALLY SIGNIFICANT DEVIATION. TO DATE, THIS STATISTICAL EVALUATION HAS BEEN PERFORMED ON INDICATOR PARAMETERS, AND THESE ANALYSES HAVE INDICATED THAT THE SITE MAY BE IMPACTING GROUNDWATER QUALITY IN THE AREA. HOWEVER, THE DATA DO NOT APPEAR TO FOLLOW A PATTERN, WASTE CONSTITUENTS HAVE BEEN DETECTED IN THE UPGRADIENT WELL, AND SUBSEQUENT SAMPLING DOES NOT CONSISTENTLY CONFIRM THE PRESENCE OF WASTE CONSTITUENTS IN THE GROUNDWATER.

AS DESCRIBED IN SECTION 1.5, FURTHER INVESTIGATION OF POSSIBLE GROUNDWATER CONTAMINATION AS WELL AS ITS REMEDIATION, IF NECESSARY, WILL BE ADDRESSED UNDER THE CERCLA INVESTIGATION OF WINKLEPECK BURNING GROUNDS.

2.2 RISK-BASED CLOSURE

The proposed procedures for closure of the OBG are to evaluate existing information concerning the presence of hazardous waste, collect necessary additional data from environmental media potentially contaminated by hazardous wastes or hazardous waste constituents, and develop a risk-based closure report.

This plan presents the proposed methodology to be used to perform a risk-based closure for the Open Burning Grounds at RVAAP. The methodology presented in this plan is based primarily on Ohio EPA's *Guidance for Reviewing Risk-based Closure Plans for RCRA Units* (Ohio EPA 1993). The proposed risk-based closure report will consist of a human health risk assessment which will evaluate risks to potential receptors under a future recreational land use scenario. Risks from exposures to both soil and ground water contaminants will be estimated in an additive assessment which considers multiple constituents and multiple pathways. The risk-based closure report will demonstrate that the residual material meets health-based standards, or if the material does not meet health-based standards, it will specify the chemical and media-specific standards that must be achieved in order to complete risk-based closure of the unit.

The preparation of a risk-based closure report indicates RVAAP's desire to pursue closure option #2 as described in the risk-based closure guidance (Ohio EPA 1993). This option requires, "Complete removal of waste materials and decontamination of environmental media (soil, water, air) to health-based standards," in order to close the RCRA unit. Waste material (residual ash, refractory material, burn trays, and ancillary equipment) was removed during operation of the unit or will be removed during implementation of an Interim Measures Plan currently being reviewed by Ohio EPA.

The risk-based closure report will present human health risk estimates based on exposure to residual contamination at the unit. The risk estimates will be used to determine whether or not constituents remaining in soils and ground water at the unit are present at levels in compliance with RCRA health-based closure standards. Based on these estimates, it will be determined if the OBG can be considered risk-based closed or whether further remediation and/or monitoring are required before certifying risk-based closure. Upon approval of risk-based closure, the unit will be considered decontaminated and will require no subsequent post-closure monitoring other than confirmatory ground water monitoring (Ohio EPA 1993). In addition, the RCRA unit will not be subject to RCRA-imposed land use restrictions (Ohio EPA 1993).

2.2.1 Risk Assessment Methodology

As stated above, the human health risk assessment will be performed according to Ohio EPA's risk-based closure guidance (Ohio EPA 1993). This guidance document specifies four

steps to be followed when preparing the risk assessment. These four steps are as follows:

(1) Data Evaluation/Collection;
(2) Exposure Assessment;
(3) Toxicity Assessment; and
(4) Risk Characterization.

In addition to these four steps, an uncertainty assessment and risk summary will be included at the end of the risk assessment.

2.2.1.1 Data Evaluation/Collection

Analytical data that will be used in the risk assessment consist of historical data from past sampling events and data obtained from additional sampling to be completed prior to performing the risk assessment. Historical data are available from the groundwater sampling previously described in Section 1.4.2.2 of this plan and soil sampling data from the United States Army Environmental Hygiene Agency - Hazardous Waste Management Study No. 37-26-0442-84, Phase 2 of AMC Open-Burning/Open Detonation Grounds Evaluation, Ravenna Army Ammunition Plant, Ravenna, Ohio, 31 October - 3 November 1983, and the Geohydrologic Study No. 38-26-KF95-92, Soils, Ground Water, and Surface Water Characterization for the Open Burning and Open Detonation Areas, Ravenna, Ohio, 20 April - 5 May 1992.

These results are explained briefly in the following bullets:

- Analytical results for ground water samples collected from the four monitoring wells installed in 1992. Analytical results are available from 15 rounds of ground water sampling from April, 1992 through June, 1996. Results are available for inorganic and organic compounds.

- The hazardous waste management study examined the Winklepeck Burning Grounds without specific focus on the RCRA permitted area (burn pad 38). The summary of the data gathered indicated three soil samples and one residue sample were collected from the OBG. The three soil samples were collected from within the approximately 30.5 meters (100 feet) square level pad, and the residue sample was collected from residue of "scrapings piled on three sides of each pad".

Three soil samples and one residue sample analytical results indicated detectable amounts of TNT. The residue sample also contained detectable levels of HMX and 2,4-DNT. Two of the samples exceeded 20 ug/g of TNT; one, the residue sample, contained 165.7 ug/g of TNT, while the other, a 0-0.15 meters (0-6 inch) soil sample, contained 152.3 ug/g of TNT.

- Analysis of heavy metals, as measured by the EP Toxicity method revealed that two samples contained measurable quantities of heavy metals. One 0-0.15 meter (0-6 inch) soil sample contained 0.1 mg/L cadmium, while a sample from the pad's scrapings contained 1.3 mg/L cadmium and 0.5 mg/L lead.

- The one sample which exceeded the RCRA criterion for cadmium (based on EP Toxicity) was collected from the "pad scrapings" presumed to be along the edges of the pad. As part of the operation of the open burning grounds, residue was collected and disposed, thus the material which was sampled is no longer at the OBG.

- The Geohydrologic Study conducted in 1992 collected soil samples for chemical analysis from nine surface locations and five soil borings on the OBG. Surface samples were collected from the top 0.15 meters (6 inches) of soil. The borings were sampled at depths of 0.3-0.9 meters (1-3 feet), 0.9-1.5 meters (3-5 feet), 1.8-2.4 meters (6-8 feet), and 2.4-3 meters (8-10 feet). A total of 9 surface samples, 20 subsurface samples, and 5 field duplicates were collected.

- The samples were analyzed for: total metals, explosives compounds, explosives byproducts, phosphorus, nitrates, and total Kjeldahl nitrogen. The total metals parameters include arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. The explosives parameters include: 2,4,6-TNT; 2,4-DNT; 2,6-DNT; RDX; HMX; and TNB. The soil samples were also analyzed for the following twelve metals: beryllium, calcium, copper, iron, potassium, magnesium, manganese, sodium, nickel, antimony, thallium, and zinc.

- Explosive were only detected in surface (0-0.15 meters (0-0.5 feet)) samples. All of the results were less than 10 parts per million except one sample, located east of the northern half of the eastern burn tray, where RDX was present at 39 ppm.

- Review of the results for the eight RCRA metals indicate there are elevated levels of arsenic, barium, cadmium, chromium, lead, selenium, and silver in the sample collected at the OBG. The maximum concentrations of heavy metals were generally found in the surface samples (0-0.15 meters (0-0.5 feet)), with arsenic being the only exception, having a maximum concentration in a sample collected from 0.3-0.9 meters (1-3 feet).

- Analytical results for 12 background soil samples as presented in the 1992 USAEHA report.

A review of these data indicate that several data gaps must be addressed in order to obtain a complete evaluation of the nature and extent of residual contamination at the OBG. These gaps must be filled prior to beginning the risk assessment. These data gaps include additional soil samples located in a manner to better define the distribution and concentration of hazardous constituents at the unit.

A sampling plan to address these data gaps will be submitted to Ohio EPA for approval prior to initiating further sampling. In addition, Ohio EPA will be consulted regarding the use of the historical data set prior to inclusion in the risk assessment. It is RVAAP's intention that approval be received from Ohio EPA regarding the complete definition of the nature and extent of contamination at the RCRA unit prior to preparing the risk-based closure report.

2.2.1.2 Background Concentrations of Naturally-Occurring Constituents

The background values for eight naturally-occurring constituents in soil were presented in the 1992 Geohydrologic Study (USAEHA 1992). These values are average concentrations based on the results of the 12 background samples collected near the RCRA unit (see Table 2-3). In the risk assessment, it is proposed that the upper confidence limit, or UCL (i.e., mean plus two standard deviations) be used rather than the average concentrations. The calculation and use of the UCL will follow Ohio EPA guidance (Ohio EPA 1993). Background concentrations for naturally-occurring constituents in ground water will be determined using results from the up gradient monitoring well (OBG-1).

Table 2-3 Average UCL Background Concentrations for Soil Constituents

Soil Constituent	Average UCL Background Concentration (mg/kg)
Arsenic	40.3
Barium	83.2
Cadmium	*
Chromium	25.3
Mercury	*
Lead	28.8
Selenium	1.2
Silver	*

* All background sample results were non-detect for this element

2.2.1.3 Selection of Contaminants of Potential Concern

Contaminants of potential concern (COPCs) are constituents determined to be potential site-related contaminants. It will be assumed that all explosive constituents detected in the OBG are site-related contaminants and all will be included as COPCs. Inorganic COPCs will be limited to the inorganic constituents listed as possible site contaminants in Table 1-2. These inorganic constituents include arsenic, barium, cadmium, chromium, lead, and mercury. Inorganic constituents that were detected in samples at concentrations greater than background are assumed to be related to the unit and will be included as COPCs. The background values used in this comparison will be UCLs. All constituents determined to be COPCs will be included in the human health risk assessment.

2.2.2 Exposure Assessment

The current land use at RVAAP is discontinued commercial/industrial and recreational. The planned land use for the foreseeable future is recreational and/or as a military training ground. As a result of these land use considerations, it is proposed that this risk assessment will estimate risks to receptors under a recreational land use. Receptors for the recreational land use include on-site receptors who may come in contact with residual contamination at the unit on an infrequent basis. There are no plans to release this property from control of the U.S. Army.

2.2.2.1 Point of Exposure

Ohio EPA (1993) and U.S.EPA (1987) specify that the potential point of exposure to hazardous waste constituents is assumed to be directly within the unit boundary. Therefore, analytical results from samples taken directly in the OD Area will be used to determine exposure intakes.

2.2.2.2 Exposure Pathways

Table 2-4 summarizes the exposure pathways evaluated for the future recreational land use scenario. These pathways represent all feasible pathways based on recreational land use. Exposure to both soil and ground water contaminants will be evaluated. In accordance with Ohio EPA 1993 guidance, the potential migration of soil contaminants to ground water will be evaluated using TCLP analysis rather than fate and transport modeling.

2.2.2.3 Exposure Parameters

Default exposure equations and parameters for industrial land use scenarios for soils and parameters are listed in Appendix E, Tables 6 through 10 of the Ohio EPA 1993 guidance. These default parameters will be used unless defensible site-specific information can be obtained. For

~~the recreational land use scenario, the concentration term will be calculated for each constituent by determining the 95 percent UCL of the arithmetic mean. The concentration term is the average constituent concentration a receptor can be expected to contact at a site over time. The 95 percent UCL is the reasonable maximum exposure estimate (RME) that provides reasonable confidence that the true site average, contacted over time, will not be underestimated. The 95 percent UCL will be determined statistically in accordance with U.S. EPA guidance (1992a).~~

Table 2-4 Exposure Pathways Evaluated for Recreational Land Use Scenario

Media	Exposure Pathways
Soil	ingestion, dermal contact, inhalation of particulates, and inhalation of volatiles
Surface Water	ingestion, dermal contact
Ground Water	ingestion, dermal contact

2.2.2.4 Intake Equations

Intakes will be estimated using the standard intake equations provided in Ohio EPA guidance (1993) (Appendix E, Tables 6 through 10). Chemical specific intakes will be estimated and will be expressed as the amount of chemical at the exposure boundary (e.g., skin, lungs, gut) that is available for absorption. Intakes from dermal contact with soils will be expressed as an absorbed dose. Dermal intake equations presented in U.S. EPA's (1992b) *Dermal Exposure Assessment: Principles and Applications* have replaced those presented in Ohio EPA (1993); therefore, the U.S. EPA, 1992b equations will be used to estimate absorbed doses. Chemical specific absorption factors (ABS) will be used to reflect the desorption of the chemical from soil and the absorption of the chemical across the skin and into the blood stream. In accordance with current Ohio EPA policy, the following ABS values will be used: 0.01 for inorganics, 0.06 for polychlorinated biphenyls (PCBs), 0.10 for semi-volatile organic compounds, and 0.25 for volatile organic compounds.

Air intakes will be assessed because individuals may be exposed to the chemical in the vapor phase (volatiles) or adsorbed to particulates (dusts) generated from contaminated soils. Airborne emissions may result from the volatilization of organic constituents from soils and/or ground water. Risk from inhalation of volatiles is assumed to be relevant only for chemicals that easily volatilize. Therefore, intakes from volatile emissions will only be calculated for those constituents with a Henry's Law Constant of greater than 1×10^{-5} atm-m^3/mole and a molecular weight of less than 200 g/mole.

A volatilization factor (VF) will be used to define the relationship between the concentration of contaminants in soil and the volatilized contaminants in air. The VF is calculated according to default EPA guidance (EPA 1991). Intakes from inhalation of particulate phase chemicals will be derived using a particulate emission factor (PEF). The PEF is used to relate the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from surface soils. This relationship is derived by Cowherd (1985) and provides as assessment procedure for hazardous waste sites where the surface contamination is

assumed to provide a continuous and constant potential for emission over an extended period of time. The PEF will be determined consistent with guidance presented in U.S. EPA (1991).

2.2.3 Toxicity Assessment

Toxicological data, used to evaluate risk, will be obtained from the U.S. EPA's Integrated Risk Information System (IRIS). IRIS is an electronic database containing the most current descriptive, quantitative and U.S. EPA regulatory information on chemical and radiological constituents. Chemical files maintained in IRIS contain information relating to noncarcinogenic and carcinogenic health effects. Noncarcinogenic toxicity values are referred to as reference doses (RfDs) or concentrations (RfCs) while carcinogenic toxicity values are referred to as slope factors (SFs). Information also will be obtained from current U.S. EPA Health Effects Summary Tables (HEAST). HEAST is a published reference, updated quarterly by U.S. EPA, and contains toxicity information and values for chemicals from health and environmental effects documents and profiles.

Currently, dermal toxicity data are not available. As a result, a procedure for the adjustment of administered to absorbed doses will be used to convert oral RfDs and SFs to dermal values. The procedure that will be followed for this conversion is outlined in Appendix A of U.S. EPA (1989). In addition, inhalation RfCs must be converted to RfDs. The procedures outlined in Ohio EPA guidance (1993) will be followed for this conversion.

2.2.4 Risk Characterization

Risks will be characterized by integrating the toxicity and exposure assessments into quantitative and qualitative expressions of risk. To characterize carcinogenic risks, probabilities that an individual will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response information. To characterize potential noncarcinogenic effects, comparisons are made between projected intakes of substances and toxicity values. Risks will be quantified for each chemical in each exposure pathway for the COPCs.

2.2.4.1 Carcinogenic Risks

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen (i.e., incremental or excess individual lifetime cancer risk [ELCR]). Carcinogenic risks are calculated using the chronic daily intake determined through the exposure assessment and chemical specific toxicity criteria. The toxicity criteria used in the risk calculation is the slope factor (SF). The cancer risk equation is defined below:

~~Cancer Risk = CDI x SF~~

~~Where:~~

~~Risk = a unitless probability of an individual developing cancer;~~

~~CDI = Chronic Daily Intake averaged over 70 years (mg/kg-day); and,~~

~~SF = chemical-specific slope factor (mg/kg-day)$^{-1}$~~

~~Ohio EPA and U.S. EPA guidance require that risks associated with simultaneous exposures to several substances be estimated. In order to assess the risks posed by multiple chemicals, individual cancer risks are summed for each exposure pathway using the following equation:~~

~~$Risk_t = Risk_1 + Risk_2 + ... Risk_i$~~

~~Where:~~

~~$Risk_t$ = the total cancer risk, expressed as a unitless probability; and~~

~~$Risk_i$ = the risk estimate for the i^{th} substance;~~

~~The risk summation methodology assumes that there are no synergistic or antagonistic chemical interactions and that all chemical produce the same effect: cancer.~~

~~2.2.4.2~~ Noncarcinogenic Risks

~~For noncarcinogens, the potential for toxic effects is measured by comparing an exposure level over a specific time period with a chemical-specific reference dose derived for a similar exposure period. This ratio of exposure is called a hazard quotient. The noncancer hazard quotient assumes that there is a level of exposure below which it is unlikely that adverse health effects will occur, even to sensitive sub-populations. The threshold level is determined through animal and human epidemiological studies and is called the reference dose (RfD). The equation for determining the hazard quotient is described below:~~

~~Noncancer Hazard Quotient = E/RfD~~

~~Where:~~

~~E = exposure level (or intake);~~

~~RfD = chemical-specific reference dose~~

If the exposure level exceeds unity (1), there may be a potential noncancer effect. The ratio of E/RfD does not represent a statistical probability; therefore, the level of concern does not increase linearly as the RfD is approached or exceeded. RfD's do not have equal accuracy or precision and are not based on the same severity of toxic effects.

To assess the overall potential for noncarcinogenic effects posed by more than one chemical, a hazard index (HI) approach will be used. This approach assumes that simultaneous subthreshold exposures to several chemicals could result in an adverse health effect.

The HI is equal to the sum of the hazard quotients, as described below;

$$\text{Noncancer Hazard Index} = E_1/RfD_1 + E_2/RfD_2 + \ldots E_i/RfD_i$$

Where:

E_i = exposure level (or intake) for the i^{th} toxicant;

RfD_i = chemical-specific reference dose for the i^{th} toxicant

The HI assumes that the magnitude of the effect will be proportional to the sum of the ratios of the subthreshold exposures to acceptable exposures.

2.2.5 Uncertainty Assessment

The sources of uncertainty in the human health risk assessment and the relative influence of these sources on the results of the risk assessment will be discussed in this section. Uncertainty is inherent in every step of the risk assessment process; therefore, the report will discuss the uncertainties associated with the following phases of the risk assessment: data analysis, the exposure assessment, the toxicity assessment, and the risk characterization. The effect of each uncertainty and potential magnitude of each effect on the risk estimates will be discussed.

2.2.6 Risk Summary

The risk summary will briefly summarize the major findings of the risk assessment. This will include the identification of chemicals with risks exceeding the EPA target risk values for noncarcinogenic (HI of 1) and carcinogenic risk (ELCR = 1×10^{-6}).

2.2.7 Conclusions and Recommendations

~~This section will present conclusions and recommendations based on the results of the risk assessment. If the results indicate that RCRA health-based standards are not exceeded at the unit, then the report will recommend that the unit be considered risk-based closed. Limited confirmatory ground water monitoring also would be recommended, if warranted, to confirm the achievement of standards for a minimum of four consecutive quarters.~~

~~However, if the results indicate that RCRA health-based standards are exceeded at the unit, then the report will specify required actions and standards to be achieved before risk-based closure certification. Standards will be identified for all constituents present at concentrations which pose risks that exceed acceptable levels. These standards will consist of risk-based levels derived from the risk assessment, UCL background concentrations, or Applicable or Relevant and Appropriate Requirements (ARARs) such as Maximum Contaminant Levels (MCLs) from the National Primary Drinking Water Standards. The extent of contamination exceeding acceptable levels also would be identified.~~

~~RVAAP would then submit a revised closure plan to detail the actions necessary to remove or otherwise eliminate the identified threat to receptors by decontamination of the affected media to the appropriate risk-based concentrations. Upon approval of the revised closure plan, closure actions would be implemented.~~

2.6 3 DESCRIPTION OF SECURITY SYSTEM

RVAAP is a controlled access facility with fencing, gates, and numerous other features that contribute to the safety and security of the facility. Security is maintained by a staff of trained security guards 24-hours a day. Routine patrols of areas outside the main complex are conducted. All security guards are equipped with two-way radios and have direct communication with other RVAAP protection personnel. Employees are required to show identification badges when entering all main complex gates. Visitors and contractors entering the main complex must sign a log sheet and obtain proper passes.

2.7 4 CLOSURE CERTIFICATION

Within sixty (60) days of final closure, the owner/operator and an Independent Registered Professional Engineer will submit a certification of closure to the Ohio EPA Director by registered mail, assuring that the closure has been performed and is in accordance with the approved closure plan.

~~2.4.1 Activities to be Conducted~~

~~The activities to be conducted to affect risk-based closure (i.e., sampling protocols and locations) will be presented in a Sampling and Analysis Plan (SAP) to be prepared upon approval of this closure plan. Upon approval of the SAP, sampling, analysis and the preparation of the risk-based closure report will be conducted.~~

~~2.4.2 Testing and Analysis to be Performed~~

~~The sampling and analysis protocol for activities proposed in the SAP will follow the requirements of SW-846. Any departure from accepted methods will be noted and the rationale expressed. In no case will activity proceed without Ohio EPA approval of the SAP. All laboratory sample analytical methods will follow a specific quality assurance and quality control plan that will be submitted with the SAP.~~

2.7.1 ~~4.3~~ Criteria for Evaluating Adequacy

The information generated in accordance with THE APPROVED CLOSURE PLAN ~~the approved SAP~~ will be evaluated by an Independent Registered Professional Engineer. THE ENGINEER SHALL ALSO ENSURE ALL CONSTRUCTION ACTIVITIES ARE PERFORMED IN ACCORDANCE WITH THE APPROVED CLOSURE PLAN AND ITS SUPPORTING DOCUMENTS. The Independent Registered Professional Engineer will be required to submit a report OF findings and recommendations.

2.7.2 ~~4.4~~ Schedule of Inspections

The areas where the ~~activities~~ proposed ~~in the SAP~~ CLOSURE OPERATIONS are to be conducted will be inspected by the independent engineer routinely. Upon the beginning of closure operations, the independent engineer will notify the Ohio EPA (District and Central Offices) five (5) days prior to any critical activity and will inspect all closure activities on a daily basis. All observation and inspection activities will be recorded in the engineer's log book. This schedule will continue until the activity has been completed, any hazardous waste generated has been transferred from the facility and the sampling protocol has been completed.

2.7.3 ~~4.5~~ Types of Documentation

Documentation that will be included in the closure certification will include sample analysis information, volume of waste generated during closure, waste shipping records, spill/leak reports, all sample and decontamination procedures documentation [Chain-of-Custody (COC), sampling logs, etc.], routine and special inspection records, photographs, the approved closure plan, ~~the risk-based closure report~~ and other related documents. In addition, the closure certification will contain any

correspondence with outside agencies and independent evaluations which relate to the closure activity.

2.7.4 ~~4.6~~ Future Use

Upon certification of closure, there are no specific plans to use the OBG. RVAAP'S PROJECTED FUTURE USE IS AS A TRAINING FACILITY FOR THE NATIONAL GUARD.

3.0 CLOSURE SCHEDULE

3.1 EXPECTED YEAR OF CLOSURE

The Open Burn Grounds Hazardous Waste Treatment Unit is expected to undergo closure beginning in SPRING OF 1998 ~~1997~~. FINAL CLOSURE WILL CONSIST OF THE REMOVAL, DECONTAMINATION, AND DISPOSITION OF THE BURNING TRAYS AND ANCILLARY EQUIPMENT.

3.2 FREQUENCY OF PARTIAL CLOSURE

There will be no partial closure for the Open Burning Grounds Hazardous Waste Treatment Unit.

3.3 WASTE REMOVAL

All waste will be removed during ~~the interim measures activities or the implementation of~~ closure. WASTE SOIL MAY BE GENERATED DURING CERCLA REMEDIAL ACTION, IF SUCH ACTION IS DETERMINED TO BE NECESSARY; HOWEVER, THIS WASTE SOIL REMOVAL WILL BE PLANNED AND EXECUTED UNDER THE CERCLA PROGRAM. At the beginning of RCRA closure, it is anticipated that the refractory material will be stored on-site and the burn trays will be temporarily stored in Building 1601. The refractory material will be disposed and the trays will be decontaminated and removed in accordance with the approved closure plan. Waste generated during the closure will be managed according to applicable RCRA requirements.

3.4 CLOSURE COMPLETION

THE CLOSURE ACTIVITIES DESCRIBED IN THIS CLOSURE PLAN ARE EXPECTED TO BE COMPLETED WITHIN 300 DAYS OF BEGINNING CLOSURE UNDER AN OHIO EPA APPROVED PLAN. BECAUSE OF THE SEVERE WINTER WEATHER AT RVAAP, FIELD CLOSURE ACTIVITIES WILL NOT BEGIN UNTIL SPRING 1998. THE ESTIMATE OF 300 DAYS IS SUBJECT TO CHANGE, SINCE ACTIVITIES PROPOSED UNDER THIS CLOSURE PLAN ARE CONTINGENT ON ACTIVITIES PERFORMED AS PART OF THE BUILDING 1601 CLOSURE.

~~Closure is expected to be completed within 310 days of beginning closure under an Ohio EPA approved plan. Although no time extension requests are anticipated, if one should become necessary, it will be requested in accordance with the demonstration requirements specified in OAC 3745-66-13.~~

3.5 CERTIFICATION OF CLOSURE

Within 60 days of successful completion of the prescribed closure, RVAAP will submit to the Director of the Ohio EPA by registered mail a certification that the Open Burning Grounds has been closed in accordance with the specifications in the approved closure plan. In addition, the Regional Administrator, U.S. EPA Region V will be sent a copy. The certification statement will include the exact wording found in OAC 3745-50-42(D). The certification will be signed by the owner and by the Independent Registered Professional Engineer responsible for closure oversight, registered in the State of Ohio.

3.6 SURVEY PLAT

~~Since the closure of the Open Burning Grounds is expected to satisfy the requirements for risk-based closure, filing a survey plat is not expected to be required. Should it be determined that a risk-based closure cannot be accomplished, RVAPP will immediately contact the Ohio EPA to discuss amending the closure plan~~. If CLEAN CLOSURE IS NOT POSSIBLE, ~~it becomes necessary~~, a survey plat will be submitted to the Portage County Recorder's Office and the Director of the Ohio EPA, which indicates the location and dimensions of the unit with respect to permanently survey benchmarks. The plat would be prepared and certified by a professional land surveyor. The plat would contain a note, prominently displayed, which states the owners' obligation to restrict disturbance of the hazardous waste unit.

3.7 REQUEST FOR EXTENSION TO DEADLINES FOR HANDLING INVENTORY OR COMPLETING CLOSURE

No requests for an extension of time to complete closure are anticipated BEYOND THE SCHEDULE OUTLINED IN SECTION 3.8. ~~, unless the risk-based closure report indicates that one or more of the risk-based standards developed in the report are exceeded. In that instance, a revised closure plan will be submitted that will detail the activities necessary to remove or decontaminate media that pose a threat~~.

3.8 MILESTONES

The schedule below exhibits the time required for each phase of the Open Burning Grounds closure:

Closure will begin within 160 ~~30~~ days of Ohio EPA approval of this closure plan. The proposed schedule of projected activities is provided below:

TASK	CUMULATIVE TIME (DAYS)
RECEIVE OHIO EPA APPROVAL OF THE CLOSURE PLANS FOR OBG AND THE 1601 BUILDING	0
REMOVE REFRACTORY MATERIAL, AND DISMANTLE TRAYS FROM THE OPEN BURN AREA AND TRANSPORT TO BUILDING 1601 *	160
DECONTAMINATE BURN TRAYS**	210
DISPOSE DECONTAMINATED MATERIALS. DISMANTLE DECONTAMINATION AREA AND COMPLETE TRAY DECONTAMINATION ACTIVITIES.	240
SUBMIT CLOSURE CERTIFICATION TO OHIO EPA	300

* DUE TO SEVERE WINTER WEATHER, CLOSURE ACTIVITIES CANNOT BEGIN BEFORE SPRING 1998.

** THE OEPA DISTRICT INSPECTOR WILL BE NOTIFIED FIVE DAYS BEFORE SAMPLING ACTIVITIES.

~~Task — Cumulative Time (days)~~

~~Receipt of Ohio EPA approval of closure plan. — 0~~

~~Notify Ohio EPA of intent to close OBG, characterize and dispose of stored material, and decontaminate equipment — 30~~

~~Submit draft SAP and QAPP for Ohio EPA approval — 120~~

~~Receive approval of SAP and QAPP ——— 150~~

~~Implement field sampling effort ——— 180~~
~~(The OEPA District Inspector will be notified five days before sampling activities.)~~

~~Submit draft risk-based closure report. ——— 250~~

~~Submit closure certification to Ohio EPA, OR, submit revised closure plan to Ohio EPA ——— 310~~

The RVAAP will contact the facility inspector from the District Office at least 5 business days in advance of certain critical activities (e.g., sampling) so that the inspector may be present to observe the activity, obtain split samples, or inspect other items.

4.0 HEALTH AND SAFETY PLAN

The Health and Safety Plan for this project is presented in Appendix A. This is for ease of removal for use by personnel during closure implementation.

DATE OF SUBMISSION: OCTOBER 31, 1997

5.0 CLOSURE PLAN CERTIFICATION

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 ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, and of 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 penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____ _____

(Signature) (Owner/Operator) (Date)

_____ _____

(Signature) (Registered Professional Engineer) (Date)

6.0 REFERENCES

Andelman, J.B. 1990. Total Exposure to Volatile Organic Chemicals in Potable Water. N.M. Ram, R.F. Christman, K.P. Cantor (eds.). Lewis Publishers.

Cowherd,C., Muleski, G., Engelhart, P., and Gillete, D. 1985. "Rapid assessment of exposure to particulate emissions from surface contamination." Prepared for EPA Office of Health and Environmental Assessment. EPA/600/8-85/002.

Ohio EPA, 1993. Guidance for Reviewing Risk-based Closure Plans for RCRA Units. Interim Final. Ohio Environmental Protection Agency, Division of Hazardous Waste Management. September 1, 1993.

USACE, 1997. PHASE I REMEDIAL INVESTIGATION REPORT FOR THE HIGH-PRIORITY AREAS OF CONCERN AT THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO (FINAL). MAY, 1997.

USAEHA, 1984. Hazardous Waste Management Study No. 37-26-0442-84. Phase 2 of AMC Open-Burning/Open-Detonation Grounds Evaluation, Ravenna Army Ammunition Plant, Ravenna, Ohio; 31 October - 3 November 1983.

USAEHA, 1992. Geohydrologic Study No. 38-26-KF95-92. Soils, Ground Water, and Surface Water Characterization for the Open Burning and Open Detonation Areas, Ravenna Army Ammunition Plant, Ravenna, Ohio; 20 April - 5 May 1992.

U.S. EPA, 1987. Interim Status Standards for Owners and Operators of Hazardous Waste Treatment Storage, and Disposal Facilities; Final Rule. FR 52 8704. United States Environmental Protection Agency. March 19, 1987.

U.S. EPA, 1989. Human Health Evaluation Manual, Volume I, Part A. United States Environmental Protection Agency. EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual, Volume I, Part B: "Development of Risk Based Preliminary Remediation Goals." United States Environmental Protection Agency. EPA/540/R-92/003 (OSWER Directive 9285.7-01B).

U.S. EPA, 1992a. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER Publication 9285.7-081. United States Environmental Protection Agency. May 1992.

~~U.S. EPA, 1992b. Dermal Exposure Assessment: Principles and Applications. Interim Report. United States Environmental Protection Agency. EPA/600/8-91/011B. January 1992.~~

APPENDIX A

Open Burning Grounds Closure Health and Safety Plan
For
The Ravenna Army Ammunition Plant
Ravenna, Ohio

APPROVALS
OPEN BURNING UNIT CLOSURE SAFETY AND HEALTH PLAN FOR THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

To Be Determined, Project Manager — Date

To Be Determined, Health and Safety Manager — Date

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1. FACILITY DESCRIPTION AND CONTAMINATION CHARACTERIZATION

1.1 SITE DESCRIPTION

The Open Burning (OB) unit consists of a level area approximately 100 feet by 100 feet. The OB unit is located along Road C East, approximately 1,000 feet north of Sand Creek. The southern portion of the OB unit is bordered by a shallow drainage way that flows to the east. The RVAAP burns bulk propellents, explosives, and explosive-contaminated material at the OB unit. Materials that are contaminated with propellents and explosives are also burned. Since 1981, burns have been conducted in metal trays. The trays are 1/4-inch boiler plate, and approximately 16 feet by 5 feet and refractory-lined. The trays are set on a pad of crushed slag. In the past, the area surrounding the current OB unit has been used for the thermal treatment of fuses, boosters, aluminum caps, bulk explosives, sump waste, and motor oil. Wastes treated at the OB unit have the EPA hazardous waste numbers D003 and K044 (due to reactivity). Treatment by open burning removes the reactivity characteristic. Waste are not chemically characterized prior to treatment because adequate physical and chemical data is known from process knowledge.

1.2 CONTAMINANTS

The following is a list of the hazardous waste previously treated at the OB unit, the EPA hazardous waste codes, and the constituents associated with those wastes. Minute quantities of these contaminants may be encountered during ash and soil removal, equipment decontamination, and sampling of soil, groundwater, or rinsates.

TABLE 1-1 POTENTIAL HAZARDOUS CONSTITUENTS AT OB UNIT

WASTE	EPA HAZARDOUS WASTE CODE	HAZARDOUS CONSTITUENT
OB Ash	D003	Reactivity Characteristic
OB Ash	D004	Arsenic
OB Ash	D005	Barium
OB Ash	D006	Cadmium
OB Ash	D007	Chromium
OB Ash	D008	Lead
OB Ash	D009	Mercury
OB Ash	D030	2,4-Dinitrotoluene
OB Ash	K044	Reactivity, based on process knowledge of presence of 2,4,5-trinitrotoluene (TNT), 1,3,5-hexahydro-1,3,5-trinitrohydazine (RDX), and 1,3,5,7-hexahydro-1,3,5,7-tetranitrohydrazine (HMX)

2. HAZARD/RISK ANALYSIS

The purpose of the task hazard analysis is to identify and assess potential hazards that may be encountered by personnel and to prescribe required controls. Table 2-1 is a checklist of common hazards that may be posed during the Closure of the OB unit and indicates if a particular major type of hazard is present. The tasks are expected to consist of ash and soil removal, equipment decontamination, and soil and groundwater sampling. In general, given these tasks, the potential for unacceptable exposure to contaminants appears to be low. Expected tasks present a variety of physical hazards including unexploded ordnance, contact with equipment, noise, and heat/cold stress.

TABLE 2-1. HAZARDS INVENTORY

Yes	No	Hazard
	X	Confined space entry
	X	Excavation entry
X		Heavy equipment
X		Fire and explosion
X		Electrical shock
X		Exposure to chemicals
X		Temperature extremes
X		Biological hazards
	X	Radiation or radioactive contamination
X		Noise

Specific tasks are as follows:

- Soil and ash sampling.
- Soil boring and sampling with a drill rig.
- Equipment decontamination and rinsate water sampling.
- Installation of monitoring wells and groundwater sampling.
- Soil excavation and sampling.

2.1 TASK-SPECIFIC HAZARD ANALYSIS

Table 2-2 presents task-specific hazards, task-specific hazard analyses [Risk Assessment Code (RAC)], relevant hazard controls, and required monitoring, if appropriate, for all of the planned tasks. The RAC in Table 2-2 is

derived through a qualitative risk assessment process using probability codes and severity codes. The severity codes are I = injuries/illnesses involving permanent total disability or death; II = injuries/illnesses with permanent partial disability or temporary total disability; III = injuries/illnesses resulting in temporary, reversible conditions with period of disability of less than 3 months; and IV = injuries/illnesses with reversible adverse effects requiring only minor treatment. The probability codes are A = likely to occur immediately, B = probably will occur in time, C = possible to occur in time, and D = unlikely to occur.

2.2 POTENTIAL EXPOSURES

Information on the significant suspected contaminants that may be encountered during the OB unit is provided in Table 2-3. Note that this list includes contaminants known or suspected to occur at concentrations sufficient to pose a risk of overexposure. Contaminants that are not expected to occur at significant concentrations are not listed.

TABLE 2-2. HAZARDS ANALYSIS

Safety and Health Hazards	RAC	Controls	Monitoring
Equipment decontamination (high pressure, hot water washing)			
General equipment decontamination hazards (hot water, slips, falls, equipment handling)	C, III	Level D PPE (see Section 5) plus: Nitrile or PVC gloves. Face shield and Saranax or rain suit (when operating steam washer).	None.
Noise (spray washer)	B, III	Hearing protection when washer is operating.	None.
Electric shock	D, II	Lockout tagout of all electrical sources in area where power wash is in use.	None.
Fire (gasoline)	D, III	Control of ignition sources. Control of flammable materials (quantities in decontamination area limited to single day use, proper storage). Fire extinguisher (see Section 9).	Combustible gas meter (as appropriate).
Contact with unexploded ordnance	D, IV	On-site training in ordnance recognition for all field personnel. Clearance of sites for intrusive work. Withdrawal of all non-EOD personnel if ordnance or suspected ordnance is discovered.	Visual surveys for ordnance (recognized as large artillery rounds or bombs). Instrument surveys by EOD technicians in munitions disposal areas.
Exposure to chemicals (see Table 2.3)	D, III	PPE (Level D) plus nitrile gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Minimal contact.	None.
Temperature extremes	C, II	Administrative controls (see Section 8).	Temperature measurements as appropriate; heart rate monitoring as appropriate.

Safety and Health Hazards	RAC	Controls	Monitoring
Soil removal using excavation equipment			
Safety hazards associated with excavation equipment	D, II	Level D PPE (see Section 5). Personnel will stay well clear of operating equipment.	Daily safety inspections of operations.
Potential excavation cave-in	C, II	Personnel will keep at least 0.9 meters (3 feet) distance from excavation edges during excavation.	Daily safety inspections of operations. Examine excavation edge for signs of spalling or collapse.
Contact with unexploded ordnance	D, II	On-site training in ordnance recognition for all field personnel. Clearance of sites by EOD personnel for intrusive work. Withdrawal of all non-EOD personnel if ordnance or suspected ordnance is discovered.	Visual surveys for ordnance (recognized as large artillery rounds or bombs). Instrument surveys by EOD technicians in munitions disposal areas.
Exposure to chemicals (see Table 2.3)	C, III	PPE (Level D) plus nitrile gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Staying upwind of any dust-generating activities. Minimal contact.	Photoionization detector and other sampling as appropriate.
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season)	D, I	No field work at dawn or dusk in areas open to hunting. High visibility vests. When possible, work in areas open to hunting will be scheduled for Sunday through Thursday.	None.
Fire (vehicle fuels)	D, III	Control of ignition sources. Control of flammable material (quantities limited to single day use, proper storage). Fire extinguisher (see Section 9).	Combustible gas indicator.
Noise	B, II	Hearing protection within 7.6 meters (25 feet) of backhoe.	Daily safety inspections.

Safety and Health Hazards	RAC	Controls	Monitoring
Animal hazards (bees, ticks, wasps, snakes)	C, III	PPE (boots, work clothes). Insect repellant, as necessary.	Visual survey.
Electric shock	D, II	Identification and clearance of overhead and underground utilities.	Visual of all work areas.
Temperature extremes	C, II	Administrative controls (see Section 8).	Heart rate monitoring as appropriate; temperature measurements as appropriate.
Soil boring, soil sampling, and monitoring well installation using a drill rig			
General safety hazards (rotating machinery, suspended loads, moving equipment, slips, falls)	C, II	Level D PPE (see Section 5) plus hard hat. No employees under lifted loads.	Daily site safety inspections. Weekly drill rig inspections.
Noise	B, II	Hearing protection within 7.6 meters (25 feet) of rig.	Daily safety inspections.
Fire (vehicle fuels)	D, III	Control of ignition sources. Control of flammable material (quantities limited to single day use, proper storage). Fire extinguisher (see Section 9).	Combustible gas indicator.
Contact with unexploded ordnance	D, II	On-site training in ordnance recognition for all field personnel. Clearance of sites by EOD personnel for intrusive work. Withdrawal of all non-EOD personnel if ordnance or suspected ordnance is discovered.	Visual surveys for ordnance (recognized as large artillery rounds or bombs). Instrument surveys by EOD technicians in munitions disposal areas.
Exposure to chemicals (see Table 2.3)	D, III	PPE (Level D) plus nitrile gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Staying upwind of any dust-generating activities. Minimal contact.	Photoionization detector and other sampling as appropriate.

Safety and Health Hazards	RAC	Controls	Monitoring
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season)	D, I	No field work at dawn or dusk in areas open to hunting. High visibility vests. When possible, work in areas open to hunting will be scheduled for Sunday through Thursday.	None.
Temperature extremes	C, II	Administrative controls (see Section 8).	Heart rate monitoring as appropriate; temperature measurements as appropriate.
Animal hazards (bees, ticks, wasps, snakes)	C, III	PPE (boots, work clothes). Insect repellant, as necessary.	Visual survey.
Electric shock	D, II	Identification and clearance of overhead and underground utilities.	Visual of all work areas.
Soil sampling using hand augers or scoops			
General safety hazards (manual lifting, slips, falls)	D, IV	Level D PPE (see Section 5). Buddy system.	Daily site safety inspections.
Contact with unexploded ordnance	D, II	On-site training in ordnance recognition for all field personnel. Clearance of sites by EOD personnel for intrusive work. Withdrawal of all non-EOD personnel if ordnance or suspected ordnance is discovered.	Visual surveys for ordnance (recognized as large artillery rounds or bombs). Instrument surveys by EOD technicians in munitions disposal areas.
Exposure to chemicals (see Table 2.3)	D, III	PPE (Level D) plus nitrile gloves for contact with contaminated material. Washing face and hands prior to taking anything by mouth. Staying upwind of any dust-generating activities. Minimal contact.	Photoionization detector and other sampling as appropriate.

Safety and Health Hazards	RAC	Controls	Monitoring
Gunfire (deer hunting with shotguns loaded with slugs allowed on Friday and Saturday during season)	D, I	No field work at dawn or dusk in areas open to hunting. High visibility vests. When possible, work in areas open to hunting will be scheduled for Sunday through Thursday.	None.
Temperature extremes	C, II	Administrative controls (see Section 8).	Heart rate monitoring as appropriate; temperature measurements as appropriate.
Animal hazards (bees, ticks, wasps, snakes)	C, III	PPE (boots, work clothes). Insect repellant, as necessary. Snake chaps for work in heavy underbrush during warm weather.	Visual survey.

EOD = explosive ordnance
GFCI = ground fault circuit interrupter
PPE = personal protective equipment
PVC = polyvinyl chloride

TABLE 2-3. POTENTIAL EXPOSURES

Chemical[a]	TLV/PEL/Activity or DAC/STEL/IDLH[b]	Health Effects/ Potential Hazards[c]	Chemical and Physical Properties[c]	Exposure Route(s)[c]
Arsenic	TLV/TWA: 0.01, A1 mg/m³ IDLH: 100 mg/m³	Potential human carcinogen per NIOSH, ulceration of nasal septum, dermatitis, GI disturbances, peripheral neuropathy, respiratory irritation, and hyperpigmentation of skin.	Metal; silver-gray or tin white, brittle, odorless solid; MP: sublimes; IP: NA; VP: 0 mm (approximate).	Inhalation Absorption Contact Ingestion
Barium	TLV/TWA: 0.5, mg/m³ IDLH: 1100 mg/m³	Upper respiratory irritation, gastroenteritis, muscle spasm,slow pulse, extrasystoles, hypokalemia, irritation eye and skin, skin burns.	Barium nitrate & barium chloride are white odorless solids. VP: Low.	Inhalation Ingestion Contact
Cadmium	TLV/TWA: 0.01, A2 mg/m³ IDLH: 100 mg/m³	Suspected human carcinogen, pulmonary edema, dyspnea, cough, chest tight, substernal pain, head, chills, muscle aches, nausea, vomit, diarrhea, anosmia, emphysema, proteinuria, mild anemia.	Metal; silver-white, blue tinged lustrous, odorless solid. VP: 0 mm, IP: NA, Non-combustible solid in bulk form, but will burn in powder form.	Inhalation Ingestion
Chromium	TLV/TWA: 0.5 mg/m³ IDLH: 25 mg/m³	Eye irritation, sensitization	Solid; properties vary depending upon specific compound. VP: 0 mm, IP: NA. Non-combustible solid in bulk form, but finely divided dust burns rapidly in a flame.	Inhalation Ingestion Contact

Chemical[a]	TLV/PEL/Activity or DAC/STEL/IDLH[b]	Health Effects/ Potential Hazards[c]	Chemical and Physical Properties[c]	Exposure Route(s)[c]
DNT (dinitrotoluene)	TLV/TWA: 0.15,A2 mg/m^3 IDLH: Ca [50 mg/m^3]	Suspected human carcinogen, anorexia, cyanosis, reproductive effects	Orange-yellow solid, VP: 1 mm; FP: 404°F	Inhalation Absorption Ingestion Contact
Gasoline (used for fuel)	TLV/TWA: 300 ppm IDLH: Ca	Potential carcinogen per NIOSH, dizziness, eye irritation, dermatitis	Liquid with aromatic odor; FP: -45°F; VP: 38-300 mm	Inhalation Ingestion Absorption Contact
Lead	TLV/TWA: 0.15 mg/m^3 PEL/TWA: 0.05 mg/m^3 IDLH: 100 mg/m^3	Weakness, anorexia, abdominal pain, anemia	Solid metal; VP: 0 mm; FP: NA; IP: NA	Inhalation Ingestion Contact
Mercury	TLV/TWA: 0.025 mg/m^3 IDLH: 28 mg/m^3	Cough, chest pain, dyspnea, bronchitis pneumonitis,tremor,insomnia, irritability, indecision, headache, fatigue, weak, stomatitis, salivation, GI disturbance, anorexia, weight lose, proteinuria, eye irritation, skin irritation.	Silver-white, heavy, odorless, liquid. VP: 0.0012 mm, IP: NA.	Inhalation Absorption Contact
RDX (cyclonite)	TLV/TWA: 1.5 mg/m^3 Skin notation IDLH: none established	Explosive; irritation of eyes and skin, dizziness, weakness	White powder; FP: explodes; VP: 0.0004 mm at 230°F	Inhalation Absorption Ingestion Contact

Chemical[a]	TLV/PEL/Activity or DAC/STEL/IDLH[b]	Health Effects/ Potential Hazards[c]	Chemical and Physical Properties[c]	Exposure Route(s)[c]
TNT	TLV/TWA: 0.5 mg/m^3 Skin notation IDLH: 500 mg/m^3	Irritation of skin and mucus membranes, liver damage, kidney damage	Pale solid; FP: explodes; VP: 0.0002 mm	Inhalation Absorption Ingestion Contact

[a] The potential chemicals were obtained from the Draft Action Plan for the Ravenna Army Ammunition Plant, May 5, 1995.
[b] From 1994-1995 Threshold Limit Values, 1994 & NIOSH Pocket Guide to Chemical Hazards, 1994.
[c] From 1994 NIOSH Pocket Guide to Chemical Hazards & the Condensed Chemical Dictionary, Tenth Edition.

A1 = confirmed human carcinogen
A2 = suspected human carcinogen
NA = not applicable
IP = ionization potential
TWA = time-weighted average
VP = vapor pressure
DAC = derived air concentration
PEL = permissible exposure limit
GI = gastrointestinal
FP = flash point
STEL = short-term exposure limit
NIOSH = National Institute for Occupational Safety and Health
IDLH = immediately dangerous to life and health
TLV = threshold limit value

3. STAFF ORGANIZATION, QUALIFICATIONS, AND RESPONSIBILITIES

This section presents the personnel (and their associated telephone numbers) responsible for site safety and health and emergency response. Table 3-1 identifies individuals who will fill key roles.

TABLE 3-1. STAFF ORGANIZATION

Position	Name	Phone
Program Manager		
Health and Safety Manager		
Project Manager		
Subcontractor Field Team Leader		
Field Task Leader		
Site Safety and Health Officer		

3.1 PROGRAM MANAGER

The Program Manager is responsible for ensuring conformance with United States Army Corps of Engineers (USACE) policies and procedures. Specific responsibilities of the Program Manager include:

- coordinating with USACE personnel;
- ensuring that project managers satisfy USACE health and safety requirements;
- ensuring that project staff implement the Site Safety and Health Plan (SSHP);
- ensuring that projects have the necessary resources to operate safely; and
- ensuring that project personnel have the appropriate regard for safe job performance.

3.2 HEALTH AND SAFETY MANAGER

The health and safety manager establishes health and safety policies and procedures, supports project and office activities, and verifies that safe work practices and conditions are being met. The specific responsibilities of the Health and Safety Manager include:

- coordinating with USACE health and safety personnel;
- reviewing and approving SSHPs;

- approving downgrades in personal protective equipment (PPE) or protective procedures; and
- interfacing with project personnel through routine communications and audits of selected projects.

3.3 PROJECT MANAGER

The Project Manager is responsible for overall project execution. The responsibilities of the Project Manager include:

- coordinating with USACE personnel, including reporting accidents and incidents to the USACE Project Manager immediately and submitting written reports within 2 working days;
- ensuring implementation of the FSHP and addenda;
- maintaining auditable project documentation of all required records;
- ensuring that a qualified Site Safety and Health Officer (SSHO) is designated; and
- maintaining a current copy of the FSHP and addenda.

3.4 FIELD OPERATIONS MANAGER OR TASK LEADER

The Field Operations Manager or Task Leader will oversee the field activities associated with a project and will be responsible for site accessibility, safety, and quality assurance. He/she is responsible for enforcing the field requirements of this FSHP and its addendum. Specific responsibilities of the Field Operations Manager or Task Leader are:

- enforcing compliance with the FSHP and its addendum;
- coordinating on-site operations, including subcontractor activities;
- ensuring that subcontractors follow the requirements of this FSHP and its addendum;
- coordinating and controlling any emergency response actions;
- ensuring that at least two persons currently certified in first aid/cardiopulmonary resuscitation (CPR) are on site during site operations; and
- maintaining current copies of the FSHP and its addendum and the EM 385-1-1 USACE Safety and Health Requirements Manual on site.

3.5 SITE SAFETY AND HEALTH OFFICER

The SSHO is responsible for making health and safety decisions, for specific health and safety activities, and for verifying the effectiveness of the health and safety program. The SSHO's qualifications include, at a minimum,

experience with similar projects, knowledge of and understanding of the FSHP and its addendum, and the ability to use the required monitoring equipment. The SSHO has primary responsibility for the following:

- implementing and verifying compliance with this FSHP and its addendum and reporting to the Field Operations Manager or Task Leader, Project Manager, and Health and Safety Manager any deviations from anticipated conditions;

- conducting daily safety inspections;

- documenting deficiencies identified in the daily inspections and responsible parties, procedures, and timetables for correction;

- stopping work or upgrading protective measures (including protective clothing) if uncontrolled health and safety hazards are encountered. Indications of uncontrolled health and safety hazards include monitoring instrument readings in excess of the established action limits, encountering liquids other than water, soil staining suggestive of unexpectedly high concentrations of nonvolatile contaminants, etc. The SSHO must also authorize resumption of work following correction of the adverse condition(s);

- ensuring that site personnel have access to this plan and are aware of its provisions;

- conducting a site-specific pre-entry health and safety briefing covering potential chemical and physical hazards, safe work practices, and emergency procedures;

- maintaining on-site auditable documentation of
  - — Material Safety Data Sheets (MSDSs) for applicable materials utilized at the site;
  - — training for site workers and visitors;
  - — calibration/maintenance of field instruments such as photoionization detectors, combustible gas indicators, etc.;
  - — environmental and personal exposure monitoring results;
  - — notification of accidents/incidents;
  - — reports of any overexposure or excessive levels;
  - — notification of employees of exposure data; and
  - — medical surveillance.

- confirming that all on-site personnel have received the training listed in the Training Requirements section (Section 4) of this FSHP;

- issuing respirators, as necessary, and ensuring that all respirator users have received medical clearance within the last year, have been properly trained, and have been successfully fitted for respiratory protection;

- verifying that the FSHP's emergency points of contact are correct;

- ensuring that all monitoring equipment is operating according to the manufacturer's specifications and performing field checks of instrument calibration;

- ensuring monitoring for potential on-site exposures is conducted in accordance with this FSHP and its addendum;

- updating the FSHP addenda (field changes) to ensure that all tasks and significant hazards are identified and notifying project personnel and the Health and Safety Manager of changes;

- investigating accidents and near accidents and reporting (in concert with Field Operations Manager or Task Leader) same to Project Manager and Health and Safety Manager;

- conducting daily "tailgate" safety briefings; and

- controlling visitor access to the exclusion zone.

3.6 SUBCONTRACTOR FIELD MANAGER

The Field Manager will oversee the field activities of his/her employees. He/she is responsible for enforcing the field requirements of this FSHP and its addendum. Specific responsibilities are:

- ensuring that his/her on-site personnel follow the requirements of the FSHP and its addendum and any other applicable health and safety requirements [Occupational Safety and Health Administration (OSHA), equipment-specific controls, state requirements];

- verifying that this FSHP adequately addresses the hazards and controls of the subcontracted work, and supplementing the information in the FSHP if necessary;

- ensuring the safe operation of any subcontractor equipment;

- coordinating on-site operations of his/her personnel; and

- maintaining any required documentation (drill rig manual) specific to his/her operations.

4. TRAINING

Personnel who participate in the closure of OB unit are subject to the following training requirements. Table 4-1 presents the requirements—in condensed format—and a brief discussion of each training course.

TABLE 4-1. TRAINING REQUIREMENTS

Training	Worker	Supervisor	Site Visitor
HAZWOPER (40-hour, 3-day OJT)	√	√	√
HAZWOPER Annual Refresher (8 hour)	√	√	√
HAZWOPER Supervisors Training (8 hour)	×	√	×
General Hazard Communication Training (Contained in 40-hour and 8-hour courses)	√	√	√
Respiratory Protection Training (required only if respirators are worn; contained in 40-hour course)	√	√	√
Hearing Conservation Training (for workers in hearing conservation program; contained in 40-hour and 8-hour courses)	√	√	√
Pre-entry Briefing	√	√	√
Site Specific Hazard Communication (contained in pre-entry briefing)	√	√	√
Safety Briefing (daily and whenever conditions or tasks change)	√	√	×

√ = Required
× = Not required
HAZWOPER = Hazardous Waste Site Operations
OJT = on-the-job training

The following paragraphs present brief summaries of the training requirements. These summaries include a course description and guidance on who must take each course.

4.1 OFF-SITE TRAINING

The 40-hour Hazardous Waste Site Worker course is required for hazardous, toxic, and radioactive waste (HTRW) activities in the exclusion (contamination) zone, contamination reduction (buffer) zone, or other

hazardous areas on site. Three days of relevant field experience is required in conjunction with this training.

The 8-hour Hazardous Waste Refresher course is required annually to maintain currency in the 40-hour course.

The Hazardous Waste Supervisors Training is required for personnel who directly supervise hazardous waste site workers. This is an 8-hour course that must be taken once. Note that the 40-hour course is a prerequisite.

General Hazard Communication Training is required for all site workers. This training must communicate the risks and protective measures for chemicals that employees may encounter. This requirement is met by taking the 40-hour Hazardous Waste Site Worker course, annual refreshers, and site-specific training.

Respiratory Protection Training is required for all individuals who wear respirators. This requirement is met by taking the 40-hour Hazardous Waste Site Worker course, annual refreshers, and site-specific training.

Hearing Conservation Training is required on an annual basis by 29 *CFR* 1910.95 for all employees enrolled in a hearing conservation program. This will include all employees exposed to occupational noise in excess of 85 dBA on a time weighted average. This refresher training is provided as part of the Hazardous Waste Refresher course.

4.2 SITE-SPECIFIC TRAINING

Personnel on site must have received the investigation-specific safety training. Two versions of this training will be used. The site worker version will contain full information regarding site hazards, hazard controls, and emergency procedures. A shortened version will be used for visitors who will be on site for short times and who will not do hands-on work. This shortened version will contain the hazard information that is directly relevant to the purpose of the visit. Signatures of those attending and the type of briefing must be entered in the field logbook before site access will be granted. Note that casual visitors (package deliverers, observers, etc.) to the support zone will not be required to have the site-specific training. The site-specific training will include the following site-specific information:

- names of site health and safety personnel and alternates;
- contents of the FSHP and appropriate addendum;
- hazards and symptoms of contaminant exposure;
- hazards and symptoms of chemicals present in the workplace;
- physical hazards in the workplace;
- recognition and avoidance of live ordnance;
- location and availability of written hazard communication program;
- site and task PPE (including purpose, donning, doffing, proper use);
- safe work practices to minimize risks;

- safe use of engineering controls and equipment;
- medical surveillance requirements;
- site control measures;
- reporting requirements for spills and emergencies;
- personnel decontamination procedures;
- contingency plans (communications, phone numbers, emergency exits, assembly point, etc.);
- spill containment procedures (reporting, clean-up methods, etc.); and
- emergency equipment locations and use (fire extinguishers, spill kits, etc.).

Safety Briefings will be held at least daily and also when conditions or tasks change. These briefings will be conducted by the SSHO and/or operations manager and will be attended by all site workers and supervisors. These briefings will address site-specific safety issues and will be used as an opportunity to refresh workers on specific procedures and to address new hazards and controls.

4.3 DOCUMENTATION

Documentation of the required training will be maintained in the on-site project files. This documentation will include copies of 40-hour, 8-hour refresher, and supervisor training certificates, copies of medical clearance reports, and entries in project logs showing the topics covered, trainer, and signatures of those attending on-site training.

5. PERSONAL PROTECTIVE EQUIPMENT

PPE for site tasks is based on potential site-specific hazards. In cases where multiple hazards are present, a combination of protective equipment will be selected so that adequate protection is provided for each hazard. When a conflict exists with the PPE requirements, the more restrictive shall apply. This section emphasizes the programmatic requirements for PPE. For task-specific equipment see the Hazard/Risk Analysis section.

5.1 PPE PROGRAM

This PPE program is designed to comply with 29 *CFR* 1910 Subpart I and EM 385-1-1 Section 5. The level of protection and types of materials selected for a particular task are based on the following:

- potential for exposure because of work being done;
- route of exposure;
- measured or anticipated concentration in the medium of concern;
- toxicity, reactivity, or other measure of adverse effect; and
- physical hazards such as falling objects, flying projectiles, etc.

In situations where the type of contamination, concentration, and probability of contact are not known, the appropriate protection is selected based on the professional judgment of the Health and Safety Manager until the hazards are further evaluated.

The SSHO may raise or lower the level of PPE worn by the teams, depending upon the site-specific hazards encountered in the field. Prior to lowering the level of PPE, the Field Task Leader and the Health and Safety Manager will be contacted/consulted and the results documented. If site conditions are such that the level of PPE is insufficient or work must be stopped, the SSHO will take appropriate action immediately and the appropriate personnel (see above) will be contacted afterwards. Criteria indicating a possible need for reassessment of the PPE selection include the following:

- commencement of an unplanned (hazard not previously assessed) work phase;
- working in unplanned temperature extremes;
- evidence of contamination such as discolored soil or elevated instrument readings near the soil;
- exceeding the action limits; or
- changing the work scope so that the degree of contact with contaminants changes.

5.2 TYPES OF EQUIPMENT

This section presents the types of protective clothing that may be used for the project. Requirements for task-specific levels of protective clothing are presented in the Hazards Analysis table (Table 2-2). Levels of protection that will be used to protect against chemical and physical hazards at this site include:

- Level C Protective Equipment
  - full-face respirator and air purifying cartridges capable of filtering out organic vapors, acid gasses, and radionuclides
  - hooded chemical-resistant clothing (Polyethylene-coated Tyvek® or equivalent) with all openings taped
  - two pair chemical-resistant gloves (nitrile and exam gloves)
  - safety boots
  - shoe covers
  - hard hat (if overhead hazards are present)

- Level D+ Protective Equipment
  - Tyvek® or equivalent coveralls
  - nitrile or polyvinyl chloride (PVC) gloves
  - safety boots
  - boot covers
  - hard hat (if overhead hazards are present)
  - safety glasses with side shields

- Level D Protective Equipment
  - coveralls/field clothes
  - safety boots
  - safety glasses with side shields
  - hard hat (if overhead hazards are present)
  - nitrile or equivalent gloves if contaminated materials are handled

5.3 CLEANING, STORAGE, AND PROGRAM VERIFICATION

If site tasks require the use of chemical protective clothing, disposable clothing will be used and will be disposed as part of project generated waste. Unused chemical protective clothing will be stored in clean staging areas until needed. The SSHO will verify that the PPE in use is appropriate and is being used properly.

6. MEDICAL SURVEILLANCE

All employees performing on-site hazardous waste-related work will be enrolled in a medical surveillance program to meet the requirements of [29 *CFR* 1910.120(f), 1910.134, 1910.20] to assess and monitor workers' health and fitness for employment in this field. Employees are provided with summaries of medical examination results following each examination and are provided more detailed information upon written request.

6.1 FREQUENCY OF EXAM

The frequency of employee medical exams shall be as follows:

- prior to assignment;
- once every 12 months for each employee covered unless the attending physician believes a shorter or longer interval (not to exceed 2 years) is appropriate;
- at termination of employment or reassignment to an area where the employee would not be covered, if the employee has performed field work since his/her last examination and has not had an examination within the last 6 months;
- as soon as possible upon notification by an employee that he/she has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the permissible exposure limit (PEL) or published exposure levels in an emergency situation.

6.2 MEDICAL EXAM CONTENT

Medical examinations shall include a medical and work history (or updated history if one is available in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances. The examination will determine potential health impairments and fitness for duty, including the ability to wear any required PPE. As a minimum, the exam will include:

- collection of information on the employee's medical and work history;
- hands on examination;
- audiometry;
- blood screen such as Sequential Multiple Analyzer with Computer 24;
- chest P/A X-ray at intervals specified by attending physician;
- complete blood count;
- electrocardiogram for persons older than 45, or where medically indicated;

- physical examination;
- spirometry (forced expiratory volume/forced vital capacity); and
- urinalysis (dipstick and microscopic).

7. EXPOSURE MONITORING/AIR SAMPLING PROGRAM

Assessment of airborne chemical concentrations will be performed, as appropriate, to ensure that exposures do not exceed acceptable levels. Action levels, with appropriate actions, will be established for this monitoring. In addition to the specified monitoring, the SSHO may perform, or require, additional monitorting, such as, personnel exposure monitoring for specific chemicals. The deployment of monitoring equipment will depend on the activities being conducted and the potential exposures. All personal exposure monitoring records will be maintained in accordance with 29 *CFR* 1910.20. The minimum monitoring requirements and action levels for OB unit closure work are presented in Table 7.1.

TABLE 7.1. MONITORING REQUIREMENTS AND ACTION LIMITS

Hazard or measured parameter	Area	Internal	Limit	Action	Tasks
Oxygen content with meter	Any area where low oxygen is suspected	First entry into enclosed areas	< 19.5% > 23%	Withdraw and allow area to ventilate; notify the Project Manager and the H&S Manager	Initial entry into igloo after it has been closed
Noise	Area near an opertating drill rig	When work is initiated and when there is a change in work	85 dBA and any area perceived as noisy	Require the use of hearing protection	Hearing protection will be worn within the exclusion zone around drill rigs,excavation equipment, and generators
Visible contamination	All	Continuously	Visible contamination of skin or personal clothing	Upgrade PPE to preclude contact. May include disposable coveralls, boot covers, etc.	All
Dust	All	Continuously	Visible dust generation	Use of plastic sheeting to minimize and contain dust	All

8. HEAT/COLD STRESS

8.1 MONITORING AND CONTROLS

Important factors in preventing heat stress-induced illnesses are acclimatization, consumption of copious quantities of fluids, and appropriate work/rest cycles. General controls will consist of making fluids readily available, use of the buddy system, and taking scheduled and unscheduled breaks in a temperature-controlled environment as necessary. The following specific steps will be taken to reduce the potential for heat stress-induced illness.

- If ambient temperatures exceed 70 degrees F, site training will include heat stress control, recognition of heat stress induced illness, and first aid for heat stress.

- If ambient temperatures exceed 70 degrees F, cool Gatorade or equivalent drink will be made conveniently available to site workers.

- If ambient temperatures exceed 70 degrees F, workers will be instructed to monitor their own and their buddy's condition relative to heat stress.

- Workers will be allowed to take unscheduled breaks, if needed.

- Workers wearing Tyvek® or other impermeable clothing when ambient temperatures exceed 70 degrees F will be monitored for heat stress by taking their pulses at the beginning of each rest period. If any worker's heart rate exceeds 110 beats per minute, the next work period will be shortened by one third [From NIOSH/OSHA/United States Coast Guard (USCG)/U.S. Environmental Protection Agency (EPA); Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities].

- An initial work rest cycle will be established for employees wearing impermeable clothing based on the adjusted air temperature [ta adj in degrees F = degrees F in shade + (13 × percent sunshine)]. The length of each work period will be as follows (From NIOSH/OSHA/USCG/EPA; Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities).

ta adj in degrees F	work period
72.5 to 77.5 degrees F	120 minutes
77.5 to 82.5 degrees F	90 minutes
82.5 to 87.5 degrees F	60 minutes
87.5 to 90 degrees F	30 minutes
≥90 degrees F	15 minutes.

Critical factors in preventing cold stress disorders are adequate clothing and staying dry. The SSHO and Field Task Leader will ensure the capability to quickly move individuals who become wet to a sheltered, warm area. The following specific steps will be taken (adapted from American Conference of Governmental Industrial Hygienists Threshold Limit Values booklet).

- If ambient temperatures are less than 40 degrees F, site training will include prevention of cold injury, cold injury symptoms, and cold injury first aid.

- A heated break area will be provided if ambient temperatures are less than 32 degrees F.
- As a minimum, breaks will be taken in a warm area every 120 minutes if ambient temperatures are less than 32 degrees F.
- Workers will be allowed to take unscheduled breaks, if needed, in a warm area.
- No outdoor work will be performed if the equivalent chill temperature (temperature combined with the effect of wind) is less than -29 degrees F.

8.2 HEAT/COLD STRESS INDUCED ILLNESS

Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

Heat exhaustion occurs from increased stress on various body organs. Signs and symptoms include:

- Pale, cool, moist skin
- Heavy sweating
- Dizziness, nausea
- Fainting

Heat stroke is the most serious form of heat-related illness and should always be treated as a medical emergency. The body's temperature regulation system fails, and the body temperature rapidly rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occurs. Signs and symptoms of heat stroke include:

- Red, hot, usually dry skin
- Lack of, or reduced perspiration
- Nausea
- Dizziness and confusion
- Strong, rapid pulse and confusion
- Coma

Hypothermia is the uncontrolled loss of body heat. As the body's core temperature decreases, bodily functions are slowed. The victim becomes weak and disoriented and may become comatose if steps are not taken to return the core temperature to the normal range. Hypothermia can occur whenever temperatures are below 45 degrees F and is most common during wet, windy conditions, with temperatures between 40 to 30 degrees F. The principal cause of hypothermia in these conditions is loss of insulating properties of clothing due to moisture,

coupled with heat loss due to wind and evaporation of moisture on the skin.

Frostbite is the freezing of body tissue, which ranges from superficial freezing of surface skin layers to deep freezing of underlying tissue. Frostbite will only occur when ambient temperatures are below 32 degrees F. The risk of frostbite increases as the temperature drops and wind speed increases.

9. STANDARD OPERATING SAFETY PROCEDURES

This section presents those general safety rules that apply to all operations performed by subcontractors at the RVAAP installation. The provisions of the plan are mandatory for all on-site employees and visitors. This includes employees engaged in initial site reconnaissance, preliminary field investigations, mobilization, project operations, and demobilization.

9.1 SITE RULES

The following rules apply to all site activities.

- The OSHA poster #2203 will be prominently displayed on site.
- Daily safety briefings ("tailgate") will be held during field activities to inform personnel of new hazards or procedures.
- The SSHO or Field Operations Manager or Task Leader will conduct and document daily safety inspections.
- The SSHO, project personnel, or management personnel are responsible to suspend/stop work and require all personnel to evacuate the affected area if any of the following situations occur:
  - — inadequate health and safety precautions on the part of any on-site personnel,
  - — potential significant environmental insult as a result of planned activities.
- Personnel will perform only those tasks that they believe can be performed safely.
- Personnel will notify the SSHO of any medical conditions (e.g., allergic to bee stings, diabetes, pregnancy) that require special consideration.
- Personnel will maintain proper workplace housekeeping to minimize the potential for tripping and other accidents.
- Contact with potentially contaminated substances will be avoided. Site personnel in the exclusion zone will avoid walking through puddles, pools, mud, kneeling on the ground, and placing equipment on the ground.
- Spills will be prevented to the extent possible. In the event that a spill occurs, the material will be contained.
- All injuries and accidents requiring first aid will be reported to the SSHO, Field Operations Manager or Task Leader, and USACE.
- All workers in the exclusion zone or other hazardous areas will abide by a buddy system. Members of a buddy team will maintain verbal or visual contact.

9.2 PERMIT REQUIREMENTS

All permits necessary for the safe execution of this project be will obtained and/or coordinated with USACE. As a minimum, this will include digging permits/clearance from local utilities prior to any drilling, excavation, etc.

9.3 DRUM/CONTAINER HANDLING

Any drums used for the project will meet the requirements of the Facility-wide Sampling and Analysis Plan and its addenda.

9.4 CONFINED SPACE ENTRY

Any confined space entry will be performed in conformance with the requirements of 29 *CFR* 1910.146 and EM 385-1-1 Section O6I.

The applicable requirements are: completion of an entry permit, atmospheric testing for oxygen (must be 19.5 to 22 percent), atmospheric testing for toxic gases (must be less than 5 ppm), atmospheric testing for flammable gases (must be less than 10% LEL), and stationing an attendant nearby but outside the excavation.

9.5 HOT WORK, SOURCES OF IGNITION, FIRE PROTECTION

- This work will be conducted in accordance with EM 385-1-1 Section 9.
- Hot work (oxyfuel cutting) will be conducted using welder's helmet or shaded goggles, leather gloves, and long-sleeved shirt.
- A fire extinguisher rated not less than 10-ABC will be immediately available in the vicinity of hot work.
- Sources of ignition will be kept at least 15.2 meters (50 feet) from flammables storage areas.
- Flammables storage areas will be posted with signs indicating "No smoking or open flame."
- At least one fire extinguisher with a rating of not less than 20-B will be kept 7.6 to 22.9 meters (25 to 75 feet) from all flammables storage areas.
- An approved flammables cabinet will be used to store 94.6 or more liters (25 or more gallons) of flammable liquid.
- Flammable liquids (other than decontamination solvents) will be kept in safety containers with flame arresters.

9.6 ELECTRICAL SAFETY

- This work will be conducted in accordance with 29 *CFR* 1910 Subpart S and EM 385-1-1 Section 11.

- All portable electrical equipment will be double insulated or grounded and connected through a ground fault circuit interrupter.

- Conductive materials (drill rigs) will be kept clear of energized power lines. The following minimum distances will be observed: 0-50 kV (10 feet); 51-100 kV (12 feet); 101-200 kV (15 feet); 201-300 kV (20 feet); 301-500 kV (25 feet); 501-750 kV (35 feet); 750-1000 kV (45 feet).

9.7 MACHINE GUARDING

All equipment will be operated with all guards provided by the manufacturer and in compliance with 29 *CFR* 1910 Subpart O and EM 385-1-1 Section 16B. If any guarding must be removed for servicing, the equipment will be disabled to preclude movement or release of energy.

9.8 EXCAVATION AND TRENCH SAFETY

Trench excavation potentially poses the following hazards; contact with buried utilities, trench cave-in and engulfment, confined space hazards such as hazardous airborne concentrations of toxic chemicals, flammable concentrations of vapors or gases, and oxygen deficiency. No such activities are anticipated for this project.

9.9 LOCKOUT/TAGOUT

All potentially hazardous servicing or equipment repair will be governed by 29 *CFR* 1910.147 and EM 385-1-1 Section 12. No such activities anticipated for this prject.

9.10 FALL PROTECTION

Work areas with the potential for a fall of 1.2 meters (4 feet) or more will be provided with fall protection in compliance with EM 385-1-1 Section 21.A.15. This fall protection will consist of guardrails or personal fall protection. Personal fall protection will be used if it is necessary for drilling personnel to climb the mast or derrick.

9.11 HAZARD COMMUNICATION

Hazard communication will be governed 29 *CFR* 1910.1200 and EM 385-1-1 Section 8. As a minimum, the following steps will be taken.

- All hazardous materials on site will be labeled to comply with the hazard communication standard.
  - — clear labeling as to the contents,
  - — the appropriate hazard warning, and
  - — the name and address of the manufacturer.

- MSDSs will be available on site for all hazardous materials that are present.

- Site-specific training will include the hazards posed by site chemicals, protective measures, and emergency procedures.

- Copies of MSDSs for all hazardous chemicals (chemicals brought on site) will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.

9.12 ILLUMINATION

All field work will be conducted during daylight hours (no earlier than 15 minutes after sunrise and no later than 15 minutes before sunset) and natural illumination will be used. Non-field work conducted in buildings will be illuminated to meet the following minimums stated in 29 *CFR* 1910.120(m) and EM 385-1-1 Section 7: general outdoors 3-foot candles, stairs and ladders 10-foot candles, offices 50-foot candles, and first aid areas 30-foot candles.

9.13 SANITATION

- Sanitation will comply with 29 *CFR* 1910.120(n) and EM 385-1-1 Section 2.
- Means for washing hands and faces prior to eating will be provided at the work site.
- Potable drinking water will be provided in labeled, sanitary dispensers.
- Toilets shall be provided according to the following: $\leq$20 employees = 2 toilets, 21 to 199 employees = 1 toilet seat and 1 urinal per 40 workers.

9.14 DRILL RIG OPERATIONS

9.14.1 General Drilling

General Drilling Practices will comply with EM 385-1-1 Section 16M

- Operating manuals will be present on site for each type of drill rig in use.
- Drill rigs will have at least two functional kill switches, one for the driller and one for the driller's helper. These switches will be confirmed to be functional each day that the rig is used.
- Drill rigs will have functional backup alarms.
- Drill rigs will be inspected weekly by the driller and this inspection will be confirmed by the SSHO.
- Only the driller, driller's helper, and personnel who have a critical need will be allowed near moving parts of the drill rig.
- Drill sites will be verified free of underground utilities by clearing each site with local utilities or appropriate installation personnel prior to beginning drilling.
- Drill-mounted fire fighting equipment will not be tampered with and will not be removed for other than the intended fire-fighting purposes or for servicing.

- Drilling crews and personnel who work near the drill rig will be trained in the location and use of the kill switches.
- If lubrication fittings are not accessible with guards in place, machinery will be stopped and disabled (locked out or ignition key removed) for oiling and greasing.
- Work areas and walkways will not be obstructed.

9.14.2 Hoisting Operations

- The derrick (mast) will not be raised unless the area is free of overhead obstructions and far enough (see Electrical Safety) from power lines.
- The derrick will not be raised until the rig has been blocked, leveled, and chocked.
- Rigging equipment for material handling will be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging will be removed from service.
- A hoisting line with a load imposed will not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.
- Workers will stand clear of the well bore when any wire line device is being run.
- No loads will be lifted over workers.

9.14.3 Cat Line Operations

- The cat head area will be kept free of obstructions and entanglements.
- The operator will not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.
- Personnel will not stand near, step over, or go under a cable or cat line that is under tension.

9.15 UNEXPLODED ORDNANCE

At a minimum, the unexploded ordnance (UX0) procedures listed below for work at the OB unit will be followed:

- All on-site workers will be trained to recognize the types of ordnance formerly handled on the facility.
- Subcontractors will not handle, move, or otherwise disturb ordnance or any items that cannot be identified as non-ordnance.
- If ordnance or potential ordnance is discovered, work will be stopped and the area will be evacuated and cordoned off.
- If ordnance or potential ordnance is discovered, the facility security organization will be notified immediately.

- If ordnance or potential ordnance is discovered, the USACE project manager will be notified immediately.
- For work in areas where UXO may reasonably be expected (former ordnance disposal sites), qualified EOD subcontractors will survey (visual and magnetometer) prior to intrusive work to preclude disturbing subsurface UXO.

10. SITE CONTROL MEASURES

The SSHO will be responsible for establishing the site control zones, as necessary, around areas that present physical or chemical hazards. Implementation of the site control zones will help to minimize the number of employees potentially exposed and to minimize the potential for the spread of contamination. The SSHO will monitor the implementation of the required site control work rules and will report any deviations from prescribed practice to the Field Operations Manager or Task Leader or stop work, as appropriate.

As a general rule, an exclusion zone will be established around any task or area that poses a potential to spread contamination or injure personnel.

10.1 EXCLUSION ZONE

The exclusion (contamination) zone is the area where the greatest potential exists for exposure to contamination or physical hazards. The periphery of the exclusion zone will be identified by barricade tape or rope suspended above the ground. An entry and exit checkpoint will be visually defined to regulate the flow of personnel and equipment. The entry and exit checkpoint will be delineated with barricade tape/rope and signs. Signs may include "Construction Area," or "High Noise Area," as deemed appropriate by the SSHO. The number of people and equipment in the exclusion zone will be minimized to control physical hazards and the spread of contamination.

The following standard rules will apply to all entry into the exclusion zone.

- The SSHO or Field Task Leader must approve (and log) entry into the exclusion zone.
- All personnel entering the exclusion zone will wear the prescribed level of protective clothing.
- All items and related paraphernalia intended to be placed on the face or in the mouth (cigarettes, lighters, matches, chewing tobacco, food, cosmetics, etc.) are prohibited in the exclusion zone.
- All personnel in the exclusion zone will follow the buddy system.

Exclusion zones will be established around drilling sites, areas of heavy equipment use, and all activities where contamination is a potential hazard. As a minimum, the exclusion zone will extend 25 feet from the hazard. For drilling operations, the exclusion zone will also be at least equal to the mast height in radius so that no part of an overturned drill rig will fall outside the zone. A larger exclusion zone will be used, as necessary, to protect bystanders and the public from chemical or other hazards. Exclusion zones for other activities will be appropriate to the hazard and surroundings.

10.2 CONTAMINATION REDUCTION ZONE

A contamination reduction (buffer) zone will be established, as necessary, outside the exclusion zone to provide a transition from and a buffer between the exclusion zone and the support zone. A formal contamination reduction zone for personnel will not be established unless Level D+ PPE or higher level (A, B, C) is used, or significant surface contamination is present or suspected. An entry and exit checkpoint will be visually defined

at the periphery of the zone to regulate the flow of personnel and equipment. The entry and exit checkpoint and the perimeter of the zone will be delineated with the use of ropes/barricade tape and signs. A contamination reduction zone will be established around the central equipment decontamination pad.

All personnel entering the contamination reduction zone will wear the prescribed level of protective clothing required for that zone. All items intended to be placed on the face or in the mouth (e.g., cigarettes, chewing tobacco, food, cosmetics, etc.) are prohibited in the contamination reduction zone. Doffing of protective clothing and personnel decontamination will occur in the contamination reduction zones.

10.3 SUPPORT ZONE

The support zone is the clean and relatively safe area surrounding the exclusion and contamination reduction zones. Entry requirements for the support zone consist of those required for entry into the general area of the facility. Primary functions of the support zone are:

- staging area for clean equipment and supplies and
- location for support services [e.g., office trailers, laboratory trailers, eating area(s), toilet facilities, parking, visitor area(s), etc.].

10.4 SITE VISITORS

Visitors will not be allowed inside controlled areas without specific approval of the SSHO and Field Manager. Visitors must meet all regulatory (specifically 29 *CFR* 1910.120) and site H&S requirements (proof of training, medical surveillance, etc.) to be considered for entry into an exclusion or contamination reduction zone. Visitors will sign in on the site entry log and will receive a health and safety briefing appropriate to the nature of the visit and the potential hazards associated with the visit. Visitors are requested to contact the Project Manager or Field Manager prior to visiting to convey information such as the date and purpose of the visit. If a visitor refuses to abide by these requirements, site operations will cease and the USACE Project Manager will be contacted.

10.5 SITE COMMUNICATION

Field personnel will be capable of contacting other field personnel and outside agencies. Communication on site will be assured by hand-held radio, portable air horns, or vehicle horns. Short blasts (less than 1/2 second) of an air horn or car horn will be used to request assistance. Prolonged blasts (more than 2 seconds) will be used to signal an evacuation. If phone service is not immediately available on the site, the crew will be equipped with a cellular phone.

11. PERSONNEL HYGIENE AND DECONTAMINATION

A system of procedures will be used to control the spread of contamination from the exclusion (contamination) zone and to ensure that workers are sufficiently free of contamination to preclude adverse health effects. PPE doffing and personnel decontamination are part of this system. The SSHO will ensure the construction of a decontamination station, as necessary, instruct personnel on its proper use, and verify that personnel follow the appropriate steps. This section presents basic requirements for personnel decontamination keyed to the level of protective clothing in use. Note that the levels of protective clothing required for particular tasks are specified in the Hazards Analysis Table (Table 2-2). These requirements may be modified by the SSHO if improvements are needed.

11.1 LEVEL D PROTECTION DECONTAMINATION

Station 1: Removal of disposable gloves and boot covers, if worn

Deposit disposable gloves and boot covers in a designated container. Note that this step is necessary only if gloves and boot covers are in use.

Station 2: Field wash

Wash face and hands prior to taking anything by mouth. This may be done with soap and water or disposable disinfectant towels.

11.2 LEVEL D+ PROTECTION DECONTAMINATION

Station 1: Tape removal

Remove all tape (if used) from outer clothing and place in appropriate waste container.

Station 2: Boot covers, outer disposable garment, and gloves removal

Carefully remove boot covers, outer contamination-resistant garment, and gloves.

Station 3: Field wash

Wash hands and face prior to eating, drinking, smoking, etc. This step may be accomplished with soap and water or disposable disinfectant wipes.

11.3 LEVEL C PROTECTION DECONTAMINATION

Station 1: Segregated equipment drop

Deposit equipment used on site (tools, sampling devices, containers, monitoring instruments, clipboards, etc.) on plastic sheets or in different containers with plastic liners. Segregation of the equipment at the drop site reduces the possibility of cross-contamination.

Station 2: Outer boot and glove removal

Remove tape from outer boots and outer gloves. Remove outer boot covers and outer gloves. Deposit gloves and boot covers in plastic trash bags.

Station 3: Cartridge change

If a worker has left the exclusion zone for the sole purpose of changing a canister/cartridge of the respirator, this is the last step of the decontamination procedure. Once the worker's canister/cartridge has been replaced, the outer boots and gloves will be replaced and retaped so that all potential pathways to the skin are sealed.

Station 4: Disposable outer garment removal

Remove disposable outer garment, deposit in a plastic trash bag, and dispose in accordance with the project Field Sampling Plan.

Station 5: Respiratory protection and disposable inner glove removal

The respirator is the next-to-last item for removal. The cartridges/canisters are placed in a plastic trash bag and disposed of in accordance with the project Field Sampling Plan. The respirator is placed in a plastic bag dedicated for used respirators only. Remove disposable inner gloves last and deposit them in a plastic trash bag, in accordance with the project Field Sampling Plan.

Station 6: Field wash

Wash hands and face prior to eating, drinking, smoking, etc. This step may be accomplished with soap and water or disposable disinfectant wipes.

12. EQUIPMENT DECONTAMINATION

The central equipment decontamination station will be constructed so that liquids generated during decontamination will be contained. Sampling and related equipment will be decontaminated to a level sufficient to prevent cross-contamination of subsequent samples. This stringent requirement assures that decontaminated sampling equipment is sufficiently clean from a personnel contact perspective. Larger pieces of equipment, such as drill rigs, will be decontaminated with pressurized hot water/steam. The following description of the sampling equipment decontamination process is intended to provide only a general overview.

Steps will be taken to assure that transportation of sampling equipment does not spread contamination to previously uncontaminated areas. Sampling and related equipment will be screened for contamination prior to being transported to the decontamination station. Any equipment that is deemed to be heavily contaminated will be decontaminated in the immediate area of the sample collection, or will be wrapped in plastic during transit.

13. EMERGENCY PROCEDURES AND EQUIPMENT

The Field Operations Manager or Task Leader will remain in charge of all personnel during emergency activities. The Field Operations Manager or Task Leader will perform emergency notification of emergency medical services, fire department, USACE Project Manager, Health and Safety Manager, etc. In order to minimize the potential for accidents and injuries, daily safety and health inspections will be conducted by the Field Operations Manager or Task Leader or SSHO. If an emergency occurs, the Field Operations Manager or Task Leader, the SSHO, and the field team will participate in a briefing to discuss the event, identify the causes, identify corrective measures, and evaluate the responses.

In the event of an accident or incident, the Field Operations Manager or Task Leader or Project Manager will notify the USACE Project Manager immediately according to the requirements of EM 385-1-1. The required Accident Reports will be completed and submitted within two days.

In the event of an accident or incident, the Field Operations Manager or Project Manager will investigate and notify the USACE Project Manager immediately (within 24 hours) according to the requirements of EM 385-1-1. An accident investigation form (ENG Form 3394) will be completed and submitted in accordance with AR 385040 and Supplement and submitted to the USACE Occupational Safety and Health Office at the following address:

U.S. Army Corps of Engineers
Nashville District
Safety and Occupational Health
CEORN-SO (ATTN: Emmett E. Forte)
Nashville, TN 37202-1070
(615) 736-7179

An accident follow-up report will also be completed and submitted within one week of the incident and submitted to the same address.

All personnel working on site will be trained in the requirements of this section. This will include recognizing emergencies, reporting emergencies to the Field Operations Manager or Task Leader or SSHO, and responding to emergencies. Employees will also be informed of any changes in potential emergencies or response plans.

13.1 POTENTIAL EMERGENCIES

Credible potential emergencies for this project include fires, minor chemical spills, and personnel injury.

13.1.1 Fires

Small quantities of flammable liquids [typically less than 18.9 liters (5 gallons)], such as, gasoline, and diesel fuel may be present on site. In the event of a fire, the local fire department will be notified immediately. If it is safe to do so, on-site personnel will attempt to extinguish the fire with the available fire extinguishers and isolate any nearby flammable materials. If there is any doubt about the safety of extinguishing the fire, site personnel will evacuate the area. The supervisor or knowledgeable employee will provide the fire department with relevant information when they arrive.

13.1.2 Spills

Potential spills include releases of fuels, and lubricants. In the event of a spill or leak, the employee making the discovery will immediately notify the SSHO and/or the Field Operations Manager or Task Leader. The Field Operations Manager or Task Leader will determine whether the leak poses an environmental risk or will exceed the capacity of on-site personnel and equipment. In the unlikely event that there is a probability that the spill will extend beyond the immediate area, result in an environmental insult, or exceed the capabilities of the on-site personnel, the Field Operations Manager or Task Leader will inform the local fire department and hazardous materials response team. If this is not the case, the on-site spill kit will be utilized to clean up the spill.

13.1.3 Medical Emergencies

Field crews will use a variety of equipment that could cause injuries. In the event of a medical emergency, the Field Operations Manager or Task Leader will notify the local emergency medical service immediately. At least two first aid/CPR-trained individuals will be on site at all times and these personnel will provide first aid pending release of the injured person to emergency medical staff. Contaminated injured personnel will be decontaminated to the extent feasible. Personnel with minor injuries will follow normal decontamination procedures. Personnel with serious injuries will be decontaminated, if necessary, by disrobing and wrapping in a blanket. Decontamination may be bypassed in the event of life-threatening injuries or illnesses.

13.2 EMERGENCY PHONE NUMBERS

Listed below are emergency groups and their telephone numbers. A telephone and 2-way radios will be present in the field and available for use. Silas Mason Co., Inc. will be contacted first for any emergency service. Silas Mason Co., Inc. will then coordinate the response.

TABLE 13-1 EMERGENCY PHONE NUMBERS

Emergency Group	Telephone No.
Police (Mason and Hanger-Silas Co., Inc.)	358-7406/7409 Pager: 216-626-0825
Emergency medical service (Borowski Funeral Home, Ravenna)	872-5050
Hospital (Robinson Memorial, Ravenna)	297-2449/0811
Fire department (City of Ravenna)	297-5738
Hazardous materials response (Silas Mason Co., Inc.)	358-7406/7409
USACE, Nashville District	615-736-2712
Health and Safety Manager	

Robinson Memorial Hospital is located approximately 32 km (20 miles) from the site at 6847 N. Chestnut Street in Ravenna, Ohio. It can be reached by taking Highway 5 E. approximately 11 km (7 miles), Highway 5 approximately 3.2 km (2 miles), Highway 76 approximately 16 km (10 miles), Highway 59, then right onto Highway 44 (Chestnut Street).

13.3 EMERGENCY ALERTING

Each team will have a means for generating an audible alarm, which will consist of a compressed gas horn or vehicle horn. These devices will be used to signal to other project personnel in the event of accidents or emergencies. Short blasts (less than 1/2 second) of the horn will be used to request assistance, while extended blasts (more than 2 seconds) will signal an evacuation.

13.4 EVACUATION

The SSHO or Field Operations Manager or Task Leader will designate the evacuation routes and an assembly area. All employees will be familiar with the evacuation routes and assembly area.

13.5 EMERGENCY EQUIPMENT

Several items of emergency equipment will be maintained at the work site. Any incident that is not clearly controllable by personnel wearing standard site clothing plus protective gloves and using the listed equipment will require reevaluation by the SSHO. If the SSHO does not feel that on-site personnel can safely control the emergency with the available equipment, the crew will use an alternate approach such as allowing a small fire to burn out or evacuating the site. The required emergency equipment includes:

- 16-unit first aid kit indoors or in weatherproof container, inspected weekly;
- compressed gas horns;
- emergency eye wash to meet American National Standards Institute standard if corrosives (water sample preservatives) are being poured;
- fire extinguisher(s) (at least 20-B) 7.6 to 22.9 meters (25 to 75 feet) from outside flammables storage (or use) area;
- basic spill kit suitable to handle small spills of decontamination fluids, hydraulic fluid, or fuels and containing sorbent pads, tubes, and nitrile or similar gloves; and
- telephone and 2-way radios.

14. LOGS, REPORTS, AND RECORD KEEPING

A system of reports and logs will be used to document activities related to site Health and Safety. Field team leaders and the SSHO will generate a brief weekly summary of Health and Safety issues and resolutions. These reports will include injuries, accidents, near accidents, interpretations of the regulations, interactions with auditors/regulators/USACE personnel, and any off-normal events. These reports will be limited to one page or less.

In addition to the weekly reports, the following documents will be generated and submitted to the USACE Project Manager.

- Training logs will contain information covered and the signatures of the trainer and those attending. These logs will contain documentation of pre-entry (project start) training, routine ("tailgate") safety briefings, and visitor training.

- Daily safety inspection logs will contain the dates of inspections, identity of the person doing the inspection, the examined areas/activities/equipment, any deficiencies, and any corrective actions taken.

- Equipment maintenance logs will contain the dates and types of routine maintenance performed on site equipment.

- Employee/visitor register will be a sign-in log for all site employees and visitors. It will contain the names of all personnel who perform on-site work or visit the site. It will not contain the names of delivery or similar personnel.

- Environmental and personal exposure monitoring/sampling results will be maintained in a log that will contain monitoring data, location and time of monitoring, types of work being done, calibration records, and the identities of personnel performing monitoring.

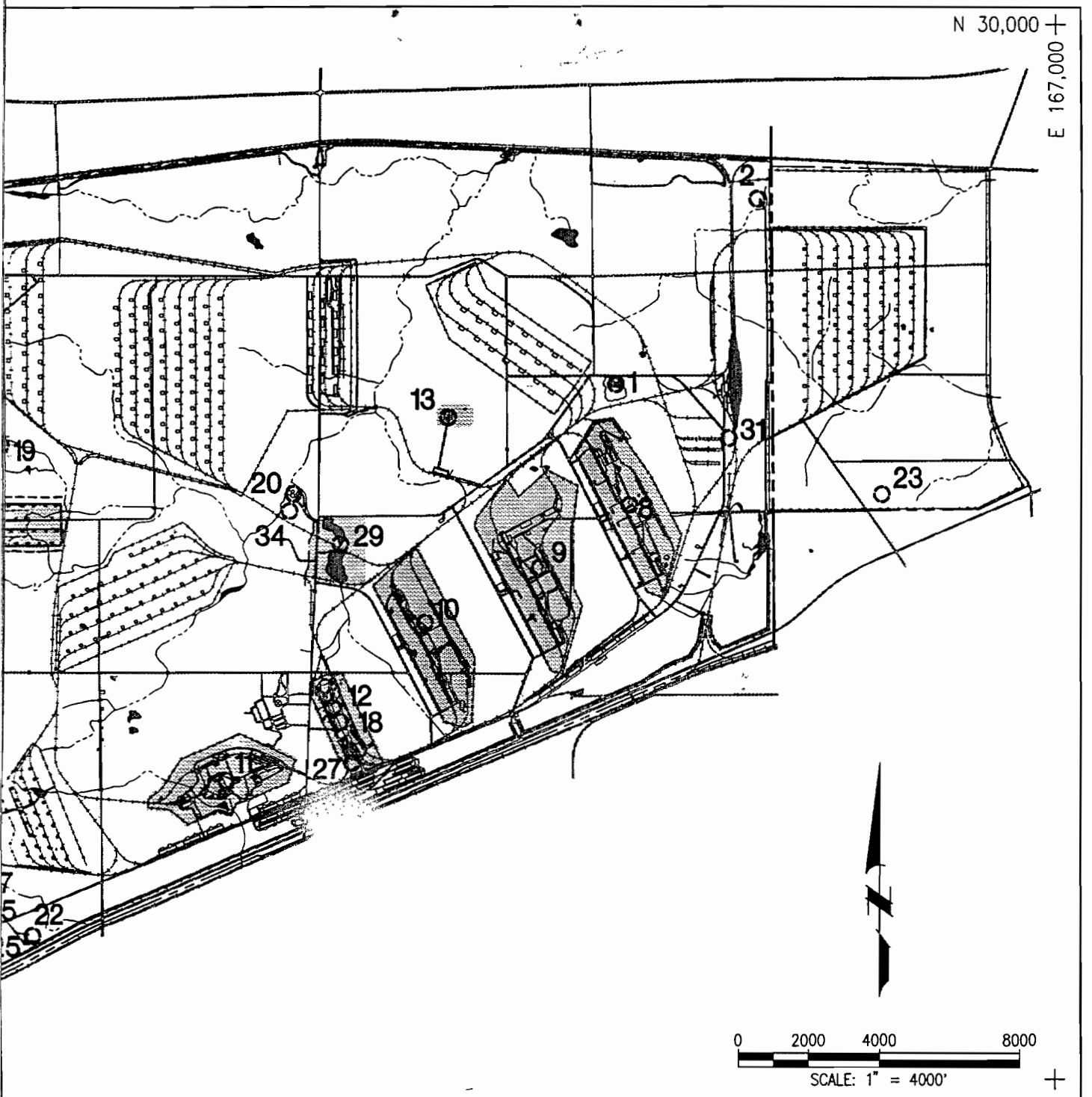
Reporting forms are included in Attachment C.

ATTACHMENT A

SITE MAP

LEGEND OF SITES:

1 ..... RAMSDELL QUARRY LANDFILL
2 ..... ERIE BURNING GROUNDS
3 ..... DEMOLITIONS AREA #1
4 ..... DEMOLITIONS AREA #2
5 ..... WINKLEPECK BURNING GROUNDS
6 ..... C BLOCK QUARRY
7 ..... BLDG 1601 HAZARDOUS WASTE STORAGE
8 ..... LOAD LINE 1 AND DILUTION/SETTLING POND
9 ..... LOAD LINE 2 AND DILUTION/SETTLING POND
10 ..... LOAD LINE 3 AND DILUTION/SETTLING POND
11 ..... LOAD LINE 4 AND DILUTION/SETTLING POND
12 ..... LOAD LINE 12 AND DILUTION/SETTLING POND
13 ..... BLDG 1200 AND DILUTION/SETTLING POND
14 ..... LOAD LINE 6, EVAPORATION UNIT
15 ..... LOAD LINE 6, TREATMENT PLANT
QUARRY LANDFILL/FORMER
16 ..... FUZE & BOOSTER BURNING PITS
17 ..... DEACTIVATION FURNACE
18 ..... LOAD LINE 12 PINK WASTE WATER TREATMENT
19 LANDFILL NORTH OF WINKLEPECK BURNING GROUND
20 ..... SAND CREEK SEWAGE TREATMENT PLANT
21 ..... DEPOT SEWAGE TREATMENT PLANT
22 ..... GEORGE ROAD SEWAGE TREATMENT PLANT
23 ..... UNIT TRAINING SITE WASTE OIL TANK
24 RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK
25 ..... BLDG 1034 MOTOR POOL WASTE OIL TANK
26 ..... FUZE BOOSTER AREA SETTLING TANKS



.....BLDG 854-PCB STORAGE	36 ..... PISTOL RANGE
.....MUSTARD AGENT BURIAL SITE	37 ..... PESTICIDE BUILDING S-44S2
....UPPER AND LOWER COBBS POND COMPLEX	38 ..... NACA TEST AREA
...LOAD LINE 7 PINK WATER TREATMENT PLANT	
..... ORE PILE RETENTION POND	
.....40 AND 60 MM FIRING RANGE	
.....FIRESTONE TEST FACILITY	
.....SAND CREEK DISPOSAL ROAD LANDFILL	
...1037 BUILDING-LAUNDRY WASTEWATER SUMP	

US Army Corps of Engineers' Nashville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
NASHVILLE, TENNESSEE

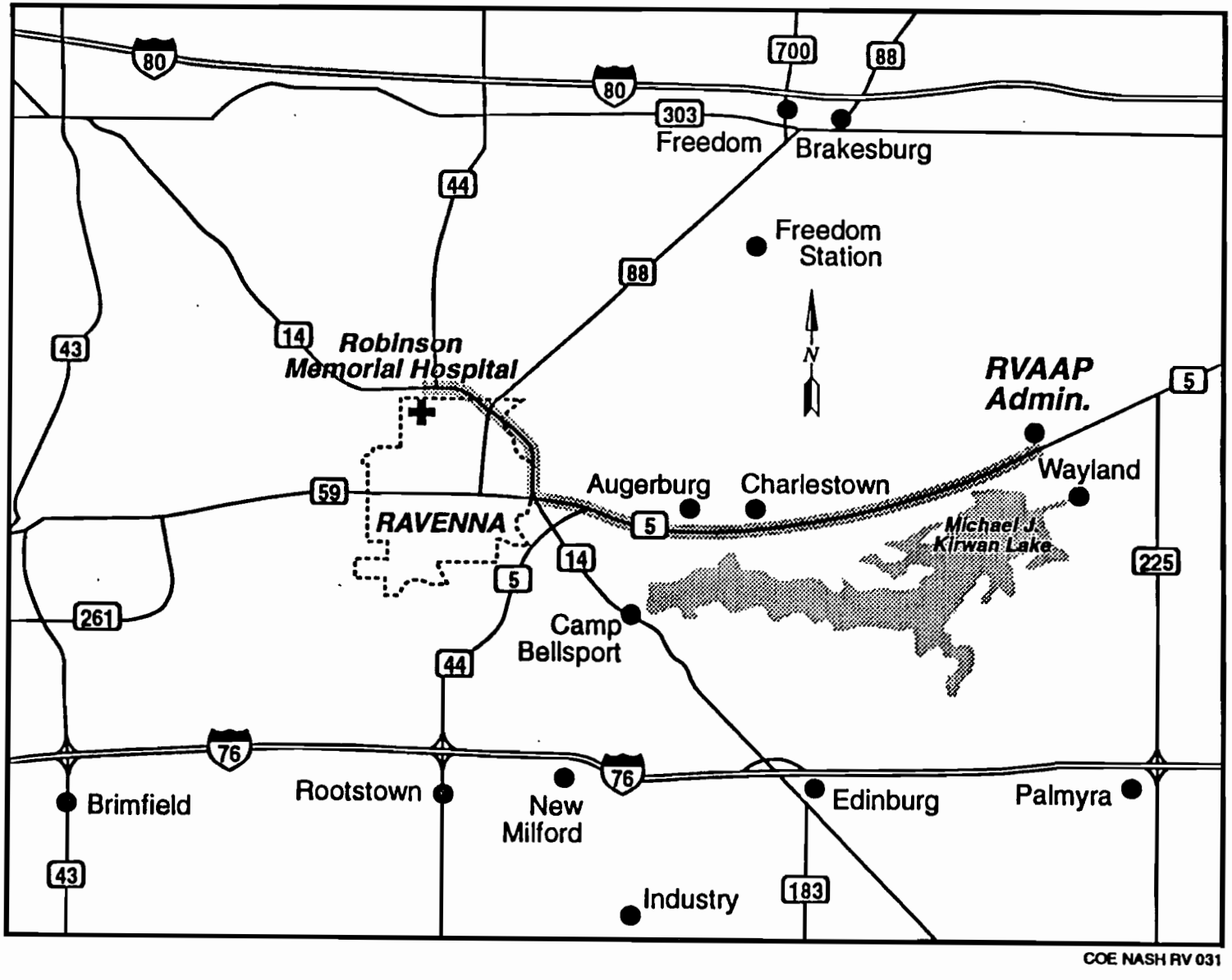
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
FACILITY MAP

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	REV. B/04-09-97	95021/DWGS/19111X17

ATTACHMENT A

ATTACHMENT B

ROUTE MAP TO PRE-NOTIFIED MEDICAL FACILITY


80
80
700
88
303
Freedom
Brakesburg
44
Freedom
Station
88
14
Robinson
Memorial Hospital
43
N
RVAAP
Admin.
5
Wayland
59
Augerburg
Charlestown
RAVENNA
5
Michael J.
Kirwan Lake
225
14
5
261
Camp
Bellsport
44
76
76
Brimfield
Rootstown
New
Milford
Edinburg
Palmyra
43
Industry
183
COE NASH RV 031

ATTACHMENT C

REPORTING FORMS

DAILY SAFETY INSPECTION

PROJECT:_____

N	Y	NA	Item
			OSHA poster #2203 displayed
			Daily safety briefing conducted
			Emergency numbers and route to hospital posted
			SSHP onsite, available to employees, and complete?
			Required exposure monitoring conducted and documented
			Monitoring instruments (PID, OVA, CGI) calibrated daily against known standard and documented
			16 unit first aid kit available and inspected weekly
			Personnel wearing PPE required by SSHP for field work (at least safety shoes or boots, safety glasses with side shields, and nitrile or similar gloves to handle potentially contaminated material)
			Personnel using buddy system (maintain visual or verbal contact and able to render aid)
			If temperature >70°F: heat stress training conducted, cool fluids available, pulse rates of personnel wearing Tyvek are being monitored, work/rest cycle in SSHP being followed
			If temperature <40°F: cold stress training conducted, controls in SSHP implemented
			Personnel using appropriate biological hazard controls (See SSHP)
			Drill rig operating manual on site
			Drill rigs inspected weekly and documented
			Personnel near drill rig or other overhead hazards wearing hardhats
			Each of two drill rig kill switches tested daily
			Employees excluded from under lifted loads
			Unnecessary personnel excluded from hazardous areas, specifically near drill rigs
			Radius of exclusion zone around drill rig at least equal to mast height
			Personnel wearing hearing protection when within 25 ft of drill rigs, generators, or other noisy equipment
			Containers of flammable liquids closed and labeled properly
			Fully charged fire extinguisher available 25 to 50 ft from flammables storage area and inspected monthly
			Personnel exiting potentially contaminated areas washing hands and face before eating
			Personnel using steam washer wearing faceshield, hearing protection, heavy duty waterproof gloves, Saranax or rainsuit
			Portable electrical equipment double insulated or plugged to a GFCI

DAILY SAFETY INSPECTION

PROJECT:_____

N	Y	NA	Item
			Electrical wiring covered by insulation or enclosure
			Three wire, UL approved, extension cords used
			Housekeeping adequate (walkways clear of loose, sharp or dangerous objects and trip hazards, work areas clear of objects that might fall on employees)
			Walking/working surfaces safe (not slippery, no unguarded holes, no trip hazards)
			Confined space entry (entry into trenches deeper than 4 ft) performed according to SSHP
			Excavations deeper than 5 ft shored or sloped (if personnel will enter) and in compliance with SSHP
			Moving (rotating) machinery guarded to prevent employee contact
			Fall protection provided for work at elevations greater than 4 ft
			All containers of hazardous material labeled to indicate contents and hazards
			MSDSs for hazardous materials on site
			If work is conducted in areas open to hunting (and during season) high visibility vests and other alerting systems such as lights, noise devices (radios) in use
			15 minute eyewash (accessible and full) within 100 ft of areas where corrosive sample preservatives are poured
			Potable and non-potable water labeled
			Chainsaws have anti kick-back protection, personnel wearing cut resistant gloves, protective chaps
			Visitor access controlled
			Site hazards and controls consistent with SSHP
			Site hazard controls appropriate and sufficient

Actions taken to correct or control any "N" responses

_____

Name Signature Date

DAILY HEALTH AND SAFETY SUMMARY

PROJECT NAME: **PROJECT NO:**

NAME: DATE: M Tu W Th F Sa Su TIME:

TASKS PERFORMED:

OFF-NORMAL EVENTS:

TAILGATE SAFETY MEETING LOG

PROJECT NAME: **PROJECT NO:**

DATE: M Tu W Th F Sa Su TIME:

WEATHER:

WORKING CONDITIONS:

PPE:

ITEMS DISCUSSED:

THE FOLLOWING INDIVIDUALS ATTENDED THE DAILY TAILGATE SAFETY MEETING (SIGNATURES)		

SITE SAFETY AND HEALTH OFFICER

VISITORS LOG

PROJECT NAME: **PROJECT NO:**

DATE	NAME	COMPANY	BADGE #	TIME IN	TIME OUT	H&S BRIEFING	PURPOSE

EQUIPMENT CALIBRATION

PROJECT NAME: **PROJECT NO:**

IDENTIFIER	DESCRIPTION	BACKGROUND READING	PRE	ADJUSTMENT (IF NEEDED)	POST	NAME	DATE

HEALTH AND SAFETY MONITORING LOG

PROJECT NAME: **PROJECT NO:**

DATE	INSTRUMENT/NO.	RESULTS	TIME	REMARKS	NAME

CALIBRATION STANDARD

PROJECT NAME: **PROJECT NO:**

INCLUSIVE DATES FOR CALIBRATION MATERIAL USAGE		INSTRUMENT DESCRIPTION	CALIBRATION MATERIAL	LOT #	NAME
Start	Finish				

EQUIPMENT INVENTORY

PROJECT NAME: **PROJECT NO:**

UNIQUE IDENTIFIER	PROJECT IDENTIFIER	ITEM DESCRIPTION	LAST RECALL	NEXT RECALL	DATE		COMMENTS
					IN SERVICE	OUT OF SERVICE	

APPENDIX B

Drilling Logs and Information Summary
Open Burning Grounds Monitoring Wells
OBG-1 Through OBG-4
(Copied from USAEHA, 1992)

Geohydrologic Study No. 38-26-KF95-92, 23-27 Mar and 20 Apr - 5 May 92

MONITORING WELL DRILLING LOGS

List of Abbreviations Used in Drill Logs

B.O.H	Bottom of Hole
bl	black
br	brown
c.s.	chemical sample
dk	dark
gr	gray
lt	light
occ	occasional
r	red or reddish
r b	reddish brown
rec	recovery
r y	reddish yellow
s.a.a.	same as above
s.s.	2 foot split spoon
s.s.s	5 foot split spoon sampler
tr	trace
v f	very fine
w	with
y	yellow

US ARMY ENVIRONMENTAL HYGIENE AGENCY

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

INSTALLATION Ravenna AAP
PROJECT NUMBER 38-26-KF95-92
LOCATION Approximately 100 ft Northwest of Open Burning Ground
DRILL RIG Mobile B-53
DATE 30 April 92
GEOLOGIST Barrett Borry
DRILLERS W.Smithson, R. Kestner, M. Farro
BORE HOLE OBG-1
WATER LEVEL 3.43 3 May 92
Sheet 1 of 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.2	3" s.s.s. 3.8 ft rec	Crushed rock and slag fragment fill, gr to bl Silty clay, r y, moist	
3.0		Clayey fine sand, y br, wet	
5.5	3" s.s.s. 5.0 ft rec	Clayey silt, y br, moist Color change to gr at 8.5 ft	
12.2	3" s.s.s. 3.2 ft rec	Sand, y br, wet	
15.0	3" s.s.s. 3.2 ft rec	Clayey silt, gr moist	
17.0		Sand, gr, wet	
17.9		Clayey, silt, gr, moist	Drill chatter at 18 ft
19.0		B.O.H. at 19 ft	

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

US ARMY ENVIRONMENTAL HYGIENE AGENCY

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

INSTALLATION Ravenna AAP
PROJECT NUMBER 38-26-KF95-92
LOCATION Eight ft North of OBG-1
DRILL RIG Mobile B-53
DATE 21 April 92
GEOLOGIST Barrett Borry
DRILLERS W.Smithson, R. Kestner, M. Farro
BORE HOLE OBG-1A
WATER LEVEL
Sheet 1 of 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
0.7	3" s.s.s. 4.4 ft rec	v f sand, lt y br, moist	
		silty clay y br, moist	
3.6		Clayey silt, dk gr br moist	
4.4		Clayey, v f sand, mottled br y to v pale br wet	
6.8	3" s.s.s. 5 ft rec	Silty clay, y br w occ rounded pebbles, moist Color change to olive y at 8 ft	
13.0	2" s.s. 0.2 ft rec	Sand y br poorly sorted, fine to coarse, wet	
15.0		Clayey silt gr Flowing sand and pebbles jammed between center stem and auger unable to attempt spoon at 18 ft	
23.0		B.O.H. at 23 ft	Auger refusal at 23 ft

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

US ARMY ENVIRONMENTAL HYGIENE AGENCY

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

INSTALLATION Ravenna AAP
PROJECT NUMBER 38-26-KF95-92
LOCATION Northeast Corner of Open Burning Ground
DRILL RIG Mobile B-53
DATE 22 April 92
GEOLOGIST Barrett Borry
DRILLERS W.Smithson, R. Kestner, M. Farro
BORE HOLE OBG-2
WATER LEVEL 5.69 3 May 92
Sheet 1 of 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
	3" s.s.s.	Crushed rock and slag fill, gr to bl	
2.0	3.0 ft rec	Clayey silt mottled br to y, moist	
	3" s.s.s. 4.2 ft rec	Color change to y br at 5 ft	
8.4		Silty clay y br occ rounded pebble, moist	
10.0	3" s.s.s. 5.0 ft rec	Clayey silt, gr occ pebble, moist	
		y br between 14-15 ft	
	3" s.s.s. 2.5 ft rec	gr at 15 ft, wet	Note: Auger turned up siltstone and shale fragments at 19 ft Very slow auger penetration at 19 ft
		Sand gr, wet	
19.0		B.O.H. at 19 ft in weathered rock	

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

US ARMY ENVIRONMENTAL HYGIENE AGENCY

DRILLING LOG

(The proponent of this form is HSHB-ES)

INSTALLATION Ravenna AAP
PROJECT NUMBER 38-26-KF95-92
LOCATION Southeast Corner of Open Burning Grounds
DRILL RIG Mobile B-53
DATE 22 April 92
GEOLOGIST Barrett Borry
DRILLERS W.Smithson, R. Kestner, M. Farro
BORE HOLE OBG-3
WATER LEVEL 4.41 3 May 92
Sheet 1 of 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
		Crushed rock and slag fill, gr to bl	
2.7	3" s.s.s. 2.5 ft rec	Clayey silt w occ pebble y br to br y w/faint mottles, moist	
4.0		Silty clay, br y w/very pale br mottles, damp	
	3" s.s.s. 5 ft rec		
		Color change to gr at 9.0 ft	
	3" s.s.s. 5.0 ft rec		
14.1		Sand, r b, wet	
14.2		Clayey silt,occ ss pebble,moist	
15.0			
16.9	3" s.s.s. 4.4 ft rec	vf sand w/clay, occ pebble,br moist	
16.9		Clayey silt, gr moist	Augers turned water at 19 ft
18.4		Sand, pale yellow, wet	B.O.H. at 20 ft in weathered rock
19.0			
20.0		Clayey, silt, lt br gr	

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

US ARMY ENVIRONMENTAL HYGIENE AGENCY

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

INSTALLATION Ravenna AAP
PROJECT NUMBER 38-26-KF95-92
LOCATION Along the Southern Boundary of the Open Burning Ground
DRILL RIG Mobile B-53
DATE 25 April 92
GEOLOGIST Barrett Borry
DRILLERS W.Smithson, R. Kestner, M. Farro
BORE HOLE OBG-4
WATER LEVEL 2.99 3 May 92
Sheet 1 of 1

DEPTH	SAMPLE TYPE	DESCRIPTION	REMARKS
1.0	3" s.s.s. 3.0 ft rec	Silty clay w/rock fragments,gr, moist	
1.5		Clayey silt, lt olive br, moist	
2.6		Silty clayey fine sand, br y w/r y mottles, wet	
		Clayey silt br y w/r y mottles damp,color change to y br at 4 ft	
	3" s.s.s. 5.0 ft rec		
	3" s.s.s. 2.0 ft rec	Color change to gr with r y mottles at 10.8 ft	
14.0	3" s.s.s. 3.0 ft rec	Fine sand and clay, gr, wet	
18.0		B.O.H. at 18 ft in weathered rock	Auger refusal at 18 ft

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

APPENDIX C

Generalized Open Burning Grounds
Monitoring Well Construction Diagram

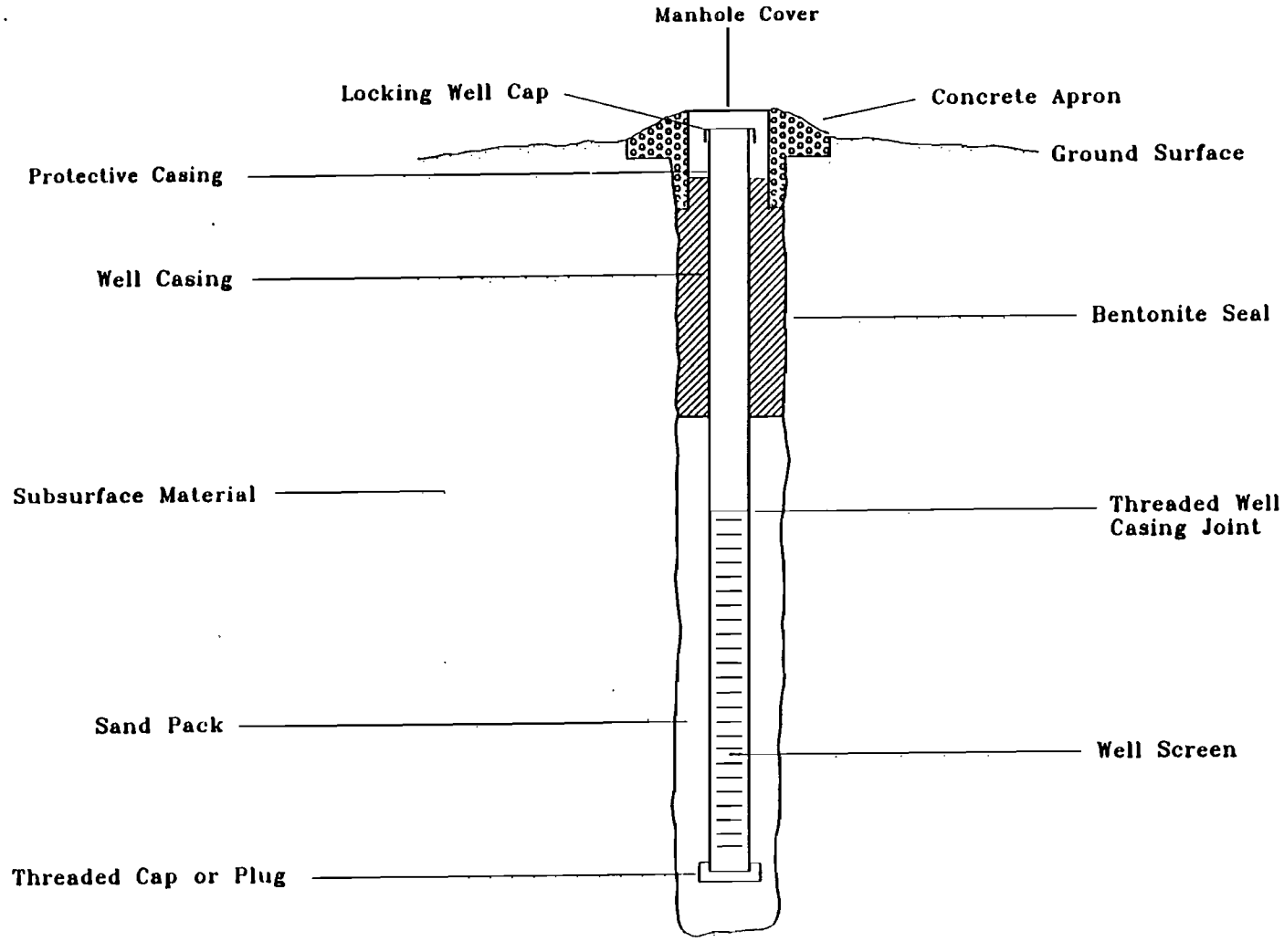


Figure F-2. Geneneralized Monitoring Well Construction for OBG.

U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY
GROUND-WATER MONITORING WELL SUMMARY

INSTALLATION Ravenna AAP
PROJECT NUMBER 38-26-KF95-92
Open Burning Grounds

DATE April 92

WELL NUMBER	OBG-1	OBG-2	OBG-3	OBG-4	OBG-1A
1. Height of Monitoring Well Casing above ground level	0.5	0.3	0.5	0.?	0.0
2. Total Depth of Well below ground level	18.0	19.0	19.0	18.2	23.0
3. Depth to Top of Well Screen below ground level	13.0	14.0	14.0	13.0	18.0
4. Well Screen Length	5.0	5.0	5.0	5.0	5.0
5. Well Screen Slot Size (in)	0.010	0.010	0.010	0.010	0.010
6. Well Diameter (in)	2	2	2	2	2
7. Monitoring Well Casing Material	PVC	PVC	PVC	PVC	PVC
8. Monitoring Well Screen Material	PVC	PVC	PVC	PVC	PVC
9. Grout Thickness below ground level	N.A.	N.A.	N.A.	N.A.	N.A.
10. Depth to Top of Bentonite Seal below ground level	0.0	0.0	0.0	0.0	0.0
11. Bentonite Seal Thickness	11.1	4.0	6.5	10.9	8.0
12. Depth to top of Sand Pack	11.1	11.3	12.5	10.9	9.7
13. Depth to bottom of sand pack	14.3	14.8	18.5	18.2	18.0
14. Elevation - top of monitoring well casing	1017.42	1013.47	1012.91	1013.33	1017.57
15. Depth to Static Water Level	3.43	5.69	4.41	2.99	12.0
a. Date Measured	3 May 92	3 May 92	3 May 92	3 May 92	22 Apr 92
b. From top of monitoring well casing	3.43	5.69	4.41	2.99	12.0
c. From ground level	2.93	5.39	3.91	2.89	12.0
16. Ground-water elevation	1013.99	1007.78	1008.50	1010.34	N.A.

Comments
OBG-1A showed very erratic water levels and was taken out of service on 4/30/93 and replaced with OBG-1.

APPENDIX D

Analytical Results from Ground Water Monitoring Samples Taken from the Open Burning Ground

Analyte	Units	4/29/92	12/30/93	2/25/93	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
1,1,1Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1,2Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCPy	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,1DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2,3TCB	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,2,3TCP	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,2,3TMB	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,2,4TCB	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,2-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2-DCP	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2DB3CH	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,2DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500	ND<0.500
1,2DiBr	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,3,5TM	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
1,3-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,3-DCp	UG/L	ND<2.000			ND<2.000									ND<2.000	ND<2.000	ND<2.000	
1,4-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1112TClE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000					ND<2.000	ND<2.000	ND<2.000	
135 TNB	UG/L	ND<1.000	2.400	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,2DCP	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
2,4-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,6-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2-ChlTol	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
246 TNT	UG/L	ND<1.000	1.900	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
4-ChlTol	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
Ag	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	2.000
AmmoniaN	MG/L	60.000	ND<100	ND<100	45.000	ND<100	570.000	ND<100	ND<100	26.000	10.000	ND<100	37.000	ND<100	12.000	ND<100	ND<5.000
As	MG/L	ND<5.000	14.000	ND<5.000	ND<5.000	38.000	ND<5.000	ND<5.000	1.000	7.000	3.000	ND<5.000	ND<5.000	ND<5.000	2.000	5.000	ND<3.000
BBenzene	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
Ba	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	39.000	15.000	35.000	13.000	9.000	ND<10.000	10.000	11.000	14.000	13.000
Be	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	6.000	ND<1.000
Benzene	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Br2ClMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrCl2Me	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrClMeth	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
BroEth	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
Bromofrm	ppb	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
CCl4	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
COD	MG/L	ND<25000	3700.000	ND<25000	ND<25000	ND<25000	7500.000	ND<25000	ND<25000	ND<25000	2200.000	ND<25000	ND<25000	ND<25000	ND<1000	ND<4000	ND<4000
Ca	MG/L	57000.000	54000.000	49000.000	130000.000	120000.000	65000.000	36000.000	56000.000	64000.000	54000.000	50000.000	50000.000	51000.000	50000.000	48000.000	48000.000
CaCO3	MG/L	180000.000	180000.000	172000.000	180000.000	190000.000	210000.000	180000.000	190000.000	200000.000	180000.000	180000.000	200000.000	200000.000	180000.000	170000.000	190000.000
Cd	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	0.000	ND<1.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlMeth	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Chloride	MG/L	ND<1000	2500.000	2000.000	1500.000	1000.000	1500.000	1500.000	ND<1000								
Chloride	mg/l									2100.000	1900.000	1700.000	1900.000	2600.000	ND<1000	ND<1000	1100.000
Chlorofm	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
CisCl2Et	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
CisDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
ClEthane	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Cond F	umhos/cm	277.000															
Cond L	umhos/cm	400.000	390.000	376.000	391.000	408.000	530.000	455.000	390.000	380.000	320.000	330.000	400.000	370.000	410.000	340.000	340.000
Cr	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	9.000	ND<1.000	ND<1.000	ND<1.000	4.000	2.000	2.000	2.000
Cu	MG/L	ND<10.000	ND<10.000	ND<10.000	23.000	ND<10.000	10.000	64.000	6.000	13.000	ND<10.000	ND<10.000	ND<10.000	4.000	ND<10.000	2.000	1.000
Cumene	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	

Analyte	Units	4/29/92	12/30/93	2/25/93	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
Cyanide	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<6.000
DClDFlMe	UG/L	ND<2.000							ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
DiBrMe	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
EthBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Fe	MG/L	ND<100	1900.000	2300.000	7100.000	5800.000	2300.000	1800.000	2600.000	16000.000	2600.000	1000.000	15000.000	1500.000	630.000	1800.000	980.000
GWL	feet	1013.990		1013.320	1013.090	1008.920	1012.820	1012.590	1009.620	1009.340	1012.340	1014.090	1011.420	1008.750	1008.590	1010.090	1015.090
HClButad	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
HMX	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<1.000
Hg	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
K	MG/L	800.000	980.000	900.000	1700.000	1600.000	2400.000	890.000	1000.000	2400.000	940.000	780.000	830.000	820.000	880.000	910.000	830.000
MeCl	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Mg	MG/L	16000.000	17000.000	15000.000	15000.000	29000.000	26000.000	19000.000	18000.000	20000.000	16000.000	16000.000	16000.000	17000.000	17000.000	15000.000	16000.000
Mn	MG/L	10.000	22.000	13.000	81.000	230.000	230.000	360.000	26.000	190.000	28.000	10.000	17.000	13.000	9.000	32.000	15.000
NG	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<1.000
NO3/NO2	MG/L	ND<50.000	1200.000	770.000	430.000	210.000	ND<50.000	470.000	190.000	280.000	430.000	240.000	260.000	160.000	280.000	280.000	240.000
Na	MG/L	5200.000	4600.000	4200.000	5300.000	5500.000	6800.000	97000.000	5600.000	4300.000	4500.000	4300.000	4500.000	4800.000	5000.000	130000.000	5500.000
Naphth	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
Ni	MG/L	ND<50.000	ND<50.000	ND<50.000	38.000	26.000	15.000	ND<50.000	ND<50.000	19.000	ND<50.000	ND<50.000	ND<50.000	2.000	1.000	2.000	ND<1.000
Oil & G	MG/L		3000.000	ND<1000	ND<1000	ND<1000	ND<1000	3000.000	ND<1000	1200.000	2200.000	ND<1000	ND<1000	ND<1000	ND<4000	ND<4000	ND<60.000
PO4	MG/L	510.000	50.000	30.000	92.000	310.000	73.000	200.000	170.000	33.000	22.000	ND<100	110.000	ND<100	84.000	ND<100	ND<50.000
Pb	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	3.000	10.000	4.000	ND<1.000	1.000	ND<1.000	2.000	5.000	ND<2.000
Phen	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	16.000	7.000	10.000	13.000	8.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000
Picric	UG/L	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<1.000
RDX	ppb	ND<1.000	ND<1.000	ND<1.000	ND<1.000	1.100	2.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
Sb	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<6.000
Se	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	2.000	ND<2.000
SecButyl	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
Styrene	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
Sulfate	MG/L	31000.000	31000.000	32000.000	36000.000	40000.000	84000.000	53000.000	32000.000	63000.000	46000.000	26000.000	33000.000	38000.000	40000.000	28000.000	45000.000
TCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TClFlMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TDS	mg/l			212000.000	250000.000	230000.000	335000.000	254000.000	360000.000	290000.000	220000.000	210000.000	270000.000	280000.000	560000.000	250000.000	270000.000
TDS	ppb	160.000	203.000														
TKN	MG/L	680.000	ND<200	ND<200	1000.000	ND<200	ND<200	ND<200	330.000	540.000	250.000	130.000	68.000	500.000	ND<200	650.000	550.000
TOC	MG/L	10000.000	ND<500	ND<500	ND<500	1500.000	1000.000	ND<500	1200.000	1600.000	1200.000	1100.000	ND<500	1200.000	ND<500	ND<500	1000.000
TOX	MG/L		ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	20.000	40.000	ND<10.000
TertButy	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
TetCEthy	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TetClEth	UG/L	ND<2.000								ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Tl	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	2.000	11.000	ND<250	2.000	ND<250	ND<250	ND<4.000
Toluen	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
TranDCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TranDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Turb	NTU		2.000	3.000	25.000	8.900	1.500	3.600	120.000	270.000	55.000	52.000	170.000	28.000	290.000	16.000	1300.000
VC	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Zn	MG/L	ND<10.000	40.000	20.000	1000.000	140.000	14.000	650.000	340.000	140.000	110.000	20.000	30.000	16.000	16.000	23.000	13.000
m,pXyln	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
n-Butyl	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
n-PB	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
oXylene	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
p-ISPTOL	UG/L	ND<2.000												ND<2.000	ND<2.000	ND<2.000	
pH	SU	7.500	7.190	7.320	7.210	8.110	7.710	7.660	7.600	7.500	7.600	7.600	7.600	7.600	7.800	7.600	7.700
pH F	SU	7.400															

Analyte	Units	4/29/92	12/30/93	2/25/93	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
1,1,1Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1,2Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCPy	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	8.000
1,1DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2,3TCB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,3TCP	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,3TMB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,4TCB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2-DCP	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2DB3CH	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	0.660	ND<2.000	ND<0.500	ND<0.500
1,2DiBr	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,3,5TM	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,3-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,3-DCp	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,4-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1112TCIE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000					ND<2.000	ND<2.000	ND<2.000	
135 TNB	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	8.000
2,2DCP	UG/L	ND<2.000				ND<2.000		ND<2.000						ND<2.000	ND<2.000	ND<2.000	
2,4-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,6-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2-ChlTol	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
246 TNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
4-ChlTol	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ag	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	3.000
AmmoniaN	MG/L	ND<100	ND<100	ND<100	400.000	60.000	580.000	ND<100	ND<100	150.000	400.000	ND<100	93.000	ND<100	40.000	ND<100	ND<5.000
As	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	11.000	15.000	ND<5.000	19.000	19.000	6.000	ND<5.000	10.000	20.000	4.000	4.000	3.000
BBenzene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ba	MG/L	80.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	43.000	51.000	110.000	37.000	40.000	53.000	83.000	48.000	39.000	54.000
Be	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	5.000	ND<1.000
Benzene	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Br2ClMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrCl2Me	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrClMeth	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
BroEth	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Bromofrm	ppb	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
CCl4	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
COD	MG/L	32000.000	11000.000	ND<25000	ND<25000	ND<25000	ND<25000	ND<25000	12000.000	27000.000	3100.000	8200.000	ND<25000	ND<25000	ND<1000	ND<4000	ND<4000
Ca	MG/L	73000.000	92000.000	95000.000	81000.000	150000.000	94000.000	78000.000	75000.000	110000.000	66000.000	75000.000	74000.000	83000.000	73000.000	75000.000	68000.000
CaCO3	MG/L	220000.000	230000.000	226000.000	210000.000	210000.000	250000.000	220000.000	210000.000	220000.000	210000.000	230000.000	240000.000	230000.000	240000.000	220000.000	240000.000
Cd	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	0.000	ND<1.000	ND<1.000	4.000	ND<2.000	ND<2.000	ND<2.000
ChlBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlMeth	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Chloride	MG/L	3000.000	6000.000	3000.000	4000.000	2500.000	2500.000	4500.000	4500.000								
Chloride	mg/l									3300.000	4100.000	3500.000	3700.000	3700.000	2500.000	4700.000	3300.000
Chlorofm	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
CisCl2Et	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
CisDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
ClEthane	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Cond F	umhos/cm	350.000															
Cond L	umhos/cm	510.000	614.000	574.000	501.000	510.000	673.000	682.000	390.000	490.000	510.000	530.000	530.000	450.000	570.000	480.000	560.000
Cr	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	32.000	ND<1.000	ND<1.000	13.000	25.000	ND<1.000	ND<1.000	ND<1.000	16.000	2.000	1.000	2.000
Cu	MG/L	ND<10.000	ND<10.000	ND<10.000	27.000	16.000	20.000	ND<10.000	18.000	28.000	ND<10.000	ND<10.000	ND<10.000	30.000	ND<10.000	1.000	ND<1.000
Cumene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	

Analyte	Units	4/29/92	12/30/93	2/25/93	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
Cyanide	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<6.000
DC1DFlMe	UG/L	ND<2.000						ND<2.000		ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
DiBrMe	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
EthBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Fe	MG/L	ND<100	1000.000	10000.000	8000.000	17000.000	6900.000	1000.000	19000.000	40000.000	1100.000	740.000	9100.000	22000.000	380.000	330.000	630.000
GWL	feet	1007.780		1006.570	1007.220	1001.670	1006.470	1006.550	1004.970	1003.470	1006.800	1007.140	1008.140	1002.890	1002.970	1005.220	1008.890
HC1Butad	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
HMX	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<1.000
Hg	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	0.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
K	MG/L	1900.000	2000.000	2300.000	3100.000	3300.000	3900.000	4000.000	3400.000	4800.000	3400.000	1300.000	22000.000	4100.000	1400.000	1300.000	1100.000
MeCl	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Mg	MG/L	20000.000	24000.000	26000.000	20000.000	37000.000	31000.000	22000.000	32000.000	29000.000	16000.000	21000.000	21000.000	28000.000	22000.000	20000.000	21000.000
Mn	MG/L	150.000	190.000	280.000	350.000	760.000	270.000	240.000	570.000	860.000	160.000	180.000	32.000	570.000	220.000	170.000	210.000
NG	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<1.000
NO3/NO2	MG/L	ND<50.000	80.000	ND<50.000	30.000	ND<50.000	20.000	100.000	56.000	150.000	670.000	ND<50.000	93.000	10.000	45.000	37.000	25.000
Na	MG/L	7500.000	7600.000	7500.000	7200.000	7900.000	13000.000	180000.000	6200.000	7400.000	34000.000	7800.000	5900.000	9000.000	8000.000	310000.000	6800.000
Naphth	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ni	MG/L	ND<50.000	ND<50.000	ND<50.000	30.000	39.000	15.000	ND<50.000	18.000	41.000	ND<50.000	ND<50.000	ND<50.000	24.000	1.000	ND<50.000	ND<1.000
Oil & G	MG/L		3000.000	ND<1000	ND<1000	ND<1000	ND<1000	6000.000	ND<1000	ND<1000	2100.000	ND<1000	ND<1000	ND<1000	ND<4000	ND<4000	380.000
PO4	MG/L	430.000	20.000	40.000	220.000	780.000	54.000	60.000	30.000	420.000	28.000	27.000	37.000	57.000	110.000	ND<100	ND<50.000
Pb	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	2.000	8.000	13.000	30.000	ND<1.000	6.000	13.000	2.000	3.000	ND<2.000
Phen	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	11.000	7.000	10.000	ND<10.000	9.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000
Picric	UG/L	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<1.000
RDX	ppb	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	1.200	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
Sb	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<6.000
Se	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	4.000	ND<2.000
SecButyl	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Styrene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Sulfate	MG/L	53000.000	120000.000	110000.000	62000.000	75000.000	109000.000	160000.000	65000.000	66000.000	120000.000	72000.000	75000.000	38000.000	78000.000	80000.000	230000.000
TCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TClFlMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TDS	mg/l			211000.000	330000.000	310000.000	446000.000	428000.000	430000.000	360000.000	37000.000	340000.000	380000.000	390000.000	390000.000	410000.000	380000.000
TDS	ppb	310.000	412.000														
TKN	MG/L	440.000	ND<200	ND<200	ND<200	1100.000	ND<200	ND<200	570.000	1000.000	610.000	230.000	240.000	ND<200	ND<200	590.000	98.000
TOC	MG/L	12000.000	ND<500	ND<500	ND<500	1000.000	2700.000	2100.000	760.000	1400.000	1600.000	1400.000	2000.000	ND<500	ND<500	ND<500	ND<1000
TOX	MG/L		80.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	10.000	ND<10.000	ND<10.000	ND<10.000	10.000	10.000	ND<10.000	ND<10.000	10.000	80.000
TertButy	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
TetCEthy	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TetClEth	UG/L	ND<2.000						ND<2.000		ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Tl	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<250	ND<250	7.000	ND<250	ND<250	1.000	ND<250	ND<4.000
Toluen	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
TranDCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TranDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Turb	NTU		ND<1.000	1.500	24.000	4.500	4.000	11.000	200.000	180.000	90.000	28.000	320.000	280.000	400.000	12.000	23.000
VC	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Zn	MG/L	14.000	30.000	30.000	310.000	350.000	44.000	1100.000	84.000	460.000	310.000	90.000	180.000	130.000	18.000	51.000	35.000
m,pXyln	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
n-Butyl	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
n-PB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
oXylene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
p-ISPTOL	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
pH	SU	7.600	7.210	7.160	7.390	7.650	7.320	7.510	8.000	7.500	7.600	7.500	7.500	7.500	7.600	7.500	7.600
pH F	SU	7.600															

Analyte	Units	4/29/92	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
1,1,1Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1,2Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCPy	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,1DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2,3TCB	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,3TCP	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,3TMB	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,4TCB	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2-DCP	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2DB3CH	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	0.660	ND<2.000	ND<0.500	ND<0.500
1,2DiBr	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,3,5TM	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,3-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,3-DCp	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,4-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1112TClE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000					ND<2.000	ND<2.000	ND<2.000	
135 TNB	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,2DCP	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
2,4-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,6-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2-ChlTol	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
246 TNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
4-ChlTol	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ag	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	3.000
AmmoniaN	MG/L	140.000	52.000	60.000	580.000	ND<100	ND<100	55.000	3160.000	30.000	36.000	ND<100	23.000	ND<100	ND<5.000
As	MG/L	ND<5.000	ND<5.000	17.000	40.000	ND<5.000	37.000	9.000	8.000	18.000	7.000	6.000	3.000	4.000	8.000
BBenzene	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ba	MG/L	100.000	ND<10.000	ND<10.000	ND<10.000	10.000	150.000	110.000	110.000	120.000	86.000	110.000	100.000	98.000	120.000
Be	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	4.000	ND<1.000
Benzene	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Br2ClMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrCl2Me	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrClMeth	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
BroEth	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Bromofrm	ppb	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
CCl4	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
COD	MG/L	170000.000	ND<25000	ND<25000	ND<25000	ND<25000	ND<25000	ND<25000	6800.000	ND<25000	6800.000	ND<25000	ND<1000	ND<4000	ND<4000
Ca	MG/L	64000.000	63000.000	140000.000	95000.000	51000.000	74000.000	68000.000	65000.000	59000.000	56000.000	58000.000	55000.000	57000.000	58000.000
CaCO3	MG/L	250000.000	180000.000	190000.000	240000.000	170000.000	190000.000	190000.000	200000.000	200000.000	200000.000	220000.000	200000.000	200000.000	210000.000
Cd	MG/L	8.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	1.000	ND<1.000	ND<1.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlMeth	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Chloride	MG/L	2500.000	4000.000	2500.000	2500.000	ND<1000	ND<1000								
Chloride	mg/l							3000.000	3000.000	3000.000	2800.000	3300.000	2000.000	1300.000	2600.000
Chlorofrm	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
CisCl2Et	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
CisDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
ClEthane	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Cond F	umhos/c	310.000													
Cond L	umhos/c	460.000	436.000	450.000	626.000	409.000	310.000	390.000	400.000	370.000	410.000	380.000	440.000	390.000	450.000
Cr	MG/L	ND<1.000	ND<1.000	42.000	36.000	ND<1.000	9.000	ND<1.000	ND<1.000	5.000	ND<1.000	4.000	2.000	1.000	1.000
Cu	MG/L	ND<10.000	29.000	20.000	54.000	ND<10.000	15.000	5.000	11.000	9.000	ND<10.000	6.000	ND<10.000	ND<10.000	ND<1.000
Cumene	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	

Analyte	Units	4/29/92	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
Cyanide	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<6.000
DClDFlMe	UG/L	ND<2.000				ND<2.000		ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
DiBrMe	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
EthBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Fe	MG/L	ND<100	13000.000	24000.000	17000.000	1600.000	14000.000	2000.000	3500.000	9400.000	1500.000	2100.000	530.000	420.000	610.000
GWL	feet	1008.500	1007.660	1003.110	1006.810	1006.660	1005.410	1003.990	1007.160	1007.740	1005.830	1004.490	1004.830	1005.990	1008.080
HClButad	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
HMX	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<1.000
Hg	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	0.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
K	MG/L	800.000	2500.000	2200.000	3100.000	1300.000	2400.000	2600.000	2800.000	2200.000	850.000	1200.000	930.000	900.000	880.000
MeCl	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Mg	MG/L	17000.000	17000.000	35000.000	32000.000	16000.000	19000.000	15000.000	16000.000	17000.000	15000.000	17000.000	16000.000	15000.000	17000.000
Mn	MG/L	160.000	290.000	920.000	300.000	160.000	330.000	160.000	180.000	250.000	130.000	160.000	130.000	130.000	130.000
NG	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<1.000
NO3/NO2	MG/L	ND<50.000	20.000	ND<50.000	ND<50.000	34.000	67.000	120.000	280.000	ND<50.000	41.000	140.000	42.000	51.000	28.000
Na	MG/L	12000.000	6900.000	6900.000	11000.000	100000.000	6500.000	6600.000	6600.000	5800.000	5300.000	6900.000	6400.000	210000.000	7000.000
Naphth	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ni	MG/L	ND<50.000	46.000	59.000	41.000	ND<50.000	11.000	ND<50.000	7.000	11.000	ND<50.000	3.000	1.000	ND<50.000	ND<1.000
Oil & G	MG/L		ND<1000	ND<1000	ND<1000	1000.000	2800.000	ND<1000	3100.000	ND<1000	ND<1000	ND<1000	ND<4000	ND<4000	ND<60.000
PO4	MG/L	2500.000	110.000	790.000	13.000	51.000	170.000	53.000	120.000	38.000	25.000	43.000	75.000	ND<100	ND<50.000
Pb	MG/L	4.000	ND<1.000	ND<1.000	16.000	ND<1.000	7.000	5.000	3.000	2.000	1.000	2.000	2.000	2.000	8.000
Phen	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	14.000	ND<10.000	10.000	8.000	12.000	ND<10.000	ND<10.000	13.000	ND<10.000
Picric	UG/L	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<1.000
RDX	ppb	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
Sb	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	7.000
Se	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	2.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	3.000	ND<2.000
SecButyl	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Styrene	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Sulfate	MG/L	42000.000	47000.000	50000.000	109000.000	84000.000	28000.000	42000.000	61000.000	31000.000	40000.000	46000.000	47000.000	39000.000	53000.000
TCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TClFlMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TDS	mg/l		310000.000	260000.000	402000.000	230000.000	370000.000	290000.000	250000.000	250000.000	270000.000	300000.000	180000.000	310000.000	200000.000
TDS	ppb	350.000													
TKN	MG/L	680.000	1000.000	ND<200	ND<200	ND<200	640.000	470.000	590.000	260.000	79.000	ND<200	ND<200	420.000	61.000
TOC	MG/L	37000.000	ND<500	1400.000	1600.000	1100.000	1100.000	1400.000	2200.000	1400.000	1000.000	ND<500	1000.000	ND<500	3800.000
TOX	MG/L		ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	10.000	ND<10.000	20.000	20.000	ND<10.000	ND<10.000	30.000	10.000
TertButy	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
TetCEthy	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TetClEth	UG/L	ND<2.000				ND<2.000		ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Tl	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<250	ND<250	ND<250	ND<250	ND<250	ND<250	ND<250	ND<4.000
Toluen	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
TranDCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TranDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Turb	NTU		72.000	9.300	3.600	15.000	120.000	120.000	76.000	68.000	73.000	19.000	44.000	18.000	20.000
VC	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Zn	MG/L	30.000	64.000	140.000	130.000	59.000	65.000	41.000	61.000	40.000	24.000	19.000	10.000	17.000	14.000
m,pXyln	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
n-Butyl	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
n-PB	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
oXylene	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
p-ISPTOL	UG/L	ND<2.000				ND<2.000						ND<2.000	ND<2.000	ND<2.000	
pH	SU	7.500	7.140	7.730	7.300	8.020	7.500	7.500	7.500	7.600	7.500	7.400	7.600	7.500	7.600
pH F	SU	8.000													

Analyte	Units	4/29/92	12/30/93	2/25/93	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
1,1,1Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1,2Tri	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,1-DCPy	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,1DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2,3TCB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,3TCP	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,3TMB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2,4TCB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2-DCP	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,2DB3CH	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,2DCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	0.700	ND<2.000	ND<0.500	ND<0.500
1,2DiBr	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,3,5TM	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,3-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1,3-DCp	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
1,4-DCB	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
1112TCIE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000					ND<2.000	ND<2.000	ND<2.000	
135 TNB	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	15.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,2DCP	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
2,4-DNT	UG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2,6-DNT	UG/L	ND<1.000	ND<1.000	2.100	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
2-ChlTol	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
246 TNT	UG/L	ND<1.000	3.900	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
4-ChlTol	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ag	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000		ND<10.000	ND<10.000	3.000
AmmoniaN	MG/L	100.000	ND<100	ND<100	55.000	50.000	580.000	ND<100	ND<100	55.000	140.000	ND<100	40.000	ND<100	ND<100	ND<100	ND<5.000
As	MG/L	ND<5.000	14.000	52.000	ND<5.000	21.000	ND<5.000	10.000	27.000	50.000	15.000	18.000	10.000	8.000	10.000	7.000	9.000
BBenzene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ba	MG/L	140.000	ND<10.000	210.000	ND<10.000	ND<10.000	ND<10.000	82.000	92.000	120.000	95.000	100.000	78.000	86.000	88.000	78.000	94.000
Be	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	4.000	ND<1.000
Benzene	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Br2ClMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrCl2Me	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
BrClMeth	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
BroEth	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Bromofrm	ppb	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
CCl4	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
COD	MG/L	80000.000	7500.000	ND<25000	ND<25000	ND<25000	7500.000	ND<25000	ND<25000	ND<25000	2500.000	5100.000	ND<25000	ND<25000	2200.000	ND<4000	ND<4000
Ca	MG/L	96000.000	95000.000	140000.000	110000.000	220000.000	97000.000	85000.000	49000.000	120000.000	98000.000	95000.000	96000.000	92000.000	96000.000	95000.000	97000.000
CaCO3	MG/L	210000.000	200000.000	200000.000	200000.000	200000.000	290000.000	200000.000	200000.000	200000.000	220000.000	220000.000	220000.000	210000.000	200000.000	210000.000	240000.000
Cd	MG/L	1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	0.000	ND<1.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
ChlMeth	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Chloride	MG/L	5000.000	7000.000	4000.000	6000.000	5500.000	1000.000	5500.000	ND<1000								
Chloride	mg/l									5000.000	5000.000	5300.000	5000.000	5700.000	3900.000	5300.000	5800.000
Chlorofm	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
CisCl2Et	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
CisDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
ClEthane	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Cond F	umhos/cm	459.000															
Cond L	umhos/cm	670.000	646.000	630.000	637.000	662.000	695.000	707.000	320.000	620.000	560.000	630.000	670.000	600.000	730.000	650.000	750.000
Cr	MG/L	ND<1.000	ND<1.000	30.000	ND<1.000	25.000	ND<1.000	ND<1.000	ND<1.000	17.000	ND<1.000	7.000	ND<1.000	1.000	2.000	ND<1.000	3.000
Cu	MG/L	ND<10.000	10.000	50.000	28.000	20.000	18.000	ND<10.000	6.000	23.000	ND<10.000	9.000	ND<10.000	ND<10.000	ND<10.000	3.000	2.000
Cumene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	

Analyte	Units	4/29/92	12/30/93	2/25/93	6/10/93	8/31/93	11/11/93	3/9/94	6/28/94	9/23/94	12/22/94	3/23/95	6/28/95	10/5/95	12/14/95	3/21/96	6/20/96
Cyanide	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<6.000
DC1DFlMe	UG/L	ND<2.000						ND<2.000		ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
DiBrMe	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
EthBenz	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Fe	MG/L	ND<100	1300.000	52000.000	8900.000	16000.000	7700.000	600.000	4000.000	29000.000	4000.000	8800.000	970.000	370.000	950.000	1100.000	2000.000
GWL	feet	1010.340		1009.080	1008.730	1004.830	1008.500	1008.660	1009.410	1005.830	1008.660	1008.580	1008.380	1006.500	1007.580	1010.080	1009.580
HC1Butad	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
HMX	UG/L	ND<10.000	ND<10.000	1.700	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<1.000
Hg	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	0.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
K	MG/L	1100.000	1800.000	5700.000	2200.000	2100.000	2300.000	1100.000	6500.000	3000.000	1400.000	1900.000	1100.000	1300.000	1500.000	1300.000	1500.000
MeCl	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Mg	MG/L	27000.000	28000.000	40000.000	30000.000	49000.000	27000.000	26000.000	9800.000	33000.000	28000.000	30000.000	28000.000	30000.000	31000.000	29000.000	33000.000
Mn	MG/L	270.000	330.000	1100.000	420.000	800.000	810.000	350.000	170.000	740.000	410.000	420.000	360.000	380.000	380.000	370.000	450.000
NG	UG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<100	ND<1.000
NO3/NO2	MG/L	ND<50.000	870.000	ND<50.000	30.000	ND<50.000	20.000	22.000	67.000	31.000	10.000	ND<50.000	30.000	39.000	19.000	32.000	26.000
Na	MG/L	12000.000	10000.000	10000.000	10000.000	11000.000	8200.000	140000.000	8600.000	9100.000	11000.000	11000.000	11000.000	13000.000	14000.000	410000.000	15000.000
Naphth	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Ni	MG/L	ND<50.000	ND<50.000	40.000	24.000	31.000	17.000	ND<50.000	ND<50.000	26.000	ND<50.000	9.000	ND<50.000	2.000	1.000	ND<50.000	1.000
Oil & G	MG/L		2000.000	1000.000	ND<1000	ND<1000	ND<1000	ND<1000	2200.000	1700.000	1900.000	ND<1000	ND<1000	ND<1000	ND<4000	ND<4000	ND<60.000
PO4	MG/L	1300.000	60.000	120.000	120.000	1100.000	81.000	17.000	130.000	110.000	240.000	15.000	18.000	33.000	47.000	ND<100	ND<50.000
Pb	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	4.000	8.000	15.000	2.000	ND<1.000	ND<1.000	1.000	2.000	3.000
Phen	MG/L	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	44.000	ND<10.000	10.000	12.000	10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000
Picric	UG/L	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	ND<1.000
RDX	ppb	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000
Sb	MG/L	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<5.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<30.000	ND<6.000
Se	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	43.000	ND<1.000	ND<1.000	ND<2.000
SecButyl	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Styrene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
Sulfate	MG/L	140000.000	160000.000	170000.000	160000.000	170000.000	110000.000	180000.000	44000.000	150000.000	280000.000	160000.000	160000.000	200000.000	210000.000	190000.000	190000.000
TCE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TC1FlMe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TDS	mg/l		432.000	382000.000	470000.000	430000.000	442000.000	458000.000	380000.000	480000.000	470000.000	460000.000	520000.000	540000.000	560000.000	570000.000	480000.000
TDS	ppb	460.000															
TKN	MG/L	1300.000	ND<200	ND<200	ND<200	ND<200	ND<200	ND<200	640.000	710.000	900.000	130.000	950.000	ND<200	ND<200	420.000	ND<40.000
TOC	MG/L	19000.000	ND<500	ND<500	ND<500	2000.000	1700.000	1200.000	3000.000	1600.000	1500.000	1900.000	1600.000	1200.000	1200.000	ND<500	ND<1000
TOX	MG/L		ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	20.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	ND<10.000	30.000	80.000	40.000	ND<10.000
TertButy	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
TetCEthy	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TetC1Eth	UG/L	ND<2.000						ND<2.000		ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Tl	MG/L	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<1.000	ND<250	4.000	ND<250	ND<250	4.000	ND<250	ND<250	ND<4.000
Toluen	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
TranDCEE	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
TranDCPe	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<0.500
Turb	NTU		ND<1.000	2.000	28.000	7.600	1.600	0.580	140.000	230.000	180.000	18.000	46.000	6.400	12.000	84.000	16.000
VC	UG/L	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<2.000	ND<1.000
Zn	MG/L	20.000	90.000	200.000	290.000	470.000	33.000	68.000	42.000	150.000	52.000	80.000	56.000	14.000	11.000	26.000	17.000
m,pXyln	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
n-Butyl	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
n-PB	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
oXylene	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
p-ISPTOL	UG/L	ND<2.000						ND<2.000						ND<2.000	ND<2.000	ND<2.000	
pH	SU	7.500	7.100	6.990	7.220	7.610	6.950	7.640	7.600	7.400	7.400	7.500	7.400	7.400	7.600	7.400	7.500
pH F	SU	8.100															