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LIST OF ACRONYMS

A&E	Architect and Engineer
ACM	Asbestos Containing Material
AOC	Area of Concern
AP	Artillery Primer
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society for Testing and Materials
BGS	Below-Ground Surface
BRA	Baseline Risk Assessment
CELRL	Corps of Engineers, Louisville District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHPPM	Center for Health Promotion and Preventive Medicine
COC	Chemical of Concern
CRREL	Cold Regions Research and Engineering Laboratory
CY	Cubic Yards
D&D	Decontamination and Decommissioning
DoD	Department of Defense
DNT	Dinitro Toluene
DQO	Data Quality Objective
FID	Flame Ionization Detector
GOCO	Government Owned Contractor Operator
HASP	Health and Safety Plan
HMX	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine
ID	Inside Diameter
IDW	Investigation-Derived Waste
IR	Industrial Readiness (Command)
IRA	Interim Removal Action
IRP	Installation Restoration Program
JMC	Joint Munitions Command
LL-11	Load Line 11
MCL	Maximum Contaminant Level
MKM	MKM Engineers, Inc
OE	Ordnance and Explosives
OEPA	Ohio Environmental Protection Agency
OHARNG	Ohio Army National Guard
PAH	Poly Aromatic Hydrocarbon
PCB	Poly Chlorinated Biphenyl
PCHD	Portage County Health Department
PID	Photo Ionization Detector
PRG	Preliminary Remediation Goal
PVC	Poly Vinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,2,5-Trinitro-1,3,5-Triazine
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study

RVAAP	Ravenna Army Ammunition Plant
SAP	Sampling and Analysis Plan
SHASP	Site Health and Safety Plan
SOW	Scope of Work
SVOC	Semi-volatile Organic Compound
TAL	Target Analyze List
TCLP	Toxicity Characteristic Leaching Procedure
TNB	Trinitro Benzene
TNT	Trinitro Toluene
TSCA	Toxic Substances Control Act
USEPA	U.S. Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
XRF	X-Ray Defraction

SECTION 1 INTRODUCTION AND SUMMARY

This report describes the activities performed to complete the Load Line # 11 (LL-11) Interim Removal Action (IRA) at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. MKM Engineers, Inc. (MKM) performed this IRA, under Contract Number DAAA09-98-G-0001 and Delivery Order Number 0026, with the US Army Joint Munitions Command (JMC).

1.1 Site History

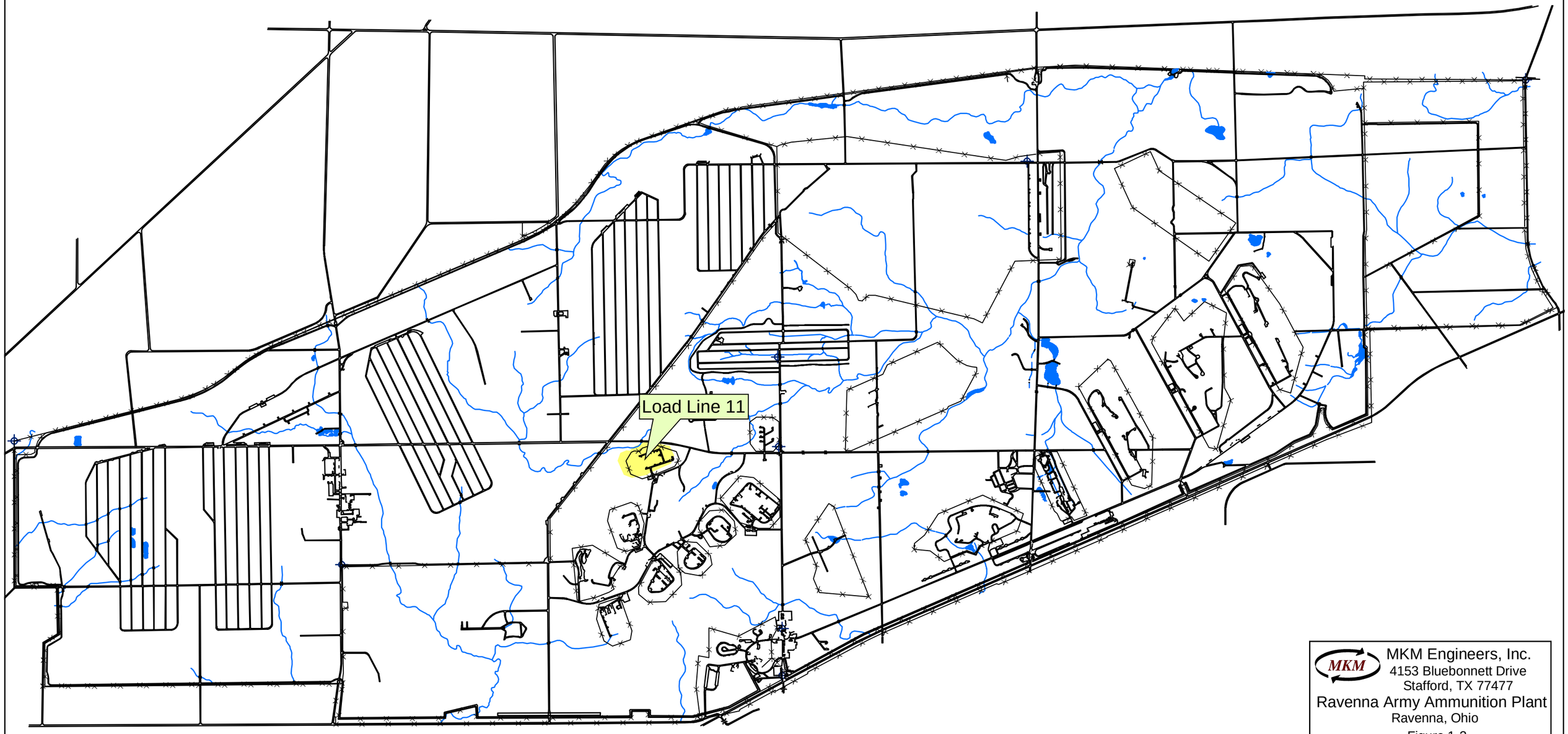
Past Department of Defense (DoD) activities at the Ravenna Army Ammunition Plant (RVAAP) date back to 1940 and include storage, handling, and packing of military ammunition and explosives. The site is located in northeastern Ohio in Portage and Trumbull Counties. RVAAP lies 23 miles east-northeast of Akron, Ohio and 30 miles west-northwest of Youngstown, Ohio (Figure 1-1). The installation includes 21,419 acres in a tract approximately 3.5 miles wide by 11 miles long. The RVAAP is a government-owned, contractor-operated (GOCO) military industrial installation.

The facility is jointly operated by the JMC and the Ohio Army National Guard Bureau, and the current contractor on-site is Toltest, Inc. The land use surrounding the installation is primarily farmland, woodland, and low density housing. The industrial operations at RVAAP consisted of 12 munitions assembly facilities referred to as "load lines" (Figure 1-2). In addition, RVAAP also had several areas used for burning, demolition and testing of munitions and buildings/areas designated for clean up and decontamination activities for the production equipment. In May 1999, the National Guard Bureau assumed operational control of 16,164 acres of RVAAP and licensed Ohio Army National Guard to use the acreage for training and other activities. The JMC controls environmental areas of concern (AOCs) and bulk explosives storage areas. A detailed history of process operations and waste processes for each AOC at RVAAP is presented in the Preliminary Assessment for the Ravenna Army Ammunition Plant, Ravenna, Ohio (USACE 1996b).

1.2 Load Line-11 Background

Load Line-11 (LL-11) is located in the south central area of the facility on Fuze and Booster Spur Road (Figure 1-2). LL-11 was used primarily for the production of artillery primer and fuzes. Industrial operations at LL-11 took place during the 1941 to 1945, 1951 to 1957 and 1969 to 1971 time frames. According to the Installation Assessment of Ravenna Army Ammunition Plant, Report No. 132 dated November 1978, from 1941 to 1945 load lines 5 through 11 combined, produced 19,257,297 miscellaneous fuzes, 44,297,485 miscellaneous boosters, 50,660,725 miscellaneous primers, 79,580,576 detonators and 226,387,306 percussion elements. From 1951 to 1957, LL-11 alone produced 9,927,118 MK2A4 percussion primers, some 24,482,465 MK2A4 primers and 1,504,935 repack primers. No definitive information is available for LL-11 regarding production during the 1969 to 1971 time frame.

Figure 1-1. Ravenna Army Ammunition Plant Location Map



MKM Engineers, Inc.
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Ravenna Army Ammunition Plant
Ravenna, Ohio

Figure 1-2
Facility Location Map
Load Line 11 Interim Removal Action

Drawn By:	Checked By:	Date Drawn:
M.Dunlevy	SL	05 Mar 04

0 950 1,900 3,800 5,700 Feet

N W E S

A total of nineteen (19) Artillery Primer (AP) Buildings were used at the load line to carry out the specific industrial operations. A brief description of each building is provided below:

- Building AP-18 was designated as a bunkered storage area for percussion elements. Inside the building there are no drains or troughs. Exterior drainage follows the contour of the land in the immediate proximity of the building.
- Building AP-9 was used as a percussion element storage and staging area for operations conducted from 1969 through 1971. Prior to product manufactured in the later 60's to early 70's, AP-9 was used for palletization and shipping of the finished products. The building contains no drains, troughs, or sumps. Exterior drainage follows the contour of the land in the immediate proximity of the building.
- Building AP-7 and AP-4 have been used throughout operation of Load Line 11 as a Black Powder staging (Rest House) area for primer charging conducted in building AP-8. The interior walls are covered with lead base paint and the floors are covered with a non-conductive rubber material for the prevention of electrostatic charge. There are no drains, troughs or sumps associated with the building. Exterior drainage follows the contour of the land in the immediate proximity of the building.
- Building AP-1 was used as a black powder service area.
- Buildings AP-5 and AP-6 were used exclusively as a Black Powder processing area. Building AP-5 contained forced air blowers for the drying ovens in AP-6. Building AP-6 has troughs and drains that lead to exterior sumps. Two sets of sumps are associated with these buildings. One set is located outside the SW wall of AP-6 and one set is located between the AP-5 and AP-6. Schematics indicate the sumps are connected with lead piping, which in turn connect with the sewer mains of the facility.
- Building AP-20 was the Quality Assurance Primer Sensitivity Testing facility. Standard Operating Procedures permitted a maximum of only 3 pounds of finished product in the building at any one time. There are no troughs or drains in this building. Exterior drainage follows the contour of the land in the immediate proximity of the building.
- Building AP-11 was the major assembly building for the MK2A4 product during the 1969 to 1971 time frame. Bay A of AP-11 was used for the insertion of the Percussion Element via Pennsylvania Heading Machines in to the main primer head. Bay B was used for the charging of the primer assemblies with the Black Powder. Bay C was used to apply lacquer sealing materials and pack out the finish product. The difference in the manufacturing process used during the periods 1941 to 1945, 1951 to 1957, and 1969 to 1971 is the black powder charging operations were shifted from Building AP-8 to AP-11 in later years. There are no troughs or drains along the walls of AP-11. There are several utility sinks with drains and piping that most likely connect to the sewer mains. Exterior drainage follows the contour of the land in the immediate proximity of the building.
- Building AP-10 was used for percussion element service in association with the production conducted in AP-11.

- Building AP-8 was used as a primer loading and administrative building. Two sets of sumps (east side and west side) are associated with this building. The schematics indicate that the sumps are lead lined and are connected to the sewer mains of the facility. There are several drains located in the building.
- Building AP-17 was used as a solvent storage facility. The building contains no sumps, troughs, or drains.
- Building AP-2 was used as a motor house to support the black powder screening operation in AP-3.
- AP-3 was used as a black powder screening facility. The floor of AP-3 is covered with a lead liner. There is a trough and associated drain on the south wall of the building connects to a sump located outside of the building. The facility drawing indicates that the trough and sump are connected with lead piping. The sump is connected to the facility sewer main.
- Support type buildings at Load Line 11 included AP-13 and AP-14 which functioned as locker rooms (Change Houses), AP-15 which was used for Inert Storage, AP-16 the shipping building and AP-19 the dining building.

1.3 Summary of IRA Activities

The objective of the IRA effort at LL-11 was to remove the primary pathways of migration for contamination that originated from the load line. This included removal of sedimentation sumps from production buildings and limited excavation of the open ditch systems that drains the site. The data from this IRA will be folded into the November – December Remedial Investigation (RI) evaluation of risk for the site followed by recommendations for additional remedial efforts, as necessary.

The approved LL-11 IRA Work Plan, Sampling and Analysis Plan Addendum and Site-Specific Safety and Health Plan dated January 2, 2001 were prepared for implementation of all IRA activities. The IRA sampling activities at LL-11 began in June 2000 and concluded in June 2001. The removal operations began during January 2001 and concluded after the June 2001 "Hot Spot" removal.

The groundwater from the sewer system was removed from each sump prior to excavation. Based on analytical results and following OEPA Approval, the water was applied to the site ground surface for infiltration (see section 3.2 for further details). Once the water was removed, selected sewer manholes were plugged using a cement/bentonite mixture to stop the infiltration of groundwater back into the sumps targeted for removal. The sump excavations were immediately backfilled following collection of confirmation samples due the unstable soil conditions.

Six locations within the site drainage ways were excavated based upon laboratory analytical results. A 20-foot section of ditch was excavated on either side of the original sample point (40-foot total) with the exception of SD018 and SD019. At these locations a total of 200 linear feet was excavated. Confirmation and delineation samples were taken prior to backfilling.

SECTION 2 BACKGROUND

2.1 Regulatory Authorities

The approach to addressing environmental conditions at RVAAP is regulatory-based following the frameworks established by the primary regulatory drivers; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), etc. CERCLA activities, including IRAs are funded under the JMC Installation Restoration Program (IRP).

2.2 RVAAP Team Coordination

All major activities of this IRA were coordinated with the major parties involved including:

- Ravenna Army Ammunition Plant (RVAAP)
- Joint Munitions Command (JMC)
- U.S. Army Corps of Engineers (USACE)
- Ohio Environmental Protection Agency (OHIO EPA)
- Portage County Health Department (PCHD)
- Ohio Army National Guard (OHARNG)
- MKM Engineers, Inc. (MKM)

2.3 Previous Investigations

The U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) conducted a Relative Risk Site Evaluation for Newly Added Sites at the RVAAP in 1998 (Hazardous and Medical Waste Study No. 37-EF-5360-99, 19-23 October 1998). From the 13 sites that were evaluated, five were classified as high-priority areas of concern and the others were classified as medium. The five high-priority areas of concern listed in this report are:

- **RVAAP 44 (LL-11)**,
- RVAAP 46 (Building F-15, F-16),
- RVAAP 47 (Building T-5301),
- RVAAP 49 (Central Burns Pits), and
- RVAAP 51 (Dump along Paris-Windham Road).

The remaining eight areas that were ranked medium priority were:

- RVAAP 39 (LL-5)
- RVAAP 40 (LL-7)
- RVAAP 41 (LL-8)

- RVAAP 42 (LL-9)
- RVAAP 43 (LL-10)
- RVAAP 45 (Wet Storage Area)
- RVAAP 48 (Anchor Test Area)
- RVAAP 50 (Atlas Scrap Yard)

The October 1998 CHPPM report identified surface soil and sediments to be potential media for contaminant migration at LL-11 due to the lack of any physical barriers/fence around the site and proximity to Sand Creek. Samples were collected and analyzed for metals and explosives. The report indicated hunters and excessors to be potential receptors of the soil contamination. As a result, the Relative Risk Site Evaluation for this AOC was scored High.

As a follow-on to the 1998 CHPPM report, MKM was tasked by the JMC to perform a Remedial Investigation (RI) at LL-11 to further evaluate the shallow and deep soils, groundwater, surface water and sediment media associated with this AOC. The RI was conducted during November and December 2000. The data from this RI was used to direct the IRA excavation/removal operations and will be folded into an evaluation of risk for the site followed by recommendations for remedial efforts, as necessary.

SECTION 3 IRA ACTIVITIES

The LL-11 IRA activities were initiated following the November - December 2000 RI as an early response action to mitigate the movement of contaminants off site. The IRA consisted of removing the sumps from the LL-11 production buildings (AP-3, AP-5, AP-6 and AP-8) and limited excavation at seven (7) affected areas identified during the 2000 RI. Six (6) of the affected areas were located within the site's drainage ditches. The seventh area, approximately 30' x 30' x 8' was located in an open field just north of AP-17. The objective of the removal action at these identified areas was to eliminate source contamination within prime migratory pathways at the AOC, and consequently remove the potential for future migration of contaminants off-site. Specific details of the LL-11 IRA activities are described in the subsections that follow. A cross-reference table that lists the samples and corresponding lab project number is found in the appendix with the laboratory data summary sheets.

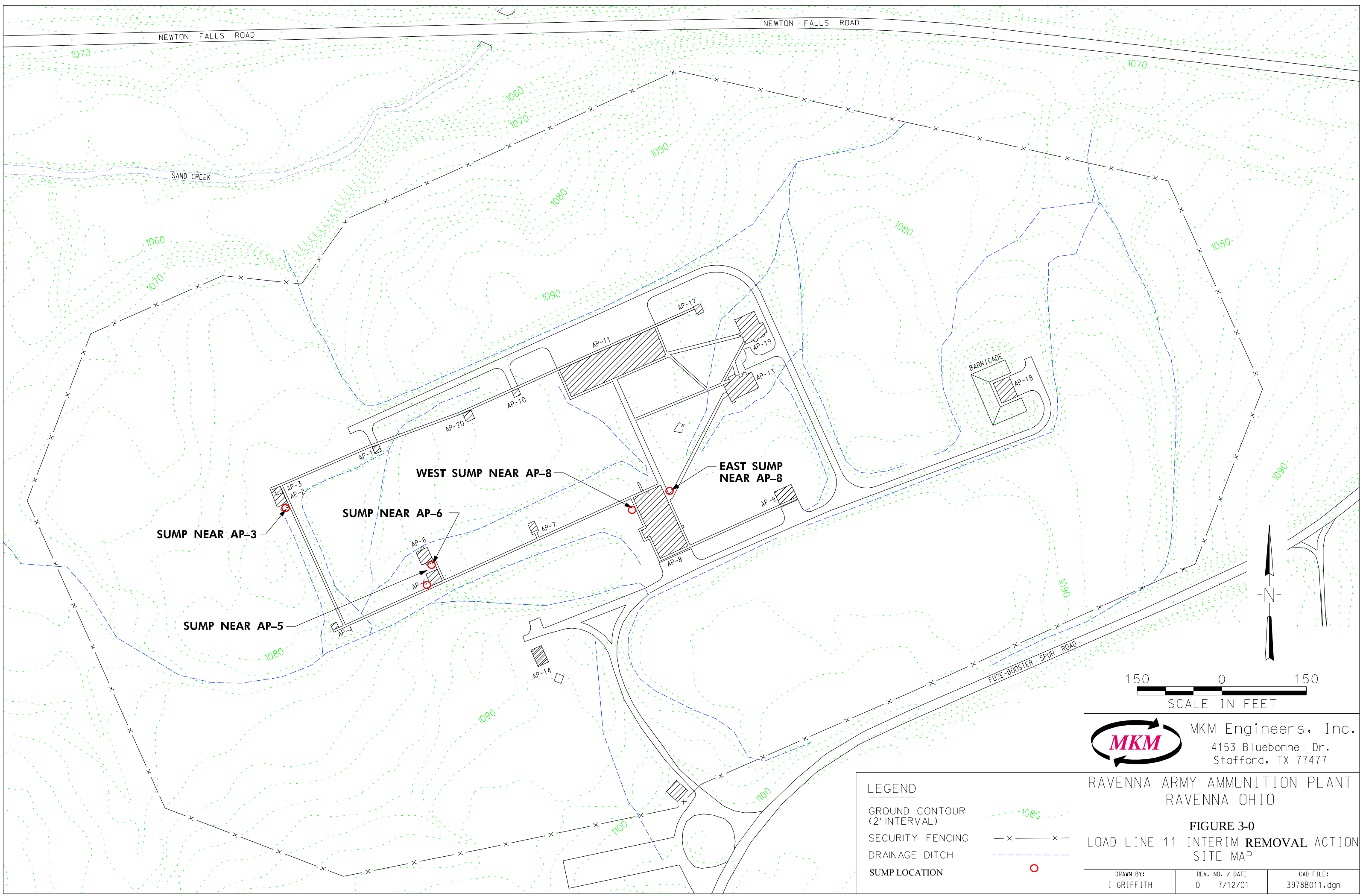
3.1 Explosive Field Screening

During IRA field operations, a UXO Technician monitored the work zone and screened excavated soils with a magnetometer for potential UXO items. All UXO screening operations were performed in accordance with the LL-11 IRA Ordnance Avoidance Plan (Appendix A). No ordnance related items were encountered during the LL-11 IRA field operations.

3.2 Sewer/Sump Water Removal

Approximately 15,000 gallons of water were removed in total, from the sedimentation sumps at process buildings AP-3, AP-5, AP-6 and AP-8 to facilitate their removal (Figure 3.0). During the initial IRA pumping operations at AP-3, it was determined that the infiltration rate of groundwater into the sewer-system was significant enough to impede the removal operations. As a result, the sewer manholes immediately downgradient of each sump were filled with bentonite cement to prevent water (from the downstream sewer system) from infiltrating back into the sumps during the excavation and removal operations. Once the water was removed, the sumps effluent sewer line was cut and then plugged with mechanical packers and cement grout, which prepared the sumps for removal.

All sump/sewer water was handled in accordance with the approved LL-11 Technical Scope Change dated January 9, 2001. A copy of this letter to OEPA is provided in Appendix B. Based upon the laboratory analysis of the sump/sewer water, contaminant concentrations (lead) were low enough to allow for ground application of the water. Table 3-1 provides a summary of the sump/sewer water analytical results. The water was pumped from the sumps through a filter directly into a holding tank before being discharged in an area just west of AP-3 and AP-4. The water was released from the tank at a very low rate, by using a spreader to control the rate of discharge across the vegetated area to ensure proper distribution and infiltration into site soils. Additionally, straw bales were installed at the discharge point to further reduce flow velocity and enhance sheet flow down gradient.



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LEGEND

GROUND CONTOUR (2' INTERVAL)	1080
SECURITY FENCING	—×——×—
DRAINAGE DITCH	- - - - -
SUMP LOCATION	○

RAVENNA ARMY AMMUNITION PLANT
RAVENNA OHIO

FIGURE 3-0
LOAD LINE 11 INTERIM REMOVAL ACTION SITE MAP

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I GRIFFITH	0 7/12/01	3978B011.dgn

Table 3-1
RAVENNA ARMY AMMUNITION PLANT
SUMP AND SEWER WATER RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SW-001-0001-SW (AP-3 sump)	LL11SW-002-0001-SW (AP-5 sump)	LL11SW-003-0001-SW (AP-6 sump)	LL11SW-004-0001-SW (AP-8 sump)	LL11SW-005-0001-SW (AP-8 west sump)	LL11SW-005-0001-TB (AP-8 west sump)	LL11SW-006-0001-SW (AP-3 manhole)	LL11SW-007-0001-SW (AP-5 & AP-6 manhole)	LL11SW-008-0001-SW (AP-8 SW manhole)	LL11SW-008-0001-FD (AP-8 SW manhole)
Sample Date			28-Jun-00	28-Jun-00	28-Jun-00	29-Jun-00	9-Oct-00	9-Oct-00	28-Jun-00	29-Jun-00	29-Jun-00	29-Jun-00
Explosives 8330 ug/L												
HMX	0.00	3100.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
RDX	0.00	4.4	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
1,3-Dinitrobenzene	0.00	24.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Nitrobenzene	0.00	20.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2,4,6-Trinitrtoluene	0.00	16.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Tetryl	0.00	610.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2,4-Dinitrotoluene	0.00	120.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2,6-Dinitrotoluene	0.00	61.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2-Nitrotoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
4-Nitrtoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
3-Nitrotoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
TAL Metals 6010B ug/L												
Silver	0.00	390.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Aluminum	17700.00	76000.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Arsenic	15.40	0.39	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Barium	88.40	5400.0	30.0	20.6	34.2	30.8	50.5	NT	43.1	25.0	32.3	31.5
Beryllium	0.88	150.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Calcium	15800.00	--	56100	42200	86600	56200	49900	NT	85400	53400	85900	86700
Cadmium	0.00	37.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Cobolt	10.40	4700.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Chromium	17.40	210.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Copper	17.70	2900.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Iron	23100.00	23000.0	BRL	BRL	BRL	2070	BRL	NT	81.6	BRL	BRL	BRL
Mercury	0.04	23.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Potassium	927.00	--	2190	1410	1640	4450	10200	NT	1140	1130	1420	1430
Magnesium	3030.00	--	15000	7900	21000	3220	5750	NT	20700	9520	12400	12500
Manganese	1450.00	1800.0	838	8.3	424	66.9	68.1	NT	3170	BRL	222	230
Sodium	123.00	--	7430	3820	14400	1640	2790	NT	8550	3040	3960	3900
Nickel	21.10	1600	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Lead, Soluable	--	--	21.6	58.8	BRL	BRL	376	NT	BRL	BRL	BRL	BRL
Antimony	0.96	31.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Selenium	1.40	390.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Thallium	0.00	5.2	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Vanadium	31.10	550.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Zinc	61.80	23000.0	BRL	19.6	10.8	12.3	27.9	NT	10.4	BRL	15.0	12.1
Metals 6010B ug/L												
Lead, Total	26.10	400.0	45.1	59.8	17.8	666	686	NT	BRL	BRL	BRL	NT
Cyanide ug/L												
Cyanide, Total	0.00	11.0	BRL	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Propellants 8330 ug/L												
Nitroglycerin	0.00	35.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Nitroguanidine	0.00	6100.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Nitrocellulose	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Table 3-1
RAVENNA ARMY AMMUNITION PLANT
SUMP AND SEWER WATER RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SW-001-0001-SW (AP-3 sump)	LL11SW-002-0001-SW (AP-5 sump)	LL11SW-003-0001-SW (AP-6 sump)	LL11SW-004-0001-SW (AP-8 sump)	LL11SW-005-0001-SW (AP-8 west sump)	LL11SW-005-0001-TB (AP-8 west sump)	LL11SW-006-0001-SW (AP-3 manhole)	LL11SW-007-0001-SW (AP-5 & AP-6 manhole)	LL11SW-008-0001-SW (AP-8 SW manhole)	LL11SW-008-0001-FD (AP-8 SW manhole)
Sample Date			28-Jun-00	28-Jun-00	28-Jun-00	29-Jun-00	9-Oct-00	9-Oct-00	28-Jun-00	29-Jun-00	29-Jun-00	29-Jun-00
VOCs TCL 8260B ug/L												
Acetone	0.00	1600	NT	NT	NT	NT	BRL	BRL	NT	NT	NT	NT
Carbon Disulfide	0.00	360.00	NT	NT	NT	NT	BRL	BRL	NT	NT	NT	NT
Methylene Chloride	0.00	8.90	NT	NT	NT	NT	BRL	0.5	NT	NT	NT	NT
SVOCs TCL 8270 C ug/L												
Diethylphthalate	0.00	29000.00	NT	NT	NT	NT	BRL	NT	NT	NT	NT	NT
bis(2-Ethylhexyl)phthalate	0.00	4.80	NT	NT	NT	NT	BRL	NT	NT	NT	NT	NT
Pesticides 8081A ug/L												
alpha-BHC	0.00	0.09	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
beta-BHC	0.00	0.32	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
delta-BHC	0.00	0.32	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
gamma-BHC (Lindane)	0.00	0.44	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Heptachlor	0.00	0.11	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aldrin	0.00	0.029	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Heptachlor epoxide	0.00	0.053	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endosulfan I	0.00	3700	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Dieldrin	0.00	0.03	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4,4-DDE	0.00	1.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endosulfan II	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4,4-DDD	0.00	2.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endrin	0.00	18	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endosulfan sulfate	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4,4-DDT	0.00	1.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methoxychlor	0.00	310	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endrin ketone	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endrin aldehyde	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
alpha-Chlodane	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
gamma-Chlordane	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Toxaphene	0.00	0.44	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB TCL 8082 ug/L												
Aroclor-1016	0.00	3.9	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aroclor-1221	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aroclor-1232	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aroclor-1242	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aroclor-1248	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aroclor-1254	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aroclor-1260	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Inorganics mg/L												
Nitrate, as N	0.00	--	BRL	BRL	BRL	0.22	0.43	NT	BRL	BRL	BRL	BRL
Sulfide	0.00	--	BRL	BRL	BRL	1.4	BRL	NT	BRL	BRL	BRL	BRL
Sulfate	0.00	--	20.2	15.7	34.9	8.9	41.9	NT	14.4	11.8	19.8	18

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but≥ IDL/MDL

Soil Samples Reported in mg/kg
Water Samples Reported in ug/L

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Table 3-1
RAVENNA ARMY AMMUNITION PLANT
SUMP AND SEWER WATER RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SW-009-0001-SW (AP-14 manhole)	LL11SW-010-0001-SW (AP-8 manhole)	LL11SW-011-0001-SW (AP-8 SE manhole)	LL11SW-011-0001-ER (AP-8 SE manhole)	LL11SW-011-0001-FB (AP-8 SE manhole)	LL11SW-011-0001-FD (AP-8 SE manhole)	LL11SW-011-0001-TB (AP-8 SE manhole)
Sample Date			29-Jun-00	29-Jun-00	28-Jun-00	28-Jun-00	28-Jun-00	28-Jun-00	29-Jun-00
Explosives 8330 ug/L									
HMX	0.00	3100.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
RDX	0.00	4.4	BRL	BRL	BRL	BRL	BRL	BRL	NT
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	NT
1,3-Dinitrobenzene	0.00	24.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Nitrobenzene	0.00	20.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,4,6-Trinitrtoluene	0.00	16.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Tetryl	0.00	610.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,4-Dinitrotoluene	0.00	120.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,6-Dinitrotoluene	0.00	61.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
2-Nitrotoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
4-Nitrtoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
3-Nitrotoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
TAL Metals 6010B ug/L									
Silver	0.00	390.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Aluminum	17700.00	76000.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Arsenic	15.40	0.39	BRL	BRL	BRL	BRL	BRL	BRL	NT
Barium	88.40	5400.0	24.1	26.1	41.6	BRL	BRL	42.9	NT
Beryllium	0.88	150.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Calcium	15800.00	--	61100	53700	65900	BRL	346	67400	NT
Cadmium	0.00	37.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Cobolt	10.40	4700.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Chromium	17.40	210.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Copper	17.70	2900.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Iron	23100.00	23000.0	BRL	BRL	BRL	BRL	177	BRL	NT
Mercury	0.04	23.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Potassium	927.00	--	1770	1740	4610	BRL	BRL	4660	NT
Magnesium	3030.00	--	8980	6340	10200	BRL	100	10400	NT
Manganese	1450.00	1800.0	7.6	114	19.8	BRL	9.0	20.3	NT
Sodium	123.00	--	3670	7720	3160	BRL	143000	3160	NT
Nickel	21.10	1600	BRL	BRL	BRL	BRL	BRL	BRL	NT
Lead, Soluable	--	--	BRL	BRL	BRL	BRL	BRL	BRL	NT
Antimony	0.96	31.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Selenium	1.40	390.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Thallium	0.00	5.2	BRL	BRL	BRL	BRL	BRL	BRL	NT
Vanadium	31.10	550.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Zinc	61.80	23000.0	15.8	15.5	12.2	BRL	29.5	BRL	NT
Metals 6010B ug/L									
Lead, Total	26.10	400.0	BRL	BRL	BRL	NT	NT	NT	NT
Cyanide ug/L									
Cyanide, Total	0.00	11.0	BRL	BRL	BRL	BRL	BRL	BRL	NT
Propellants 8330 ug/L									
Nitroglycerin	0.00	35.0	NT	NT	ND	ND	ND	ND	NT
Nitroguanidine	0.00	6100.0	NT	NT	ND	ND	ND	ND	NT
Nitrocellulose	0.00	--	NT	NT	ND	ND	ND	ND	NT

Table 3-1
RAVENNA ARMY AMMUNITION PLANT
SUMP AND SEWER WATER RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SW-009-0001-SW (AP-14 manhole)	LL11SW-010-0001-SW (AP-8 manhole)	LL11SW-011-0001-SW (AP-8 SE manhole)	LL11SW-011-0001-ER (AP-8 SE manhole)	LL11SW-011-0001-FB (AP-8 SE manhole)	LL11SW-011-0001-FD (AP-8 SE manhole)	LL11SW-011-0001-TB (AP-8 SE manhole)
Sample Date			29-Jun-00	29-Jun-00	28-Jun-00	28-Jun-00	28-Jun-00	28-Jun-00	29-Jun-00
VOCs TCL 8260B ug/L									
Acetone	0.00	1600	NT	NT	2	BRL	BRL	BRL	BRL
Carbon Disulfide	0.00	360.00	NT	NT	BRL	BRL	BRL	BRL	BRL
Methylene Chloride	0.00	8.90	NT	NT	BRL	BRL	BRL	BRL	1
SVOCs TCL 8270 C ug/L									
Diethylphthalate	0.00	29000.00	NT	NT	BRL	8 (J)	BRL	BRL	NT
bis(2-Ethylhexyl)phthalate	0.00	4.80	NT	NT	**8 (J)**	BRL	BRL	**14**	NT
Pesticides 8081A ug/L									
alpha-BHC	0.00	0.09	NT	NT	BRL	BRL	BRL	BRL	NT
beta-BHC	0.00	0.32	NT	NT	BRL	BRL	BRL	BRL	NT
delta-BHC	0.00	0.32	NT	NT	0.020 (J)	BRL	BRL	BRL	NT
gamma-BHC (Lindane)	0.00	0.44	NT	NT	BRL	BRL	BRL	BRL	NT
Heptachlor	0.00	0.11	NT	NT	BRL	BRL	BRL	BRL	NT
Aldrin	0.00	0.029	NT	NT	BRL	BRL	BRL	BRL	NT
Heptachlor epoxide	0.00	0.053	NT	NT	BRL	BRL	BRL	BRL	NT
Endosulfan I	0.00	3700	NT	NT	BRL	BRL	BRL	BRL	NT
Dieldrin	0.00	0.03	NT	NT	BRL	BRL	BRL	BRL	NT
4,4-DDE	0.00	1.7	NT	NT	BRL	BRL	BRL	BRL	NT
Endosulfan II	0.00	--	NT	NT	BRL	BRL	BRL	BRL	NT
4,4-DDD	0.00	2.4	NT	NT	BRL	BRL	BRL	BRL	NT
Endrin	0.00	18	NT	NT	BRL	BRL	BRL	BRL	NT
Endosulfan sulfate	0.00	--	NT	NT	BRL	BRL	BRL	BRL	NT
4,4-DDT	0.00	1.7	NT	NT	BRL	BRL	BRL	BRL	NT
Methoxychlor	0.00	310	NT	NT	BRL	BRL	BRL	BRL	NT
Endrin ketone	0.00	--	NT	NT	BRL	BRL	BRL	BRL	NT
Endrin aldehyde	0.00	--	NT	NT	BRL	BRL	BRL	BRL	NT
alpha-Chlodane	0.00	--	NT	NT	BRL	BRL	BRL	BRL	NT
gamma-Chlordane	0.00	--	NT	NT	BRL	BRL	BRL	BRL	NT
Toxaphene	0.00	0.44	NT	NT	BRL	BRL	BRL	BRL	NT
PCB TCL 8082 ug/L									
Aroclor-1016	0.00	3.9	NT	NT	BRL	BRL	BRL	BRL	NT
Aroclor-1221	0.00	0.22	NT	NT	BRL	BRL	BRL	BRL	NT
Aroclor-1232	0.00	0.22	NT	NT	BRL	BRL	BRL	BRL	NT
Aroclor-1242	0.00	0.22	NT	NT	BRL	BRL	BRL	BRL	NT
Aroclor-1248	0.00	0.22	NT	NT	BRL	BRL	BRL	BRL	NT
Aroclor-1254	0.00	0.22	NT	NT	BRL	BRL	BRL	BRL	NT
Aroclor-1260	0.00	0.22	NT	NT	BRL	BRL	BRL	BRL	NT
Inorganics mg/L									
Nitrate, as N	0.00	--	0.16	0.24	BRL	BRL	BRL	BRL	NT
Sulfide	0.00	--	BRL	BRL	1.5	BRL	BRL	1.2	NT
Sulfate	0.00	--	19.4	22.4	17.2	BRL	58.1	19.9	NT

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but≥ IDL/MDL

Soil Samples Reported in mg/kg
Water Samples Reported in ug/L

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

3.3 Sump Excavation

This task involved the excavation, removal and disposal of the 5 sedimentation sumps located at LL-11. The sumps were located adjacent to buildings AP-3, AP-5, AP-6 and AP-8 as shown in Figure 3.0. During the initial sump removal operations, a fibrous liner material was found attached to the lead lining in each of the sumps. Bulk samples of the material were collected and submitted for asbestos analysis. Analytical results indicated the fibrous material was comprised of 60% chrysotile asbestos. As a result, the sump excavation and removal operations were performed in accordance with Federal (40 CFR Part 61, Subpart M) and State (OAC 3745-20) asbestos emission control regulations. A copy of the OEPA asbestos removal notification form is provided in Appendix C. A copy of the bulk sample results for the fibrous material is provided in Appendix D.

The sump excavation operations began on January 22, 2001 and were completed on February 27, 2001. Following removal, the sumps were placed on a plastic sheeting adjacent to the excavation. The lead liner was then separated from the concrete (sump) and transported to the decontamination pad for removal of the Asbestos Containing Material (ACM) and final decontamination. The concrete sumps were broken into manageable pieces and immediately encapsulated (spray encapsulant) prior to being loaded into rolloffs for transport to the off-site disposal facility. Throughout the sump removal operations, the sumps and associated liner were adequately wetted to prevent dust emissions.

As the fibrous material (ACM) was removed from the lead liner, it was placed directly into 6-ml plastic bags by the asbestos abatement workers. The lead liner was then decontaminated using a pressure washer to remove the sump sediments and residual asbestos contamination. The decontamination pad was constructed of 2 layers of 6-ml liner material and bermed with straw bales to contain overspray/rinseate. All rinseate was pumped into four (4) 55-gallon DOT approved drums for storage and subsequent disposal. Once deconned, the lead liners were inspected, sampled and certified as “asbestos free” by the Asbestos Hazard Abatement Specialist for recycling. Copies of the wipe sample results from the lead liner are provided in Appendix E.

The decontaminated lead liner from each of the sumps was loaded into a dump truck and transported to Akron Recycling in Akron, Ohio for recycling. The concrete and fibrous materials were transported to the Minerva Enterprises Landfill in Minerva, Ohio for disposal as special waste (ACM). Copies of the manifests and weight tickets for the ACM materials are provided in Appendix F.

3.4 Sewer Excavation

Due to both the shallow depth to saturation and large water bearing capacity of the course sands encountered during the RI soil boring operations, the sewer lines downstream from the sumps (up to the first manhole) were not excavated as originally scoped in the LL-11 IRA Work

Plan. Removal of the sewer would have constituted excavation below the ground water table, which is not permissible by the OEPA. In addition, excavations into these shallow, saturated lithologies would have generated large quantities of groundwater that would have also caused unstable and unsafe conditions for site workers. As a result, the sewer line and nearest manhole associated with the sumps were plugged, as described in section 3.2, and left in place. Additionally, due the very small amount of sediment that was found to exist in each manhole as well as the relatively low concentrations of contaminants associated with this material, it was not necessary to remove sediments prior to the grouting operations. These field modifications were performed in accordance with the approved LL-11 Technical Scope Change dated January 9, 2001 (Appendix B). Table 3-2 provides a summary of the sump/sewer sediment sample results. Copies of the RI sump/sewer sediment and water analytical reports are provided in Appendix G.

3.5 Ditch Excavation

The November-December 2000 RI sampling data identified six (6) locations within the site drainage ditches that exhibited elevated concentrations of site contaminants (metals, VOCs, SVOCs and/or pesticides/PCBs). The excavations were located in the ditch lines southeast of AP-3 at RI sample point SD027, east of AP-4 at RI sample point SD026, just north of AP-14 at RI sample point SD032, on the south end of the facility just east of the entrance road at RI sample point SD013 and north of AP-19 at RI sample points SD018 and SD019 (Figures 3-1A and 3-1B). Table 3-3 provides a summary of all the RI ditch sediment sample results. Copies of the RI ditch sediment analytical reports are provided in Appendix G.

Prior to performing the ditch excavation operations, pre-excavation field screening samples were collected to help define the lateral extent of each excavation. Field screening samples were taken at intervals of twenty and forty-feet on either side of the identified sediment sample locations. Field screening was performed for metals using X-Ray Defraction (XRF) technology and nitrates using the HACH N Trak® soil test kit. Since explosive compounds were not detected in any of the RI soil, groundwater or surface water sampling media, pre-excavation field screening for explosives (by Modified Jenkins) was not required during the ditch excavation operations.

Based on the RI sample results and pre-excavation field screening results, a 20-foot section of each drainage ditch was excavated on either side of sediment samples SD013, SD026, SD027, SD033, SD018, and SD019 to a depth of 2-feet as shown in Figure 3-2. A total of 230 cubic yards (CY) of contaminated soil was removed during the ditch excavation operations using a track-mounted excavator. All the excavated soil was staged on the pavement north of AP-11 on plastic and covered for run-off control purposes prior to disposal. Following the excavation operations, confirmation samples were collected to verify removal of the contaminated soils. The ditch excavation operations began at LL-11 on March 20, 2001 and were completed on March 21, 2001.

Table 3-2
RAVENNA ARMY AMMUNITION PLANT
SUMP/SEWER SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-002-0001-SD (sump at AP-5)	LL11SD-003-0001-SD (sump at AP-6)	LL11SD-003-0001-ER (AP-6 sump)	LL11SD-005-0001-SD (sump NW of AP-8)	LL11SD-007-0001 SD (manhole near AP-5, AP-6)	LL11SD-008-0001-SD (manhole SW of AP-8)	LL11SD-009-0001-SD (manhole at AP-14)	LL11SD-010-0001-SD (manhole at AP-8)	LL1SD-011-0001 SD (manhole SE of AP-8)
Sample Date			2-Aug-00	2-Aug-00	2-Aug-00	9-Oct-00	31-Jul-00	1-Aug-00	1-Aug-00	31-Jul-00	1-Aug-00
Explosives 8330 ug/kg											
HMX	0.00	3100.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
RDX	0.00	4.4	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	0.24 ug/L	BRL	BRL	BRL	BRL	BRL	BRL
1,3-Dinitrobenzene	0.00	6.10	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Nitrobenzene	0.00	20.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,4,6-Trinitrtoluene	0.00	16.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Tetryl	0.00	610.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,4-Dinitrotoluene	0.00	120.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,6-Dinitrotoluene	0.00	61.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Nitrotoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4-Nitrtoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
3-Nitrotoluene	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
TAL Metals 6010B mg/kg											
Silver	0.00	390.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aluminum	13900.00	76000.0	9040	9080	BRL	18900	16500	3950	5180	10100	7900
Arsenic	19.50	22.0	**83.2**	**30.4**	BRL	19.4	**69.5**	21.0	9.9	**41.8**	**34.1**
Barium	123.00	5400.0	131	130	BRL	384	240	101	29.0	238	131
Beryllium	0.38	150.0	0.66	0.69	BRL	2.6	0.96	0.31	0.35	0.78	0.62
Calcium	5510.00	--	3510	3590	BRL	85500	5140	3190	1150	6080	5960
Cadmium	0.00	37.0	1.8	0.54	BRL	20.2	1.3	0.20	0.09	0.30	0.45
Cobolt	9.10	4700.0	7.4	10.7	BRL	23.6	18.0	7.5	4.4	12.5	12.8
Chromium	18.10	210.0	24.8	13.2	BRL	81.8	30.5	5.3	7.6	13.5	11.2
Copper	27.60	2900.0	602	38.4	BRL	1100	330	8.7	10.1	30.9	19.4
Iron	28200.00	23000.0	20500	21400	BRL	**43300**	**82600**	10900	11200	**32200**	**28400**
Mercury	0.06	23.0	0.28	BRL	BRL	BRL	0.44	BRL	0.12	0.15	BRL
Potassium	1950.00	--	1110	1030	BRL	1690	2360	498	611.0	1470	907
Magnesium	2760.00	--	2270	2190	BRL	19000	3560	1120	1220	2400	1900
Manganese	1950.00	1800.0	**2470**	**9940**	BRL	1060	**4040**	**9230**	173.0	**16700**	**19900**
Sodium	112.00	--	151	181	BRL	774	1560	BRL	BRL	1050	BRL
Nickel	17.70	1600.00	16.0	16.5	BRL	58.8	29.2	10.5	8.2	21.7	18.2
Lead	27.40	400.0	**16100**	**3910**	BRL	**37000**	**1770**	23.6	35.7	**693**	64.8
Antimony	0.00	31.0	BRL	0.87	BRL	16.8	BRL	0.18	0.36	BRL	BRL
Selenium	1.70	390.0	BRL	BRL	BRL	5.1	BRL	BRL	6.0	BRL	BRL
Thallium	0.89	5.2	BRL	BRL	BRL	BRL	BRL	0.14	0.11	0.18	0.20
Vanadium	26.10	550.0	16.6	17.5	BRL	13.8	55.7	7.3	9.8	21.5	14.7
Zinc	532.00	23000.0	295	111	BRL	2580	286	59.7	43.9	142	117
Cyanide mg/kg											
Cyanide, Total	0.00	0.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
SVOCs TCL 8270 C ug/kg											
1,4-Dichlorobenzene	0.00	3.40	NT	NT	NT	**980 (J)**	NT	NT	NT	NT	NT
2,4-Dimethylphenol	0.00	1200.00	NT	NT	NT	**2000**	NT	NT	NT	NT	NT
Acenaphthene	0.00	3700.00	NT	NT	NT	1900 (J)	NT	NT	NT	NT	NT
Fluorene	0.00	2600.00	NT	NT	NT	1900	NT	NT	NT	NT	NT
Phenanthrene	0.00	--	NT	NT	NT	17000	NT	NT	NT	NT	NT
Anthracene	0.00	22000.00	NT	NT	NT	4300	NT	NT	NT	NT	NT
Di-n-butylphthalate	0.00	6100.00	NT	NT	NT	**900 (J)**	NT	NT	NT	NT	NT
Fluoranthene	0.00	2300.00	NT	NT	NT	**21000**	NT	NT	NT	NT	NT
Pyrene	0.00	2300.00	NT	NT	NT	**22000**	NT	NT	NT	NT	NT
Benzo(a)anthracene	0.00	0.62	NT	NT	NT	**18000**	NT	NT	NT	NT	NT
Crysene	0.00	62.00	NT	NT	NT	**17000**	NT	NT	NT	NT	NT
bis(2-Ethylhexyl)phthalate	0.00	35.00	NT	NT	NT	**5300**	NT	NT	NT	NT	NT
Benzo(k)fluoranthene	0.00	6.20	NT	NT	NT	**17000**	NT	NT	NT	NT	NT
Benzo(b)fluoranthene	0.00	0.62	NT	NT	NT	**13000**	NT	NT	NT	NT	NT
Benzo(a)pyrene	0.00	0.062	NT	NT	NT	**16000**	NT	NT	NT	NT	NT
Indeno(1,2,3-cd)pyrene	0.00	0.62	NT	NT	NT	**7900**	NT	NT	NT	NT	NT
Dibenzo(a,h)anthracene	0.00	0.062	NT	NT	NT	**3800**	NT	NT	NT	NT	NT
Benzo(g,h,I)pyrlene	0.00	--	NT	NT	NT	8000	NT	NT	NT	NT	NT
Carbazole	0.00	24.00	NT	NT	NT	**1800 (J)**	NT	NT	NT	NT	NT
Dibenzofuran	0.00	290.00	NT	NT	NT	**800 (J)**	NT	NT	NT	NT	NT
Inorganics mg/kg											
Nitrate, as N	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Sulfide	0.00	--	2890	1170	BRL	1540	BRL	50.4	609	161	86.2
Sulfate	0.00	--	720	BRL	BRL	192	BRL	BRL	334	BRL	174

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS
(B) = result is < CRDL/RL, but > IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS
(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Table 3-3
RAVENNA ARMY AMMUNITION PLANT
DITCH SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Surface Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-013-0001-SD (Soil)	LL11SD-013-0001-FD (Soil)	LL11SD-013-0001-ER	LL11SD-014-0001-SD (Soil)	LL11SD-015-0001-SD (Soil)	LL11SD-016-0001-SD (Soil)	LL11SD-017-0001-SD (Sediment)	LL11SD-017-0001-FD (Sediment)	LL11SD-017-0001-ER	LL11SD-017-0001-TB
Sample Date				15-Nov-00	15-Nov-00	15-Nov-00	14-Nov-00	14-Nov-00	14-Nov-00	15-Nov-00	15-Nov-00	15-Nov-00	15-Nov-00
Explosives 8330 ug/kg													
HMX	0.00	0.00	3100.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
RDX	0.00	0.00	4.4	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
1,3,5-Trinitrotoluene	0.00	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
1,3-Dinitrobenzene	0.00	0.00	6.10	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Nitrobenzene	0.00	0.00	20.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,4,6-Trinitrtoluene	0.00	0.00	16.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Tetryl	0.00	0.00	610.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,4-Dinitrotoluene	0.00	0.00	120.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,6-Dinitrotoluene	0.00	0.00	61.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2-Nitrotoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
4-Nitrtoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
3-Nitrotoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
TAL Metals 6010B mg/kg													
Silver	0.00	0.00	390.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Aluminum	13900.00	17700.00	76000.0	14800	14400	BRL	12500	8640	11800	10700	10300	BRL	NT
Arsenic	19.50	15.40	0.39	**30.0**	**26.2**	BRL	**12.7**	**9.7**	**14.1**	**21.1**	**11.9**	BRL	NT
Barium	123.00	88.40	5400.0	70.5	71.6	BRL	98.1	48.5	74.5	90.6	89.3	BRL	NT
Beryllium	0.38	0.88	150.0	0.93	0.81	BRL	0.68	0.52	0.71	0.69	0.61	BRL	NT
Calcium	5510.00	15800.00	--	2410	2390	134 ug/L	1940	1790	18100	2730	2630	BRL	NT
Cadmium	0.00	0.00	37.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Cobalt, Total	9.10	10.40	4700.0	14.3	12.5	BRL	13.9	8.1	11.8	9.5	9.5	BRL	NT
Chromium	18.10	17.40	210.0	21.7	19.6	BRL	14.6	12.3	17.2	15.5	14.0	BRL	NT
Copper	27.60	17.70	2900.0	24.5	22.0	BRL	11.3	15.0	19.6	15.9	15.3	BRL	NT
Iron	28200.00	23100.00	23000.0	**30500**	**27100**	BRL	19500	18600	**23900**	**23300**	20700	BRL	NT
Mercury	0.06	0.04	23.0	0.07	BRL	BRL	0.05	BRL	BRL	BRL	BRL	BRL	NT
Potassium	1950.00	927.00	--	1100	1200	BRL	1120	971	1870	1110	1020	BRL	NT
Magnesium	2760.00	3030.00	--	1900	1900	BRL	2220	2050	6390	2160	2110	BRL	NT
Manganese	1950.00	1450.00	1800.0	910	753	BRL	**1930**	302	356	**2020**	**1980**	BRL	NT
Sodium	112.00	123.00	--	BRL	BRL	BRL	807	553	736	BRL	BRL	BRL	NT
Nickel	17.70	21.10	1600.00	24.4	21.5	BRL	14.7	15.3	24.7	14.0	13.4	BRL	NT
Lead	27.40	26.10	400.0	34.8	22.5	BRL	16.2	18.3	20.3	39.8	26.8	BRL	NT
Antimony	0.00	0.96	31.0	0.42	0.46	BRL	BRL	BRL	0.77	BRL	0.42	BRL	NT
Selenium	1.70	1.40	390.0	0.93	0.63	BRL	0.59	0.69	BRL	BRL	1.9	BRL	NT
Thallium	0.89	0.00	5.2	BRL	0.27	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Vanadium	26.10	31.10	550.0	20.4	21.1	BRL	24.4	16.9	21.4	22.2	19.9	BRL	NT
Zinc	532.00	61.80	23000.0	263	235	BRL	53.0	73.3	63.4	64.3	63.4	BRL	NT
SVOCs TCL 8270 C ug/kg													
Phenanthrene	0.00	150.00	--	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Fluoranthene	0.00	290.00	2300.0	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Pyrene	0.00	230.00	2300.0	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Benzo(a)anthracene	0.00	110.00	0.62	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Chrysene	0.00	120.00	62.0	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
bis(2-Ethylhexyl)phthalate	0.00	47.00	35	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Benzo(b)fluoranthene	0.00	140.00	0.62	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Benzo(k)flouranthene	0.00	54.00	6.2	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Benzo(a)pyrene	0.00	100.00	0.062	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Indeno(1,2,3-cd)pyrene	0.00	54.00	0.62	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Benzo(g,h,i)perylene	0.00	51.00	--	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	NT
Propellants 8330 mg/kg													
Nitroglycerin	0.00	0.00	35.0	NT	NT	NT	NT	NT	NT	ND	ND	ND	NT
Nitroguanidine	0.00	0.00	6100.0	NT	NT	NT	NT	NT	NT	ND	ND	ND	NT
Nitrocellulose	0.00	0.00	--	NT	NT	NT	NT	NT	NT	1.8 (B)	ND	ND	NT

Table 3-3
RAVENNA ARMY AMMUNITION PLANT
DITCH SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Surface Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-013-0001-SD (Soil)	LL11SD-013-0001-FD (Soil)	LL11SD-013-0001-ER	LL11SD-014-0001-SD (Soil)	LL11SD-015-0001-SD (Soil)	LL11SD-016-0001-SD (Soil)	LL11SD-017-0001-SD (Sediment)	LL11SD-017-0001-FD (Sediment)	LL11SD-017-0001-ER	LL11SD-017-0001-TB
Sample Date				15-Nov-00	15-Nov-00	15-Nov-00	14-Nov-00	14-Nov-00	14-Nov-00	15-Nov-00	15-Nov-00	15-Nov-00	15-Nov-00
Cyanide mg/kg													
Cyanide, Total	0.00	0.00	11.0	BRL	BRL	13.0 ug/L	BRL	BRL	0.35	BRL	BRL	BRL	NT
VOCs TCL 8260B ug/kg													
Acetone	0.00	0.00	1600.0	NT	NT	NT	NT	NT	NT	30	28	BRL	BRL
Toluene	0.00	0.00	520.0	NT	NT	NT	NT	NT	NT	BRL	BRL	BRL	BRL
Pesticides 8081A ug/kg													
alpha-BHC	0.00	0.00	0.09	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
beta-BHC	0.00	0.00	0.32	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
delta-BHC	0.00	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
gamma-BHC (Lindane)	0.00	0.00	0.44	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Heptachlor	0.00	0.00	0.11	NT	BRL	BRL	NT	NT	NT	BRL	BRL	0.064 ug/L	NT
Aldrin	0.00	0.00	0.029	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Heptachlor epoxide	0.00	0.00	0.053	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Endosulfan I	0.00	0.00	370.0	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Dieldrin	0.00	0.00	0.03	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
4,4-DDE	0.00	0.00	1.7	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Endosulfan II	0.00	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
4,4-DDD	0.00	0.00	2.4	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Endrin	0.00	0.00	18.0	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Endosulfan sulfate	0.00	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
4,4-DDT	0.00	0.00	1.7	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Methoxychlor	0.00	0.00	310.0	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Endrin ketone	0.00	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Endrin aldehyde	0.00	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
alpha-Chlordane	0.00	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
gamma-Chlordane	0.00	0.00	1.6	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Toxaphene	0.00	0.00	0.44	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
PCB TCL 8082 ug/kg													
Aroclor-1016	0.00	0.00	3.90	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Aroclor-1221	0.00	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Aroclor-1232	0.00	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Aroclor-1242	0.00	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Aroclor-1248	0.00	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Aroclor-1254	0.00	0.00	0.22	NT	BRL	BRL	NT	NT	NT	56	37	BRL	NT
Aroclor-1260	0.00	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL	BRL	BRL	NT
Inorganics mg/kg													
Nitrate, as N	0.00	0.00	--	BRL	BRL	BRL	3.0	BRL	0.69	BRL	BRL	BRL	NT
Sulfide	0.00	0.00	--	82.1	82.5	BRL	79.7	58	68.2	210	137	BRL	NT
Sulfate	0.00	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	252	76.4	BRL	NT
Grain Size													
Maximum Particle Size	0.00	0.00	--	NT	NT	NT	NT	NT	NT	9.5 mm	9.5 mm	NT	NT
TOC mg/kg													
TOC	0.00	24000.00	--	NT	NT	NT	NT	NT	NT	21400	27300	NT	NT

** = Only detected compounds listed

-- = Data not available

BRL = Below Reporting Limit

ND = Not detected

NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but≥ IDL/MDL

PRGs = Preliminary Remediation Goals

mg/kg = milligrams per kilogram (parts per million - ppm)

ug/L = micrograms per Liter (parts per billion - ppb)

= concentration greater than background

BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL

(J) = Result is an estimated value below the RL

(A) = Concentration exceeds the instrument calibration range or below the RL

Table 3-3
RAVENNA ARMY AMMUNITION PLANT
DITCH SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Surface Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-018-0001-SD (Sediment)	LL11SD-019-0001-SD (Sediment)	LL11SD-020-0001-FD (Soil)	LL11SD-021-0001-SD (Sediment)	LL11SD-022-0001-SD (Soil)	LL11SD-023-0001-SD (Soil)	LL11SD-024-0001-SD (Sediment)	LL11SD-025-0001-SD (Soil)	LL11SD-026-0001-SD (Sediment)	LL11SD-027-0001 SD (Sediment)
Sample Date				15-Nov-00	15-Nov-00	15-Nov-00	16-Nov-00	15-Nov-00	15-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	15-Nov-00
Explosives 8330 ug/kg													
HMX	0.00	0.00	3100.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
RDX	0.00	0.00	4.4	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
1,3,5-Trinitrotoluene	0.00	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
1,3-Dinitrobenzene	0.00	0.00	6.10	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Nitrobenzene	0.00	0.00	20.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,4,6-Trinitrtoluene	0.00	0.00	16.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
Tetryl	0.00	0.00	610.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,4-Dinitrotoluene	0.00	0.00	120.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2,6-Dinitrotoluene	0.00	0.00	61.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
2-Nitrotoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
4-Nitrtoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
3-Nitrotoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	NT
TAL Metals 6010B mg/kg													
Silver	0.00	0.00	390.0	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aluminum	13900.00	17700.00	76000.0	7700	12700	6170	4300	10100	13300	15400	13700	11700	13500
Arsenic	19.50	15.40	0.39	**39.4**	**23.7**	**11.4**	**12.8**	**12.5**	**12.7**	**19.5**	**21.0**	**13.4**	**13.9**
Barium	123.00	88.40	5400.0	389	84.7	37.7	48.0	46.7	51.8	111	67.6	59.4	88.1
Beryllium	0.38	0.88	150.0	BRL	0.72	0.41	BRL	0.53	0.46	1.0	0.68	0.49	0.80
Calcium	5510.00	15800.00	--	5120	2230	1780	2960	1240	830	2520	1290	1810	3730
Cadmium	0.00	0.00	37.0	BRL	0.23	BRL	BRL	BRL	BRL	BRL	0.20	BRL	0.92
Cobalt, Total	9.10	10.40	4700.0	13.9	9.4	6.2	5.3	5.6	3.8	14.1	33.8	6.3	11.8
Chromium	18.10	17.40	210.0	14.8	17.2	10.5	7.1	15.3	17.0	21.0	17.5	15.1	20.7
Copper	27.60	17.70	2900.0	16.7	16.2	18.2	13.4	14.3	13.2	21.4	12.1	13.4	26.9
Iron	28200.00	23100.00	23000.0	**48300**	**25300**	17400	12100	21100	**25800**	**27800**	**25400**	20200	**27500**
Mercury	0.06	0.04	23.0	BRL	0.06	0.08	BRL	BRL	BRL	BRL	0.05	BRL	BRL
Potassium	1950.00	927.00	--	854	1170	934	521	1040	831	2010	1320	1130	1820
Magnesium	2760.00	3030.00	--	1920	2470	1740	1340	2190	2220	3630	2510	2400	3660
Manganese	1950.00	1450.00	1800.0	**8280**	565	266	1760	210	63.9	530	1160	285	389
Sodium	112.00	123.00	--	BRL	BRL	BRL	396	BRL	BRL	1060	721	702	BRL
Nickel	17.70	21.10	1600.00	13.8	17.5	13.3	11.1	14.1	11.5	27.7	15.1	14.6	25.1
Lead	27.40	26.10	400.0	119	240	27.2	19.3	10.8	13.0	19.7	33.8	29.2	63.3
Antimony	0.00	0.96	31.0	BRL	BRL	BRL	BRL	BRL	0.30	0.90	0.60	0.63	BRL
Selenium	1.70	1.40	390.0	6.5	1.5	0.64	BRL	0.68	1.1	0.66	1.0	0.68	BRL
Thallium	0.89	0.00	5.2	BRL	BRL	BRL	BRL	0.23	0.21	BRL	0.21	BRL	BRL
Vanadium	26.10	31.10	550.0	18.6	24.0	12.2	8.9	19.9	29.1	30.8	28.0	21.8	25.6
Zinc	532.00	61.80	23000.0	454	184	68.1	47.2	55.8	36.6	79.5	71.2	90.6	137
SVOCs TCL 8270 C ug/kg													
Phenanthrene	0.00	150.00	--	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Fluoranthene	0.00	290.00	2300.0	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Pyrene	0.00	230.00	2300.0	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Benzo(a)anthracene	0.00	110.00	0.62	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Chrysene	0.00	120.00	62.0	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
bis(2-Ethylhexyl)phthalate	0.00	47.00	35	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Benzo(b)fluoranthene	0.00	140.00	0.62	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Benzo(k)flouranthene	0.00	54.00	6.2	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Benzo(a)pyrene	0.00	100.00	0.062	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Indeno(1,2,3-cd)pyrene	0.00	54.00	0.62	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Benzo(g,h,i)perylene	0.00	51.00	--	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Propellants 8330 mg/kg													
Nitroglycerin	0.00	0.00	35.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Nitroguanidine	0.00	0.00	6100.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Nitrocellulose	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

Table 3-3
RAVENNA ARMY AMMUNITION PLANT
DITCH SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Surface Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-018-0001-SD (Sediment)	LL11SD-019-0001-SD (Sediment)	LL11SD-020-0001-FD (Soil)	LL11SD-021-0001-SD (Sediment)	LL11SD-022-0001-SD (Soil)	LL11SD-023-0001-SD (Soil)	LL11SD-024-0001-SD (Sediment)	LL11SD-025-0001-SD (Soil)	LL11SD-026-0001-SD (Sediment)	LL11SD-027-0001-SD (Sediment)
Sample Date				15-Nov-00	15-Nov-00	15-Nov-00	16-Nov-00	15-Nov-00	15-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	15-Nov-00
Cyanide mg/kg													
Cyanide, Total	0.00	0.00	11.0	2.2	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
VOCs TCL 8260B ug/kg													
Acetone	0.00	0.00	1600.0	BRL	NT	NT	NT	NT	NT	NT	NT	NT	50
Toluene	0.00	0.00	520.0	BRL	NT	NT	NT	NT	NT	NT	NT	NT	BRL
Pesticides 8081A ug/kg													
alpha-BHC	0.00	0.00	0.09	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
beta-BHC	0.00	0.00	0.32	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
delta-BHC	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
gamma-BHC (Lindane)	0.00	0.00	0.44	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Heptachlor	0.00	0.00	0.11	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aldrin	0.00	0.00	0.029	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Heptachlor epoxide	0.00	0.00	0.053	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endosulfan I	0.00	0.00	370.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Dieldrin	0.00	0.00	0.03	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4,4-DDE	0.00	0.00	1.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endosulfan II	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4,4-DDD	0.00	0.00	2.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endrin	0.00	0.00	18.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endosulfan sulfate	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
4,4-DDT	0.00	0.00	1.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Methoxychlor	0.00	0.00	310.0	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endrin ketone	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Endrin aldehyde	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
alpha-Chlordane	0.00	0.00	--	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
gamma-Chlordane	0.00	0.00	1.6	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Toxaphene	0.00	0.00	0.44	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
PCB TCL 8082 ug/kg													
Aroclor-1016	0.00	0.00	3.90	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Aroclor-1221	0.00	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Aroclor-1232	0.00	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Aroclor-1242	0.00	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Aroclor-1248	0.00	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Aroclor-1254	0.00	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Aroclor-1260	0.00	0.00	0.22	NT	NT	NT	NT	NT	NT	NT	NT	BRL	NT
Inorganics mg/kg													
Nitrate, as N	0.00	0.00	--	BRL	BRL	BRL	BRL	1.3	BRL	BRL	BRL	BRL	BRL
Sulfide	0.00	0.00	--	276	90.3	48.0	540	51.5	76.0	43.4	45.3	BRL	247
Sulfate	0.00	0.00	--	593	BRL	BRL	248	BRL	BRL	BRL	BRL	BRL	BRL
Grain Size													
Maximum Particle Size	0.00	0.00	--	9.5 mm	NT	NT	Coarse Sand	NT	NT	19 mm	NT	NT	Medium Sand
TOC mg/kg													
TOC	0.00	24000.00	--	46000	NT	NT	17600	NT	NT	5390	NT	NT	19000

** = Only detected compounds listed

-- = Data not available

BRL = Below Reporting Limit

ND = Not detected

NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals

mg/kg = milligrams per kilogram (parts per million - ppm)

ug/L = micrograms per Liter (parts per billion - ppb)

= concentration greater than background

BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL

(J) = Result is an estimated value below the RL

(A) = Concentration exceeds the instrument calibration range or below the RL

Table 3-3
RAVENNA ARMY AMMUNITION PLANT
DITCH SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Surface Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-028-0001-SD (Sediment)	LL11SD-029-0001-SD (Soil)	LL11SD-029-0001-FD (Soil)	LL11SD-029-0001-ER	LL11SD-029-0001-TB	LL11SD-030-0001-SD (Sediment)	LL11SD-031-0001-SD (Soil)	LL11SD-032-0001-SD (Soil)	LL11SD-033-0001-SD (Soil)
Sample Date				15-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	15-Nov-00	16-Nov-00
Explosives 8330 ug/kg												
HMX	0.00	0.00	3100.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
RDX	0.00	0.00	4.4	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
1,3,5-Trinitrotoluene	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
1,3-Dinitrobenzene	0.00	0.00	6.10	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Nitrobenzene	0.00	0.00	20.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2,4,6-Trinitrtoluene	0.00	0.00	16.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Tetryl	0.00	0.00	610.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2,4-Dinitrotoluene	0.00	0.00	120.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2,6-Dinitrotoluene	0.00	0.00	61.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
2-Nitrotoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
4-Nitrtoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
3-Nitrotoluene	0.00	0.00	370.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
TAL Metals 6010B mg/kg												
Silver	0.00	0.00	390.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Aluminum	13900.00	17700.00	76000.0	11400	11000	15400	BRL	NT	21400	15500	12800	14600
Arsenic	19.50	15.40	0.39	**9.0**	**18.2**	**9.3**	BRL	NT	**11.9**	**21.1**	**17.2**	**15.4**
Barium	123.00	88.40	5400.0	80.4	61.0	86.3	BRL	NT	159	66.9	64.2	92.2
Beryllium	0.38	0.88	150.0	BRL	0.64	0.84	BRL	NT	BRL	0.69	0.69	1.1
Calcium	5510.00	15800.00	--	3460	5670	3510	BRL	NT	6490	2030	20900	3990
Cadmium	0.00	0.00	37.0	0.60	BRL	BRL	BRL	NT	BRL	BRL	0.20	0.26
Cobalt, Total	9.10	10.40	4700.0	5.4	9.4	11.1	BRL	NT	11.5	9.6	11.5	8.4
Chromium	18.10	17.40	210.0	15.0	16.4	20.9	BRL	NT	26.2	19.9	18.3	17.2
Copper	27.60	17.70	2900.0	20.4	17.7	20.9	BRL	NT	32.7	18.0	20.9	13.7
Iron	28200.00	23100.00	23000.0	17800	22200	**26900**	64.3 ug/L	NT	**24900**	**25400**	**24100**	**25100**
Mercury	0.06	0.04	23.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	BRL
Potassium	1950.00	927.00	--	1520	1580	2530	BRL	NT	2240	1830	2520	1810
Magnesium	2760.00	3030.00	--	2210	3510	4440	BRL	NT	4260	3300	5960	3270
Manganese	1950.00	1450.00	1800.0	129	285	367	BRL	NT	311	294	394	1020
Sodium	112.00	123.00	--	BRL	746	864	BRL	NT	1450	796	832	852
Nickel	17.70	21.10	1600.00	14.7	22.0	27.5	BRL	NT	31.1	20.0	29.2	18.1
Lead	27.40	26.10	400.0	48.7	15.6	14.0	BRL	NT	47.6	20.7	13.6	23.3
Antimony	0.00	0.96	31.0	BRL	0.43	BRL	BRL	NT	BRL	0.50	BRL	0.49
Selenium	1.70	1.40	390.0	1.2	0.62	BRL	BRL	NT	BRL	0.55	BRL	0.51
Thallium	0.89	0.00	5.2	BRL	0.16	BRL	BRL	NT	BRL	0.21	0.26	BRL
Vanadium	26.10	31.10	550.0	19.1	20.1	26.4	BRL	NT	35.6	30.7	21.6	27.8
Zinc	532.00	61.80	23000.0	465	60.5	62.3	BRL	NT	202	60.8	90.5	93.1
SVOCs TCL 8270 C ug/kg												
Phenanthrene	0.00	150.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Fluoranthene	0.00	290.00	2300.0	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Pyrene	0.00	230.00	2300.0	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Benzo(a)anthracene	0.00	110.00	0.62	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Chrysene	0.00	120.00	62.0	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
bis(2-Ethylhexyl)phthalate	0.00	47.00	35	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Benzo(b)fluoranthene	0.00	140.00	0.62	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Benzo(k)flouranthene	0.00	54.00	6.2	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Benzo(a)pyrene	0.00	100.00	0.062	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Indeno(1,2,3-cd)pyrene	0.00	54.00	0.62	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Benzo(g,h,i)perylene	0.00	51.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Propellants 8330 mg/kg												
Nitroglycerin	0.00	0.00	35.0	NT	ND	ND	ND	NT	NT	NT	ND	NT
Nitroguanidine	0.00	0.00	6100.0	NT	ND	ND	ND	NT	NT	NT	ND	NT
Nitrocellulose	0.00	0.00	--	NT	0.91 (B)	0.97 (B)	ND	NT	NT	NT	1.1 (B)	NT

Table 3-3
RAVENNA ARMY AMMUNITION PLANT
DITCH SEDIMENT RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Sediment Background Criteria mg/kg	Surface Soil Background Criteria (0-1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SD-028-0001-SD (Sediment)	LL11SD-029-0001-SD (Soil)	LL11SD-029-0001-FD (Soil)	LL11SD-029-0001-ER	LL11SD-029-0001-TB	LL11SD-030-0001-SD (Sediment)	LL11SD-031-0001-SD (Soil)	LL11SD-032-0001-SD (Soil)	LL11SD-033-0001-SD (Soil)
Sample Date				15-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	15-Nov-00	16-Nov-00
Cyanide mg/kg												
Cyanide, Total	0.00	0.00	11.0	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL	4.2
VOCs TCL 8260B ug/kg												
Acetone	0.00	0.00	1600.0	31	BRL	BRL	BRL	BRL	NT	NT	BRL	NT
Toluene	0.00	0.00	520.0	19	BRL	BRL	BRL	BRL	NT	NT	BRL	NT
Pesticides 8081A ug/kg												
alpha-BHC	0.00	0.00	0.09	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
beta-BHC	0.00	0.00	0.32	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
delta-BHC	0.00	0.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
gamma-BHC (Lindane)	0.00	0.00	0.44	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Heptachlor	0.00	0.00	0.11	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aldrin	0.00	0.00	0.029	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Heptachlor epoxide	0.00	0.00	0.053	NT	BRL	BRL	BRL	NT	NT	NT	0.98	NT
Endosulfan I	0.00	0.00	370.0	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Dieldrin	0.00	0.00	0.03	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
4,4-DDE	0.00	0.00	1.7	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Endosulfan II	0.00	0.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
4,4-DDD	0.00	0.00	2.4	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Endrin	0.00	0.00	18.0	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Endosulfan sulfate	0.00	0.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
4,4-DDT	0.00	0.00	1.7	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Methoxychlor	0.00	0.00	310.0	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Endrin ketone	0.00	0.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Endrin aldehyde	0.00	0.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
alpha-Chlordane	0.00	0.00	--	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
gamma-Chlordane	0.00	0.00	1.6	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Toxaphene	0.00	0.00	0.44	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
PCB TCL 8082 ug/kg												
Aroclor-1016	0.00	0.00	3.90	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aroclor-1221	0.00	0.00	0.22	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aroclor-1232	0.00	0.00	0.22	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aroclor-1242	0.00	0.00	0.22	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aroclor-1248	0.00	0.00	0.22	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aroclor-1254	0.00	0.00	0.22	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Aroclor-1260	0.00	0.00	0.22	NT	BRL	BRL	BRL	NT	NT	NT	BRL	NT
Inorganics mg/kg												
Nitrate, as N	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	0.92	BRL	3.8
Sulfide	0.00	0.00	--	975	BRL	37.4	BRL	NT	431	42.8	BRL	113
Sulfate	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	4220	BRL	BRL	BRL
Grain Size												
Maximum Particle Size	0.00	0.00	--	Coarse Sand	NT	NT	NT	NT	Medium Sand	NT	NT	NT
TOC mg/kg												
TOC	0.00	24000.00	--	34400	NT	NT	NT	NT	57200	NT	NT	NT

** = Only detected compounds listed

-- = Data not available

BRL = Below Reporting Limit

ND = Not detected

NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals

mg/kg = milligrams per kilogram (parts per million - ppm)

ug/L = micrograms per Liter (parts per billion - ppb)

= concentration greater than background

BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL

(J) = Result is an estimated value below the RL

(A) = Concentration exceeds the instrument calibration range or below the RL

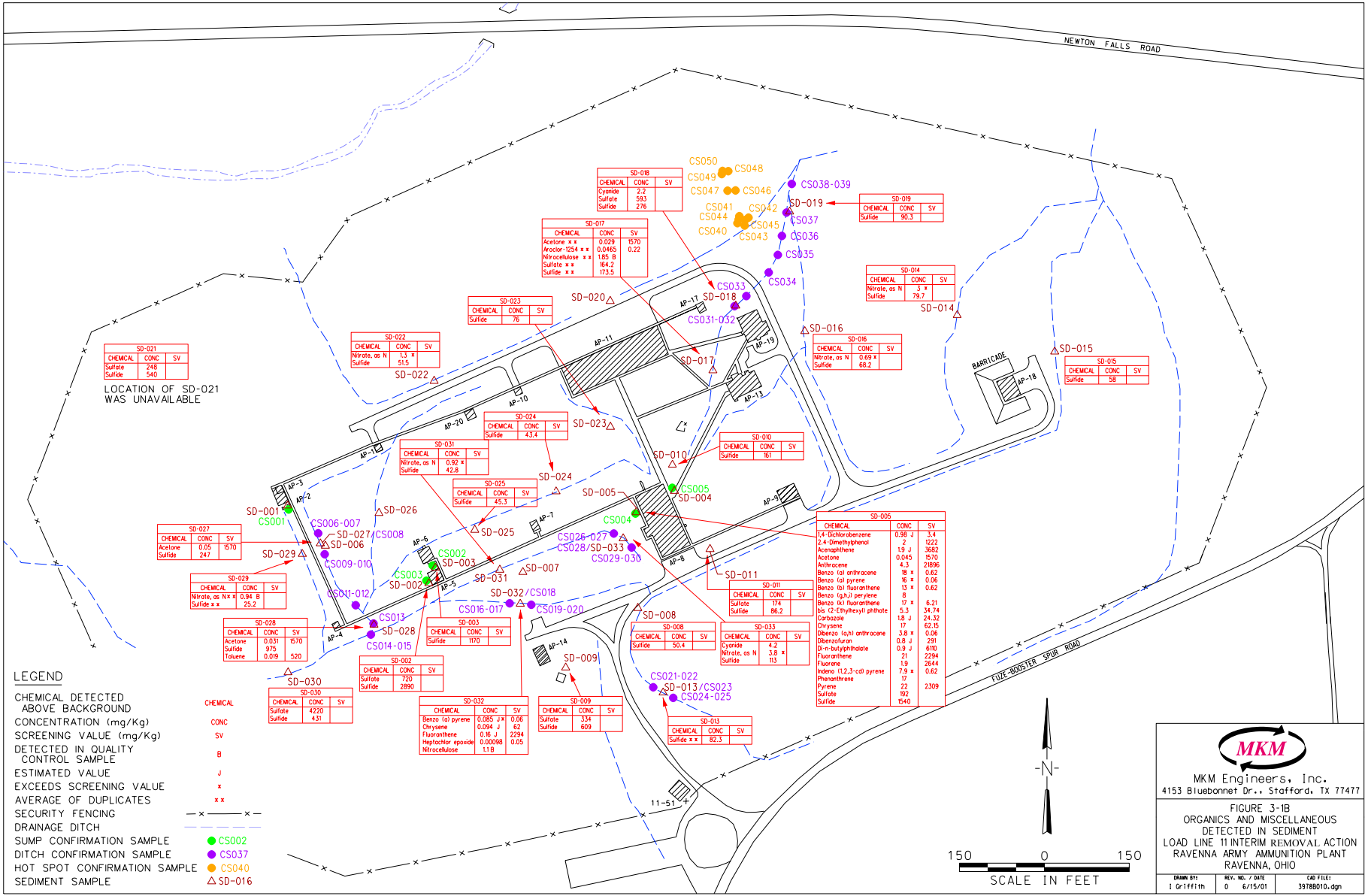

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FIGURE 3-1B
ORGANICS AND MISCELLANEOUS DETECTED IN SEDIMENT
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I Griffith	0 6/15/01	3978B010.dgn

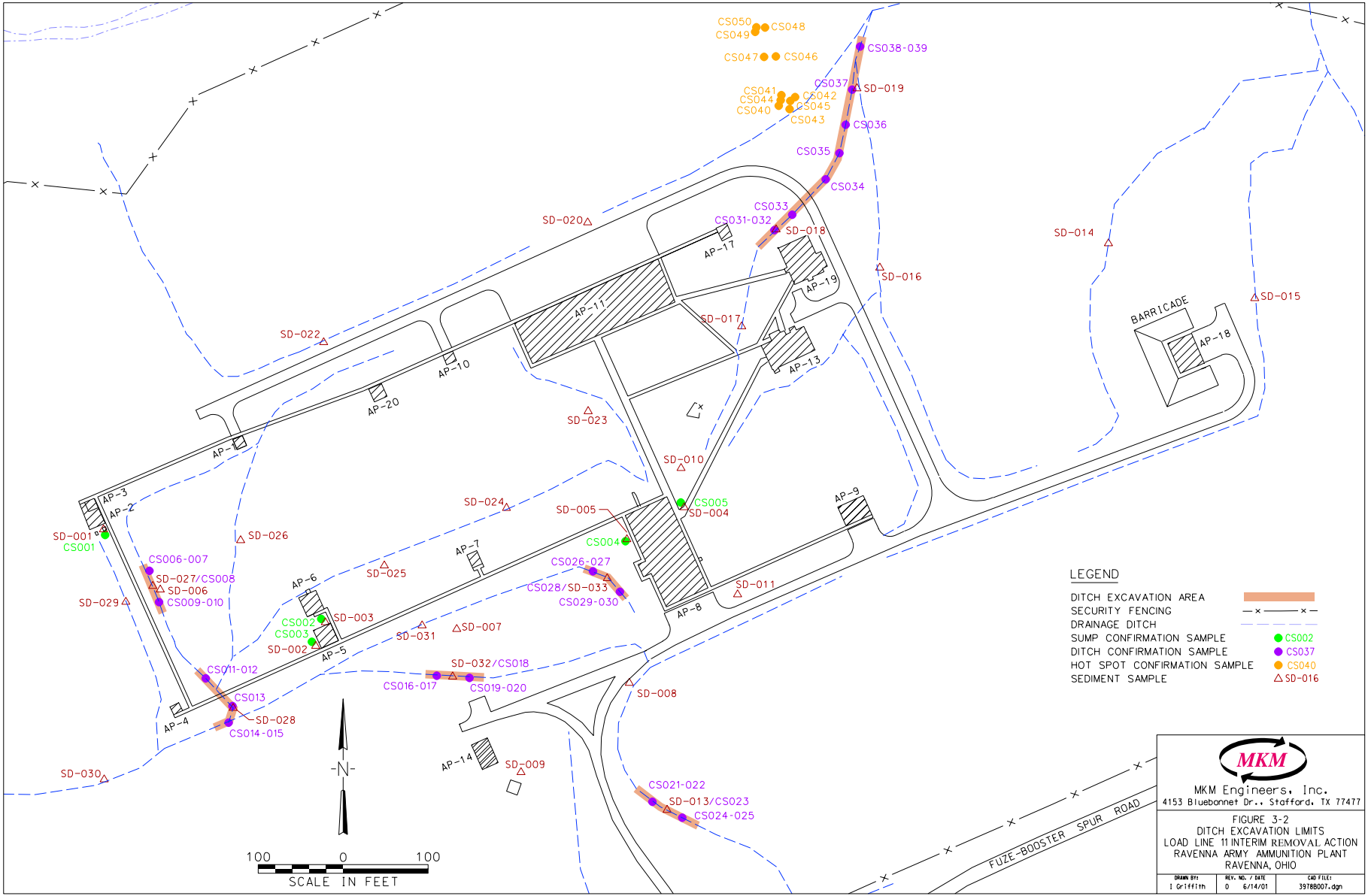

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FIGURE 3-2
DITCH EXCAVATION LIMITS
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I Griffith	0 6/14/01	3978B007.dgn

3.6 Hot Spot Excavation

During the LL-11 November-December 2000 RI, an area of petroleum contaminated soil (Hot Spot) approximately 30 feet long by 30 feet wide and 8 feet deep was identified just north of AP-17 (Figure 3-3). The hot spot was encountered during soil boring operations at SB005a for installation of MW005. As a result of the contamination, MW005 was relocated approximately 50 feet northeast of the original location.

In order to determine the lateral and vertical extent of the contamination, additional soil borings were completed across the area on a grid with 50-foot centers using Geoprobe® direct push technology. Soil samples were collected from the borings at varying depth intervals (2-4 ft., 4-6 ft., 6-8 ft. or 8-10 ft.) and sent to the laboratory for Explosives, TAL Metals, Cyanide, VOCs, and SVOCs analysis. The depth interval sent to the laboratory was selected based upon volatile headspace readings, visual and olfactory observations. Additionally, 10% of these samples were analyzed for Propellants, Pest/PCB, Nitrate, Sulfide and Sulfate analysis.

Based on the Geoprobe® sampling results, the lateral extent of the hot spot was delineated to approximately a square shaped area between soil borings SB032, SB033, SB034 and SB035 as shown in Figure 3-3. The vertical extent of the contamination started at 4-feet below ground surface (bgs) and extended to a maximum depth of 8-feet bgs. All of the delineation sampling operations were performed in accordance with the approved Final Sampling and Analysis Plan Addendum for the Interim Removal Actions at LL-11 (AOC 44), dated January 2, 2001. A summary of the hot spot delineation samples is provided in Table 3-4.

Excavation operations began March 22, 2001 and were completed the same day. A total of 130 CY of petroleum contaminated soil was excavated using a track-mounted excavator. The excavated soil was stockpiled on the pavement north of AP-11 for subsequent waste characterization sampling and disposal. All excavated soils were placed on plastic and covered to control run-off. Since laboratory and field screening analysis indicated that the volatile compound contamination did not begin until 4 feet bgs, the top 4 feet of the excavation was staged separately for reuse at LL-11. Following the excavation operations, confirmation samples were collected to verify effective removal of the petroleum-contaminated soils. All excavation activities were conducted in compliance with the Ohio Administrative Code 3745-27-13 (OAC Rule 13).

3.7 Test Trench Excavations

An area of high magnetometer readings was encountered, N-NW of the hot spot, while clearing the excavation area for the hot spot, by the UXO technicians. During the excavation of the hot spot, it was determined that the area needed to be assessed for unexploded ordnance. It was determined that the area(s) needed subsurface examination by the UXO technicians.

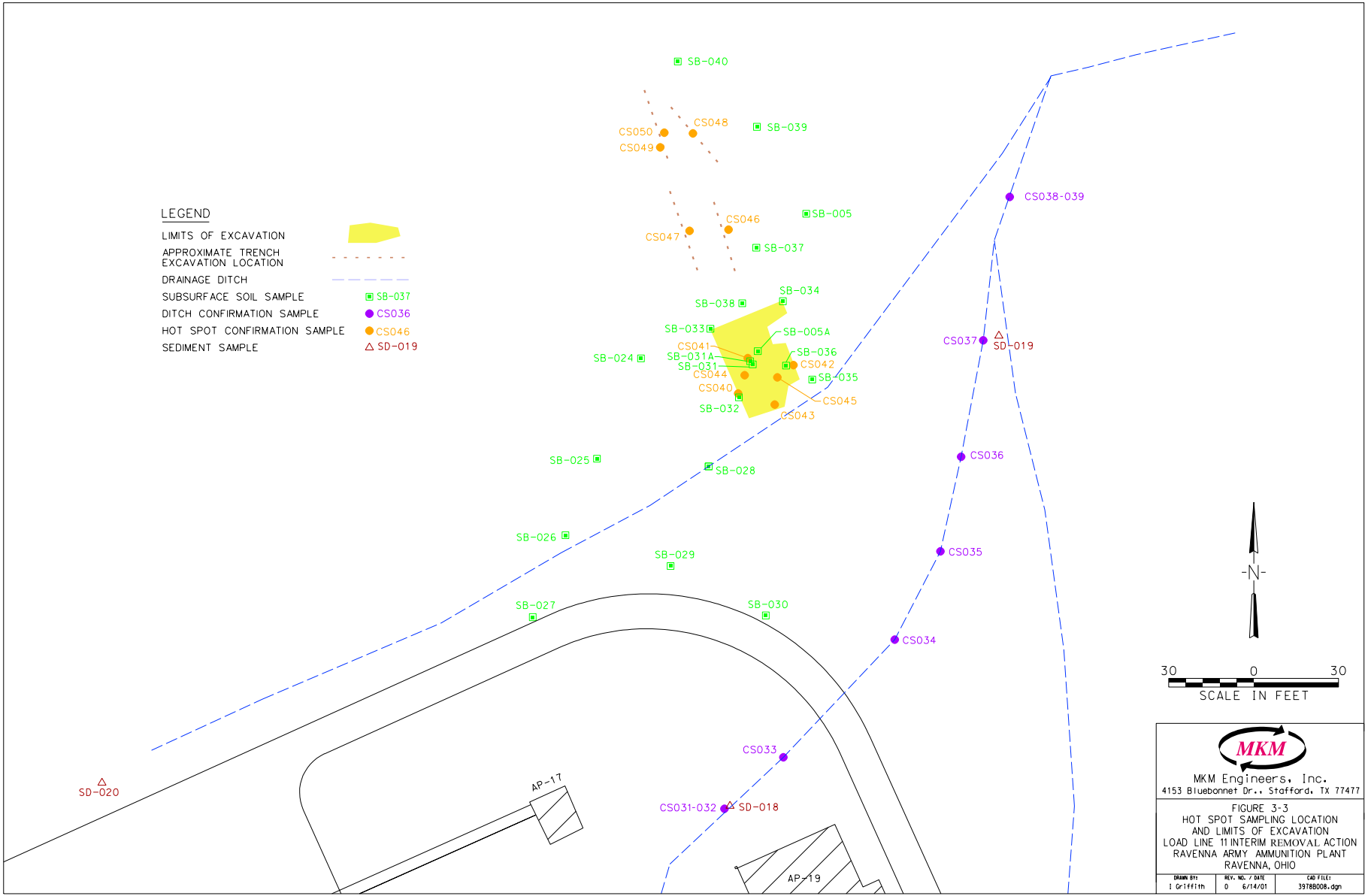

LEGEND
LIMITS OF EXCAVATION
APPROXIMATE TRENCH EXCAVATION LOCATION
DRAINAGE DITCH
SUBSURFACE SOIL SAMPLE SB-037
DITCH CONFIRMATION SAMPLE CS036
HOT SPOT CONFIRMATION SAMPLE CS046
SEDIMENT SAMPLE SD-019
SB-040
CS048
SB-039
CS050
CS049
CS046
SB-005
CS047
SB-037
SB-034
SB-038
SB-033
SB-005A
CS041
SB-036
SB-024
SB-031A
CS042
SB-031
CS044
SB-035
CS040
CS045
SB-032
CS043
SB-025
SB-028
SB-026
SB-029
SB-027
SB-030
AP-17
AP-19
SD-020
CS031-032
SD-018
CS033
CS034
CS035
CS036
CS037
SD-019
CS038-039
-N-
30 0 30
SCALE IN FEET
MKM
MKM Engineers, Inc.
4153 Bluebonnet Dr., Stafford, TX 77477
FIGURE 3-3
HOT SPOT SAMPLING LOCATION
AND LIMITS OF EXCAVATION
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
DRAWN BY: I Griffith
REV. NO. / DATE: 0 6/14/01
CAD FILE: 39788008.dgn

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-024-0001-SO	LL11SB-025-0001-SO	LL11SB-026-0001-SO	LL11SB-027-0001-SO	LL11SB-027-0001-FD	LL11SB-028-0001-SO	LL11SB-029-0001-SO
Sample Date			16-Nov-00	17-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00
Explosives 8330 ug/kg									
HMX	0.00	3100.0	NT	NT	NT	NT	NT	NT	NT
RDX	0.00	4.4	NT	NT	NT	NT	NT	NT	NT
1,3,5-Trinitrotoluene	0.00	--	NT	NT	NT	NT	NT	NT	NT
1,3-Dinitrobenzene	0.00	6.10	NT	NT	NT	NT	NT	NT	NT
Nitrobenzene	0.00	20.0	NT	NT	NT	NT	NT	NT	NT
2,4,6-Trinitrtoluene	0.00	16.0	NT	NT	NT	NT	NT	NT	NT
Tetryl	0.00	610.0	NT	NT	NT	NT	NT	NT	NT
2,4-Dinitrotoluene	0.00	120.0	NT	NT	NT	NT	NT	NT	NT
2,6-Dinitrotoluene	0.00	61.0	NT	NT	NT	NT	NT	NT	NT
2-Nitrotoluene	0.00	370.0	NT	NT	NT	NT	NT	NT	NT
4-Nitrtoluene	0.00	370.0	NT	NT	NT	NT	NT	NT	NT
3-Nitrotoluene	0.00	370.0	NT	NT	NT	NT	NT	NT	NT
TAL Metals 6010B mg/kg									
Aluminum	19500.00	76000.0	NT	NT	NT	NT	NT	NT	NT
Antimony	0.96	31.0	NT	NT	NT	NT	NT	NT	NT
Arsenic	19.80	0.39	NT	NT	NT	NT	NT	NT	NT
Barium	124.00	5400.0	NT	NT	NT	NT	NT	NT	NT
Beryllium	0.88	150.0	NT	NT	NT	NT	NT	NT	NT
Cadmium	0.00	37.0	NT	NT	NT	NT	NT	NT	NT
Calcium	35500.00	--	NT	NT	NT	NT	NT	NT	NT
Chromium	27.20	210.0	NT	NT	NT	NT	NT	NT	NT
Cobolt	23.20	4700.0	NT	NT	NT	NT	NT	NT	NT
Copper	32.30	2900.0	NT	NT	NT	NT	NT	NT	NT
Iron	35200.00	23000.0	NT	NT	NT	NT	NT	NT	NT
Lead	19.10	400.0	NT	NT	NT	NT	NT	NT	NT
Magnesium	8790.00	--	NT	NT	NT	NT	NT	NT	NT
Manganese	3030.00	1800.0	NT	NT	NT	NT	NT	NT	NT
Mercury	0.04	23.0	NT	NT	NT	NT	NT	NT	NT
Nickel	60.70	1600.0	NT	NT	NT	NT	NT	NT	NT
Potassium	3350.00	--	NT	NT	NT	NT	NT	NT	NT
Selenium	1.50	390.0	NT	NT	NT	NT	NT	NT	NT
Silver	0.00	390.0	NT	NT	NT	NT	NT	NT	NT
Sodium	145.00	--	NT	NT	NT	NT	NT	NT	NT
Thallium	0.91	5.2	NT	NT	NT	NT	NT	NT	NT
Vanadium	37.60	550.0	NT	NT	NT	NT	NT	NT	NT
Zinc	93.30	23000.0	NT	NT	NT	NT	NT	NT	NT
Cyanide mg/kg									
Cyanide, Total	0.00	11.0	NT	NT	NT	NT	NT	NT	NT
Propellants 8330 mg/kg									
Nitroglycerin	0.00	35.00	NT	NT	NT	NT	NT	NT	NT
Nitroguanidine	0.00	6100.00	NT	NT	NT	NT	NT	NT	NT
Nitrocellulose	0.00	--	NT	NT	NT	NT	NT	NT	NT
VOCs TCL 8260B ug/kg									
Acetone	0.00	1600.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Methylene Chloride	0.00	8.9	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Butanone	0.00	7300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Chloroform	0.00	0.24	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Carbon Tetrachloride	0.00	0.24	BRL	BRL	**1 (J)**	BRL	BRL	BRL	BRL
Trichloroethene	0.00	2.8	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Toluene	0.00	520.00	BRL	BRL	BRL	BRL	2 (J)	BRL	BRL
Xylene	0.00	210.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-024-0001-SO	LL11SB-025-0001-SO	LL11SB-026-0001-SO	LL11SB-027-0001-SO	LL11SB-027-0001-FD	LL11SB-028-0001-SO	LL11SB-029-0001-SO
Sample Date			16-Nov-00	17-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00	16-Nov-00
SVOCs TCL 8270 C ug/kg									
Naphthalene	0.00	56.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Methylnaphthylene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Dibenzofuran	0.00	290.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Fluorene	0.00	2600.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Phenanthrene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Fluoranthene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Pyrene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)anthracene	0.00	0.62	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Crysene	0.00	62.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
bis(2-Ethylhexyl)phthalate	0.00	35.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(b)fluoranthene	0.00	0.62	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(k)flouranthene	0.00	6.20	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)pyrene	0.00	0.062	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Indeno(1,2,3-*cd*)pyrene	0.00	0.62	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(g,h,i)perylene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Diethylpthalate	0.00	49000.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Pesticides 8081A ug/kg									
alpha-BHC	0.00	0.09	NT	NT	NT	NT	NT	NT	NT
beta-BHC	0.00	0.32	NT	NT	NT	NT	NT	NT	NT
delta-BHC	0.00	--	NT	NT	NT	NT	NT	NT	NT
gamma-BHC (Lindane)	0.00	0.44	NT	NT	NT	NT	NT	NT	NT
Heptachlor	0.00	0.11	NT	NT	NT	NT	NT	NT	NT
Aldrin	0.00	0.029	NT	NT	NT	NT	NT	NT	NT
Heptachlor epoxide	0.00	0.053	NT	NT	NT	NT	NT	NT	NT
Endosulfan I	0.00	370.0	NT	NT	NT	NT	NT	NT	NT
Dieldrin	0.00	0.03	NT	NT	NT	NT	NT	NT	NT
4,4-DDE	0.00	1.7	NT	NT	NT	NT	NT	NT	NT
Endosulfan II	0.00	--	NT	NT	NT	NT	NT	NT	NT
4,4-DDD	0.00	2.4	NT	NT	NT	NT	NT	NT	NT
Endrin	0.00	18.0	NT	NT	NT	NT	NT	NT	NT
Endosulfan sulfate	0.00	--	NT	NT	NT	NT	NT	NT	NT
4,4-DDT	0.00	1.7	NT	NT	NT	NT	NT	NT	NT
Methoxychlor	0.00	310.0	NT	NT	NT	NT	NT	NT	NT
Endrin ketone	0.00	--	NT	NT	NT	NT	NT	NT	NT
Endrin aldehyde	0.00	--	NT	NT	NT	NT	NT	NT	NT
alpha-Chlodane	0.00	--	NT	NT	NT	NT	NT	NT	NT
gamma-Chlordane	0.00	1.6	NT	NT	NT	NT	NT	NT	NT
Toxaphene	0.00	0.44	NT	NT	NT	NT	NT	NT	NT
PCB TCL 8082 ug/kg									
Aroclor-1016	0.00	3.90	NT	NT	NT	NT	NT	NT	NT
Aroclor-1221	0.00	0.22	NT	NT	NT	NT	NT	NT	NT
Aroclor-1232	0.00	0.22	NT	NT	NT	NT	NT	NT	NT
Aroclor-1242	0.00	0.22	NT	NT	NT	NT	NT	NT	NT
Aroclor-1248	0.00	0.22	NT	NT	NT	NT	NT	NT	NT
Aroclor-1254	0.00	0.22	NT	NT	NT	NT	NT	NT	NT
Aroclor-1260	0.00	0.22	NT	NT	NT	NT	NT	NT	NT
TPH		BUSTR Soil Saturation Limit for TPH***							
DRO mg/kg	0.00	20000	NT	NT	NT	NT	NT	NT	NT
GRO ug/kg	0.00	10000	NT	NT	NT	NT	NT	NT	NT
Inorganics mg/kg									
Nitrate, as N	0.00	--	NT	NT	NT	NT	NT	NT	NT
Sulfide	0.00	--	NT	NT	NT	NT	NT	NT	NT
Sulfate	0.00	--	NT	NT	NT	NT	NT	NT	NT

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL
(M) = Manually Integrated Compound

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-030-0001-SO	LL11SB-031-0001-SO	LL11SB-032-0001-SO	LL11SB-032-0001-SO (RE)	LL11SB-033-0001-SO	LL11SB-034-0001-SO	LL11SB-035-0001-S0
Sample Date			17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00
Explosives 8330 ug/kg									
HMX	0.00	3100.0	NT	BRL	BRL	NT	NT	NT	BRL
RDX	0.00	4.4	NT	BRL	BRL	NT	NT	NT	BRL
1,3,5-Trinitrotoluene	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
1,3-Dinitrobenzene	0.00	6.10	NT	BRL	BRL	NT	NT	NT	BRL
Nitrobenzene	0.00	20.0	NT	BRL	BRL	NT	NT	NT	BRL
2,4,6-Trinitrtoluene	0.00	16.0	NT	BRL	BRL	NT	NT	NT	BRL
Tetryl	0.00	610.0	NT	BRL	BRL	NT	NT	NT	BRL
2,4-Dinitrotoluene	0.00	120.0	NT	BRL	BRL	NT	NT	NT	BRL
2,6-Dinitrotoluene	0.00	61.0	NT	BRL	BRL	NT	NT	NT	BRL
2-Nitrotoluene	0.00	370.0	NT	BRL	BRL	NT	NT	NT	BRL
4-Nitrtoluene	0.00	370.0	NT	BRL	BRL	NT	NT	NT	BRL
3-Nitrotoluene	0.00	370.0	NT	BRL	BRL	NT	NT	NT	BRL
TAL Metals 6010B mg/kg									
Aluminum	19500.00	76000.0	NT	13000	8540	NT	NT	NT	7490
Antimony	0.96	31.0	NT	BRL	0.41	NT	NT	NT	0.35
Arsenic	19.80	0.39	NT	**13.9**	**17.9**	NT	NT	NT	**11.5**
Barium	124.00	5400.0	NT	58.1	32.3	NT	NT	NT	28.9
Beryllium	0.88	150.0	NT	0.56	0.55	NT	NT	NT	0.43
Cadmium	0.00	37.0	NT	BRL	BRL	NT	NT	NT	BRL
Calcium	35500.00	--	NT	174	365	NT	NT	NT	186
Chromium	27.20	210.0	NT	14.5	12.1	NT	NT	NT	8.5
Cobolt	23.20	4700.0	NT	7.1	7.3	NT	NT	NT	6.0
Copper	32.30	2900.0	NT	14.9	20.4	NT	NT	NT	18.2
Iron	35200.00	23000.0	NT	18900	22600	NT	NT	NT	15600
Lead	19.10	400.0	NT	6.1	6.7	NT	NT	NT	5.3
Magnesium	8790.00	--	NT	2200	1990	NT	NT	NT	1360
Manganese	3030.00	1800.0	NT	238	253	NT	NT	NT	265
Mercury	0.04	23.0	NT	BRL	BRL	NT	NT	NT	BRL
Nickel	60.70	1600.0	NT	14.7	15.7	NT	NT	NT	11.4
Potassium	3350.00	--	NT	1130	921	NT	NT	NT	941
Selenium	1.50	390.0	NT	0.51	0.73	NT	NT	NT	0.61
Silver	0.00	390.0	NT	BRL	BRL	NT	NT	NT	BRL
Sodium	145.00	--	NT	883	744	NT	NT	NT	562
Thallium	0.91	5.2	NT	BRL	BRL	NT	NT	NT	0.14
Vanadium	37.60	550.0	NT	18.5	14.1	NT	NT	NT	13.0
Zinc	93.30	23000.0	NT	45.1	53.0	NT	NT	NT	50.8
Cyanide mg/kg									
Cyanide, Total	0.00	11.0	NT	BRL	BRL	NT	NT	NT	BRL
Propellants 8330 mg/kg									
Nitroglycerin	0.00	35.00	NT	ND	ND	NT	NT	NT	ND
Nitroguanidine	0.00	6100.00	NT	ND	ND	NT	NT	NT	ND
Nitrocellulose	0.00	--	NT	1.5(B)	0.86(B)	NT	NT	NT	0.87(B)
VOCs TCL 8260B ug/kg									
Acetone	0.00	1600.00	BRL	160	BRL	9	BRL	BRL	BRL
Methylene Chloride	0.00	8.9	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Butanone	0.00	7300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Chloroform	0.00	0.24	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Carbon Tetrachloride	0.00	0.24	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Trichloroethene	0.00	2.8	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Toluene	0.00	520.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Xylene	0.00	210.00	BRL	150	BRL	BRL	BRL	BRL	BRL

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-030-0001-SO	LL11SB-031-0001-SO	LL11SB-032-0001-SO	LL11SB-032-0001-SO (RE)	LL11SB-033-0001-SO	LL11SB-034-0001-SO	LL11SB-035-0001-S0
Sample Date			17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00
SVOCs TCL 8270 C ug/kg									
Naphthalene	0.00	56.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
2-Methylnaphthylene	0.00	--	BRL	BRL	BRL	NT	BRL	BRL	BRL
Dibenzofuran	0.00	290.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
Fluorene	0.00	2600.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
Phenanthrene	0.00	--	BRL	BRL	BRL	NT	BRL	BRL	BRL
Fluoranthene	0.00	2300.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
Pyrene	0.00	2300.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
Benzo(a)anthracene	0.00	0.62	BRL	BRL	BRL	NT	BRL	BRL	BRL
Crysene	0.00	62.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
bis(2-Ethylhexyl)phthalate	0.00	35.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
Benzo(b)fluoranthene	0.00	0.62	BRL	BRL	BRL	NT	BRL	BRL	BRL
Benzo(k)flouranthene	0.00	6.20	BRL	BRL	BRL	NT	BRL	BRL	BRL
Benzo(a)pyrene	0.00	0.062	BRL	BRL	BRL	NT	BRL	BRL	BRL
Indeno(1,2,3-*cd*)pyrene	0.00	0.62	BRL	BRL	BRL	NT	BRL	BRL	BRL
Benzo(g,h,i)perylene	0.00	--	BRL	BRL	BRL	NT	BRL	BRL	BRL
Diethylpthalate	0.00	49000.00	BRL	BRL	BRL	NT	BRL	BRL	BRL
Pesticides 8081A ug/kg									
alpha-BHC	0.00	0.09	NT	BRL	BRL	NT	NT	NT	BRL
beta-BHC	0.00	0.32	NT	BRL	BRL	NT	NT	NT	BRL
delta-BHC	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
gamma-BHC (Lindane)	0.00	0.44	NT	BRL	BRL	NT	NT	NT	BRL
Heptachlor	0.00	0.11	NT	BRL	BRL	NT	NT	NT	BRL
Aldrin	0.00	0.029	NT	BRL	BRL	NT	NT	NT	BRL
Heptachlor epoxide	0.00	0.053	NT	BRL	BRL	NT	NT	NT	BRL
Endosulfan I	0.00	370.0	NT	BRL	BRL	NT	NT	NT	BRL
Dieldrin	0.00	0.03	NT	BRL	BRL	NT	NT	NT	BRL
4,4-DDE	0.00	1.7	NT	BRL	BRL	NT	NT	NT	BRL
Endosulfan II	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
4,4-DDD	0.00	2.4	NT	BRL	BRL	NT	NT	NT	BRL
Endrin	0.00	18.0	NT	BRL	BRL	NT	NT	NT	BRL
Endosulfan sulfate	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
4,4-DDT	0.00	1.7	NT	BRL	BRL	NT	NT	NT	BRL
Methoxychlor	0.00	310.0	NT	BRL	BRL	NT	NT	NT	BRL
Endrin ketone	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
Endrin aldehyde	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
alpha-Chlodane	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
gamma-Chlordane	0.00	1.6	NT	BRL	BRL	NT	NT	NT	BRL
Toxaphene	0.00	0.44	NT	BRL	BRL	NT	NT	NT	BRL
PCB TCL 8082 ug/kg									
Aroclor-1016	0.00	3.90	NT	BRL	BRL	NT	NT	NT	BRL
Aroclor-1221	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL
Aroclor-1232	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL
Aroclor-1242	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL
Aroclor-1248	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL
Aroclor-1254	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL
Aroclor-1260	0.00	0.22	NT	BRL	BRL	NT	NT	NT	BRL
TPH		BUSTR Soil Saturation Limit for TPH***							
DRO mg/kg	0.00	20000	NT	NT	NT	NT	NT	NT	NT
GRO ug/kg	0.00	10000	NT	NT	NT	NT	NT	NT	NT
Inorganics mg/kg									
Nitrate, as N	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL
Sulfide	0.00	--	NT	BRL	38.5	NT	NT	NT	BRL
Sulfate	0.00	--	NT	BRL	BRL	NT	NT	NT	BRL

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL
(M) = Manually Integrated Compound

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-035-0001-FD	LL11SB-035-0001-ER	LL11SB-036-0001-S0	LL11SB-036-0001-ER	LL11SB-031a-0001-SO	LL11SB-037-0001-SO	LL11SB-038-0001-SO
Sample Date			17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	13-Mar-01	13-Mar-01	13-Mar-01
Explosives 8330 ug/kg									
HMX	0.00	3100.0	BRL	BRL	NT	NT	NT	BRL	BRL
RDX	0.00	4.4	BRL	BRL	NT	NT	NT	BRL	BRL
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
1,3-Dinitrobenzene	0.00	6.10	BRL	BRL	NT	NT	NT	BRL	BRL
Nitrobenzene	0.00	20.0	BRL	BRL	NT	NT	NT	BRL	BRL
2,4,6-Trinitrtoluene	0.00	16.0	BRL	BRL	NT	NT	NT	BRL	BRL
Tetryl	0.00	610.0	BRL	BRL	NT	NT	NT	BRL	BRL
2,4-Dinitrotoluene	0.00	120.0	BRL	BRL	NT	NT	NT	BRL	BRL
2,6-Dinitrotoluene	0.00	61.0	BRL	BRL	NT	NT	NT	BRL	BRL
2-Nitrotoluene	0.00	370.0	BRL	BRL	NT	NT	NT	BRL	BRL
4-Nitrtoluene	0.00	370.0	BRL	BRL	NT	NT	NT	BRL	BRL
3-Nitrotoluene	0.00	370.0	BRL	BRL	NT	NT	NT	BRL	BRL
TAL Metals 6010B mg/kg									
Aluminum	19500.00	76000.0	7410	BRL	NT	NT	**77500**	6990	7170
Antimony	0.96	31.0	0.40	BRL	NT	NT	BRL	BRL	BRL
Arsenic	19.80	0.39	**13.5**	BRL	NT	NT	**10.9**	**15.4**	**9.8**
Barium	124.00	5400.0	30.5	BRL	NT	NT	25.5	27.0	25.3
Beryllium	0.88	150.0	0.49	BRL	NT	NT	0.37	BRL	BRL
Cadmium	0.00	37.0	BRL	BRL	NT	NT	BRL	BRL	BRL
Calcium	35500.00	--	173	BRL	NT	NT	88.6	297	192
Chromium	27.20	210.0	9.5	13.4 ug/L	NT	NT	10.4	9.4	9.1
Cobolt	23.20	4700.0	7.2	BRL	NT	NT	7.4	5.3	5.8
Copper	32.30	2900.0	22.2	BRL	NT	NT	22.8	16.4	19.5
Iron	35200.00	23000.0	20100	125 ug/L	NT	NT	20600	16200	17800
Lead	19.10	400.0	7.0	BRL	NT	NT	9.0	8.8	11.5
Magnesium	8790.00	--	1680	BRL	NT	NT	1840	1350	1480
Manganese	3030.00	1800.0	248	BRL	NT	NT	213	250	245
Mercury	0.04	23.0	BRL	BRL	NT	NT	BRL	BRL	BRL
Nickel	60.70	1600.0	14.0	BRL	NT	NT	15.8	10.9	11.6
Potassium	3350.00	--	888	BRL	NT	NT	965	695	707
Selenium	1.50	390.0	0.64	BRL	NT	NT	BRL	BRL	0.54
Silver	0.00	390.0	BRL	BRL	NT	NT	BRL	BRL	BRL
Sodium	145.00	--	724	BRL	NT	NT	212	552	631
Thallium	0.91	5.2	0.16	BRL	NT	NT	BRL	BRL	BRL
Vanadium	37.60	550.0	12.9	BRL	NT	NT	13.1	13.5	13.3
Zinc	93.30	23000.0	59.2	BRL	NT	NT	59.3	47.4	47.7
Cyanide mg/kg									
Cyanide, Total	0.00	11.0	BRL	BRL	NT	NT	NT	BRL	BRL
Propellants 8330 mg/kg									
Nitroglycerin	0.00	35.00	ND	ND	NT	NT	NT	ND	ND
Nitroguanidine	0.00	6100.00	ND	ND	NT	NT	NT	ND	ND
Nitrocellulose	0.00	--	1.1(B)	ND	NT	NT	NT	2.0 (J)	1.8 (B)
VOCs TCL 8260B ug/kg									
Acetone	0.00	1600.00	BRL	BRL	12	BRL	BRL	BRL	BRL
Methylene Chloride	0.00	8.9	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Butanone	0.00	7300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Chloroform	0.00	0.24	BRL	0.7ug/L	BRL	0.6ug/L	BRL	BRL	BRL
Carbon Tetrachloride	0.00	0.24	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Trichloroethene	0.00	2.8	BRL	BRL	BRL	0.4 (J)	BRL	BRL	BRL
Toluene	0.00	520.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Xylene	0.00	210.00	BRL	0.3 ug/L(J)	BRL	BRL	BRL	BRL	BRL

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-035-0001-FD	LL11SB-035-0001-ER	LL11SB-036-0001-S0	LL11SB-036-0001-ER	LL11SB-031a-0001-SO	LL11SB-037-0001-SO	LL11SB-038-0001-SO
Sample Date			17-Nov-00	17-Nov-00	17-Nov-00	17-Nov-00	13-Mar-01	13-Mar-01	13-Mar-01
SVOCs TCL 8270 C ug/kg									
Naphthalene	0.00	56.00	BRL	BRL	1800	BRL	1100	BRL	BRL
2-Methylnaphthylene	0.00	--	BRL	BRL	4600	BRL	2500	BRL	BRL
Dibenzofuran	0.00	290.00	BRL	BRL	520	BRL	390 (J)	BRL	BRL
Fluorene	0.00	2600.00	BRL	BRL	420	BRL	420 (M)	BRL	BRL
Phenanthrene	0.00	--	BRL	BRL	1100	BRL	950	BRL	BRL
Fluoranthene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Pyrene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)anthracene	0.00	0.62	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Crysene	0.00	62.00	BRL	BRL	270	BRL	260 (J)	BRL	BRL
bis(2-Ethylhexyl)phthalate	0.00	35.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(b)fluoranthene	0.00	0.62	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(k)flouranthene	0.00	6.20	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)pyrene	0.00	0.062	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Indeno(1,2,3-*cd*)pyrene	0.00	0.62	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(g,h,i)perylene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Diethylpthalate	0.00	49000.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Pesticides 8081A ug/kg									
alpha-BHC	0.00	0.09	BRL	BRL	NT	NT	NT	BRL	BRL
beta-BHC	0.00	0.32	BRL	BRL	NT	NT	NT	BRL	BRL
delta-BHC	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
gamma-BHC (Lindane)	0.00	0.44	BRL	BRL	NT	NT	NT	BRL	BRL
Heptachlor	0.00	0.11	BRL	BRL	NT	NT	NT	BRL	BRL
Aldrin	0.00	0.029	BRL	BRL	NT	NT	NT	BRL	BRL
Heptachlor epoxide	0.00	0.053	BRL	BRL	NT	NT	NT	BRL	BRL
Endosulfan I	0.00	370.0	BRL	BRL	NT	NT	NT	BRL	BRL
Dieldrin	0.00	0.03	BRL	BRL	NT	NT	NT	BRL	BRL
4,4-DDE	0.00	1.7	BRL	BRL	NT	NT	NT	BRL	BRL
Endosulfan II	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
4,4-DDD	0.00	2.4	BRL	BRL	NT	NT	NT	BRL	BRL
Endrin	0.00	18.0	BRL	BRL	NT	NT	NT	BRL	BRL
Endosulfan sulfate	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
4,4-DDT	0.00	1.7	BRL	BRL	NT	NT	NT	BRL	BRL
Methoxychlor	0.00	310.0	BRL	BRL	NT	NT	NT	BRL	BRL
Endrin ketone	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
Endrin aldehyde	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
alpha-Chlodane	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
gamma-Chlordane	0.00	1.6	BRL	BRL	NT	NT	NT	BRL	BRL
Toxaphene	0.00	0.44	BRL	0.44 ug/L (J)	NT	NT	NT	BRL	BRL
PCB TCL 8082 ug/kg									
Aroclor-1016	0.00	3.90	BRL	BRL	NT	NT	NT	BRL	BRL
Aroclor-1221	0.00	0.22	BRL	BRL	NT	NT	NT	BRL	BRL
Aroclor-1232	0.00	0.22	BRL	BRL	NT	NT	NT	BRL	BRL
Aroclor-1242	0.00	0.22	BRL	BRL	NT	NT	NT	BRL	BRL
Aroclor-1248	0.00	0.22	BRL	BRL	NT	NT	NT	BRL	BRL
Aroclor-1254	0.00	0.22	BRL	BRL	NT	NT	NT	BRL	BRL
Aroclor-1260	0.00	0.22	BRL	BRL	NT	NT	NT	BRL	BRL
TPH		BUSTR Soil Saturation Limit for TPH***							
DRO mg/kg	0.00	20000	NT	NT	NT	NT	2900	BRL	BRL
GRO ug/kg	0.00	10000	NT	NT	NT	NT	630	BRL	BRL
Inorganics mg/kg									
Nitrate, as N	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
Sulfide	0.00	--	BRL	BRL	NT	NT	NT	BRL	BRL
Sulfate	0.00	--	BRL	BRL	NT	NT	NT	36.3	40.3 (B)

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL
(M) = Manually Integrated Compound

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-038-0001-TB	LL11SB-038-0001-ER	LL11SB-039-0001-SO	LL11SB-040-0001-SO	LL11SB-041-0001-SO	LL11SB-042-0001-SO	LL11SB-043-0001-SO
Sample Date			13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01
Explosives 8330 ug/kg									
HMX	0.00	3100.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
RDX	0.00	4.4	NT	BRL	BRL	BRL	BRL	BRL	BRL
1,3,5-Trinitrotoluene	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
1,3-Dinitrobenzene	0.00	6.10	NT	BRL	BRL	BRL	BRL	BRL	BRL
Nitrobenzene	0.00	20.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
2,4,6-Trinitrtoluene	0.00	16.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Tetryl	0.00	610.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
2,4-Dinitrotoluene	0.00	120.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
2,6-Dinitrotoluene	0.00	61.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
2-Nitrotoluene	0.00	370.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
4-Nitrtoluene	0.00	370.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
3-Nitrotoluene	0.00	370.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
TAL Metals 6010B mg/kg									
Aluminum	19500.00	76000.0	NT	BRL	7460	8690	6020	11900	8910
Antimony	0.96	31.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Arsenic	19.80	0.39	NT	BRL	**22.3**	**23.4**	**11.2**	**20.6**	**22.4**
Barium	124.00	5400.0	NT	BRL	28.8	34.7	23.5	69.2	42.3
Beryllium	0.88	150.0	NT	BRL	0.44	0.48	BRL	0.74	0.49
Cadmium	0.00	37.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Calcium	35500.00	--	NT	BRL	206	247	844	7850	1260
Chromium	27.20	210.0	NT	BRL	11.6	13.4	9.8	16.0	13.4
Cobolt	23.20	4700.0	NT	BRL	8.0	8.6	6.3	7.9	8.0
Copper	32.30	2900.0	NT	BRL	21.2	21.9	21.1	16.3	23.6
Iron	35200.00	23000.0	NT	60.2 ug/L	22100	**24700**	20600	21300	**25000**
Lead	19.10	400.0	NT	BRL	11.3	10.9	9.1	11.8	12.7
Magnesium	8790.00	--	NT	BRL	2160	2500	1810	4630	2550
Manganese	3030.00	1800.0	NT	BRL	277	323	145	578	231
Mercury	0.04	23.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Nickel	60.70	1600.0	NT	BRL	18.6	21.5	16.0	22.1	19.5
Potassium	3350.00	--	NT	BRL	1110	1340	679	1480	802
Selenium	1.50	390.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Silver	0.00	390.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	--	NT	BRL	873	970	712	923	909
Thallium	0.91	5.2	NT	BRL	BRL	BRL	BRL	0.19	BRL
Vanadium	37.60	550.0	NT	BRL	13.2	14.8	11.8	18.1	15.1
Zinc	93.30	23000.0	NT	BRL	57.5	63.9	53.3	55.3	61.6
Cyanide mg/kg									
Cyanide, Total	0.00	11.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Propellants 8330 mg/kg									
Nitroglycerin	0.00	35.00	NT	ND	ND	ND	ND	ND	ND
Nitroguanidine	0.00	6100.00	NT	ND	ND	ND	ND	ND	ND
Nitrocellulose	0.00	--	NT	ND	2.0 (B)	1.8 (B)	1.9 (B)	1.6 (B)	2.0 (B)
VOCs TCL 8260B ug/kg									
Acetone	0.00	1600.00	BRL	2 ug/L (M)	BRL	BRL	BRL	BRL	BRL
Methylene Chloride	0.00	8.9	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Butanone	0.00	7300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Chloroform	0.00	0.24	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Carbon Tetrachloride	0.00	0.24	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Trichloroethene	0.00	2.8	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Toluene	0.00	520.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Xylene	0.00	210.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL

TABLE 3-4
RAVENNA ARMY AMMUNITION PLANT
SOIL BORING RESULTS
LOAD LINE 11 RI

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11SB-038-0001-TB	LL11SB-038-0001-ER	LL11SB-039-0001-SO	LL11SB-040-0001-SO	LL11SB-041-0001-SO	LL11SB-042-0001-SO	LL11SB-043-0001-SO
Sample Date			13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01	13-Mar-01
SVOCs TCL 8270 C ug/kg									
Naphthalene	0.00	56.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
2-Methylnaphthylene	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
Dibenzofuran	0.00	290.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
Fluorene	0.00	2600.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
Phenanthrene	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
Fluoranthene	0.00	2300.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
Pyrene	0.00	2300.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)anthracene	0.00	0.62	NT	BRL	BRL	BRL	BRL	BRL	BRL
Crysene	0.00	62.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
bis(2-Ethylhexyl)phthalate	0.00	35.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(b)fluoranthene	0.00	0.62	NT	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(k)flouranthene	0.00	6.20	NT	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)pyrene	0.00	0.062	NT	BRL	BRL	BRL	BRL	BRL	BRL
Indeno(1,2,3-*cd*)pyrene	0.00	0.62	NT	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(g,h,i)perylene	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
Diethylpthalate	0.00	49000.00	NT	BRL	BRL	BRL	BRL	BRL	BRL
Pesticides 8081A ug/kg									
alpha-BHC	0.00	0.09	NT	BRL	BRL	BRL	BRL	BRL	BRL
beta-BHC	0.00	0.32	NT	BRL	BRL	BRL	BRL	BRL	BRL
delta-BHC	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
gamma-BHC (Lindane)	0.00	0.44	NT	BRL	BRL	BRL	BRL	BRL	BRL
Heptachlor	0.00	0.11	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aldrin	0.00	0.029	NT	BRL	BRL	BRL	BRL	BRL	BRL
Heptachlor epoxide	0.00	0.053	NT	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan I	0.00	370.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Dieldrin	0.00	0.03	NT	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDE	0.00	1.7	NT	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan II	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDD	0.00	2.4	NT	BRL	BRL	BRL	BRL	BRL	BRL
Endrin	0.00	18.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan sulfate	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDT	0.00	1.7	NT	BRL	BRL	BRL	BRL	BRL	BRL
Methoxychlor	0.00	310.0	NT	BRL	BRL	BRL	BRL	BRL	BRL
Endrin ketone	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
Endrin aldehyde	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
alpha-Chlodane	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
gamma-Chlordane	0.00	1.6	NT	BRL	BRL	BRL	BRL	BRL	BRL
Toxaphene	0.00	0.44	NT	BRL	BRL	BRL	BRL	BRL	BRL
PCB TCL 8082 ug/kg									
Aroclor-1016	0.00	3.90	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1221	0.00	0.22	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1232	0.00	0.22	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1242	0.00	0.22	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1248	0.00	0.22	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1254	0.00	0.22	NT	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1260	0.00	0.22	NT	BRL	BRL	BRL	BRL	BRL	BRL
TPH		BUSTR Soil Saturation Limit for TPH***							
DRO mg/kg	0.00	20000	NT	0.094 ug/L	BRL	BRL	NT	NT	NT
GRO ug/kg	0.00	10000	NT	BRL	BRL	BRL	NT	NT	NT
Inorganics mg/kg									
Nitrate, as N	0.00	--	NT	BRL	0.41 (B)	0.54 (B)	0.15 (B)	0.14 (B)	0.15 (B)
Sulfide	0.00	--	NT	BRL	BRL	BRL	BRL	BRL	BRL
Sulfate	0.00	--	NT	BRL	27.3 (B)	22.7 (B)	23.0 (B)	44.2 (B)	22.8 (B)

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL
(M) = Manually Integrated Compound

Upon excavation, cable, scrap metal, bolts, and magnetite containing rock was found. After excavation, and determining no unexploded ordnance was present, the test trenches were backfilled and leveled to the original ground surface elevation.

3.8 Waste Management Disposition

During the IRA implementation, various waste streams were generated at LL-11, which required characterization and disposal. Representative composite samples from each waste stream including the sump/sewer water, sedimentation sumps and liners, decontamination water and excavated soils were collected and analyzed per requirements of the disposal facility. The wastes generated during the LL-11 IRA were managed and disposed of in accordance with all applicable federal, state and local rules, laws and regulations. The following provides a summary of the LL-11 IRA waste management disposition operations:

- Based on analytical results, a total of 15,000 gallons of non-contaminated sump/sewer water was removed and applied to a heavily vegetated area just west of AP-3. All sump/sewer water was handled in accordance with the OEPA approved LL-11 Technical Scope Change dated January 9, 2001 (Appendix B) (Section 3.3).
- 230 CY of non-hazardous soil was excavated from the LL-11 drainage ditches. Based on composite sample results of the stockpile, the non-hazardous soils were stockpiled onsite and stabilized in accordance with the OEPA letter dated 07 June 01 regarding disposition of LL-11 IRA non-hazardous investigative-derived wastes (IDW), and have been subsequently picked up for disposal. A copy of this letter is provided in Appendix B. A summary of the composite sample (WD4-0001) results for the ditch soil stockpile is provided in Table 3-5.
- One yard of asbestos contaminated material including the concrete sumps and fibrous liner material was disposed of at the Minerva Enterprises Landfill in Minerva, Ohio. A summary of the bulk sample results for the fibrous material is provided in Table 3-5.
- A total of 130 CY of petroleum contaminated soil was excavated from the LL-11 hot spot. All of the petroleum contaminated soils were disposed of as non-hazardous solid waste at the County Wide RDF landfill in East Sparta, Ohio. A summary of the composite sample (WD3-0001) results for the hot spot soil stockpile is provided in Table 3-5.
- 130 CY of soil was excavated from the top 4 feet of the hot spot. The non-contaminated soil was used as backfill within the hotspot excavation. Application of this soil was performed in accordance with the OEPA letter dated 07 June 01 (Appendix B). A summary of the composite sample (WC2-001) results for the 0 to 4 feet (hot spot) soil stockpile is provided in Table 3-5.
- 220 gallons of rinseate were generated during decontamination of the sump liners. This water was transported to Chemical Solvents in Cleveland, Ohio for disposal as non-hazardous wastewater. A summary of the composite sample (WD1-0001) results for the decontamination rinseate is provided in Table 3-5.

TABLE 3-5
RAVENNA ARMY AMMUNITION PLANT
WASTE CHARACTERIZATION - DECON WATER/STOCKPILES
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Decon Pad Water (WD1-0001-DL)	Hot Spot 0'-4' LL11 (WC2-0001-SO)	Hot Spot 4'-8' LL11 (WD3-0001-SO)	Ditch Sediments LL11 (WD4-0001-SO)	LL11ACM-001-001	RAAP-100BS (Wipe Test)	RAAP-101BS (Wipe Test)	RAAP-102BS (Wipe Test)
Sample Date	21-Mar-01	22-Mar-01	23-Mar-01	23-Mar-01	26-Jan-01	3-Jul-01	3-Jul-01	3-Jul-01
Explosives 8330 ug/kg								
HMX	BRL	BRL	BRL	BRL	NT	NT	NT	NT
RDX	BRL	BRL	BRL	BRL	NT	NT	NT	NT
1,3,5-Trinitrotoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
1,3-Dinitrobenzene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Nitrobenzene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
2,4,6-Trinitrtoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Tetryl	BRL	BRL	BRL	BRL	NT	NT	NT	NT
2,4-Dinitrotoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
2,6-Dinitrotoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
2-Nitrotoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
4-Nitrtoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
3-Nitrotoluene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
TAL Metals 6010B mg/kg								
Aluminum	1970 ug/L	11000	9550	12800	NT	NT	NT	NT
Antimony	BRL	0.39	BRL	0.64	NT	NT	NT	NT
Arsenic	BRL	13.2	12.3	28.8	NT	NT	NT	NT
Barium	105 ug/L	49.6	42.3	73.3	NT	NT	NT	NT
Beryllium	BRL	0.45	0.49	0.78	NT	NT	NT	NT
Cadmium	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Calcium	36700 ug/L	901	383	5450	NT	NT	NT	NT
Chromium	4.8 ug/L	12.6	12.2	16.5	NT	NT	NT	NT
Cobalt	BRL	6.8	7.0	16.4	NT	NT	NT	NT
Copper	49.9 ug/L	13.8	17.7	17.0	NT	NT	NT	NT
Iron	11100 ug/L	18500	20700	30000	NT	NT	NT	NT
Lead	1890 ug/L	19.8	9.1	18.1	NT	NT	NT	NT
Magnesium	9060 ug/L	2050	2080	3670	NT	NT	NT	NT
Manganese	277 ug/L	369	258	1540	NT	NT	NT	NT
Mercury	0.38 ug/L	BRL	BRL	BRL	NT	NT	NT	NT
Nickel	6.2 ug/L	13.2	15.5	20.5	NT	NT	NT	NT
Potassium	43100 ug/L	874	1010	1740	NT	NT	NT	NT
Selenium	10.1 ug/L	BRL	0.72	BRL	NT	NT	NT	NT
Silver	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Sodium	35800 ug/L	22.3	694	859	NT	NT	NT	NT
Thallium	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Vanadium	5.6 ug/L	20.2	14.7	23.8	NT	NT	NT	NT
Zinc	122 ug/L	45.6	53.0	67.5	NT	NT	NT	NT
Cyanide mg/kg								
Cyanide, Total	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Propellants 8330 mg/kg								
Nitroglycerin	ND	ND	ND	ND	NT	NT	NT	NT
Nitroguanidine	ND	ND	ND	ND	NT	NT	NT	NT
Nitrocellulose	BRL	BRL	BRL	BRL	NT	NT	NT	NT
VOCs TCL 8260B ug/kg								
Acetone	10 ug/L	6	BRL	6	NT	NT	NT	NT
2-Butanone	BRL	6	30	6	NT	NT	NT	NT
Benzene	0.7 ug/L	BRL	BRL	BRL	NT	NT	NT	NT
Toluene	1 ug/L	BRL	BRL	BRL	NT	NT	NT	NT
2-Hexanone	BRL	6	BRL	6	NT	NT	NT	NT
Xylene	2 ug/L	BRL	58	BRL	NT	NT	NT	NT

TABLE 3-5
RAVENNA ARMY AMMUNITION PLANT
WASTE CHARACTERIZATION - DECON WATER/STOCKPILES
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Decon Pad Water (WD1-0001-DL)	Hot Spot 0'-4' LL11 (WC2-0001-SO)	Hot Spot 4'-8' LL11 (WD3-0001-SO)	Ditch Sediments LL11 (WD4-0001-SO)	LL11ACM-001-001	RAAP-100BS (Wipe Test)	RAAP-101BS (Wipe Test)	RAAP-102BS (Wipe Test)
Sample Date	21-Mar-01	22-Mar-01	23-Mar-01	23-Mar-01	26-Jan-01	3-Jul-01	3-Jul-01	3-Jul-01
SVOCs TCL 8270 C ug/kg								
2-Methylnaphthalene	BRL	BRL	420	BRL	NT	NT	NT	NT
Pesticides 8081A mg/kg								
alpha-BHC	BRL	BRL	BRL	BRL	NT	NT	NT	NT
beta-BHC	BRL	BRL	BRL	BRL	NT	NT	NT	NT
delta-BHC	BRL	BRL	BRL	BRL	NT	NT	NT	NT
gamma-BHC (Lindane)	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Heptachlor	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aldrin	0.056 ug/L	BRL	BRL	BRL	NT	NT	NT	NT
Heptachlor epoxide	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Endosulfan I	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Dieldrin	BRL	BRL	BRL	BRL	NT	NT	NT	NT
4,4-DDE	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Endosulfan II	BRL	BRL	BRL	BRL	NT	NT	NT	NT
4,4-DDD	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Endrin	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Endosulfan sulfate	BRL	BRL	BRL	BRL	NT	NT	NT	NT
4,4-DDT	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Methoxychlor	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Endrin ketone	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Endrin aldehyde	BRL	BRL	BRL	BRL	NT	NT	NT	NT
alpha-Chlodane	BRL	BRL	BRL	BRL	NT	NT	NT	NT
gamma-Chlordane	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Toxaphene	BRL	BRL	BRL	BRL	NT	NT	NT	NT
PCB TCL 8082 mg/kg								
Aroclor-1016	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aroclor-1221	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aroclor-1232	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aroclor-1242	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aroclor-1248	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aroclor-1254	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Aroclor-1260	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Asbestos Content								
% Chrysotile Asbestos	NT	NT	NT	NT	60% (Friable)	< 1.00%	< 1.00%	< 1.00%
TPH * BUSTR Soil Saturation Limit (PPM)**								
DRO mg/kg	NT	140	250	NT	NT	NT	NT	NT
GRO ug/kg	NT	56 (J) (A)	81000	NT	NT	NT	NT	NT
Inorganics mg/kg								
Nitrate, as N	BRL	BRL	BRL	1.5	NT	NT	NT	NT
Sulfide	BRL	BRL	BRL	BRL	NT	NT	NT	NT
Sulfate	72.2 mg/L	BRL	BRL	BRL	NT	NT	NT	NT

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS
(B) = result is < CRDL/RL, but ≥ IDL/MDL

mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)

ORGANIC FLAGS/QUALIFIERS
(M) = Manually integrated compound
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Copies of all the manifests and weight tickets for the LL-11 IRA petroleum contaminated soil, ACM and non-hazardous wastewater are provided in Appendix F. Copies of the laboratory results for all the LL-11 IRA waste characterization samples are provided in Appendix H.

3.9 Site Restoration

Following completion of the confirmation sampling operations, each of the seven excavated areas were immediately backfilled, between 05 Jul 01 and 07 Jul 01 in accordance with project specifications, using approved backfill material from Patrick Excavating, Ravenna, OH. The LL-11 sump excavations were backfilled to original ground elevation with 190 CY of approved off-site soil from Patrick Excavating in Ravenna, Ohio. The ditch excavations were backfilled with a total of 230 CY of approved backfill soil from Patrick Excavation to complete these sites. The hot spot was backfilled with 130 CY of approved off-site borrow material followed by 130 CY of the clean soil from the 0 to 4-foot depth interval that had been set aside during the hot spot excavation.

All backfill material was placed in 12-inch lifts and compacted with the track excavator to match previously existing site conditions. The approved off-site borrow soil was obtained from Patrick Excavating with access to material with a virgin source. This material was analyzed prior to use for VOCs, SVOCs, Explosives, Propellants, TAL Metals, Pesticides/PCBs, and Cyanide to satisfy the OEPAs requirement for analytical data on any source of backfill used at RVAAP. A copy of the analytical results for the backfill material is provided in Appendix G.

SECTION 4 SOIL ASSESSMENT

Confirmatory sampling was performed in accordance with the approved Final Sampling and Analysis Plan Addendum for the Interim Removal Actions at LL-11 (AOC 44), dated January 2, 2001. Confirmation samples were collected from each completed excavation to evaluate the effectiveness of the IRA; the analytical results are provided in Appendix H. All non-nutritional metals that exceed the RVAAP background values are described in the following sections. Exceedences for the nutritional elements such as calcium, magnesium, and sodium are not included in the narratives below, but are shown on the result tables within this section.

4.1 Sump Excavation Confirmation Sampling

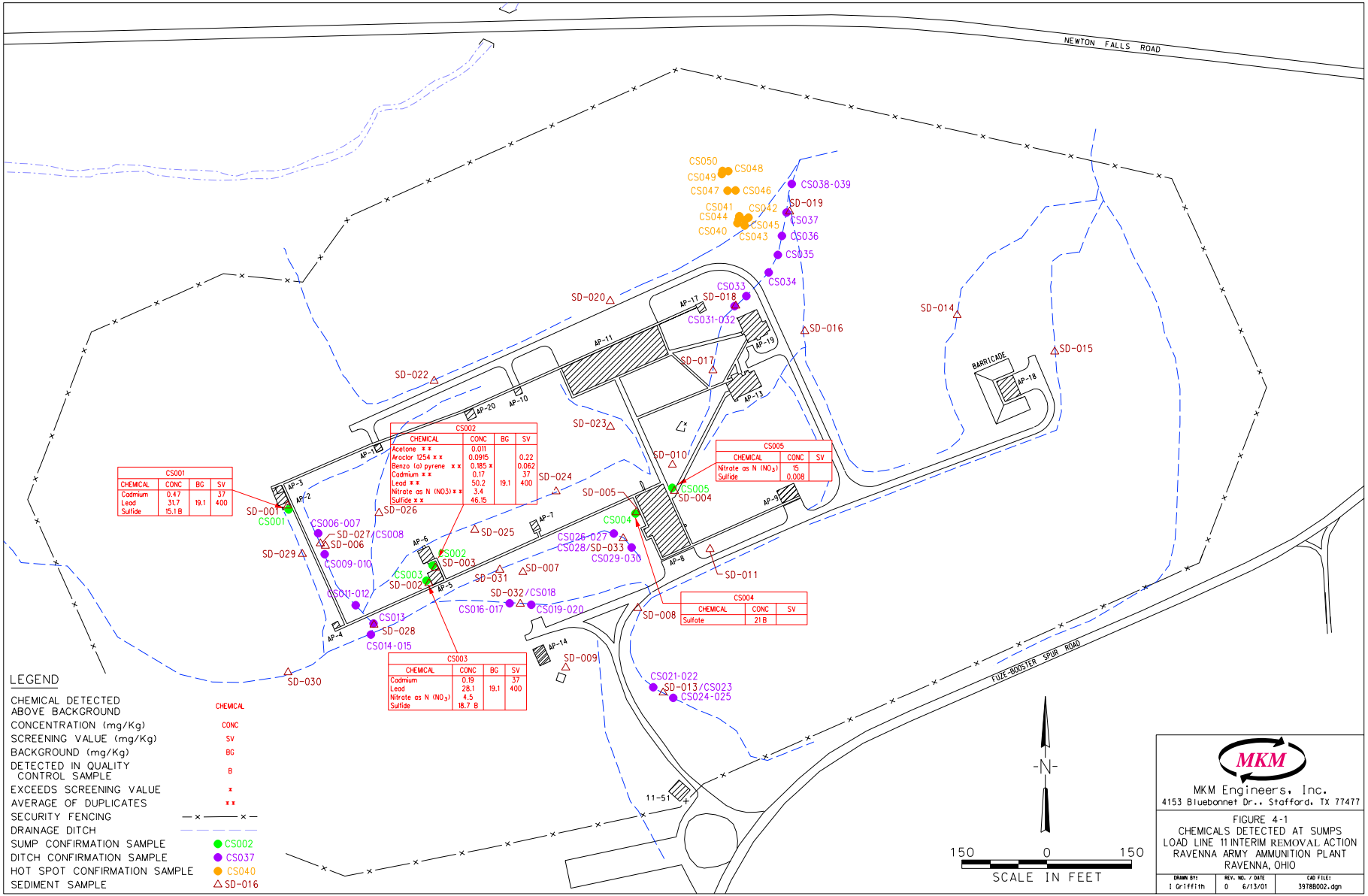
Upon removal of the sumps, one confirmation sample was collected from the bottom of each excavation (5 total not including QA/QC) as illustrated in Figure 4-1. Based on the November-December 2001 RI sump soil sampling data, the sump excavation confirmation samples were analyzed for Explosives, TAL Metals, Cyanide, Sulfide, Sulfate and Nitrate. In addition, 10% of the samples were also analyzed for VOCs, SVOCs, Propellants, and Pest/PCB. Explosives and Cyanide were not detected in any of the five sump excavations. The sump excavation confirmation samples were collected from January 24, 2001 to February 22, 2001, at depths ranging from four to six feet BGS. The following paragraphs provide a summary of the sump excavation samples that exceed RVAAP background values. Copies of the sump excavation/confirmation sample results are provided in Appendix H.

Cadmium was reported above the RVAAP background value of 0.00 ppm at three of the sump excavations. The cadmium concentrations included 0.47 ppm at AP-3 (CS-001-0001-SO), 0.19 at AP-5 (CS-003-0001-SO), and AP-6 at 0.26 (CS-002-0001-FD).

Three of the five sump excavations reported lead concentrations above RVAAP background (19.10 ppm). The lead concentrations were as follows: 31.7 ppm at AP-3 (CS-001-0001-SO), 61.4 ppm (CS-002-0001-SO) and 39.0 ppm (CS-002-0001-FD) at AP-6, and 28.1 ppm at AP-5 (CS-003-0001-SO).

Nitrate was detected at CS-002-0001-FD in the AP-6 excavation (5.8 ppm), at CS-003-0001-SO in the AP-5 excavation (4.5 ppm), and at CS-005-0001-SO in the AP-8 east sump excavation (15 ppm). Sulfide was detected in the AP-6 sump excavation (CS-002-0001-SO) at 48.4 ppm and (CS-002-0001-FD) at 43.9 ppm. Sulfate was detected at CS004 (21.0 B ppm) and CS005 (19.9 B ppm). Nitrocellulose was detected at CS004 (1.7 B ppm) and CS005 (1.7 B ppm).

The 10% QA/QC samples were collected at the AP-6 and AP-8 east and west sump excavations. No detections were reported in either of the AP-8 sump excavations. However, analytical results showed detectable concentration of PCBs - Aroclor 1254 (23 ppm) in the AP-6 excavation confirmation sample CS-002-0001-SO and 160 ppm in the field duplicate sample CS-002-0001-FD.



MKM Engineers, Inc.
4153 Bluebonnet Dr., Stafford, TX 77477

FIGURE 4-1
CHEMICALS DETECTED AT SUMPS
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I Griffith	0 6/13/01	39788002.dgn

It should also be noted, that VOCs (Acetone 19 ppb) were detected in the AP-6 duplicate sample, but not in the original sample, CS-002-0001-SO. A summary of all the LL-11 IRA sump excavation confirmatory samples results is provided in Table 4-1. Copies of the sump excavation confirmation sample-results are provided in Appendix H.

4.2 Drainage Ditch Confirmation Sampling

Once the drainage ditch excavation operations were completed, confirmatory soil samples were collected from the bottom and at both ends of each excavation to evaluate the success of the removal of the identified contaminants. Based on the RI ditch soil and sediment sampling data, the drainage ditches excavated southeast of AP-3 and east of AP-4, were analyzed for VOCs and TAL Metals. The section of ditch excavated just north of AP-14 was analyzed for VOCs, SVOCs, and pesticides. The three sections of ditch line excavated east of the entrance road, west of AP-8 and on the north end of the facility between AP-17 and AP-19 were all analyzed for TAL Metals. The drainage ditch excavation confirmation samples were collected on March 20, 21, 22 and 23, 2001. Details on all the drainage ditch confirmation sample results are provided in the subsections that follow.

4.2.1 Drainage Ditch Southeast of AP-3

Five (5) confirmation samples were collected at the ditch excavation southeast of AP-3 (Figure 4-2 A and 4-2 B). Three soil samples were collected on the bottom of the excavation (~2 feet bgs) and two sediment samples (surface) were collected at the ends of the excavation to verify removal of metals and VOC contamination. One of the soil samples was located 20 feet north and one was located 20 feet south of the RI sediment sample SD027. The third soil sample was co-located at the RI sample point. The confirmation sediment samples were collected just outside of each end of the excavation, within the undisturbed ditch. One of the sediment samples was located 20 feet north of the RI sample point SD027 and the other was located 20 feet south of SD027. The confirmation samples at this ditch excavation were collected on March 23, 2001.

The analytical results showed metal concentrations above RVAAP background values at four sample locations and one VOC detection at one location. Aluminum, beryllium, cadmium, chromium, cobalt, lead, mercury, nickel, and potassium were detected above RVAAP background at confirmation sample (sediment) CS-006-0001-SD (on the north end of the excavation). The concentrations are 14500 ppm, 0.72 ppm, 0.71 ppm, 20.4 ppm, 9.7 ppm, 102 ppm, 0.074 ppm, 23.7 ppm and 1950 ppm respectively. The RVAAP background values for these metals of concern are as follows: 13900 ppm, 0.38ppm, 0.00 ppm, 18.1 ppm, 9.10 ppm, 27.40 ppm, 0.06 ppm, 17.70 ppm, and 1950 ppm respectively.

Lead was detected above RVAAP background at confirmatory sample soil CS-009-0001-SO. Lead was detected at 20.2 ppm. The RVAAP background value for lead in soil at this depth is 19.10 ppm.

Table 4-1
LOAD LINE 11 - RAVENNA ARMY AMMUNITION PLANT
SUMP CONFIRMATION SAMPLE RESULTS
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-001-0001-SO (Soil)	LL11CS-002-0001-SO (Soil)	LL11CS-002-0001-ER	LL11CS-002-0001-FD (Soil)	LL11CS-003-0001-SO (Soil)	LL11CS-004-0001-SO (Soil)	LL11CS-004-0001-TB (Soil)	LL11CS-005-0001-SO (Soil)
Sample Date			24-Jan-01	26-Jan-01	26-Jan-01	26-Jan-01	26-Jan-01	21-Feb-01	21-Feb-01	22-Feb-01
Explosives 8330 ug/kg										
HMX	0.00	3100.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
RDX	0.00	4.40	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
1,3-Dinitrobenzene	0.00	6.10	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
Nitrobenzene	0.00	20.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
2,4,6-Trinitrtoluene	0.00	16.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
Tetryl	0.00	610.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
2,4-Dinitrotoluene	0.00	120.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
2,6-Dinitrotoluene	0.00	61.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
2-Nitrotoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
4-Nitrtoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
3-Nitrotoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
TAL Metals 6010B mg/kg										
Aluminum	19500.00	76000.00	7750	15000	BRL	12800	12400	7450	NT	12500
Antimony	0.96	31.00	0.41	0.91	BRL	0.24	BRL	0.28	NT	0.35
Arsenic	19.80	0.39	**8.4**	**6.3**	BRL	**11.2**	**13.8**	**17.5**	NT	**17.4**
Barium	124.00	5400.00	40.4	74.6	BRL	73.1	65.8	27.7	NT	81.9
Beryllium	0.88	150.00	0.38	0.60	BRL	0.57	0.49	0.45	NT	0.70
Cadmium	0.00	37.00	0.47	BRL	BRL	0.26	0.19	BRL	NT	BRL
Calcium	35500.00	--	24000	10300	BRL	11000	7610	1190	NT	1770
Chromium	27.20	210.00	9.8	17.6	BRL	16.2	13.9	11.3	NT	16.8
Cobalt	23.20	4700.00	5.6	9.2	BRL	10.1	8.0	7.9	NT	7.6
Copper	32.30	2900.00	18.5	18.2	BRL	20.0	17.2	19.7	NT	17.6
Iron	35200.00	23000.00	17000	**23100**	BRL	**23000**	21600	21300	NT	20800
Lead	19.10	400.00	31.7	61.4	BRL	39.0	28.1	11.1	NT	12.7
Magnesium	8790.00	--	7270	4160	BRL	4040	3160	2490	NT	2930
Manganese	3030.00	1800.00	422	336	BRL	353	369	222	NT	313
Mercury	0.04	23.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
Nickel	60.70	1600.00	14.2	21.4	BRL	21.0	20.0	19.4	NT	22.5
Potassium	3350.00	--	1370	2330	BRL	1850	1580	1470	NT	1800
Selenium	1.50	390.00	BRL	0.44	BRL	BRL	BRL	0.48	NT	BRL
Silver	0.00	390.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
Sodium	145.00	--	90.7	117	BRL	115	83.7	BRL	NT	108
Thallium	0.91	5.20	BRL	BRL	BRL	0.17	BRL	BRL	NT	BRL
Vanadium	37.60	550.00	15.3	25.9	BRL	23.2	22.9	13.4	NT	20.4
Zinc	93.30	23000.00	78.9	63.5	BRL	85.9	66.7	79.2	NT	59.0
Cyanide mg/kg										
Cyanide, Total	0.00	11.00	BRL	BRL	BRL	BRL	BRL	BRL	NT	BRL
Propellants 8330 mg/kg										
Nitroglycerin	0.00	35.00	NT	NT	NT	NT	NT	ND	NT	ND
Nitroguanidine	0.00	6100.00	NT	NT	NT	NT	NT	ND	NT	ND
Nitrocellulose	0.00	--	NT	NT	NT	NT	NT	1.7 (B)	NT	1.7 (B)

Table 4-1
LOAD LINE 11 - RAVENNA ARMY AMMUNITION PLANT
SUMP CONFIRMATION SAMPLE RESULTS
LOAD LINE 11 IRA

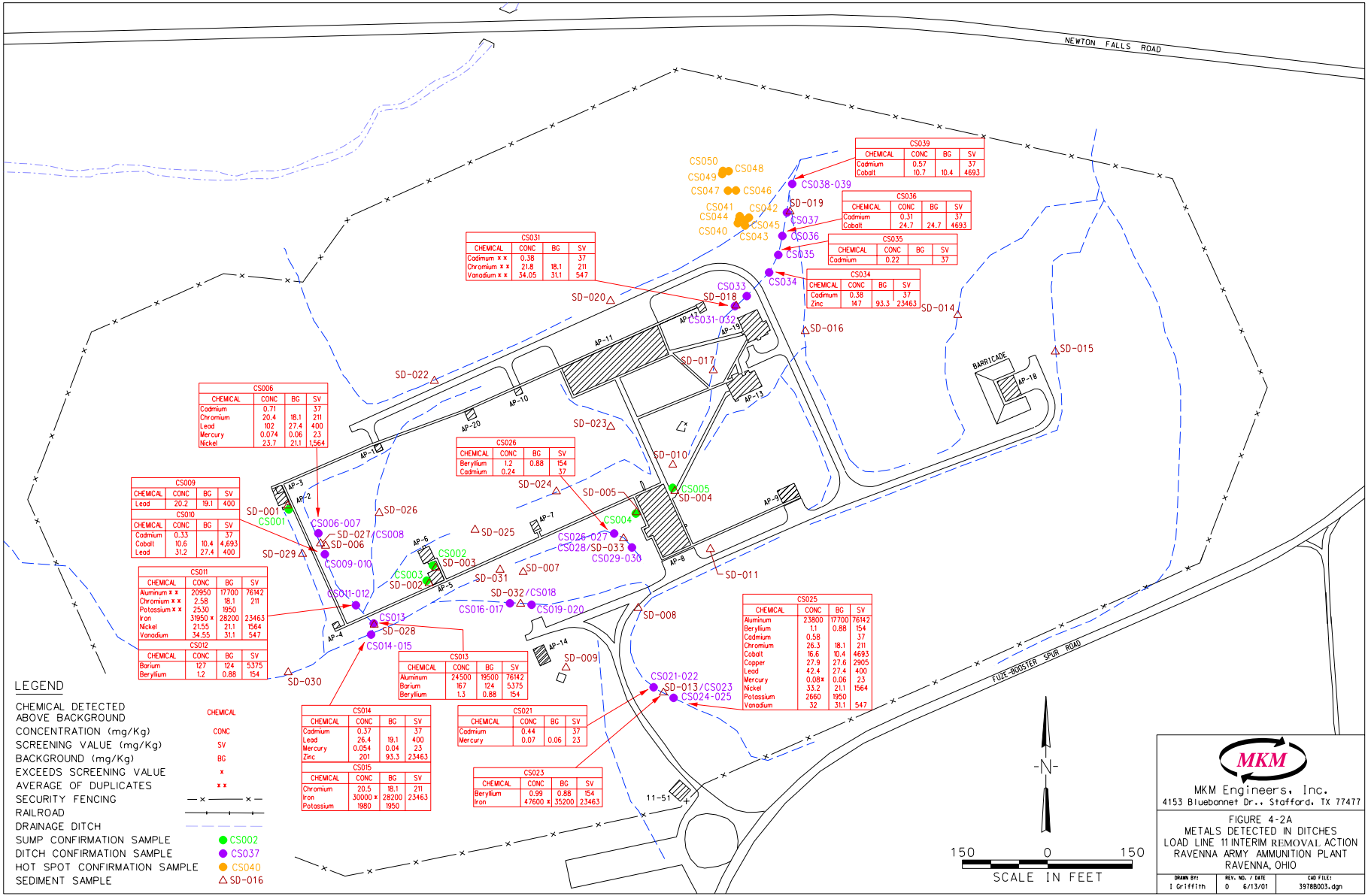
ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-001-0001-SO (Soil)	LL11CS-002-0001-SO (Soil)	LL11CS-002-0001-ER	LL11CS-002-0001-FD (Soil)	LL11CS-003-0001-SO (Soil)	LL11CS-004-0001-SO (Soil)	LL11CS-004-0001-TB (Soil)	LL11CS-005-0001-SO (Soil)
Sample Date			24-Jan-01	26-Jan-01	26-Jan-01	26-Jan-01	26-Jan-01	21-Feb-01	21-Feb-01	22-Feb-01
VOCs TCL 8260B ug/kg										
Acetone	0.00	1600.00	NT	BRL	NT	19	NT	BRL	BRL	BRL
Ethylbenzene	0.00	230.00	NT	BRL	NT	BRL	NT	BRL	BRL	BRL
Xylene	0.00	210.00	NT	BRL	NT	BRL	NT	BRL	BRL	BRL
SVOCs TCL 8270 C ug/kg										
Fluoranthene	0.00	2300.00	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Pyrene	0.00	2300.00	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Pesticides 8081A mg/kg										
alpha-BHC	0.00	0.09	NT	BRL	NT	BRL	NT	BRL	NT	BRL
beta-BHC	0.00	0.32	NT	BRL	NT	BRL	NT	BRL	NT	BRL
delta-BHC	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
gamma-BHC (Lindane)	0.00	0.44	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Heptachlor	0.00	0.11	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Aldrin	0.00	0.029	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Heptachlor epoxide	0.00	0.053	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Endosulfan I	0.00	370.00	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Dieldrin	0.00	0.03	NT	BRL	NT	BRL	NT	BRL	NT	BRL
4,4-DDE	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Endosulfan II	0.00	1200.00	NT	BRL	NT	BRL	NT	BRL	NT	BRL
4,4-DDD	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Endrin	0.00	18.00	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Endosulfan sulfate	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
4,4-DDT	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Methoxychlor	0.00	310.00	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Endrin ketone	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Endrin aldehyde	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
alpha-Chlodane	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
gamma-Chlordane	0.00	--	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Toxaphene	0.00	0.44	NT	BRL	NT	BRL	NT	BRL	NT	BRL
PCB TCL 8082 mg/kg										
Aroclor-1016	0.00	3.90	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Aroclor-1221	0.00	0.22	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Aroclor-1232	0.00	0.22	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Aroclor-1242	0.00	0.22	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Aroclor-1248	0.00	0.22	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Aroclor-1254	0.00	0.22	NT	**23**	NT	**160**	NT	BRL	NT	BRL
Aroclor-1260	0.00	0.22	NT	BRL	NT	BRL	NT	BRL	NT	BRL
Inorganics mg/kg										
Nitrate, as N	0.00	--	BRL	BRL	BRL	5.8	4.5	BRL	NT	15
Sulfide	0.00	--	BRL	48.4	BRL	43.9	BRL	BRL	NT	BRL
Sulfate	0.00	--	BRL	BRL	BRL	BRL	BRL	21.0 (B)	NT	19.9 (B)

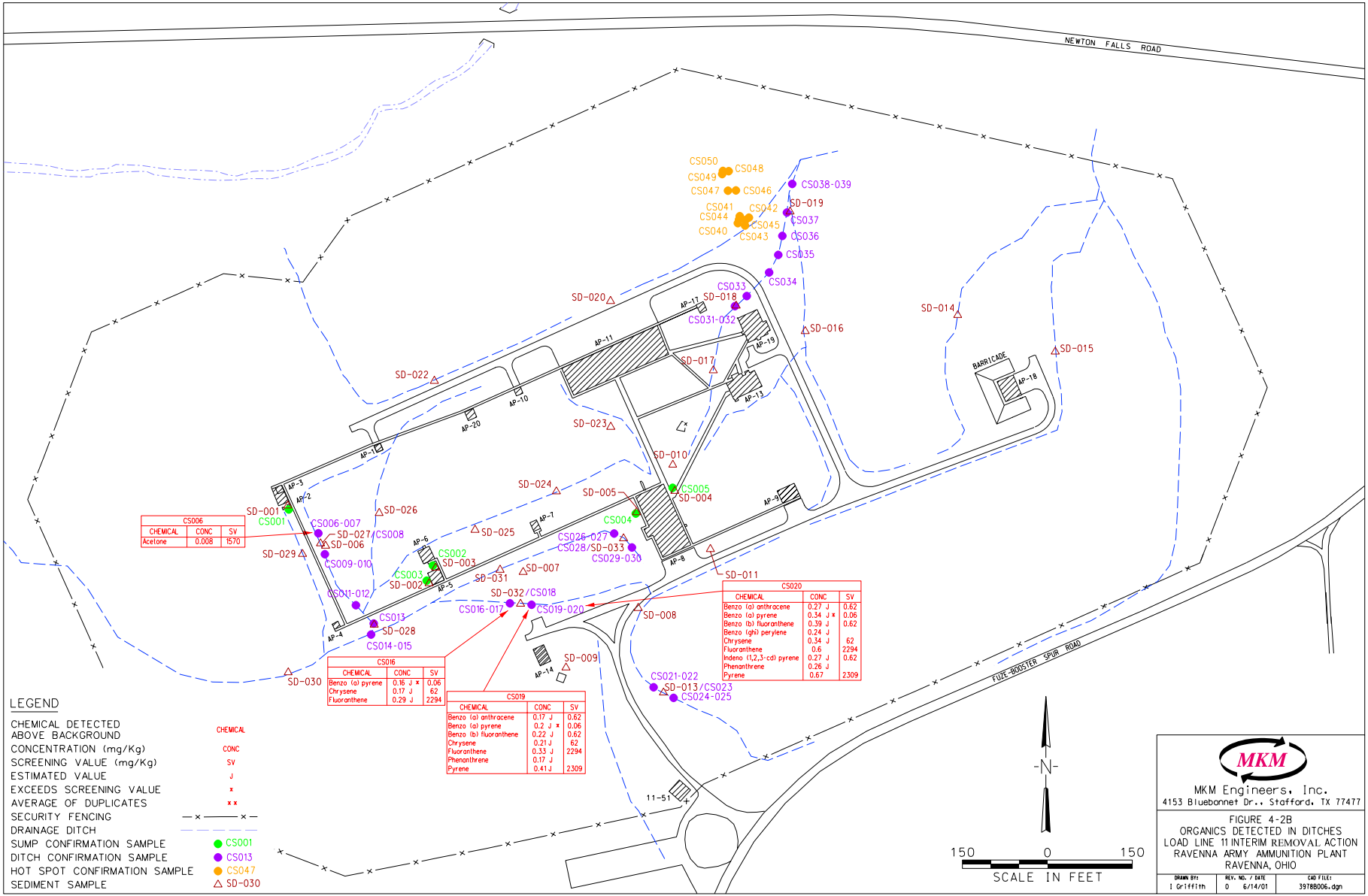
** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS
(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS
(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL


NEWTON FALLS ROAD
FUZE-BOOSTER SPUR ROAD
BARRICADE
CS039
CHEMICAL CONC BG SV
Cadmium 0.57 37
Cobalt 10.7 10.4 4693
CS036
CHEMICAL CONC BG SV
Cadmium 0.31 37
Cobalt 24.7 24.7 4693
CS035
CHEMICAL CONC BG SV
Cadmium 0.22 37
CS034
CHEMICAL CONC BG SV
Cadmium 0.38 37
Zinc 147 93.3 23463
CS031
CHEMICAL CONC BG SV
Cadmium x x 0.38 37
Chromium x x 21.8 18.1 211
Vanadium x x 34.05 31.1 547
CS006
CHEMICAL CONC BG SV
Cadmium 0.71 37
Chromium 20.4 18.1 211
Lead 102 27.4 400
Mercury 0.074 0.06 23
Nickel 23.7 21.1 1564
CS026
CHEMICAL CONC BG SV
Beryllium 1.2 0.88 154
Cadmium 0.24 37
CS009
CHEMICAL CONC BG SV
Lead 20.2 19.1 400
CS010
CHEMICAL CONC BG SV
Cadmium 0.33 37
Cobalt 10.6 10.4 4,693
Lead 31.2 27.4 400
CS011
CHEMICAL CONC BG SV
Aluminum x x 20950 17700 76142
Chromium x x 2.58 18.1 211
Potassium x x 2530 1950
Iron 31950 x 28200 23463
Nickel 21.55 21.1 1564
Vanadium 34.55 31.1 547
CS012
CHEMICAL CONC BG SV
Barium 127 124 5375
Beryllium 1.2 0.88 154
CS013
CHEMICAL CONC BG SV
Aluminum 24500 19500 76142
Barium 167 124 5375
Beryllium 1.3 0.88 154
CS014
CHEMICAL CONC BG SV
Cadmium 0.37 37
Lead 26.4 19.1 400
Mercury 0.054 0.04 23
Zinc 201 93.3 23463
CS015
CHEMICAL CONC BG SV
Chromium 20.5 18.1 211
Iron 30000 x 28200 23463
Potassium 1980 1950
CS021
CHEMICAL CONC BG SV
Cadmium 0.44 37
Mercury 0.07 0.06 23
CS023
CHEMICAL CONC BG SV
Beryllium 0.99 0.88 154
Iron 47600 x 35200 23463
CS025
CHEMICAL CONC BG SV
Aluminum 23800 17700 76142
Beryllium 1.1 0.88 154
Cadmium 0.58 37
Chromium 26.3 18.1 211
Cobalt 16.6 10.4 4693
Copper 27.9 27.6 2905
Lead 42.4 27.4 400
Mercury 0.08 x 0.06 23
Nickel 33.2 21.1 1564
Potassium 2660 1950
Vanadium 32 31.1 547
CS038-039
CS019
CS037
CS036
CS035
CS034
CS050
CS049
CS048
CS047
CS046
CS041
CS042
CS044
CS045
CS040
CS043
CS033
SD-018
SD-020
CS031-032
SD-014
SD-016
SD-015
SD-017
SD-022
SD-023
SD-010
SD-024
SD-005
CS005
SD-004
CS004
SD-026
SD-025
SD-027/CS008
CS006-007
SD-006
SD-029
CS009-010
CS002
SD-003
CS003
SD-002
SD-001
CS001
SD-031
SD-007
SD-032/CS018
CS016-017
CS019-020
CS011-012
CS013
SD-028
CS014-015
SD-030
SD-008
SD-009
CS021-022
SD-013/CS023
CS024-025
SD-011
AP-1
AP-2
AP-3
AP-4
AP-5
AP-6
AP-7
AP-8
AP-9
AP-10
AP-11
AP-12
AP-13
AP-14
AP-18
AP-19
AP-20
11-51
LEGEND
CHEMICAL DETECTED ABOVE BACKGROUND CHEMICAL
CONCENTRATION (mg/Kg) CONC
SCREENING VALUE (mg/Kg) SV
BACKGROUND (mg/Kg) BG
EXCEEDS SCREENING VALUE x
AVERAGE OF DUPLICATES x x
SECURITY FENCING
RAILROAD
DRAINAGE DITCH
SUMP CONFIRMATION SAMPLE CS002
DITCH CONFIRMATION SAMPLE CS037
HOT SPOT CONFIRMATION SAMPLE CS040
SEDIMENT SAMPLE SD-016
-N-
150 0 150
SCALE IN FEET
MKM
MKM Engineers, Inc.
4153 Bluebonnet Dr., Stafford, TX 77477
FIGURE 4-2A
METALS DETECTED IN DITCHES
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
DRAWN BY: I Griffith
REV. NO. / DATE: 0 6/13/01
CAD FILE: 3978B003.dgn



MKM Engineers, Inc.
4153 Bluebonnet Dr., Stafford, TX 77477

FIGURE 4-2B
ORGANICS DETECTED IN DITCHES
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I Griffith	0 6/14/01	39788006.dgn

Beryllium was detected at 0.49 ppm, cadmium was detected at 0.33 ppm, cobalt was reported at 10.6 ppm, lead was reported at 31.2 ppm and nickel was reported at 20.9 ppm (CS010). The RVAAP background values for these metals in sediment include 0.38 ppm for beryllium, 0.00 ppm for cadmium, 9.10 ppm for cobalt, 27.40 ppm for lead and 17.70 ppm for nickel.

In addition to metals, one VOC (acetone) was also detected at sediment confirmation sample location CS-006-0001-SD at 8.0 ppb. A summary of all the AP-3 drainage ditch confirmatory samples results is provided in Table 4-2. Copies of the ditch excavation confirmation-sample results are provided in Appendix H.

4.2.2 Drainage Ditch East of AP-4

A total of five (5) confirmation samples were collected at the ditch excavation east of AP-4 (Figure 4-2 A and 4-2 B). Three samples were collected on the floor of the excavation (~2 feet BGS) and two sediment samples (surface) were collected at either end of the excavation to verify removal of metals and VOC contamination. One of the soil samples was located 20 feet north and one was located south of the RI sediment sample SD028. The third soil sample was co-located at the RI sample point. The confirmation sediment samples were collected just outside each end of the excavation, within the undisturbed ditch. One of the sediment samples was located 20 feet north of the RI sample point (SD028) and the other was located 20 feet south of this point. All the confirmation-sampling operations at the drainage ditch east of AP-4 were conducted on March 23, 2001.

Both sediment samples and each of the three confirmatory soil samples reported metals in excess of the RVAAP background values. The sediment sample on the north end of the excavation (CS-011-0001-SD) showed eight metals (aluminum, antimony, arsenic, beryllium, chromium, iron, nickel, and vanadium) above RVAAP background values. The field duplicate, CS-011-0001-FD, showed six metals of concern (aluminum, antimony, beryllium, chromium, nickel, and vanadium) above RVAAP background values. The sediment sample CS015 on the south end of the excavation reported seven metals of concern (aluminum, antimony, beryllium, chromium, iron, nickel and vanadium) above RVAAP background values. Confirmatory soil sample CS012 showed two metals of concern (barium and beryllium) above RVAAP background values. Confirmatory soil sample CS013 showed three metals of concern (aluminum, barium, and beryllium) above RVAAP background values. Confirmatory soil sample CS014 showed four metals of concern (cadmium, lead, mercury, and zinc) above the RVAAP background values. A summary of the analytical results for the drainage ditch excavation east of AP-4 is provided in the paragraphs that follow.

At the sediment confirmation sample CS-011-0001-SD (south end of the excavation), the analytical results showed an aluminum concentration of 23600 ppm, an antimony concentration of 0.50 ppm, an arsenic concentration of 22.6 ppm, a beryllium concentration of 0.84 ppm, a chromium concentration of 28.6 ppm, an iron concentration of 38300 ppm, a nickel concentration of 22.6 ppm, a potassium concentration of 2910 ppm, and a vanadium concentration of 38.8 ppm.

Table 4-2
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
DITCH EXCAVATION SOUTH EAST OF AP-3
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-006-0001-SD (Sediment)	LL11CS-006-0001-TB	LL11CS-007-0001-SO (Soil)	LL11CS-008-0001-SO (Soil)	LL11CS-009-0001-SO (Soil)	LL11CS-010-0001-SD (Sediment)
Sample Date				21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01
TAL Metals 6010B mg/kg									
Aluminum	19500.00	13900.00	76000.00	14500	NT	6910	13600	11700	9340
Antimony	0.96	0.00	31.00	BRL	NT	BRL	BRL	BRL	BRL
Arsenic	19.80	19.50	0.39	**9.3**	NT	**12.5**	**13.7**	**16.6**	**15.0**
Barium	124.00	123.00	5400.00	81.8	NT	32.1	62.4	55.2	52.0
Beryllium	0.88	0.38	150.00	0.72	NT	BRL	0.58	0.54	0.49
Cadmium	0.00	0.00	37.00	0.71	NT	BRL	BRL	BRL	0.33
Calcium	35500.00	5510.00	--	2860	NT	1080	1870	13800	1790
Chromium	27.20	18.10	210.00	20.4	NT	11.0	16.7	17.5	13.9
Cobalt	23.20	9.10	4700.00	9.7	NT	5.6	9.4	8.6	10.6
Copper	32.30	27.60	2900.00	21.9	NT	15.1	17.4	22.7	16.1
Iron	35200.00	28200.00	23000.00	**23000**	NT	18300	22500	**25400**	21300
Lead	19.10	27.40	400.00	102	NT	11.5	16.0	20.2	31.2
Magnesium	8790.00	2760.00	--	3600	NT	1890	3300	5730	2740
Manganese	3030.00	1950.00	1800.00	283	NT	294	300	249	356
Mercury	0.04	0.06	23.00	0.074	NT	BRL	BRL	BRL	BRL
Nickel	60.70	17.70	1600.00	23.7	NT	13.7	20.6	23.8	20.9
Potassium	3350.00	1950.00	--	**1950**	NT	**977**	**1800**	**1820**	**1480**
Selenium	1.50	1.70	390.00	BRL	NT	BRL	BRL	BRL	BRL
Silver	0.00	0.00	390.00	BRL	NT	BRL	BRL	BRL	BRL
Sodium	145.00	112.00	--	232	NT	121	207	198	172
Thallium	0.91	0.89	5.20	BRL	NT	BRL	BRL	0.19	BRL
Vanadium	37.60	26.10	550.00	25.8	NT	11.2	22.8	19.0	16.8
Zinc	93.30	532.00	23000.00	137	NT	40.1	51.9	57.3	71.3
VOCs TCL 8260B ug/kg									
Acetone	0.00	0.00	1600.00	8.0	BRL	BRL	BRL	BRL	BRL
Ethylbenzene	0.00	0.00	230.00	BRL	BRL	BRL	BRL	BRL	BRL
Xylene	0.00	0.00	210.00	BRL	BRL	BRL	BRL	BRL	BRL

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but > IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Analytical results for the sediment confirmation sample CS011FD reported concentrations of aluminum at 18300 ppm, antimony at 1.1 ppm, beryllium at 0.68 ppm, chromium at 23.2 ppm, nickel at 20.5 ppm, a potassium concentration of 2150 ppm, and vanadium at 30.3 ppm. Analytical results for the sediment confirmation sample on the north end of the excavation (CS015) reported concentrations of aluminum at 17700 ppm, antimony at 0.41 ppm, beryllium at 0.82 ppm, chromium at 20.5 ppm, iron at 30000 ppm, nickel at 19.8 ppm and vanadium at 26.1 ppm. The RVAAP background values for aluminum, antimony, arsenic, beryllium, chromium, iron, nickel, potassium and vanadium in sediment is 13900 ppm, 0.00 ppm, 19.50 ppm, 0.38 ppm, 18.10 ppm, 28200 ppm, 17.70 ppm, 1980 ppm and 26.10 ppm respectively.

At confirmatory soil sample CS012, the analytical results reported barium at 127 ppm and beryllium at 1.20 ppm. The analytical results for the confirmatory soil sample at CS13 showed aluminum was detected at 24500 ppm, barium at 167 ppm and beryllium at 1.3 ppm. Confirmatory soil sample CS014 reported a cadmium concentration of 0.37 ppm, a lead concentration of 26.4 ppm, a mercury concentration of 0.054 ppm, and a zinc concentration of 201 ppm. The corresponding RVAAP background values for all these metals in soil (>1 ft) include 19500 ppm for aluminum, 124 ppm for barium, 0.88 ppm for beryllium, 0.00 ppm for cadmium, 19.10 ppm for lead, 0.04 ppm for mercury, and 93.3 ppm for zinc.

Analytical results detected four VOC concentrations above RVAAP background values, in the equipment rinseate sample CS-011-0001-ER, for acetone (2 ug/L), ethylbenzene (0.6 ug/L), xylene (0.6 ug/L), and benzene (0.4 ug/L (J)). These chemicals were not detected in the characterization sample.

A summary of the confirmatory sample results for this drainage ditch excavation is provided in Table 4-3. Copies of the ditch excavation confirmation-sample results are provided in Appendix H.

4.2.3 Drainage Ditch North of AP-14

A total of five (5) confirmation samples were collected at the ditch excavation north of AP-14 to verify removal of the VOC, SVOC and pesticide contamination. Three (3) soil samples were collected from the floor of the excavation (~2 feet BGS) and two (2) sediment samples (surface) were collected at either end (Figure 4-2 A and 4-2 B). One of the soil samples was located 20 feet east and one was located 20 feet west of the RI sediment sample SD032. The third soil sample was co-located at the RI sample point. The confirmation sediment samples were collected just outside each end of the excavation, within the undisturbed ditch. One was located 20 feet east of the RI sediment sample SD032 and one was located 20 feet west of this sample point. All the confirmation samples at this ditch location were collected on March 23, 2001.

Table 4-3
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
DITCH EXCAVATION EAST OF AP-4
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-011-0001-SD (Sediment)	LL11CS-011-0001-FD (Sediment)	LL11CS-011-0001-ER	LL11CS-012-0001-SO (Soil)	LL11CS-013-0001-SO (Soil)	LL11CS-014-0001-SO (Soil)	LL11CS-015-0001-SD (Sediment)
Sample Date				23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01
TAL Metals 6010B mg/kg										
Aluminum	19500.00	13900.00	76000.00	23600	18300	283 mg/L	12100	24500	13800	17700
Antimony	0.96	0.00	31.00	0.50	1.1	BRL	BRL	BRL	BRL	0.41
Arsenic	19.80	19.50	0.39	**22.6**	**14.9**	BRL	**7.5**	BRL	**6.0**	**11.6**
Barium	124.00	123.00	5400.00	70.6	62.5	BRL	127	167	71.0	86.3
Beryllium	0.88	0.38	150.00	0.84	0.69	BRL	1.2	1.3	0.80	0.82
Cadmium	0.00	0.00	37.00	BRL	BRL	BRL	BRL	BRL	0.37	BRL
Calcium	35500.00	5510.00	--	1490	1740	115 mg/L	1030	2880	3200	2170
Chromium	27.20	18.10	210.00	28.4	23.2	6 mg/L	16.1	24.3	17.1	20.5
Cobalt	23.20	9.10	4700.00	7.4	7.4	BRL	12.5	3.3	11.7	7.9
Copper	32.30	27.60	2900.00	23.8	19.2	8.1 mg/L	22.8	25.2	21.6	26.3
Iron	35200.00	28200.00	23000.00	**38300**	**25600**	79.8 mg/L	**26900**	9560	20300	**30000**
Lead	19.10	27.40	400.00	17.0	26.1	BRL	9.0	12.3	26.4	14.7
Magnesium	8790.00	2760.00	--	4450	3800	203 mg/L	3750	2380	2890	3080
Manganese	3030.00	1950.00	1800.00	147	211	13.5 mg/L	673	103	201	193
Mercury	0.04	0.06	23.00	BRL	0.049	BRL	BRL	BRL	0.054	BRL
Nickel	60.70	17.70	1600.00	22.6	20.5	BRL	36.0	12.2	24.7	19.8
Potassium	3350.00	1950.00	--	2910	2150	BRL	2080	2600	1680	1980
Selenium	1.50	1.70	390.00	0.94	0.61	BRL	BRL	BRL	1.1	0.50
Silver	0.00	0.00	390.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	112.00	--	943	827	BRL	1010	951	831	938
Thallium	0.91	0.89	5.20	0.21	BRL	BRL	BRL	BRL	0.22	0.23
Vanadium	37.60	26.10	550.00	38.8	30.3	BRL	20.8	30.2	22.7	26.1
Zinc	93.30	532.00	23000.00	63.8	75.5	BRL	62.9	77.8	201	65.3
VOCs TCL 8260B ug/kg										
Acetone	0.00	0.00	1600.00	BRL	BRL	**2 ug/L**	BRL	BRL	BRL	BRL
Ethylbenzene	0.00	0.00	230.00	BRL	BRL	**0.6 ug/L**	BRL	BRL	BRL	BRL
Xylene	0.00	0.00	210.00	BRL	BRL	**0.6 ug/L**	BRL	BRL	BRL	BRL
Benzene	0.00	0.00	0.65	BRL	BRL	**0.4 ug/L (J)**	BRL	BRL	BRL	BRL

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Analytical results showed three SVOC concentrations above RVAAP background values in confirmatory sediment sample CS-016-0001-SD, fluoranthene at 290(J) ppb, crysene at 170(J) ppb, and benzo (a) pyrene at 160(J) ppb. Analytical results showed nine SVOCs above the laboratory reporting values at the sediment sample on the east of the excavation (CS-020-0001-SD). Fluoranthene was detected at 600 ppb, pyrene at 670 ppb, crysene at 340(J) ppb, benzo (a) pyrene at 340(J) ppb, benzo (g,h,i) perylene at 240(J) ppb, benzo (a) anthracene at 270(J) ppb, benzo (b) anthracene at 390(J) ppb, indo (1,2,3-cd) pyrene at 270(J) ppb and phenanthrene at 260(J) ppb. The corresponding RVAAP background values for all of these SVOC concentrations in sediment are 0.0 ppb for all analytes.

Analytical results in confirmatory soil sample CS-019-0001-SO, show that nine SVOC concentrations were above RVAAP background values. Fluoranthene was detected at 600 ppb, pyrene at 670 ppb, crysene at 340(J) ppb, benzo (a) pyrene at 340(J) ppb, benzo (g,h,i) perylene at 240(J) ppb, benzo (a) anthracene at 270(J) ppb, benzo (b) anthracene at 390(J) ppb, indo (1,2,3-cd), pyrene at 270(J) ppb and phenanthrene at 260(J) ppb. The corresponding RVAAP background values for all of these SVOC concentrations in soil >1 foot, are 0.0 ppb for all analytes.

Analytical results showed one VOC concentration, acetone (3 ug/L), was detected in CS-017-0001-ER. These chemicals were not detected in the characterization sample.

Pesticides were not detected in any of the confirmation samples in this drainage ditch excavation. A summary of the confirmatory sample results for the drainage ditch excavation north of AP-14 is provided in Table 4-4. Copies of the ditch excavation confirmation-sample results are provided in Appendix H.

4.2.4 Drainage Ditch East of LL-11 Entrance Road

A total of five (5) confirmation samples were collected at the ditch excavation east of AP-4 (Figure 4-2 A and 4-2 B). Three (3) soil samples were collected from the bottom of the excavation (~2 feet BGS) and two (2) sediment samples (surface) were collected at either end of the excavation (5 total) to verify removal of the metals contamination. One of the soil samples was located 20 feet north of the RI sediment sample SD013 and one sample was located 20 feet south of the RI sample SD013. The third soil sample was co-located at the RI sample point. The confirmation sediment samples were collected just outside each end of the excavation, within the undisturbed ditch. The confirmation samples at this drainage ditch location were collected on March 21, 2001.

Analytical results showed metals concentrations above the RVAAP background values at both sediment confirmatory sample locations. At confirmation sediment sample CS021 on the north end of the excavation, beryllium was reported at 0.70 ppm, cadmium was reported at 0.44 ppm, cobalt was reported at 9.9 ppm and mercury was reported at 0.07 ppm.

Table 4-4
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
DITCH EXCAVATION NORTH OF AP-14
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-016-0001-SD (Sediment)	LL11CS-017-0001-SO (Soil)	LL11CS-017-0001-FD (Soil)	LL11CS-017-0001-ER	LL11CS-017-0001-TB	LL11CS-018-0001-SO (Soil)	LL11CS-019-0001-SO (Soil)	LL11CS-020-0001-SD (Sediment)
Sample Date				23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01	23-Mar-01
VOCs TCL 8260B ug/kg											
Acetone	0.00	0.00	1600.00	BRL	BRL	BRL	3 ug/L	BRL	BRL	BRL	BRL
Ethylbenzene	0.00	0.00	230.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Xylene	0.00	0.00	210.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
SVOCs TCL 8270 C ug/kg											
Fluoranthene	0.00	0.00	2300.00	290 (J)	BRL	BRL	BRL	NT	BRL	330 (J)	600
Pyrene	0.00	0.00	2300.00	BRL	BRL	BRL	BRL	NT	BRL	410 (J)	670
Crysene	0.00	0.00	62.00	170 (J)	BRL	BRL	BRL	NT	BRL	210 (J)	340 (J)
Benzo(a)pyrene	0.00	0.00	0.062	**160 (J)**	BRL	BRL	BRL	NT	BRL	**200 (J)**	**340 (J)**
Benzo(g,h,i)perylene	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	240 (J)
Benzo(a)anthracene	0.00	0.00	0.62	BRL	BRL	BRL	BRL	NT	BRL	170 (J)	270 (J)
Benzo(b)fluoranthene	0.00	0.00	0.62	BRL	BRL	BRL	BRL	NT	BRL	220 (J)	390 (J)
Indeno(1,2,3-*cd*)pyrene	0.00	0.00	0.62	BRL	BRL	BRL	BRL	NT	BRL	BRL	270 (J)
Phenanthrene	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	**170 (J)**	**260 (J)**
Pesticides 8081A mg/kg											
alpha-BHC	0.00	0.00	0.09	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
beta-BHC	0.00	0.00	0.32	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
delta-BHC	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
gamma-BHC (Lindane)	0.00	0.00	0.44	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Heptachlor	0.00	0.00	0.11	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Aldrin	0.00	0.00	0.029	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Heptachlor epoxide	0.00	0.00	0.053	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Endosulfan I	0.00	0.00	370.00	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Dieldrin	0.00	0.00	0.03	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
4,4-DDE	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Endosulfan II	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
4,4-DDD	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Endrin	0.00	0.00	18.00	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Endosulfan sulfate	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
4,4-DDT	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Methoxychlor	0.00	0.00	310.00	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Endrin ketone	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Endrin aldehyde	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
alpha-Chlodane	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
gamma-Chlordane	0.00	0.00	--	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL
Toxaphene	0.00	0.00	0.44	BRL	BRL	BRL	BRL	NT	BRL	BRL	BRL

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Confirmatory sediment sample CS025 (south end of excavation) reported twelve metals above RVAAP background including: aluminum (23800 ppm), antimony (0.46 ppm), beryllium (1.1 ppm), cadmium (0.58 ppm), chromium (26.3 ppm), cobalt (16.6 ppm), copper (27.9 ppm), lead (42.4 ppm), mercury (0.08 ppm) nickel (33.2 ppm), potassium (2660 ppm) and vanadium (32.0 ppm). The corresponding RVAAP background value for the confirmatory sediment samples include aluminum at 13900 ppm, antimony at 0.00 ppm, beryllium at 0.38 ppm, cadmium at 0.00 ppm, chromium at 18.10 ppm, cobalt at 9.10 ppm, copper at 27.60 ppm, lead at 27.40 ppm, mercury at 0.06 ppm, nickel at 17.7 ppm, potassium at 1950 ppm and vanadium at 26.1 ppm.

One of the three soil confirmation samples, CS-023-0001-SO, at this ditch excavation reported metals above the RVAAP background values. A beryllium concentration of 0.99 ppm and an iron concentration of 47600 ppm were reported. The RVAAP background value for beryllium and iron is 0.88 ppm and 28200 ppm, respectively. A summary of the drainage ditch confirmatory sample results for the excavation just east of the LL-11 entrance road is provided in Table 4-5. Copies of the ditch excavation confirmation-sample results are provided in Appendix H.

4.2.5 Drainage Ditch West of AP-8

A total of five (5) confirmation samples were collected at the ditch excavation west of AP-8 (Figure 4-2 A and 4-2 B). Three (3) soil samples were collected from the bottom of the excavation (~2 feet BGS) and two (2) sediment samples (surface) were collected at either end to verify removal of the metals contamination (Figure 4-2 A and 4-2 B). One of the soil samples was located 20 feet north and one was located 20 feet south of the RI sediment sample SD033. The third soil sample was co-located at the RI sample point. The confirmation sediment samples were collected just outside each end of the excavation in the undisturbed ditch. All the confirmation-sampling operations at the drainage ditch west of AP-8 were performed on March 21, 2001.

Antimony, beryllium and cadmium were detected above RVAAP background in the sediment on the north end of the excavation at confirmation sample location CS026. The reported concentrations of metals that were above RVAAP background data are: antimony at 0.50 ppm, beryllium at 1.2 ppm and cadmium at 0.24 ppm. Only one metal of concern (beryllium at 0.56 ppm) was detected above RVAAP background at the confirmatory sediment sample on the south end of the excavation (CS030). The RVAAP background values for antimony, beryllium, and cadmium in sediment are 0.00 ppm, 0.38 ppm and 0.00 ppm respectively.

None of the soil confirmation samples on the bottom of the excavation reported metals concentrations in excess of RVAAP background values. A summary of the drainage ditch confirmatory sample results for the ditch excavation west of AP-8 is provided in Table 4-6. Copies of the ditch excavation confirmation-sample results are provided in Appendix H.

Table 4-5
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
DITCH EXCAVATION EAST OF THE LL-11 ENTRANCE ROAD
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-021-0001-SD (Sediment)	LL11CS-022-0001-SO (Soil)	LL11CS-023-0001-SO (Soil)	LL11CS-024-0001-SO (Soil)	LL11CS-025-0001-SD (Sediment)
Sample Date				21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01
TAL Metals 6010B mg/kg								
Aluminum	19500.00	13900.00	76000.00	13400	6260	15700	13200	23800
Antimony	0.96	0.00	31.00	BRL	BRL	BRL	BRL	0.46
Arsenic	19.80	19.50	0.39	**8.2**	**15.7**	**11.5**	**11.3**	**8.8**
Barium	124.00	123.00	5400.00	68.5	35.9	82.8	58.8	94.7
Beryllium	0.88	0.38	150.00	0.70	BRL	0.99	0.47	1.1
Cadmium	0.00	0.00	37.00	0.44	BRL	BRL	BRL	0.58
Calcium	35500.00	5510.00	--	3220	408	1020	745	3660
Chromium	27.20	18.10	210.00	15.7	8.8	21.9	16.0	26.3
Cobalt	23.20	9.10	4700.00	9.9	6.4	13.9	6.9	16.6
Copper	32.30	27.60	2900.00	14.6	19.4	26.0	16.1	27.9
Iron	35200.00	28200.00	23000.00	16400	18700	**47600**	20800	**27000**
Lead	19.10	27.40	400.00	26.8	17.3	10.8	7.8	42.4
Magnesium	8790.00	2760.00	--	1830	1650	3780	2310	2940
Manganese	3030.00	1950.00	1800.00	410	592	1030	203	342
Mercury	0.04	0.06	23.00	0.070	BRL	BRL	BRL	0.080
Nickel	60.70	17.70	1600.00	17.0	13.9	27.9	15.7	33.2
Potassium	3350.00	1950.00	--	1500	883	2700	1640	2660
Selenium	1.50	1.70	390.00	0.63	BRL	BRL	BRL	1.3
Silver	0.00	0.00	390.00	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	112.00	--	189	122	245	155	278
Thallium	0.91	0.89	5.20	BRL	BRL	BRL	BRL	BRL
Vanadium	37.60	26.10	550.00	22.0	10.2	26.5	20.5	32.0
Zinc	93.30	532.00	23000.00	219	54.8	67.5	51.8	465

** = Only detected compounds listed

-- = Data not available

BRL = Below Reporting Limit

ND = Not detected

NT = Not Tested

PRGs = Preliminary Remediation Goals

mg/kg = milligrams per kilogram (parts per million - ppm)

ug/L = micrograms per Liter (parts per billion - ppb)

= concentration greater than background

BOLD = concentration greater than Region 9 PRG data

INORGANIC FLAGS

(B) = result is < CRDL/RL, but ≥ IDL/MDL

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL

(J) = Result is an estimated value below the RL

(A) = Concentration exceeds the instrument calibration range or below the RL

Table 4-6
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
DITCH EXCAVATION WEST OF AP-8
LOAD LINE 11 2001 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-026-0001-SD (Sediment)	LL11CS-027-0001-SO (Soil)	LL11CS-028-0001-SO (Soil)	LL11CS-029-0001-SO (Soil)	LL11CS-030-0001-SD (Sediment)
Sample Date				21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01	21-Mar-01
TAL Metals 6010B mg/kg								
Aluminum	19500.00	13900.00	76000.00	12900	15800	14500	10500	13600
Antimony	0.96	0.00	31.00	0.50	0.34	0.51	0.26	BRL
Arsenic	19.80	19.50	0.39	**11.6**	**11.9**	**15.1**	**15.0**	**10.9**
Barium	124.00	123.00	5400.00	89.4	79.0	95.3	68.7	65.8
Beryllium	0.88	0.38	150.00	1.2	0.53	0.7	0.53	0.56
Cadmium	0.00	0.00	37.00	0.24	BRL	BRL	BRL	BRL
Calcium	35500.00	5510.00	--	12300	922	1440	2680	3610
Chromium	27.20	18.10	210.00	14.1	16.7	18.5	14.8	18.1
Cobalt	23.20	9.10	4700.00	6.8	8.0	12.1	9.5	5.6
Copper	32.30	27.60	2900.00	12.6	16.8	20.5	21.8	9.8
Iron	35200.00	28200.00	23000.00	18500	20400	**31200**	**25100**	**25100**
Lead	19.10	27.40	400.00	24.6	7.6	9.2	13.2	12.4
Magnesium	8790.00	2760.00	--	5430	2670	2850	3770	3550
Manganese	3030.00	1950.00	1800.00	654	180	1140	508	260
Mercury	0.04	0.06	23.00	BRL	BRL	BRL	BRL	BRL
Nickel	60.70	17.70	1600.00	13.4	17.7	23.8	27.1	15.4
Potassium	3350.00	1950.00	--	1430	1820	2260	1600	1620
Selenium	1.50	1.70	390.00	0.9	BRL	BRL	BRL	0.55
Silver	0.00	0.00	390.00	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	112.00	--	241	172	182	193	185
Thallium	0.91	0.89	5.20	BRL	BRL	BRL	BRL	BRL
Vanadium	37.60	26.10	550.00	18.1	21.7	24.9	16.9	25.2
Zinc	93.30	532.00	23000.00	65.8	57.4	62.3	59.5	55.2

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS

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PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS

(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

4.2.6 Drainage Ditch North of AP-19

A total of nine (9) confirmation samples were collected from the excavation at the drainage ditch north of AP-19 to verify removal of the metals contamination (Figure 4-2A and 4-2B). Seven (7) soil samples were collected from the bottom of the excavation (~2 feet BGS) and two (2) sediment samples (surface) were collected at either end of the excavation. One of the soil samples was located 20 feet east of the RI sediment sample SD018 and one was located 20 feet west of SD018. The third soil sample was co-located at SD018. Four other soil samples were targeted around the RI sediment sample SD019. One was located 20 feet north and one was located 20 feet south of SD019. The third sample was co-located at this RI sample point. Due to the size of the excavation, an additional sample was collected from the center of the excavation (40 feet north of SD018 and 40 feet south of SD019). The confirmation sampling operations at this drainage ditch location were performed on March 20, 2001.

Analytical results reported metals concentrations in excess of the RVAAP background values at both of the sediment confirmation sample locations and four of the seven soil confirmation samples on the bottom of the excavation. At sediment sample CS031 a total of five were detected above the RVAAP background values including beryllium (0.61ppm), cadmium (0.47 ppm), lead (64.5 ppm), mercury (0.090 ppm) and selenium (2.0 ppm). In the associated duplicate sample (CS031-FD), a total of nine metals of concern were detected at levels greater than RVAAP background including aluminum (21000 ppm), beryllium (0.71 ppm), cadmium (0.29 ppm), chromium (27.1 ppm), iron (33100 ppm), lead (55.0 ppm), nickel (22.3 ppm), potassium (2000 ppm) and vanadium (43.9 ppm).

The sediment confirmation sample on the north end of the excavation (CS039) reported four metals of concern in excess of the RVAAP background value. Analytical results showed beryllium at 0.61 ppm, cadmium at 0.57 ppm, cobalt at 10.7 ppm, and lead at 41.3 ppm. The corresponding RVAAP background values for the metals in sediment at both confirmation sample locations include 13900 ppm for aluminum, 0.38 ppm for beryllium, 0.00 ppm for cadmium, 18.10 ppm for chromium, 9.10 ppm for cobalt, 28200 ppm for iron, 27.40 ppm for lead, 0.06 ppm for mercury, 17.70 ppm for nickel, 1950 for potassium, 1.70 ppm for selenium, and 26.10 ppm for vanadium.

Two metals (arsenic and lead) were detected above RVAAP background at confirmatory soil sample CS032. Analytical results showed arsenic at 25.3 ppm and lead at 19.2 ppm. Three metals of concern were also reported in excess of the RVAAP background values at confirmatory soil sample CS034. Analytical results showed cadmium at 0.38 ppm, lead at 20.6 ppm and zinc at 147 ppm. Confirmatory soil sample CS035 reported one metal of concern in excess of RVAAP background values (cadmium at 0.22 ppm). At CS036, two metals of concern were reported in excess of RVAAP background values: a cadmium concentration of 0.31 ppm, and a cobalt concentration of 24.7 ppm.

No metals were detected above the RVAAP background values at CS033, CS037, and CS038. The RVAAP background values for all the metals detected in confirmation soil samples from the bottom of the ditch excavation north of AP-19 are as follows: arsenic at 19.8 ppm, cadmium at 0.00 ppm, cobalt at 23.2 ppm, lead at 19.1 ppm, and zinc at 93.30 ppm. A summary of the drainage ditch confirmatory sample results for the ditch excavation north of AP-19 is provided in Table 4-7. Copies of the ditch excavation confirmation-sample results are provided in Appendix H.

4.3 Hot Spot Confirmation Sampling

Following removal of the petroleum contaminated soils (PCS), a total of six (6) confirmation samples (not including QC samples) were collected from the bottom of the hot spot excavation as shown in Figure 4-3A and 4-3B, approximately 8 feet BGS. Each of the samples were analyzed for VOCs, SVOCs, Explosives, Propellants, TAL Metals, Pest/PCBs, Cyanide, Sulfide, Sulfate, Nitrate, TPH (DRO) and TPH (GRO) analysis.

Analytical results reported that of the metals analyzed, arsenic and cyanide were detected above the RVAAP background value (19.8 ppm and 0.00 ppm respectively). Arsenic concentrations of 44.1 ppm and 36.4 ppm were detected at CS-045-0001-SO and CS-045-0001-FD. Cyanide concentrations of 0.015(B) ppm and 0.018(B) ppm were detected at CS-040-0001-SO and CS-040-0001-FD.

In addition to metals, nitrocellulose, with a RVAAP background value of 0.00 ppm, was detected at confirmation sample locations CS-040-0001-SO (1.5(B) ppm), CS-040-0001-FD (0.4(B) ppm), CS-041-0001-SO (0.77(B) ppm), CS-042-0001-SO (0.8(B) ppm), CS-043-0001-SO (0.83(B) ppm), CS-044-0001-SO (0.97(B) ppm), CS-045-0001-SO (0.89(B) ppm) and CS-045-0001-FD (0.9(B) ppm).

Two SVOCs were detected at confirmation sample location CS-043-0001-SO (fluoranthene at 160(J) ppb and benzo (a) pyrene at 120(J) ppb). TPH (DRO) and TPH (GRO) were also detected at confirmation sample location CS-043-0001-SO (34 ppm and 0.054(J) ppm respectively) and TPH (GRO) was detected at CS-047-0001-SO (0.026(J)).

Analytical results reported that inorganics were detected in the confirmation samples taken at the hot spot. Nitrate was detected at the following locations: CS040 (0.88(J) ppm), CS040 FD (0.44 (J) ppm), CS041 (0.72(B) ppm), CS042 (0.48(B) ppm), CS043 (0.40(B) ppm), CS044 (0.62(B) ppm), CS045 (0.55(B) ppm) and CS045 FD (0.47(B) ppm). Sulfide was detected at CS045 ER with a concentration of 0.50 mg/L (B). Sulfate was detected at the following locations: CS040 (23.1(B) ppm), CS040 FD (27.8 (B) ppm), CS041 (40(B) ppm), CS042 (19.8(B) ppm), CS043 (18.1(B) ppm), CS044 (29.9(B) ppm), CS045 (35(B) ppm) and CS045 FD (27(B) ppm).

One VOC, (acetone), and one pesticide, (heptachlor), were detected above RVAAP background values in two equipment rinseate samples. CS-040-0001-ER and CS-045-0001-ER had detections of 4 ug/L and 2 ug/L respectively for acetone and 0.058 mg/L and 0.061 mg/L respectively for heptachlor.

A summary of all the LL-11 IRA hot spot confirmatory samples results is provided in Table 4-8. Copies of the hot spot excavation confirmation sample results are provided in Appendix H.

Table 4-7
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
DITCH EXCAVATION NORTH OF AP-19
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Sediment Background Criteria mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-031-0001-SD (Sediment)	LL11CS-031-0001-FD (Sediment)	LL11CS-031-0001-ER	LL11CS-032-0001-SO (Soil)	LL11CS-033-0001-SO (Soil)	LL11CS-034-0001-SO (Soil)	LL11CS-035-0001-SO (Soil)	LL11CS-036-0001-SO (Soil)	LL11CS-037-0001-SO (Soil)	LL11CS-038-0001-SO (Soil)	LL11CS-039-0001-SD (Sediment)
Sample Date				20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-01	20-Mar-10	20-Mar-01
TAL Metals 6010B mg/kg														
Aluminum	19500.00	13900.00	76000.00	10600	21000	BRL	9150	13900	13400	12200	9250	8960	6670	7960
Antimony	0.96	0.00	31.00	BRL	BRL	BRL	0.46	0.39	0.39	BRL	BRL	0.53	BRL	BRL
Arsenic	19.80	19.50	0.39	**15.0**	**11.5**	BRL	**25.3**	**18.9**	**17.5**	**17.3**	**14.8**	**15.7**	**7.2**	**14.7**
Barium	124.00	123.00	5400.00	85.2	87.5	BRL	72.0	52.8	87.8	41.6	83.2	33.7	27.1	61.1
Beryllium	0.88	0.38	150.00	0.61	0.71	BRL	0.51	0.50	0.73	0.69	0.58	0.47	BRL	0.61
Cadmium	0.00	0.00	37.00	0.47	0.29	BRL	BRL	BRL	0.38	0.22	0.31	BRL	BRL	0.57
Calcium	35500.00	5510.00	--	2390	1980	BRL	392	1240	1970	930	823	508	620	2160
Chromium	27.20	18.10	210.00	16.5	27.1	BRL	10.5	19.5	15.8	16.5	13.3	12.5	8.5	10.8
Cobalt	23.20	9.10	4700.00	8.2	8.7	BRL	12.6	5.5	10.0	8.9	24.7	6.7	3.4	10.7
Copper	32.30	27.60	2900.00	19.7	20.6	BRL	19.4	18.6	13.1	25.6	20.5	18.4	6.0	9.3
Iron	35200.00	28200.00	23000.00	19200	**33100**	BRL	22300	**23100**	**25800**	**29800**	**24300**	22400	14800	20600
Lead	19.10	27.40	400.00	64.5	55.0	BRL	19.2	14.6	20.6	9.6	12.2	14.2	9.4	41.3
Magnesium	8790.00	2760.00	--	2140	3880	BRL	1920	2950	2380	2940	2730	2190	1800	1500
Manganese	3030.00	1950.00	1800.00	754	882	BRL	488	102	861	242	**1930**	218	165	443
Mercury	0.04	0.06	23.00	0.090	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Nickel	60.70	17.70	1600.00	15.2	22.3	BRL	15.7	17.2	17.1	21.4	33.5	16.9	10.6	12.0
Potassium	3350.00	1950.00	--	856	2000	BRL	872	1330	1480	1470	1090	1020	688	675
Selenium	1.50	1.70	390.00	2.0	0.6	BRL	0.60	BRL	0.85	BRL	BRL	0.63	0.78	0.86
Silver	0.00	0.00	390.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	112.00	--	817	1180	BRL	623	928	923	1050	807	724	608	655
Thallium	0.91	0.89	5.20	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Vanadium	37.60	26.10	550.00	24.2	43.9	BRL	16.3	22.6	25.6	20.3	14.8	15.1	13.5	20.9
Zinc	93.30	532.00	23000.00	234	81.0	BRL	47.2	57.3	147	61.8	60.6	50.9	29.0	176

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested

INORGANIC FLAGS
(B) = result is < CRDL/RL, but ≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS
(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

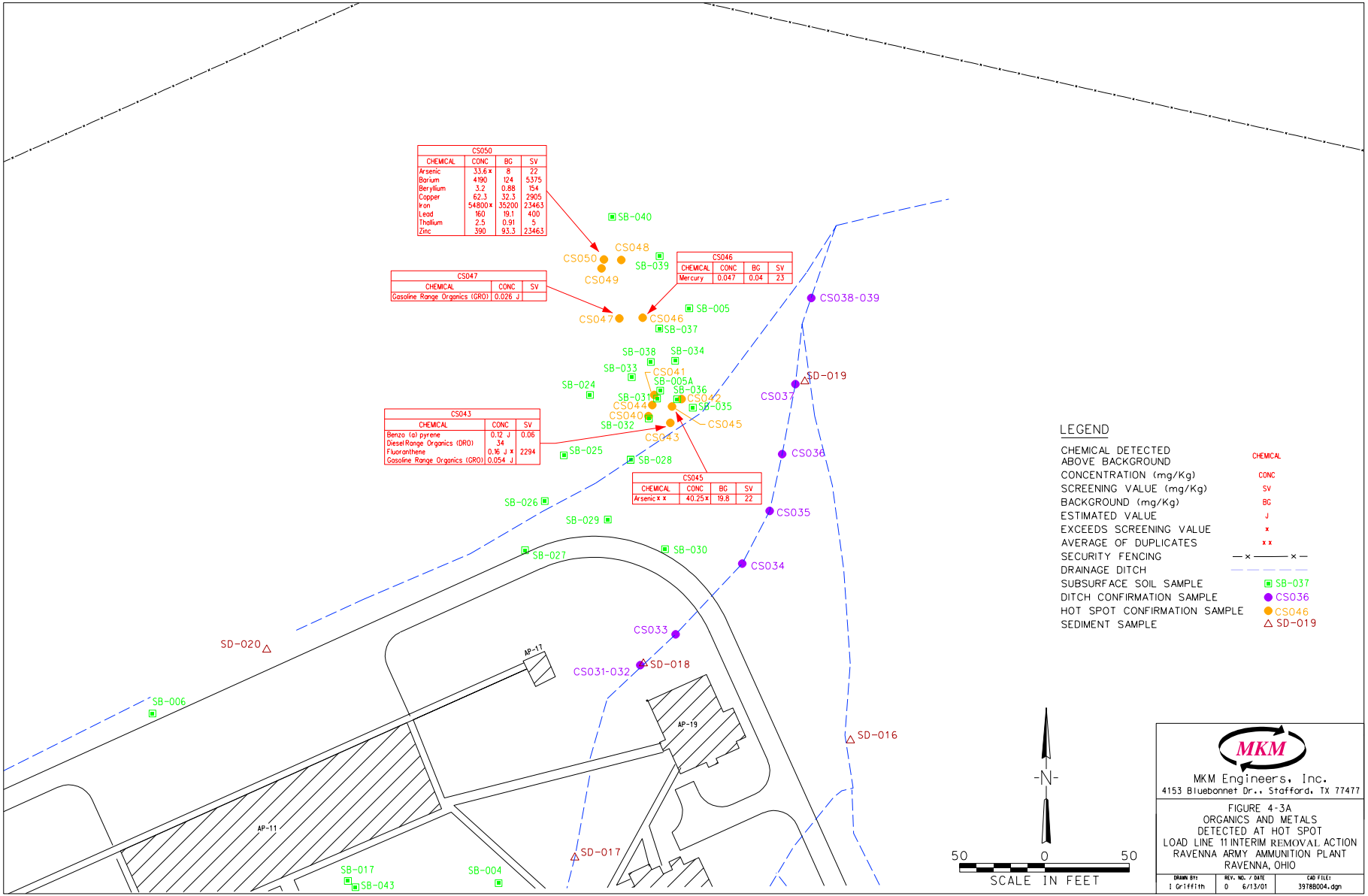

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FIGURE 4-3A
ORGANICS AND METALS
DETECTED AT HOT SPOT
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I Griffith	0 6/13/01	39788004.dgn

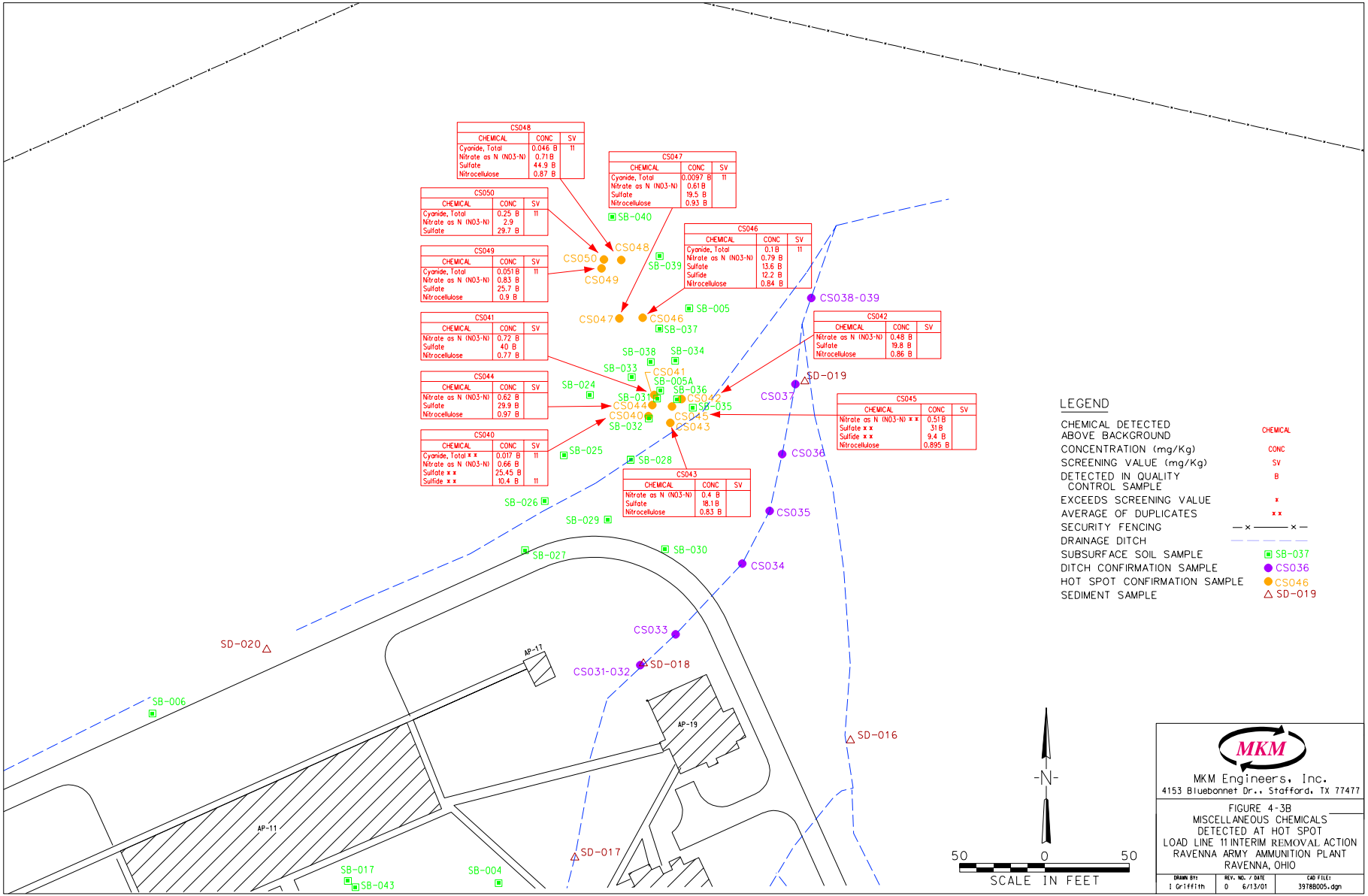

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FIGURE 4-3B
MISCELLANEOUS CHEMICALS DETECTED AT HOT SPOT
LOAD LINE 11 INTERIM REMOVAL ACTION
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

DRAWN BY:	REV. NO. / DATE	CAD FILE:
I Griffith	0 6/13/01	39788005.dgn

4.4 Data Validation

The analytical methods employed during the implementation of the LL-11 IRA sampling are defined in the Revised 2001 Facility-Wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna Ohio (FW SAP). Severn Trent Laboratories of University Park, IL performed all confirmatory sample analyses. Sample results were validated according to the criteria established by the Revised 2001 Facility-Wide Quality Assurance Project Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio (FW QAPP). In situations where additional information was required for data validation, the SW-846 methods were reviewed followed by consideration of the National Functional Guidelines for Laboratory Data Review (EPA, 1994). Included in the FW QAPP is a description of the quality control sample collection requirements and specific quality assurance objectives for the measurement data. These QA objectives, typically called Data Quality Objectives (DQOs), are quantitative and qualitative statements that specify the quality of data used to support project decisions. They are expressed in terms of precision, accuracy, representativeness, comparability, completeness and sensitivity.

The criteria for evaluating DQOs are presented in the FW QAPP. These criteria include review of quality control (QC) samples collected in the field, laboratory QC samples, and analytical method performance. The field QC samples and analytical data reports were reviewed in accordance with validation guidance presented in the FW QAPP.

Field duplicate samples and field equipment rinseates were collected at a frequency of 10 percent for analysis to assess field sample precision and accuracy. Additionally, the laboratory analyzed a method blank and a method blank spike for each analytical batch to detect reagent contamination and proper instrument performance. Matrix spike and matrix spike duplicate samples, provided by the field sampling teams, were analyzed with each analytical batch to evaluate the impact of sample matrix on sample analyses.

The primary objectives of data validation include review of sampling, analytical, and data reduction protocols for correctness; quantitative assessment of the measurement data validity; assessment of data completeness. The project data validation procedures were designed to review all data and identify biases inherent to the data including assessment of laboratory performance, overall precision and accuracy, representativeness, and completeness.

The analytical laboratory as specified by the RVAAP Revised 2001 FW SAP applied data validation flags. The analytical data was then reviewed and validated by Purves Environmental, Inc. If appropriate, the data validator revised the laboratory flagging after a thorough review of all quality control criteria. An explanation of the data usability, laboratory performance and data qualifiers are provided in the data validation reports for LL-11 IRA prepared by Purves Environmental, Inc. The data validation reports and analytical reports are provided in Appendix G and H.

Table 4-8
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
HOT SPOT NORTH EAST OF AP-19
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-040-0001-SO (Soil)	LL11CS-040-0001-FD (Soil)	LL11-CS-040-0001-ER	LL11CS-041-0001-SO (Soil)	LL11CS-042-0001-SO (Soil)	LL11CS-043-0001-SO (Soil)	LL11CS-044-0001-SO (Soil)	LL11CS-045-0001-SO (Soil)
Sample Date			22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01
Explosives 8330 ug/kg										
HMX	0.00	3100.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
RDX	0.00	4.40	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
1,3-Dinitrobenzene	0.00	6.10	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Nitrobenzene	0.00	20.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,4,6-Trinitrtoluene	0.00	16.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Tetryl	0.00	610.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,4-Dinitrotoluene	0.00	120.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,6-Dinitrotoluene	0.00	61.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Nitrotoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4-Nitrtoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
3-Nitrotoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
TAL Metals 6010B mg/kg										
Aluminum	19500.00	76000.00	12100	11400	BRL	8170	9500	9380	4900	7030
Antimony	0.96	31.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Arsenic	19.80	0.39	**16.2**	**19.7**	BRL	**17.3**	**16.1**	**15.6**	**13.6**	**44.1**
Barium	124.00	5400.00	32.2	30.9	BRL	26.7	33.3	30.6	28.2	82.3
Beryllium	0.88	150.00	0.42	0.41	BRL	0.34	0.38	0.38	BRL	BRL
Cadmium	0.00	37.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Calcium	35500.00	--	762	688	101	216	489	435	162	246
Chromium	27.20	210.00	12.6	12.1	BRL	9.3	12.0	11.5	5.9	10.1
Cobalt	23.20	4700.00	7.8	7.2	BRL	6.7	7.0	6.2	4.9	17.4
Copper	32.30	2900.00	22.4	20.5	BRL	18.4	18.0	17.7	14.4	18.5
Iron	35200.00	23000.00	22700	22400	BRL	17800	19900	18600	13700	**27500**
Lead	19.10	400.00	15.4	11.4	BRL	9.3	9.5	9.9	8.2	9.5
Magnesium	8790.00	--	2120	2020	BRL	1580	2220	1930	1060	1970
Manganese	3030.00	1800.00	341	304	BRL	324	274	222	228	1630
Mercury	0.04	23.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Nickel	60.70	1600.00	15.0	14.2	BRL	12.2	15.8	13.5	10.6	25.1
Potassium	3350.00	--	942	831	BRL	873	1010	1080	691	1060
Selenium	1.50	390.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Silver	0.00	390.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Thallium	0.91	5.20	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Vanadium	37.60	550.00	20.6	19.4	BRL	13.6	14.8	15.1	9.1	9.7
Zinc	93.30	23000.00	51.9	48.7	BRL	48.3	53.8	49.7	48.7	66.6
Cyanide mg/kg										
Cyanide, Total	0.00	11.00	0.015 (B)	0.018 (B)	BRL	BRL	BRL	BRL	BRL	BRL
Propellants 8330 mg/kg										
Nitroglycerin	0.00	35.00	ND	ND	ND	ND	ND	ND	ND	ND
Nitroguanidine	0.00	6100.00	ND	ND	ND	ND	ND	ND	ND	ND
Nitrocellulose	0.00	0.00	**1.5 (B)**	**0.40 (B)**	ND	**0.77 (B)**	**0.80 (B)**	**0.83 (B)**	**0.97 (B)**	**0.89 (B)**
VOCs TCL 8260B ug/kg										
Acetone	0.00	1600.00	BRL	BRL	4 ug/L	BRL	BRL	BRL	BRL	BRL
Ethylbenzene	0.00	230.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Xylene	0.00	210.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL

Table 4-8
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
HOT SPOT NORTH EAST OF AP-19
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-040-0001-SO (Soil)	LL11CS-040-0001-FD (Soil)	LL11-CS-040-0001-ER	LL11CS-041-0001-SO (Soil)	LL11CS-042-0001-SO (Soil)	LL11CS-043-0001-SO (Soil)	LL11CS-044-0001-SO (Soil)	LL11CS-045-0001-SO (Soil)
Sample Date			22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01
SVOCs TCL 8270 C ug/kg										
Fluoranthene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	160 (J)	BRL	BRL
Pyrene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)pyrene	0.00	0.062	BRL	BRL	BRL	BRL	BRL	**120 (J)**	BRL	BRL
Pesticides 8081A mg/kg										
alpha-BHC	0.00	0.09	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
beta-BHC	0.00	0.32	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
delta-BHC	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
gamma-BHC (Lindane)	0.00	0.44	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Heptachlor	0.00	0.11	BRL	BRL	0.058 mg/L	BRL	BRL	BRL	BRL	BRL
Aldrin	0.00	0.029	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Heptachlor epoxide	0.00	0.053	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan I	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Dieldrin	0.00	0.03	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDE	0.00	1.7	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan II	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDD	0.00	2.4	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endrin	0.00	18.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan sulfate	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDT	0.00	1.7	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Methoxychlor	0.00	310.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endrin ketone	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endrin aldehyde	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
alpha-Chlodane	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
gamma-Chlordane	0.00	1.6	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Toxaphene	0.00	0.44	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
PCB TCL 8082 mg/kg										
Aroclor-1016	0.00	3.90	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1221	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1232	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1242	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1248	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1254	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1260	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
TPH mg/kg		**BUSTR Soil Saturation Limit for TPH (PPM)*** **								
DRO mg/kg	0.00	20000.00	BRL	BRL	BRL	BRL	BRL	34	BRL	BRL
GRO ug/kg	0.00	10000.00	BRL	BRL	BRL	BRL	BRL	0.054 (J)	BRL	BRL
Inorganics mg/kg										
Nitrate, as N	0.00	--	0.88 (J)	0.44 (J)	BRL	0.72 (B)	0.48 (B)	0.40 (B)	0.62 (B)	0.55 (B)
Sulfide	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Sulfate	0.00	--	23.1 (B)	27.8 (B)	BRL	40.0 (B)	19.8 (B)	18.1 (B)	29.9 (B)	35.0 (B)

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS
(B) = result is < CRDL/RL, but≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS
(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

Table 4-8
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
HOT SPOT NORTH EAST OF AP-19
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-045-0001-FD (Soil)	LL11CS-045-0001-ER	LL11CS-046-0001-SO (Soil)	LL11CS-047-0001-SO (Soil)	LL11CS-048-0001-SO (Soil)	LL11CS-049-0001-SO (Soil)	LL11CS-050-0001-SO (Soil)
Sample Date			22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01
Explosives 8330 ug/kg									
HMX	0.00	3100.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
RDX	0.00	4.40	BRL	BRL	BRL	BRL	BRL	BRL	BRL
1,3,5-Trinitrotoluene	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
1,3-Dinitrobenzene	0.00	6.10	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Nitrobenzene	0.00	20.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,4,6-Trinitrtoluene	0.00	16.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Tetryl	0.00	610.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,4-Dinitrotoluene	0.00	120.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2,6-Dinitrotoluene	0.00	61.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
2-Nitrotoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4-Nitrtoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
3-Nitrotoluene	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
TAL Metals 6010B mg/kg									
Aluminum	19500.00	76000.00	7620	BRL	11500	9980	10500	12600	13200
Antimony	0.96	31.00	BRL	BRL	BRL	BRL	BRL	BRL	0.39
Arsenic	19.80	0.39	**36.4**	BRL	**9.6**	**13.9**	**13.6**	**10.4**	**33.6**
Barium	124.00	5400.00	83.7	BRL	80.0	36.2	40.6	57.4	4190
Beryllium	0.88	150.00	0.39	BRL	0.61	0.37	0.35	0.44	3.2
Cadmium	0.00	37.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Calcium	35500.00	--	271	BRL	1500	682	655	983	4730
Chromium	27.20	210.00	10.9	BRL	12.3	10.6	11.4	14.7	14.1
Cobalt	23.20	4700.00	14.7	BRL	8.1	6.8	7.5	8.4	5.5
Copper	32.30	2900.00	20.2	BRL	9.2	11.4	10.8	9.6	62.3
Iron	35200.00	23000.00	**27500**	BRL	16800	17400	16200	18900	**54800**
Lead	19.10	400.00	17.9	BRL	17.7	10.0	8.2	17.3	160
Magnesium	8790.00	--	1970	BRL	1840	1890	1970	2440	786
Manganese	3030.00	1800.00	1420	BRL	1040	411	394	598	173
Mercury	0.04	23.00	BRL	BRL	0.047	BRL	BRL	BRL	BRL
Nickel	60.70	1600.00	23.5	BRL	13.5	12.4	11.3	13.5	10.9
Potassium	3350.00	--	1190	BRL	896	834	1050	1050	1130
Selenium	1.50	390.00	BRL	BRL	0.56	BRL	BRL	0.68	BRL
Silver	0.00	390.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Sodium	145.00	--	BRL	BRL	BRL	BRL	BRL	53.1	1530
Thallium	0.91	5.20	BRL	BRL	0.20	BRL	BRL	BRL	**2.5**
Vanadium	37.60	550.00	11.6	BRL	20.3	18.4	18.7	24.8	21.8
Zinc	93.30	23000.00	64.7	BRL	49.3	37.8	37.5	46.7	390
Cyanide mg/kg									
Cyanide, Total	0.00	11.00	BRL	BRL	0.10 (B)	0.0097 (B)	0.046 (B)	0.051 (B)	0.25 (B)
Propellants 8330 mg/kg									
Nitroglycerin	0.00	35.00	ND	ND	ND	ND	ND	ND	NT
Nitroguanidine	0.00	6100.00	ND	ND	ND	ND	ND	ND	NT
Nitrocellulose	0.00	0.00	**0.90 (B)**	ND	**0.84 (B)**	**0.93 (B)**	**0.87 (B)**	**0.90 (B)**	NT
VOCs TCL 8260B ug/kg									
Acetone	0.00	1600.00	BRL	2 ug/L	BRL	BRL	BRL	BRL	NT
Ethylbenzene	0.00	230.00	BRL	BRL	BRL	BRL	BRL	BRL	NT
Xylene	0.00	210.00	BRL	BRL	BRL	BRL	BRL	BRL	NT

Table 4-8
RAVENNA ARMY AMMUNITION PLANT
CONFIRMATION SAMPLE RESULTS
HOT SPOT NORTH EAST OF AP-19
LOAD LINE 11 IRA

ANALYTE**, UNITS, METHOD NO.	Soil Background Criteria (>1 ft) mg/kg	Region 9 PRG Data (Residential Soil) mg/kg	LL11CS-045-0001-FD (Soil)	LL11CS-045-0001-ER	LL11CS-046-0001-SO (Soil)	LL11CS-047-0001-SO (Soil)	LL11CS-048-0001-SO (Soil)	LL11CS-049-0001-SO (Soil)	LL11CS-050-0001-SO (Soil)
Sample Date			22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01	22-Mar-01
SVOCs TCL 8270 C ug/kg									
Fluoranthene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Pyrene	0.00	2300.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Benzo(a)pyrene	0.00	0.062	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Pesticides 8081A mg/kg									
alpha-BHC	0.00	0.09	BRL	BRL	BRL	BRL	BRL	BRL	BRL
beta-BHC	0.00	0.32	BRL	BRL	BRL	BRL	BRL	BRL	BRL
delta-BHC	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
gamma-BHC (Lindane)	0.00	0.44	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Heptachlor	0.00	0.11	BRL	0.061 mg/L	BRL	BRL	BRL	BRL	BRL
Aldrin	0.00	0.029	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Heptachlor epoxide	0.00	0.053	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan I	0.00	370.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Dieldrin	0.00	0.03	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDE	0.00	1.7	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan II	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDD	0.00	2.4	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endrin	0.00	18.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endosulfan sulfate	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
4,4-DDT	0.00	1.7	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Methoxychlor	0.00	310.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endrin ketone	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Endrin aldehyde	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
alpha-Chlodane	0.00	--	BRL	BRL	BRL	BRL	BRL	BRL	BRL
gamma-Chlordane	0.00	1.6	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Toxaphene	0.00	0.44	BRL	BRL	BRL	BRL	BRL	BRL	BRL
PCB TCL 8082 mg/kg									
Aroclor-1016	0.00	3.90	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1221	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1232	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1242	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1248	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1254	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL
Aroclor-1260	0.00	0.22	BRL	BRL	BRL	BRL	BRL	BRL	BRL
TPH mg/kg		**BUSTR Soil Saturation Limit for TPH (PPM)*** **							
DRO mg/kg	0.00	20000.00	BRL	BRL	BRL	BRL	BRL	BRL	BRL
GRO ug/kg	0.00	10000.00	BRL	BRL	BRL	0.026 (J)	BRL	BRL	NT
Inorganics mg/kg									
Nitrate, as N	0.00	--	0.47 (B)	BRL	0.79 (B)	0.61 (B)	0.71 (B)	0.83 (B)	2.9
Sulfide	0.00	--	BRL	0.50 mg/L (B)	12.2 (B)	BRL	BRL	BRL	BRL
Sulfate	0.00	--	27.0 (B)	BRL	13.6 (B)	19.5 (B)	44.9 (B)	25.7 (B)	29.7 (B)

** = Only detected compounds listed
-- = Data not available
BRL = Below Reporting Limit
ND = Not detected
NT = Not Tested
*** = OH Code 1301-7-9-13

INORGANIC FLAGS
(B) = result is < CRDL/RL, but≥ IDL/MDL

PRGs = Preliminary Remediation Goals
mg/kg = milligrams per kilogram (parts per million - ppm)
ug/L = micrograms per Liter (parts per billion - ppb)
= concentration greater than background
BOLD = concentration greater than Region 9 PRG data

ORGANIC FLAGS/QUALIFIERS
(B) = Batch QC is greater than the RL
(J) = Result is an estimated value below the RL
(A) = Concentration exceeds the instrument calibration range or below the RL

4.4.1 Sump Excavation Confirmatory Samples

In summary, there were no analytical difficulties encountered by the laboratory during the analysis of the LL-11 IRA sump excavation confirmatory samples. All sample-holding times were met. All calibration (Initial, Second Source, and Continuing Calibration) criteria met the QAPP requirements. All laboratory and Preparation blanks met the QAPP criteria. In addition, all Laboratory Control and Surrogate Spike QAPP requirements were achieved.

4.4.2 Ditch Excavation Confirmatory Samples

In summary, there were no analytical difficulties encountered by the laboratory during the analysis of the LL-11 IRA ditch excavation confirmatory samples. All sample-holding times were met. All calibration (Initial, Second Source, and Continuing Calibration) criteria met the QAPP requirements. All laboratory and Preparation blanks met the QAPP criteria. In addition, all Laboratory Control, Matrix and Surrogate Spike QAPP requirements were achieved.

4.4.3 Hot Spot Excavation Confirmatory Samples

In summary, there were no analytical difficulties encountered by the laboratory during the analysis of the LL-11 IRA hot spot confirmatory samples. All sample-holding times were met. All calibration (Initial, Second Source, and Continuing Calibration) criteria met the QAPP requirements. All laboratory and Preparation blanks met the QAPP criteria. In addition, all Laboratory Control and Surrogate Spike QAPP requirements were achieved.

SECTION 5 SUMMARY

The LL-11 IRA activities were initiated as an early response action to mitigate the movement of contaminants off site prior to implementation of final remedial actions, if required. The objective of the IRA was to remove the primary migration pathways for contamination originating at the load line. These pathways included sedimentation sumps associated with production buildings and negatively impacted areas (drainage ditches and hot spot) identified during the November – December 2000 RI.

Between January 2001 and June 2001 a total of five (5) sedimentation sumps, one (1) 30' x 30' x 8' "Hot Spot" and six (6) sections of drainage ditches were removed to meet the IRA objective. Confirmation samples were collected from each of the completed excavations to evaluate the success of the IRA. This information will be folded into the November – December 2000 RI data for inclusion in the LL-11 Human Health and Ecological Risk Assessment. As a result, all findings and recommendations relative to subsequent remedial efforts will be provided in the LL-11 RI Report.

SECTION 6 PHOTOGRAPHIC DOCUMENTATION

The following photographs provide illustrations of the LL-11 IRA activities. Descriptions are provided below each photograph.

Cement/Bentonite Grouting of Manhole

Finished Grouted Manhole

Sump AP-2

Sump AP-2

AP-6 Backfilled

AP-5 ready to be pulled

Covered debris pile @ AP-5&6

Debris from AP-3, 5, & 6 sumps

Excavating NW Sump AP-8

AP-8 NW Sump

NE Sump AP-8

Asbestos Behind Lead Liner

Spraying Down Lead Liner

Spraying Sump

Spiker Decon Pad

Lead Pile at AP-8

Lined Roll-off

Placing Sump Cement Debris

Ditch near AP-4

Ditch Near Gate Entry

Long Ditch, Looking Away from AP-19

Long Ditch, Looking at AP-19

Hot Spot Excavation

Schondstadt Screening for Ordnance

Grey Sand in Hot Spot

Grey Sand in Hot Spot

Grey Sand in Hot Spot

Finished Excavation

SECTION 7 REFERENCES

1. US Army Center for Health Promotion and Preventive Medicine. "Relative Risk Site Evaluation for Newly Added Sites at the Ravenna Army Ammunition Plant, Ravenna, OH. 1998". Hazardous and Medical Waste Study No. 37-EF-5360-99.

2. "Rainwater and Land Development". Ohio's Standards for Stormwater Management, Land Development and Urban Stream Protection. Ohio Department of Natural Resources, Natural Resources Conservation Service, Ohio Environmental Protection Agency, Columbus, OH. 1996.

3. Phase I Remedial Investigation Report for the High Priority Areas of Concern at the Ravenna Army Ammunition Plant, Ravenna, OH. Prepared by SAIC for The US Army Corps of Engineers, Nashville District. 1998.

4. Facility-Wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna, OH. Prepared by SAIC for The US Army Corps of Engineers, Nashville District. 1996.

5. OHIOEPA-IDW

6. Facility-Wide Health and Safety Plan for the Ravenna Army Ammunition Plant, Ravenna, OH. Prepared by SAIC for The US Army Corps of Engineers, Nashville District. 1999.

7. Phase II Remedial Investigation Report for the Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, OH. Prepared by SAIC for the US Army Corps of Engineers, Nashville District. 1999.

8. Ohio Environmental Protection Agency. "Stock Piled IRA Sediment and "Hot Spot" Soils, Load Line 11 (RVAAP), Portage County". Technical Scope Change, June 7, 2001. Located in Appendix B.

APPENDIX A

Ordinance Avoidance Plan

STATEMENT OF WORK FOR ORDNANCE AVOIDANCE AT LOAD LINE 11, RAVENNA ARMY AMMUNITION PLANT, RAVENNA , OHIO

1. **General.** MKM Engineers, Inc. Unexploded Ordnance (UXO) staff personnel will provide a two-person Unexploded Ordnance (UXO) team to provide on-site UXO support during all sampling activities. The UXO team will not destroy any UXO encountered. The UXO team will report all located UXO to Mark Patterson, Environmental Manager, Ravenna Army Ammunition Plant, Ravenna, Ohio, for disposition and guidance

2. Definitions.

   a. **Ordnance and Explosive (OE).** Bombs and warheads, guided and ballistic missiles, artillery, rocket and mortar ammunition, small arms ammunition, anti-personnel and anti-tank mines, demolition charges, pyrotechnics, grenades, containerized and uncontainerized explosives and propellants, military chemical agents and all similar and related items or components, explosive in nature or otherwise designed to cause damage to personnel or material. Soils with explosive constituents are considered to be OE if the concentration is sufficient to be reactive and present an imminent safety hazard.

   b. **Unexploded Ordnance (UXO).** An item of explosive ordnance that has failed to function as designed or has been abandoned, discarded or improperly disposed of and is still capable of functioning and causing damage to personnel or materials.

   c. **Inert Ordnance.** An item that has functioned as designed, leaving an inert carrier. An item manufactured to serve a specific training purpose. Fragments from UXO.

   d. **Explosive Ordnance Disposal (EOD) Personnel.** Active duty military EOD personnel.

   e. **UXO Personnel.** Former EOD personnel employed by a contractor.

   f. **Recovered Chemical Warfare Materiel (RCWM).** RCWM is defined as chemical agent material and/or associated equipment and surrounding contaminated media discovered either by chance or during deliberate real estate recover/restoration operations that was previously disposed of as waste. RCWM is classified as hazardous waste by the Army and not within the scope of the Army Chemical Surety Program.

   g. **Chemical Event.** Discovery of an actual or suspected chemical agent or container that may require emergency transportation or disposal.

3. **UXO Team Composition and Qualifications.** UXO Team shall consist of two members with the following qualifications:

a. **UXO Team Leader.** The UXO supervisor for this project will be Mr. Dewey Thedford. He will be the technical lead for all UXO operations on the site. Mr. Thedford is qualified for this project by virtue of training and experience. He has over 25 years of military and civilian experience. He has served as a Senior UXO Supervisor, UXO Supervisor, Safety Officer and Quality Control Specialist. Duties and assignments include range clearances as EOD Range Control Officer and Range Supervisor of multiple team operations and civilian UXO experience including performance as a Senior UXO Supervisor for OE removal operations.

b. **UXO Specialist.** The UXO specialist for this project will be Mr. Bill Howell. Mr. Howell has 20 years military and civilian experience. He has served as EOD Demolition Supervisor, Safety Officer and Senior UXO Supervisor for OE removal operations.

4. **Responsibilities and Authority.** The UXO Team will provide the explosive ordnance recognition, location and safety functions for the operation. The UXO team leader has the final authority for on-site personnel regarding all matters concerning UXO.

5. **Work and Safety Plans.** The UXO team will assist in the development of the site safety and health plan and the work plan. The UXO team leader will conduct UXO safety briefings for all site-personnel and visitors.

6. Access Routes to Sampling Locations.

a. Prior to commencement of operations at specific sites, the UXO team will conduct a reconnaissance of the sampling area. The reconnaissance shall include locating a clear path for the sampling crews, vehicles and equipment to approach the site. The approach path, at a minimum, will be twice the width of the widest vehicle. MKM UXO personnel will clearly mark all boundaries of the cleared approach path to prevent personnel from straying into uncleared areas. The path will be marked utilizing red pin flags spaced no more than fifteen (15) feet apart or as visibility dictates. No personnel shall be allowed outside the cleared paths.

b. If UXO is encountered on the surface, divert the approach path around the UXO, clearly mark the area and report the UXO.

c. A Schonstedt magnetometer will be used to insure there is no subsurface UXO within the approach path. If a magnetic anomaly is encountered, assume it to

be a UXO and divert the path around the anomaly. Only UXO personnel shall handle UXO and operate the magnetometers.

7. Soil Sampling and Well Drilling Sites

   a. The UXO team will locate magnetic anomaly free areas for soil samples and GEOPROBE operations. If a pre-selected area indicates magnetic anomalies, a new sampling site will be chosen.

   b. The UXO team will clearly mark the boundaries of the cleared soil sampling or well drilling sites. Personnel will not go outside the cleared areas. As a minimum, the cleared area will be square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment to be brought on site.

   c. Prior to drilling equipment being moved to the proposed drilling site, the UXO team will locate a magnetic anomaly free site. This shall be accomplished using a Schonstedt GEOMAG. The UXO team shall start the borehole with a hand held or portable auger. At not more than a two-foot depth, the auger will be withdrawn and the magnetometer probe will be lowered into the hole. This procedure will be used to ensure that smaller items of UXO, undetectable from the surface can be detected. If no magnetic anomalies are found, the procedure will be repeated at two-foot intervals to the maximum depth of the auger, but not less than six feet. If the proposed drilling site is still free of magnetic anomalies, the drilling equipment may be brought on site and utilized. Borehole monitoring with the GEOMAG shall continue at two-foot intervals, until virgin soil is encountered.

APPENDIX B

Technical Scope Changes Letters

MKM

MKM Engineers, Inc.

Geotechnical, Environmental and Remediation Services

January 09, 2001

Mr. Todd Fisher
Environmental Coordinator
Ohio Environmental Protection Agency
2110 E. Aurora Rd.
Twinsburg, Ohio 44087

Subject: Load Line 11 IRA technical scope change at the Ravenna Army Ammunition Plant

Dear Mr. Fisher:

The U S Army Operations Support Command (OSC) has contracted MKM Engineers (MKM) to conduct a Remedial Investigation (RI) and Interim Removal Action (IRA) at Load Line 11 of the Ravenna Army Ammunition Plant. The RI scope of work includes the evaluation of site soils, sediments, surface water, and groundwater for possible impact from previous site operations. The IRA scope of work includes sump and limited associated sewer line/manhole and soil removal. There are five sedimentation sumps associated with Load Line 11 buildings AP-3, AP-5, AP-6, and AP-8 (2). The sumps functioned as sedimentation collection vessels for the associated building washout drains. Schematics indicate the sumps are connected with lead piping, which in turn connect with the sewer mains of the facility. Black powder and or other potential explosives were handled or processed in these Load Line buildings.

The RI field sampling effort for soils, sediments, surface water and groundwater was conducted during November and December 2000. Sump contents were sampled (water and sediment) during June and July 2000 as per the letter dated 23 June 2000. Subsurface soil testing of the listed sumps and associated sewer manholes was conducted during August 2000 as per the letter dated 15 August 2000. Each sample was submitted to an independent laboratory for analysis of the following analytes:

- Explosives as per EPA Method 8330;
- TAL Metals according to EPA SW-846 Methods 6010/7000;
- Cyanide as per EPA Methods 9010B/9012A.
- Nitrate as per EPA Methods 9210/355.22
- Sulfide/sulfate as per EPA Methods 9030/300.1
- The sump/sewer water samples were also submitted for total lead.

Ravenna Army Ammunition Plant, Building 1038, 8451 St. Rt. 5, Ravenna, OH 44266
Phone: (330) 358-2920 Fax: (330) 358-2924

Additionally, 10 percent of the samples were be analyzed for the additional following analytes:

- Propellants as per modified EPA Method 8330;
- VOCs as per EPA Method 8260B;
- SVOCs as per EPA Method 8270C;
- Pesticides as per EPA Method 8081A;
- PCBs as per EPA Method 8082;

RI SUMP AND SEWER WATER ANALYTICAL RESULTS:

The laboratory analytical results were compared to RVAAP surface water criteria. The analytical results indicate that the detected analytes of concern include lead (Table 1). Sump and manhole water samples lead results were below reporting limits with the exception of those samples from the sumps including: AP-3 (45.1 ppb), AP-5 (59.8 ppb), AP-6 (17.8 ppb), and AP-8 (east 666 ppb, west 686 ppb). The RVAAP surface water background criteria is 0.0 ppb for lead.

RI SUMP AND SEWER SEDIMENT ANALYTICAL RESULTS:

Sump and sewer manhole sediment samples lead analytical results indicate elevated levels in sumps AP-5 (16,100 ppm), AP-6 (3910 ppm), and AP-8 west (37,000 ppm) (Table 2). Elevated lead analytical results were also reported for the sewer manhole sediment samples from AP-5/6 (1770 ppm) and the AP-8 (693 ppm) (east sump). All of the detected lead in sediments values exceed the RVAAP background value for lead in soils greater than 1.0 feet bgs. Analytical results indicate that mercury was detected in the AP-5 (0.28 ppm), AP-5/6 sewer manhole (0.44 ppm), AP-8 east sewer manhole (0.15), and the AP-14 manhole (0.12 ppm). The RVAAP background value for mercury in soil greater than 1.0 feet bgs is 0.04 ppm.

RI SUMP AND SEWER SOILS ANALYTICAL RESULTS:

The soils immediately adjacent to the sumps/sewers have not been been impacted by previous Load Line 11 operations with the exception of lead. Lead concentrations at sumps AP-4 (65.5 ppm 6.0 to 8.0 feet bgs and AP-6 (70.9 ppm 0.0 to 2.0 feet bgs) (Table 3) are 2 to 3 times RVAAP background values.

TECHNICAL CHANGES TO THE IRA SCOPE OF WORK:

The following changes to the technical scope of work for the IRA are proposed based upon information collected during the RI:

- *SUMP AND SEWER WATER HANDLING/DISPOSAL:*

The analytical results indicate that the primary detected contaminants of concern includes lead in sump/sewer water for AP-3, AP-5, AP-6, and AP-8 east/west. Presently the groundwater level at buildings AP-5 and AP-6 is sufficiently high enough to cause an outflow of water from both the sumps. The water is flowing away from the sumps in a western direction to the nearest drainage way. The scope of work for the removal and handling of the sump and sewer water outlined in Section 2.1.2 of the IRA Work Plan and Section 3.2.1 of the IRA Sampling and Analysis Plan, will be changed as follows:

- Based upon the laboratory analysis of the sump/sewer water, lead concentrations are low enough to allow ground application of the water removed from the sumps/sewers. The pumped water will be discharged onto the ground surface at a location west of AP-3 and AP-4. This area will provide at least 300 feet of vegetated surface for distribution and infiltration into the site soils prior to the intersection of a drainage way. The discharge point will be maintained with sufficient surface baffles to reduce velocity and allow a low velocity sheet flow down gradient. The discharge point location will be mutually agreed upon prior to commencement of operations.

- *SUMP AND SEWER MANHOLE SEDIMENT HANDLING:*

The analytical results indicate that the sediments in sumps AP-5, AP-6, AP-8 east and AP-8 west have lead concentrations significantly above the RVAAP background soil levels. Sump AP-3 did not have sufficient volumes of sediment for sample collection. The sediment samples from Laboratory analytical results also indicate that the AP-5/AP-6, AP-8 east and AP-8 southeast sewer manholes have elevated concentrations of lead. The AP-3 sewer manhole did not have sufficient volumes of sediment for sample collection.

The AP-8 west sump was difficult to locate since it was paved over with asphalt. This sump was subsequently sampled at a later date than the other sumps/sewer manholes. During the sample collection process at this sump a heavy sheen was noted in the sediment sample. Based upon this sheen, the analytical suite for the water and sediment sample was expanded to include volatiles and semi-volatiles. The analytical results indicate that the sediments are impacted with a variety of semi-volatile compounds. The sump water analytical results indicate that sump water is not impacted with volatile and semi-volatile compounds. Sediment volumes were insufficient for sampling in the AP-3 sump and

manhole. The AP-8 east sump sediment was composed of abundant organics (leaves, twigs, sticks and was therefore not sampled either.

- Based upon the analytical information from the sump/sewer manhole sediments, the sediments from AP-3, 5, and 6 sumps/sewer manholes will be collected and drummed separately from the sediments in the AP-8 east and west sump/sewer manholes. Sediment volumes to be collected are anticipated to be low based upon information gained during the sampling events.

- *SUMP AND SEWER EXCAVATION/REMOVAL:*

Ten soil borings were advanced and ten monitor wells installed during the RI at LL 11. Saturated soil conditions were encountered in each boring ranging from 5 to 17 feet below ground surface (bgs). Groundwater depths in the monitor wells range from 0.0 to 12.07 feet bgs. The saturated lithology varied between borings and included silts to coarse sands. The coarse sands were encountered as shallow as 8 feet bgs and as deep as 17 feet bgs.

The saturated silts and sands pose a logistical issue during the excavation of the sumps and sewer lines outlined in Section 2.1.3 of the IRA Work Plan and Section 3.1.3 of the IRA Sampling and Analysis Plan. Excavation into saturated lithologies could generate large quantities of groundwater into the excavations and cause unstable excavation conditions. Based upon the shallow depth to saturation and large water bearing capacity of the encountered coarse sands during the advancement of RI soil borings, the following changes to the IRA scope of work are proposed:

- The sump and sewer removal will be changed to include removal of the sumps only. The sewer lines will be plugged and cut at the sump. Plugging will be accomplished with both mechanical packers and cement grout. The sewer manholes will be left in place.

- Since additional contaminants of concern were identified in the AP-8 sumps, additional laboratory analysis will be required. Confirmation samples from the AP-8 sumps excavations will include the following analysis:
  - -Explosives as per EPA Method 8330;
  - -TAL Metals according to EPA SW-846 Methods 6010/7000;
  - -Cyanide as per EPA Methods 9010B/9012A.
  - -Nitrate as per EPA Methods 9210/355.22
  - -Sulfide/sulfate as per EPA Methods 9030/300.1
  - -Propellants as per modified EPA Method 8330;
  - -VOCs as per EPA Method 8260B;

-SVOCs as per EPA Method 8270C;
-Pesticides as per EPA Method 8081A;
-PCBs as per EPA Method 8082;

- Additional subsurface soil sampling will be conducted along the sewer lines in selected areas to evaluate potential impact from additional compounds of potential concern. Samples will be collected utilizing a direct push (Geoprobe) method. The soils from sewers adjacent to AP-8 will be analyzed for the following:

  -Explosives as per EPA Method 8330;
  -TAL Metals according to EPA SW-846 Methods 6010/7000;
  -Cyanide as per EPA Methods 9010B/9012A.
  -Nitrate as per EPA Methods 9210/355.22
  -Sulfide/sulfate as per EPA Methods 9030 300.1
  -Propellants as per modified EPA Method 8330;
  -VOCs as per EPA Method 8260B;
  -SVOCs as per EPA Method 8270C;
  -Pesticides as per EPA Method 8081A;
  -PCBs as per EPA Method 8082;

Soils collected from non-production areas will be analyzed for the following:

- Explosives as per EPA Method 8330;
-TAL Metals according to EPA SW-846 Methods 6010/7000;
-Cyanide as per EPA Methods 9010B/9012A.
-Nitrate as per EPA Methods 9210/355.22
-Sulfide/sulfate as per EPA Methods 9030 300.1

Additionally, 10 percent of the non-production area samples were be analyzed for the additional following analytes:

- Propellants as per modified EPA Method 8330;
- VOCs as per EPA Method 8260B;
- SVOCs as per EPA Method 8270C;
- Pesticides as per EPA Method 8081A;
- PCBs as per EPA Method 8082;

MKM

MKM Engineers, Inc.

Geotechnical, Environmental and Remediation Services

Presently, we are planning to commence fieldwork at Load Line 11 on 22 January 2001. MKM will keep you informed of any issues or specifics regarding this work as they arise.

Should you have any questions or comments regarding these issues, then please do not hesitate to call us at 330-358-2920.

Respectfully,
MKM ENGINEERS, INC.

Stan Levenger,
Project Manager

Attachments
cc: Mark Patterson, RVAAP Environmental Coordinator

Ravenna Army Ammunition Plant, Building 1038, 8451 St. Rt. 5, Ravenna, OH 44266
Phone: (330) 358-2920 Fax: (330) 358-2924

OhioEPA
State of Ohio Environmental Protection Agency
Northeast District Office

2110 E. Aurora Road
Twinsburg, Ohio 44087-1969

TELE (330) 425-9171 FAX (330) 487-0769

Bob Taft, Governor
Christopher Jones, Director

June 7, 2001

RE: Stockpiled IRA Sediments and
"Hot Spot" Soils
Load Line 11 (RVAAP)
Portage County

Mr. Stan Levenger
MKM Engineers, Inc.
c/o Ravenna Army Ammunition Plant
8451 State Route 5, Bldg. 1038
Ravenna, Ohio 44266

Dear Mr. Levenger:

The Ohio EPA met with MKM Engineers, Inc. on May 24, 2001 to discuss the analytical data from Load Line 11 IRA stockpiled soils. Two of the stockpiles were created from excavations into the petroleum contaminated "hot spot" located directly northeast of building AP-17. The other stockpile was created when contaminated sediment and clean soil was excavated along targeted drainage ditches. The following resolutions were agreed upon by both parties:

1. Based on the waste characterization data, soil excavated from the 0' to 4' interval of the hot spot can be used to fill in low lying (subsidence) areas created by the removal of several waste water sumps. Any remaining soil can be stockpiled separately on the AOC, and be utilized at a later date.

2. VOCs, SVOCs, and TPH (diesel and gasoline range) were detected in soils excavated from the 4' to 8' interval of the hot spot. These soils can be stockpiled separately within the AOC, provided that they are: 1) covered with plastic or seeded with an approved grass mix; or 2) containerized into drums or lined roll-offs that are clearly labeled. All stockpiled soils should be rimmed with straw bails and silt fences should be erected to control erosion and run-off. These soils may remain on-site until all remedial investigations and interim removal actions are complete at the AOC. At that time, all stockpiled/containerized soils must be properly characterized and disposed of.

3. Arsenic was detected at levels above background and Region IX PRGs in the ditch sediment/soil stockpile. These stockpiled sediments and soils may be stockpiled separately within the AOC, provided that they are: 1) covered with plastic, or seeded with an approved grass mix; or 2) containerized into drums or

lined roll-offs that are clearly labeled. All stockpiled sediment and soils should be rimmed with straw bails and silt fences should be erected to control erosion and run-off. These sediments/soils may remain stockpiled on-site until all remedial investigations and interim removal actions are complete at the AOC. At that time, all stockpiled/containerized sediment and soils must be properly characterized and disposed of.

If you have any questions regarding this letter, please contact me at (330) 963–1148.

Sincerely,

Todd R. Fisher
Project Coordinator
Division of Emergency and Remedial Response
Todd.Fisher@epa.state.oh.us

TF:tf

cc: Eileen Mohr, DERR, NEDO
Rod Beals, DERR, NEDO
Bonnie Buthker, OFFO, SWDO
Rick Callahan, MKM Engineers, RVAAP
Mark Patterson, RVAAP
John Jent, USACE, Louisville
Brian Stockwell, MKM Engineers, RVAAP
Mark Dunlevy, MKM Engineers, RVAAP

APPENDIX C

Asbestos Removal Notification

SPIKER Industrial Services, Ltd.

330 Tallmadge Rd., Bldg. B, Brimfield, OH 44240
Mail: P.O. Box 295, Mogadore, OH 44260-0295
Phone: 330-673-6226 • Fax: 330-673-5434

Please deliver to.

Stan Levenger

MKM

6 Pages

01-RAAP-01

Postmark	Date Received	Notification No.

Ohio Department of Health

Prior Notification of Asbestos Hazard Abatement Project

Read carefully all the instructions and questions prior to completing the notification form.

1. Notifications including check shall be typed and sent to the Ohio Department of Health, Attn: Revenue Processing, P.O. Box 15278, Columbus, Ohio 43215.
2. Checks shall be made payable to: Treasure, State of Ohio, for the amount of twenty-five dollars ($25.00).
3. Any licensed asbestos hazard abatement contractor who performs any asbestos hazard abatement projects within the State of Ohio shall submit prior notification to the Director postmarked at least ten business days before beginning each planned asbestos hazard abatement project as required by Chapter 3701-34 of the Ohio Administrative Code.
4. Type of notification ☐ blanket ☒ original ☐ emergency ☐ cancellation ☐ revision number _____ revised line(s) number _____
5. Type of abatement involving at least 50 linear feet or 50 square feet ☐ repair ☐ encapsulation ☐ enclosure ☒ removal ☐ renovation

6. Owner name: Ravenna Army Ammunitions Plant			
Address: 8451 State Route 5	City: Ravenna	State: OH	Zip: 44266
Contact: Stan Levenger		Contact telephone number: (330) 358-2920	
7. Abatement Contractor: Spiker Industrial Services, Ltd.		License number: 1783	Expiration: 10/16/01
Address: 330 Tallmadge Road, Bldg. B	City: Brimfield	State: OH	Zip: 44240
Contact: Gary Spiker		Telephone number: (330) 673-6226	
8. Name of asbestos hazard abatement specialist for project: Samuel Harsh		Certification number: 2971	Expiration: 6/21/01
9. Project information - Building name: Load Line 11 at Ravenna Arsenal Facility			
Address: Fuze & Booster Spur	City: Ravenna	State: OH	County: Portage
Site location (specific): 5 outside sumps			

10. Project description

Type of asbestos material	☐ surfacing	☐ mechanical	☒ other	backing paper
Asbestos removal from	☐ pipe	☐ boiler	☐ other	concrete sump/lead liner
Engineering controls	☐ AFD	☐ glovebag	☒ other	amended water/encapsulant

11. Estimate of asbestos containing material: linear feet					square feet	945 cubic feet	
12. Abatement dates: set up	2/16/01	abatement	2/19/01		completion (acm work only)	2/23/01	
Hours of operation: 7:00 am - 5:30 pm							
Days of the week	Monday: X	Tuesday: X	Wednesday: X	Thursday: X	Friday: X	Saturday:	Sunday:

13. Approved landfill - Name: Minerva Enterprises		EPA permit number: 15-1292
City: Waynesburg	State: OH	Telephone number: 330 866 3435
14. Name of person filing this notice: Gary Spiker		Date: 2/2/01

01-RAAP-01

5 Exterior in-ground concrete sumps with lead liners were found to have asbestos paper behind the liner after being removed from the ground.
Segregation of the lead and asbestos will be performed by hand and power washing. Power washing to be completed in a diked area for bulk material to be picked out and waste water to be filtered for asbestos particles. Once process is complete dike poly will be cleaned of all visible debris and placed in double six mil poly bags for disposal. When asbestos paper cannot be separated from the concrete waste, it will be encapsulated and placed in a roll off dumpster that has 2, 6 mil liners. Excavating loader to be used to place the concrete/asbestos waste into the roll off box for transport and disposal to an approved landfill. Proper DOT placarding and packaging labeling to be completed before transporting off-site.

Wet method procedures to be used throughout the process (amended water/encapsulant.)
Water hoses, airless sprayer and hudson sprayers will be used to apply wetting agents to asbestos waste.

OHIO ENVIRONMENTAL PROTECTION AGENCY
NOTIFICATION OF DEMOLITION AND RENOVATION

Operator Project #	Postmark	Date Received	Notification #
01-RAAP-01			

I. **Type of Notification** (check one): X Original Revised Canceled

II. **Facility Description** (include building name, number, and floor or room number)

Building Name: Load Line 11 at Ravenna Arsenal Facility
Address: Fuze & Booster Spur
City: Ravenna State: OHIO Zip Code: 44266 County: Portage
Site Location (specific): 5 outside sumps
Building Size (square feet): n/a # of Floors: n/a Age in Years 60
Present Use: vacant Prior Use: ammunitions facility

III. **Type of Operation** (check one): X Demo Ordered Demo Renovation Emergency Renovation Fire Training

IV. **Is Asbestos Present?** (check one): X Yes No

V. **Facility Information**

Owner Name: Ravenna Army Ammunitions Plant
Address: 0451 State Route 5
City: Ravenna State: OH Zip Code: 44266
Contact: Stan Levenger Telephone: 330-358-2920 Fax: 330-358-2924
Removal Contractor Name: Spiker Industrial Services, Ltd. License # 1783
Address: 330 Tallmadge Road, Building B
City: Brimfield State: OH Zip Code: 44240
Contact: Gary Spiker Telephone: 330-673-6226 Fax: 330-673-5434
Other Operator (demolition/general): License #
Address:
City: State: Zip Code:
Contact: Telephone: Fax:

VI. **Procedure, including analytical methods, employed to detect the presence of and to estimate the quantity of RACM and Category I and Category II nonfriable ACM:**

PLM

Ohio Asbestos Hazard Evaluation Specialist: Keith Bickel (Name) 31476 (Certification #)

VII. **Approximate Amount of Asbestos Materials:**

	RACM to be Removed	Nonfriable Asbestos Material to be Removed		Nonfriable Asbestos Material NOT to be Removed	
		Category I	Category II	Category I	Category II
Pipes (linear feet)					
Surface Area (square feet)					
Facility Components (cubic feet)	945				

VIII. **Scheduled Dates Demolition or Renovation:** Start: Complete:

IX. **Dates for Asbestos Removal** (MM/DD/YY) Start: 2/19/01 Complete: 2/23/01

Days of the week:	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Hours of Operation:	7:00am-5:30pm	7:00am-5:30pm	7:00am-5:30pm	7:00am-5:30pm	7:00am-5:30pm		

Complete all unshaded spaces, except demolitions which involve less than 260 linear feet, 160 square feet, or 35 cubic feet of RACM, need not complete spaces VII, XI, XII, XIII, XIV, and XV. Notifications for Emergency Demolition or Emergency Renovation must supply attachments.

OHIO ENVIRONMENTAL PROTECTION AGENCY
NOTIFICATION OF DEMOLITION AND RENOVATION

X. **Description of planned Demolition or Renovation work to be performed and method(s) to be employed, including demolition or renovation techniques to be used and description of affected facility components:**

see attachment

XI. **Description of work practices and engineering controls to be used to comply with the requirements, including asbestos removal and waste handling emission control procedures:**

see attachment

XII. **Waste Transporter #1**

Name: Spiker Industrial Services, Ltd.
Address: 330 Tallmadge Road, Building B
City: Brimfield State: OH Zip Code: 44240
Contact: Gary Spiker Telephone: 330-673-6226 Fax: 330-673 5434

Waste Transporter #2

Name:
Address:
City: State: Zip Code:
Contact: Telephone: Fax:

XIII. **Waste Disposal**

Name: Minerva Enterprises
Address: 9000 Minerva Road
City: Waynesburg State: OH Zip Code: 44688
Contact: Telephone: 330-866-3435 Fax:

XIV. **Emergency Demolition** (complete Item XIV and all other sections, only if this project is an Emergency Demo.)

1. Attach a copy of the Order to this notice.
2. Name of Authority Issuing Order: Title:
3. Authority of Order (Citation of Code):
4. Date of Order (MM/DD/YY): Date Ordered to Begin:

XV. **Emergency Renovation** (Attach separate sheet with the following information if project is Emergency Reno.)

1. Date and Hour of the Emergency.
2. Description of the Sudden, Unexpected Event.
3. Explanation of how the event caused unsafe conditions or equipment damage or an unreasonable financial burden.

XVI. **Description of procedures to be followed in the event that unexpected RACM is found or nonfriable ACM becomes crumbled, pulverized or reduced to powder.**

Stop Work Immediately.
Contain area - saturate with surfactant solution and take appropriate action.
Advise OEPA during next workday and/or on monthly report as applicable.

XVII. **I certify that an individual trained in the provisions of NESHAPS (40 CFR PART 61, SUBPART M) will be on-site during the Demolition or Renovation and evidence that the required training has been accomplished by this person will be available during normal business hours.**

Gary Spiker, sole — 2/2/01 — Gary Spiker, Co-Owner
Signature of Owner/Operator — Date — Type or Print Name and Title

XVIII. **I acknowledge the existence of laws prohibiting the submission of false or misleading statements and I certify that facts contained in this notification are true, accurate, and complete.**

Gary Spiker, sole — 2/2/01 — Gary Spiker, Co-Owner
Signature of Owner/Operator — Date — Type or Print Name and Title

Original Notification must be mailed or hand delivered at least ten working days (Monday-Friday excluding weekends) before demolition or renovation begins, except emergency demolitions and emergency renovations (see regulation) which must be submitted as soon as possible before operations begin. (Form Revised 11/12/97)

Mr. Marc Davis/Akron Air Pollution Control

RE: Notification

Item X

6 Exterior in-ground concrete sumps with lead liners were found to have asbestos paper behind the liner after being removed from the ground.
Segregation of the lead and asbestos will be performed by hand and power washing. Power washing to be completed in a diked area for bulk material to be picked out and waste water to be filtered for asbestos particles. Once process is complete dike poly will be cleaned of all visible debris and placed in double six mil poly bags for disposal. When asbestos paper cannot be separated from the concrete waste, it will be encapsulated and placed in a roll off dumpster that has 2, 6 mil liners. Excavating loader to be used to place the concrete/asbestos waste into the roll off box for transport and disposal to an approved landfill. Proper DOT placarding and packaging labeling to be completed before transporting off-site.

ITEM XI

Wet method procedures to be used throughout the process (amended water/encapsulant.)
Water hoses, airless sprayer and hudson sprayers will be used to apply wetting agents to asbestos waste.

APPENDIX D

Asbestos Sample Results

Environmental Industrial Hygiene Occupational Safety

Diamond Environmental

P.O. Box 2543 • Stow, Ohio 44224 • (330) 686-5996

BULK SAMPLING SHEET
RUSH ANALYSIS

Client: MKM Engineers, Inc.
Project: RVAAP-LL11 IRA
Diamond Work Order: 1-0022

Sampling Date: 1/26/01
Sampler: Stan Levenger/ MKM
Building: LL11

Lab Number	Sample Number	Material	Functional Space	FRIABLE/ NON	Analysis
100649	LL11 ACM-001-0001	Sump lining	LL11 Sump lining,	FRIABLE	**Chrysotile Asbestos 60%** Binders 40%

SEVERN TRENT SERVICES

STL Chicago
2417 Bond Street
University Park, IL 60466
Phone: 708-534-5200
Fax: 708-534-5211

Report To: Stan Levenger
Contact: Stan
Company: MKM Engineers, INC.
Address: 8451 St. Rte 5
Ravenna, OH 44266
Phone: 330.358.2920
Fax: .2924
E-Mail:

To:
Contact:
Company:
Address: SAME
Phone:
Fax:
PO#: Quote:

Shaded Areas For Internal Use

Lab Lot#

Package Sealed Yes No	Samples Sealed Yes No
Received on Ice Yes No	Samples Intact Yes No
Temperature °C of Cooler	
Within Hold Time Yes No	Preserv. Indicated Yes No NA
pH Check OK Yes No NA	Res Cl_2 Check OK Yes No NA
Sample Labels and COC Agree Yes No	COC not present

Sampler Name:	Signature:	Refrg #												
Stan Levenger		# / Cont.	1											
Project Name: RVAAP LL-11 IRA	Project Number: G00077	Volume	2 Block											
Project Location: Ravenna, OH	Date Required Hard Copy: Rush - 2 Days	Preserv												
Lab PM:	Fax:	Matrix												
		Comp/Grab												
		Asbestos												

Laboratory ID	MS-MSD	Client Sample ID	Sampling Date	Sampling Time	Matrix	Comp/Grab	Asbestos	Additional Analyses / Remarks
		LL-11 Sump lining	1-26-01	1210	SO		X	Bulk Asbestos Sample
		LL11ACM-001-0001-	ACM					
								LL-11 IRA
								Sump Lining AP5,6

RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME
Stan Levenger	MKM	2/8/2001	1550	Richard Walker	DE	2/8/01	5:36 p.m.
RELINQUISHED BY	COMPANY	DATE	TIME	RECEIVED BY	COMPANY	DATE	TIME

Matrix Key
WW = Wastewater
W = Water
S = Soil
SL = Sludge
MS = Miscellaneous
OL = Oil
A = Air
SE = Sediment
SO = Solid
DS = Drum Solid
DL = Drum Liquid
L = Leachate
WI = Wipe
O = _____

Container Key
1. Plastic
2. VOA Vial
3. Sterile Plastic
4. Amber Glass
5. Widemouth Glass
6. Other _____

Preservative Key
1. HCl, Cool to 4°
2. H2SO4, Cool to 4°
3. HNO3, Cool to 4°
4. NaOH, Cool to 4°
5. NaOH/Zn, Cool to 4°
6. Cool to 4°
7. None

COMMENTS

Date Received / /
Courier: **Hand Delivered** ☐
Bill of Lading

APPENDIX E

Wipe Sample Results

SPIKER Industrial Services, Ltd.

330 Tallmadge Rd., Bldg. B, Brimfield, OH 44240
Mail: P.O. Box 295, Mogadore, OH 44260-0295
Phone: 330-673-6226 • Fax: 330-673-5434

March 6, 2001

Mr. Bob Graham Phone: 330-233-6473
5-G Construction Fax: 330-358-2924

Dear Bob:

Spiker Industrial Services, Ltd. has completed the asbestos abatement and disposal associated with the 5 in ground sumps located at load line 11 per our contract with MKM Engineers, Inc.

Two parties and myself inspected the lead liners for ACM and found no visible material. My evaluation of the lead waste is that it is non asbestos containing debris and can be recycled for its value. Any material that has one percent asbestos or less by volume is considered asbestos free and can be handled as general waste for disposal or recycling.

Sincerely,

Gary Spiker

Gary Spiker
CAHAS #2974

PLEASE DELIVER TO:

Rick Callahan

CONFIDENTIAL

GARY SPIKER
SPIKER INDUSTRIAL SERVICES

PAGE # 1 OF # 6 TOTAL PAGES

AMERICAN ANALYTICAL LABORATORIES, INC.

ANALYTICAL SCIENCES

840 S. MAIN STREET
AKRON, OHIO 44311-1516
(330) 535-1300
email: aal@raex.com

March 08, 2001
Order No. 0103248

Gary Spiker
Spiker Industrial Services
PO BOX 295
Mogadore, OH 44260
TEL: (330) 633-0724
FAX: (330) 633-0831

RE: 01-RAAP01/Asbestos Identification

Dear Gary Spiker,

American Analytical Laboratories, Inc. received samples on 3/7/01 for the analyses presented in the following report.

Results have been reviewed for compliance with the indicated methods listed in the report. All data meets method criteria.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Melody Johnson for

David Rodriguez
IH Manager

American Analytical Laboratories, Inc.

Date: *08-Mar-01*

CLIENT: Spiker Industrial Services
Project: 01-RAAP01/Asbestos Identification
Lab Order: 0103248
Date Received: 3/7/01

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Collection Date
0103248-01A	RAAP-100BS	3/7/01
0103248-02A	RAAP-101BS	3/7/01
0103248-03A	RAAP-102BS	3/7/01

Bulk Asbestos Analysis Report

Work Order: 0103248

Client: SPIKERINDUSTRIAL
Sample Type: Bulk
Project Name: 01-RAAP01/Asbestos Identification
Collection Date: 03/07/2001
Date Received: 03/07/2001

Report Issued To:
Gary Spiker
Spiker Industrial Services
PO BOX 295
Mogadore OH 44260

Lab ID:	Sample ID:	Sample Description:	Analyst:	Date Analyzed:
0103248-01A	RAAP-100BS	Grey Lead	DAR	03/07/2001

Layer Description ([Layer %] and Morphology)	Asbestos Content (Percent and Type)	Non-asbestos Fibers (Percent and Type)	Non-fibrous Materials (Percent and Type)
(1) 100% Gray Material	<1.00% Chrysotile	None Detected	>99% Metal Opaques Calcite

Bulk Asbestos Analysis Report

Work Order: 0103248

Lab ID:	Sample ID:	Sample Description:	Analyst:	Date Analyzed:
0103248-02A	RAAP-101BS	Grey Lead	DAR	03/07/2001

Layer Description ([Layer %] and Morphology)	Asbestos Content (Percent and Type)	Non-asbestos Fibers (Percent and Type)	Non-fibrous Materials (Percent and Type)
(1) 100% Gray Material	<1.00% Chrysotile	None Detected	>99% Metal Opaques Gypsum Calcite

Lab ID:	Sample ID:	Sample Description:	Analyst:	Date Analyzed:
0103248-03A	RAAP-102BS	Grey Lead	DAR	03/07/2001

Layer Description ([Layer %] and Morphology)	Asbestos Content (Percent and Type)	Non-asbestos Fibers (Percent and Type)	Non-fibrous Materials (Percent and Type)
(1) 100% Gray Material	<1.00% Chrysotile	<1% Cellulose fibers <1% Synthetic fibers	>97% Metal Calcite Gypsum Opaques

Bulk Asbestos Analysis Report

Work Order: 0103246

TEST METHOD: EPA method for the Determination of Asbestos in Building Material EPA/600/R-93/116, 6-93.
ANALYTICAL TECHNIQUE: Polarized light microscopy with dispersion staining (central stop).
INSTRUMENTATION: Olympus BHTP polarized light microscope with McCrone 10x dispersion staining objective.
QUANTIFICATION: Visual microscope estimation base on percent by area; INSTRUMENTATION: Olympus VMZ stereoscopic microscope.
LABORATORY QUALITY ASSURANCE: AIHA Bulk Asbestos Proficiency Testing Program. Laboratory I.D. Number 100898

*Percentages reported are visual estimates only, without point count analysis. According to EPA/600/R-93/116, 9-93, "If the asbestos content is less than 10% as determined by a method other than point counting by polarized light microscopy (PLM), verify the asbestos content by point counting using PLM." Point count analysis can be performed for an additional fee. Written authorization must be provided.

APPENDIX F

Manifests and Weight Tickets

01-RAAP-01
MANIFEST #

MEH491160

U.S. EPA WASTE SHIPMENT RECORD FOR REGULATED ASBESTOS WASTE MATERIAL

This form is prepared in accordance with 40 C. F. R. 61.150(d) (NESHAPs)

GENERATOR

1 **Work site name:** RAVENNA ARMY AMMUNITIONS PLANT
Location: LOAD LINE 11
Mailing Address: 8451 STATE RTE 5, RAVENNA OHIO 44266
County: PORTAGE
Owners name: RAVENNA ARMY AMMUNITIONS PLANT
Owner's Phone: 330-358-2920

2 **Operator's name:** Spiker Industrial Services, Ltd.
Contractor I.D. Number: 1783
Mailing Address: P.O. Box 295, Mogadore,OH 44260-0295
Operator's Phone: 330-673-6226
Contact Person: Gary Spiker
Operator's fax: 330-673-5434

3 **Waste disposal site (WDS) DESTINATION:**
Name: MINERVA ENTERPRISES
WDS Phone: 330-866-3435
Mailing Address: 9000 Minerva Road, Waynesburg, Ohio 44688
WDS fax: 330-866-3488

WDS Address/ location:

4 **Name and address of responsible agency** (Local, District or EPA Office where demolition/renovation notification was sent):
AKRON REGIONAL AIR QUALITY

5 Description of waste materials	6. Containers Number	Type	7. Total Quantity (cubic yards)
RQ, ASBESTOS, 9, NA 2212, PG111			
HVAC DUCT PAPER ATTACHED TO CONCRETE DEBRI	1	CM	

8 **Special handling instructions and additional information:**
MATERIAL CONTAINED IN DBL 6 MIL LINRES, MATERIAL TO BE UNLOADED DIRECTLY INTO EXCAVATED PIT

9 **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. (Obtain signature in item 10 before taking Gold sheet for receipt)

M.S.-RAAP

Gary Spiker	Partner	Gary Spiker	2 / 19 / 01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

TRANSPORTER

10 **TRANSPORTER 1** (Acknowledgment of receipt of materials)
Name: Spiker Industrial Services, Ltd.
330 Tallmadge Road, Bldg. B
Brimfield, OH 44240
Phone: 330-673-6226

GARY SPIKER	Driver		2 / 19 / 01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

11 **TRANSPORTER 2** (Acknowledgment of receipt of materials)
Name: EXIT
Address: 7099 FAIRHILL STREET SE, WAYNESBURG, OHIO
Phone: 800-944-9722

BILL HUG	DRIVER		2/20/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

WASTE DISPOSAL SITE

12 **Discrepancy indication space:**

Optional Disposal Location Index X	Y	Depth

13 **WASTE DISPOSAL SITE CERTIFICATION:** I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true, accurate and complete except as noted in the item 12.

JOYCE L MULINIX			02/20/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

Upon Transfer: Owner / operator retains **GOLD**, Transporter retains **PINK**, WDS retains **YELLOW** and sends completed **WHITE** copy to operator in item 2.

01-RAAP-02

ME#491102

U.S. EPA WASTE SHIPMENT RECORD FOR REGULATED ASBESTOS WASTE MATERIAL

This form is prepared in accordance with 40 C. F. R. 61.150(d) (NESHAPs)

GENERATOR

1 **Work site name:** RAVENNA ARMY AMMUNITIONS PLANT
Location: LOAD LINE 11
Mailing Address: 8451 STATE RTE. 5, RAVENNA, OHIO 44266 **County:** PORTAGE
Owners name: RAVENNA ARMY AMMUNITIONS PLANT **Owner's Phone:** 330-358-2920

2 **Operator's name:** Spiker Industrial Services, Ltd. **Contractor I.D. Number:** 1783
Mailing Address: P.O. Box 295, Mogadore,OH 44260-0295 **Operator's Phone:** 330-673-6226
Contact Person: Gary Spiker **Operator's fax:** 330-673-5434

3 **Waste disposal site (WDS) DESTINATION:**
Name: MINERVA ENTERPRISES **WDS Phone:** 330-866-3435
Mailing Address: 9000 Minerva Road, Waynesburg, Ohio 44688 **WDS fax:** 330-866-3488

WDS Address/ location:

4 **Name and address of responsible agency** (Local, District or EPA Office where demolition/renovation notification was sent):
AKRON REGIONAL AIR QUALITY

5. Description of waste materials	6. Containers Number	6. Containers Type	7. Total Quantity (cubic yards)
RQ, ASBESTOS, 9, NA 2212, PG111			
HVAC DUCT PAPER ATTACHED TO CONCRETE DEBRI	1	CM	

8 **Special handling instructions and additional information:**
MATERIAL CONTAINED IN DBL 6 MIL LINERS, MATREIAL TO BE UNLOADED DIRECTLY INTO EXCAVATED PIT

9 **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. (Obtain signature in item 10 before taking Gold sheet for receipt)

M.P. RAAP

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
Gary Spiker	Partner		2 / 19 / 01

TRANSPORTER

10 **TRANSPORTER 1** (Acknowledgment of receipt of materials)
Name: Spiker Industrial Services, Ltd., 330 Tallmadge Road, Bldg. B, Brimfield, OH 44240 **Phone:** 330-673-6226

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
GARY SPIKER	Driver		2 / 19 / 01

11 **TRANSPORTER 2** (Acknowledgment of receipt of materials)
Name: EXIT **Phone:** 880-944-9722
Address: 7099 FAIRHILL STREET SE, WAYNESBURG, OHIO

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
TERRY WILSON	DRIVER		2 / 20 / 01

WASTE DISPOSAL SITE

12 **Discrepancy indication space:**

Optional Disposal Location Index X	Y	Depth

13 **WASTE DISPOSAL SITE CERTIFICATION:** I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true, accurate and complete except as noted in the item 12.

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
Joyce L. Mullinix			12 / 20 / 01

Upon Transfer: Owner / operator retains **GOLD**, Transporter retains **PINK**, WDS retains **YELLOW** and sends completed **WHITE** copy to operator in item 2.

01-RAAP-0103

ME49286

U.S. EPA WASTE SHIPMENT RECORD FOR REGULATED ASBESTOS WASTE MATERIAL

This form is prepared in accordance with 40 C. F. R. 61.150(d) (NESHAPs)

GENERATOR

1 **Work site name:** RAVENNA ARMY AMMUNITIONS PLANT
Location: LOAD LINE 11
Mailing Address: 8451 STATE RTE 5
RAVENNA OHIO 44266
County: PORTAGE
Owners name: RAVENNA ARMY AMMUNITIONS PLANT
Owner's Phone: 330-358-2920

2 **Operator's name:** Spiker Industrial Services, Ltd.
Contractor I.D. Number: 1783
Mailing Address: P.O. Box 295
Mogadore,OH 44260-0295
Operator's Phone: 330-673-6226
Contact Person: Gary Spiker
Operator's fax: 330-673-5434

3 **Waste disposal site (WDS) DESTINATION:**
Name: MINERVA ENTERPRISES
WDS Phone: 330-866-3435
Mailing Address: 9000 Minerva Road
Waynesburg, Ohio 44688
WDS fax: 330-866-3488

WDS Address/ location:

4 **Name and address of responsible agency** (Local, District or EPA Office where demolition/renovation notification was sent):
AKRON REGIONAL AIR QUALITY

5 Description of waste materials	6. Containers Number	6. Containers Type	7. Total Quantity (cubic yards)
RQ, ASBESTOS, 9, NA 2212, PG111			
HVAC PAPER ATTACHED TO CONCRETE DEBRI	1	CM	

8 **Special handling instructions and additional information:**
DISPOSE OF IN PREDUG HOLE FOR DISPOSAL

9 **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. (Obtain signature in item 10 before taking Gold sheet for receipt)

Gary Spiker	Partner	Gary Spiker	2 / 21 / 01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

TRANSPORTER

10 **TRANSPORTER 1** (Acknowledgment of receipt of materials)
Name: Spiker Industrial Services, Ltd.
330 Tallmadge Road, Bldg. B
Brimfield,OH 44240
Phone: 330-673-6226

Mark Mason	Driver	Mark Mason	2/23/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

11 **TRANSPORTER 2** (Acknowledgment of receipt of materials)
Name: EXIT
Address: 7099 FAIRHILL STREET SE
WAYNESBURG OHIO
Phone: 800-944-9722

BILL HOG	DRIVER	Bill Hog	2/23/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

WASTE DISPOSAL SITE

12 **Discrepancy indication space:**

Optional Disposal Location Index

X	Y	Depth

13 **WASTE DISPOSAL SITE CERTIFICATION:** I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true, accurate and complete except as noted in the item 12.

Karen Solenthaler	owner	K. Solenthaler	2/23/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

Upon Transfer: Owner / operator retains **GOLD**, Transporter retains **PINK**, WDS retains **YELLOW** and sends completed **WHITE** copy to operator in item 2.

01-RAAP-0104

ME# 49347

U.S. EPA WASTE SHIPMENT RECORD FOR REGULATED ASBESTOS WASTE MATERIAL

This form is prepared in accordance with 40 C. F. R. 61.150(d) (NESHAPs)

GENERATOR

1 **Work site name:** RAVENNA ARMY AMMUNITIONS PLANT
Location: LOAD LINE 11
Mailing Address: 8451 STATE RTE 5
RAVENNA OHIO 44266
County: PORTAGE
Owners name: RAVENNA ARMY AMMUNITIONS PLANT
Owner's Phone: 330-358-2920

RVAAP 23 FEB 01

2 **Operator's name:** Spiker Industrial Services, Ltd.
Contractor I.D. Number: 1783
Mailing Address: P.O. Box 295
Mogadore,OH 44260-0295
Operator's Phone: 330-673-6226
Contact Person: Gary Spiker
Operator's fax: 330-673-5434

3 **Waste disposal site (WDS) DESTINATION:**
Name: MINERVA ENTERPRISES
WDS Phone: 330-866-3435
Mailing Address: 9000 Minerva Road
Waynesburg, Ohio 44688
WDS fax: 330-866-3488

WDS Address/ location:

4 **Name and address of responsible agency** (Local, District or EPA Office where demolition/renovation notification was sent):
AKRON REGIONAL AIR QUALITY

5 Description of waste materials	6. Containers Number	Type	7. Total Quantity (cubic yards)
RQ, ASBESTOS, 9, NA 2212, PG111			
HVAC PAPER ATTACHED TO CONCRETE DEBRI	1	CM	

8 **Special handling instructions and additional information:**
DISPOSE OF IN A PREDUG HOLE FOR DISPOSAL

9 **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. (Obtain signature in item 10 before taking Gold sheet for receipt)

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
Gary Spiker	Partner	Gary Spiker	2 26 (22) (JEP) / 01

TRANSPORTER

10 **TRANSPORTER 1** (Acknowledgment of receipt of materials)
Name: Spiker Industrial Services, Ltd.
330 Tallmadge Road, Bldg. B
Brimfield, OH 44240
Phone: 330-673-6226

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
Sam Hargl	Driver	Sam Hargl	2/26 (JEP) /01

11 **TRANSPORTER 2** (Acknowledgment of receipt of materials)
Name: EXIT
Address: 7099 FAIRHILL, SE
WAYNESBURG OHIO
Phone: 800-944-9722

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
Bill Hug	DRIVER	Bill Hug	2/26/01

WASTE DISPOSAL SITE

12 **Discrepancy indication space:**
Change of date (JEP)

Optional Disposal Location Index

X	Y	Depth

13 **WASTE DISPOSAL SITE CERTIFICATION:** I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true, accurate and complete except as noted in the item 12.

Printed / typed Name	Title	Signature	Date (MM / DD / YY)
Joyce L. Mullinix		Joyce L. Mullinix	02/27/01

Upon Transfer: Owner / operator retains **GOLD**, Transporter retains **PINK**, WDS retains **YELLOW** and sends completed **WHITE** copy to operator in item 2.

01-RAAP-0105 MC#49348

U.S. EPA WASTE SHIPMENT RECORD FOR REGULATED ASBESTOS WASTE MATERIAL

This form is prepared in accordance with 40 C. F. R. 61.150(d) (NESHAPs)

GENERATOR

1 Work site name: RAVENNA ARMY AMMUNITIONS PLANT
Location: LOAD LINE 11
Mailing Address: 8451 STATE RTE 5
RAVENNA OHIO 44266
County: PORTAGE
Owners name: RAVENNA ARMY AMMUNITIONS PLANT
Owner's Phone: 330-358-2920

Jeff ... RVAAP 23 FEB 01

2 Operator's name: Spiker Industrial Services, Ltd.
Contractor I.D. Number: 1783
Mailing Address: P.O. Box 295
Mogadore,OH 44260-0295
Operator's Phone: 330-673-6226
Contact Person: Gary Spiker
Operator's fax: 330-673-5434

3 Waste disposal site (WDS) DESTINATION:
Name: MINERVA ENTERPRISES
WDS Phone: 330-866-3435
Mailing Address: 9000 Minerva Road
Waynesburg, Ohio 44688
WDS fax: 330-866-3488

WDS Address/ location:

4 Name and address of responsible agency (Local, District or EPA Office where demolition/renovation notification was sent):
AKRON REGIONAL AIR QUALITY

5 Description of waste materials	6. Containers Number	Type	7. Total Quantity (cubic yards)
RQ, ASBESTOS, 9, NA 2212, PG111			
HVAC PAPER ATTACHED TO CONCRETE DEBRI	1	CM	

8 Special handling instructions and additional information:
DISPOSE OF IN A PREDUG HOLE FOR DISPOSAL

9 **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. (Obtain signature in item 10 before taking Gold sheet for receipt) JEP

Gary Spiker	Partner	Gary Spiker	2 ~~22~~ 26 01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

TRANSPORTER

10 TRANSPORTER 1 (Acknowledgment of receipt of materials)
Name: Spiker Industrial Services, Ltd.
330 Tallmadge Road, Bldg. B
Brimfield, OH 44240
Phone: 330-673-6226

JEP

Sam Harsh	Driver	Sam Harsh	2/~~27~~ 26/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

11 TRANSPORTER 2 (Acknowledgment of receipt of materials)
Name: EXIT
Address: 7099 FAIRHILL, SE
WAYNESBURG OHIO
Phone: 800-944-9722

Greg McWilliams	DRIVER	[signature]	2/26/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

WASTE DISPOSAL SITE

12 Discrepancy indication space:
Change of date JEP

Optional Disposal Location Index X	Y	Depth

13 **WASTE DISPOSAL SITE CERTIFICATION:** I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true, accurate and complete except as noted in the item 12.

Joyce L Mullinix		[signature]	02/27/01
Printed / typed Name	Title	Signature	Date (MM / DD / YY)

Upon Transfer: Owner / operator retains GOLD, Transporter retains PINK, WDS retains YELLOW and sends completed WHITE copy to operator in item 2.

01-RAAP-01

U.S. EPA WASTE SHIPMENT RECORD FOR REGULATED ASBESTOS WASTE MATERIAL

This form is prepared in accordance with 40 C. F. R. 61.150(d) (NESHAPs)

GENERATOR

1 **Work site name:** RAVENNA ARMY AMMUNITIONA PLANT
Location: LOAD LINE 11
Mailing Address: 8451 STATE ROUTE 5
RAVENNA OHIO 44266
County: PORTAGE
Owners name: RAVENNA ARMY AMMUNITIONS PLANT **Owner's Phone:** 330-358-2920

2 **Operator's name:** Spiker Industrial Services, Ltd. **Contractor I.D. Number:** 1783
Mailing Address: P.O. Box 295
Mogadore,OH 44260-0295 **Operator's Phone:** 330-673-6226
Contact Person: Gary Spiker **Operator's fax:** 330-673-5434

3 **Waste disposal site (WDS) DESTINATION:**
Name: MINERVA ENTERPRISES **WDS Phone:** 330-866-3435
Mailing Address: 9000 Minerva Road **WDS fax:** 330-866-3488
Waynesburg, Ohio 44688

WDS Address/ location:

4 **Name and address of responsible agency** (Local, District or EPA Office where demolition/renovation notification was sent):
AKRON REGIONAL AIR QUALITY

5 Description of waste materials	6. Containers Number	Type	7. Total Quantity (cubic yards)
RQ, ASBESTOS, 9, NA 2212, PG111			
ACM PAPER	15	BA	1

8 **Special handling instructions and additional information:**

9 **OPERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations. (Obtain signature in item 10 before taking Gold sheet for receipt)

Gary Spiker — Partner — Gary Spiker — 2 / 27 / 01
Printed / typed Name — Title — Signature — Date (MM / DD / YY)

TRANSPORTER

10 **TRANSPORTER 1** (Acknowledgment of receipt of materials)
Name: Spiker Industrial Services, Ltd. **Phone:** 330-673-6226
330 Tallmadge Road, Bldg. B
Brimfield, OH 44240

ED STANLEY — Driver — Ed Stanley — 2 / 27 / 01
Printed / typed Name — Title — Signature — Date (MM / DD / YY)

11 **TRANSPORTER 2** (Acknowledgment of receipt of materials)
Name: **Phone:**
Address:

Printed / typed Name — Title — Signature — Date (MM / DD / YY)

WASTE DISPOSAL SITE

12 **Discrepancy indication space:**

Optional Disposal Location Index X	Y	Depth

13 **WASTE DISPOSAL SITE CERTIFICATION:** I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true, accurate and complete except as noted in the item 12.

Karen Solenthaler — owner — K. Solenthaler — 2 28 01
Printed / typed Name — Title — Signature — Date (MM / DD / YY)

Upon Transfer: Owner / operator retains **GOLD**, Transporter retains **PINK**, WDS retains **YELLOW** and sends completed **WHITE** copy to operator in item 2.

Manifest # NFT-0078-2001

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of 1	
	OH5210020736			

GENERATOR

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5, Ravenna, Ohio 44266

4. Generator's Phone (330) 358-2920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
Emerald Environmental Services, Inc.	OHR000102053	(330) 677-0795
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone
9. Designated Facility Name and Site Address Countywide RDF 3619 Gracemont Avenue SW East Sparta, Oh 44626	10. US EPA ID Number N/A	C. Facility's Phone (330) 874-3855

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA / NOT-DOT REGULATED SOLIDS (TPH SOILS)	001	DT	EST. ~~0002~~	T
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
11a) Approval #509236
Ticket # 162738

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Emergency Phone (330) 358-2920
Load Line 11 IRA PCS Soil

16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
X Mark Patterson	Mark Patt	08	24	01

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
X Michael Fisher	Michael Fisher	08	24	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space
#13 ACTUAL 25.43

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Patricia Wright	Patricia Wright	08	24	01

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

TRANSPORTER #1

Manifest # NJH-010-2001

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of 1
	OH5210020736		

GENERATOR

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5, Ravenna, Ohio 44266

4. Generator's Phone (330) 358-2920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
Emerald Environmental Services, Inc.	OHR000102053	(330) 677-0785
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone

9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
Countywide RDF 3619 Gracemont Avenue SW East Sparta, Oh 44626	N/A	(330) 874-3855

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA / NOT-DOT REGULATED SOLIDS (TPH SOILS)	001	DT	EST. ~~0.002~~ T	
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
11a) Approval #509236
TICKET # 162734

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Emergency Phone (330) 358-2920
Load Line 11 IRA PCS Soil

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
X Mark Patterson	Mark Patterson	10	24	01

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
X LARRY STRATERI	Larry Straten	10	24	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space
#13) ACTUAL 2495 CKL

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Lethia Wright	Lethia Wright	10	24	01

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

TRANSPORTER #1

Manifest # NH-011-2001

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. OH5210020736	Manifest Doc. No.	2. Page 1 of 1	

GENERATOR

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5, Ravenna, Ohio 44266

4. Generator's Phone (330) 358-2920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
Emerald Environmental Services, Inc.	OHR000102053	(330) 677-0785
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone

9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
Countywide RDF 3619 Gracemont Avenue SW East Sparta, Oh 44626	N/A	(330) 874-3855

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA / NOT-DOT REGULATED SOLIDS (TPH SOILS)	001	DT	EST. ~~00032~~ 7	
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
11a) Approval #509236
TICKET # 162724

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Emergency Phone (330) 358-2920

LL-11 IRA PCB Soil

16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
X Mark Patterson	Mark Patt	08	24	01

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
X Pete Timms	Pete Timms	08	24	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space
#13) Actual 27.15

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Lethia Wright	Lethia Wright	08	24	01

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

TRANSPORTER #1

Manifest # NH-012-2001

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of 1
	OH5210020736		

GENERATOR

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5, Ravenna, Ohio 44266

4. Generator's Phone (330) 358-2920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
Emerald Environmental Services, Inc.	OHR000102053	(330) 677-0785
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone
9. Designated Facility Name and Site Address Countywide RDF 3619 Gracemont Avenue SW East Sparta, Oh 44626	10. US EPA ID Number N/A	C. Facility's Phone (330) 874-3855

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA / NOT-DOT REGULATED SOLIDS (TPH SOILS)	001	DT	EST. ~~0002~~	T
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
11a) Approval #509236
TICKET # 162723

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Emergency Phone (330) 358-2920

LL-11 IRA PCS Soil

16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
Mark Patterson	Mark Patt	08	24	01

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
David L. Alexoff	David L. Alexoff	8	24	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

FACILITY

19. Discrepancy Indication Space
#13) ACTUAL 25.49

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Leticia Wright	Letti Wright	08	24	01

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

TRANSPORTER #1

Manifest # NH-013-2001

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No. OH5210020736	Manifest Doc. No.	2. Page 1 of 1

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5, Ravenna, Ohio 44266

4. Generator's Phone (330) 358-2920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
Emerald Environmental Services, Inc.	OHR000102053	(330) 677-0785
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone
9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
Countywide RDF 3619 Gracemont Avenue SW East Sparta, Oh 44626	N/A	(330) 874-3855

GENERATOR

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA / NOT-DOT REGULATED SOLIDS (TPH SOILS)	001	DT	EST. 00022	T
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above

11a) Approval #509236

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

Emergency Phone (330) 358-2920

Load Line 11 PCS Soil

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month Day Year
Mark Patterson	[signature]	08 24 01

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year
LARRY STRATEN	[signature]	08 24 01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month Day Year

FACILITY

19. Discrepancy Indication Space

#13) ACTUAL WEIGHT - 26.73 TONS

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month Day Year
E Sthn Ward	[signature]	08 24 01

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

12-BLS-C6 Rev. 12/98

TRANSPORTER #1

1192 tracking # NH-001-2001

...ASTE MANIFEST

1. Generator's US EPA ID No.	Manifest Doc. No.	2. Page 1 of 1
OH 5 2 1 0 0 2 0 7 3 6		

Generator's Name and Mailing Address: RAVENNA ARMY AMMUNITION PLANT
8451 ST. RT 5 RAVENNA OH 44266

4. Generator's Phone (330) 358-0920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
EMERALD ENVIRONMENTAL SERVICES	OHR000034660	(330)677-0785
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone

9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
CHEMICAL SOLVENTS INC 3751 JENNINGS RD CLEVELAND OH 44109	OHD980897636	(800)362-0673

11. Waste Shipping Name and Description	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA/NOT DOT REGULATED LIQUIDS	001	TT	01500	G
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
11a) 015758

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
LL 11 RI Purge + Decon Water

16. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
Mark Patterson	Mark Patterson	01	11	01

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
Terry Baum	Terry Baum	01	11	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
	R Campbell C.S.I			

GENERATOR / TRANSPORTER / FACILITY

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

TRANSPORTER #1

CHEMICAL SOLVENTS INC.
WEIGHED ON A FAIRBANKS SCALE

Truck Number 204 Date 81-4-01

Customer's Name RAVENNA ARSENAL - EMULS.

Address

Products WASTE WATER Trailer No. 4104 Compartment No. 1

Lbs. Gross

Lbs. Tare

Lbs. Net @

Shipper

Weigher

Please print or type
(Form designed for use on elite (12-pitch) typewriter.)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. OH 521 002 0736 | Manifest Doc. No. 08131 | 2. Page 1 of 1

3. Generator's Name and Mailing Address RAVENNA ARMY AMMUNITIONS PLANT
8451 STATE 5 RAVENNA, OHIO 44266

4. Generator's Phone (330) 358-2920

5. Transporter 1 Company Name	6. US EPA ID Number	A. Transporter's Phone
EMERALD ENVIRONMENTAL SERVICES	OH 2000102053	(330) 677-0785
7. Transporter 2 Company Name	8. US EPA ID Number	B. Transporter's Phone

9. Designated Facility Name and Site Address	10. US EPA ID Number	C. Facility's Phone
CHEMICAL SOLVENTS INC 1010 DENNISON AVE. CLEVELAND, OHIO 44109	OH D980897656	(800) 362-0693

11. Waste Shipping Name and Description	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol
a. NON-RCRA/NOT DOT REGULATED LIQUIDS	001	TT	04800	G
b.				
c.				
d.				

D. Additional Descriptions for Materials Listed Above
11a) PROFILE # 015032

E. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Load Line 11 Decon Water
EMERGENCY PHONE (330) 677-0785

16. **GENERATOR'S CERTIFICATION:** I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Printed/Typed Name	Signature	Month	Day	Year
X Mark Patterson	X Mark Patt	08	13	01

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year
CHARLIE REITENMAN		08	13	01

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Month	Day	Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of waste materials covered by this manifest except as noted in Item 19.

Printed/Typed Name	Signature	Month	Day	Year
Richard Chaplet		08	13	01

GENERATOR
TRANSPORTER
FACILITY

Printed by J. J. KELLER & ASSOCIATES, INC.
Neenah, WI 54957-0368

TRANSPORTER #1

Field Forms

The field forms that are presented in this report are from all of the IRA activities. The field forms associated with the LL-11 RI samples, that are shown on the figures and are described in this report, are presented in the Load Line 11 RI Report.

Field Sampling Report

Location ID: LL11 CS-001-0001-50 (Sump @ AP-3)

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 01/24/01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1439 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - Estimated - Measured - ~~Surveyed~~

Sample Depth: 6 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
ıter Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	℃	SVOC		Cyanide	X	MS/MSD	Yes / No	(NA)	
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB		Duplicate ID		(NA)	
pH	units	Propellants		Nitrate	X	Field Blank ID		(NA)	
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID		(NA)	

Sample Description

Brown, Sandy, Silty Clay
Moist, No Staining, Small-Medium Sized Pebbles + Rocks

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Michael Samelak (Please Print)

Signature: Michael A Bl

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-002-0001-50

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 01/26/01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1009 hrs Sample Type: Composite (Grab) Location: Plotted on Map - (Staked in Field) Estimated - Measured - Surveyed

Sample Depth: 6 FT (below surface) Decon: Dedicated - Each Day (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC	X	TAL Metals	X	Ignitability			
Temperature	°C	SVOC	X	Cyanide	X	QA Samples			
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	MS/MSD	(Yes) / No		NA
pH	units	Propellants		Nitrate	X	Duplicate ID	LL11CS-002-0001-FD		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Field ~~Blank~~ Equipment ID	LL11CS-002-0001-ER		NA
						Trip Blank ID			(NA)

Sample Description

Gray/Brown, Sandy, Silty Clay
Organic odor, Some small - Medium sized Gravel
Very wet.

Split Sample

Split Sample ID: ~~LL11CS-002-0001-50~~

Name: ~~John Jent~~ 2415, 1-26-01
Agency/Company: ~~USACOE~~
Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks
Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: Michael Samelak (Please Print)
Signature: Michael Samelak

Reviewed by: J. Panozzo (Please Print)
Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-003-0001-50

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 01/26/01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1301 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - (Staked in Field)
Estimated - Measured - Surveyed

Sample Depth: 6 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
ater Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide	X	MS/MSD	Yes / No		(NA)
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate	X	Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			(NA)

Sample Description

Brown, Sandy, Silty Clay
No Odor, No staining, Moist
Some small - Medium gravel

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Michael Samelak (Please Print)

Signature: Michael Samelak

Reviewed by: J. Panozzo (Please Print)

Signature: James Panozzo Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-004-0001-50

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 02-21-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 10:20 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - (Staked in Field) Estimated - Measured - Surveyed

Sample Depth: 0 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC	X	TAL Metals	X	Ignitability			
Temperature	°C	SVOC	X	Cyanide	X	QA Samples			
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	MS/MSD	Yes / (No)		(NA)
pH	units	Propellants	X	Nitrate	X	Duplicate ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Field Blank ID			(NA)
						Trip Blank ID	LL11CS-004-0001-TB		(NA)

Sample Description

Reddish Brown / with gray mottles silty clay Moist

Split Sample

Split Sample ID: LL11CS-004-0001-50

Name: John Jent

Agency/Company: USACE - Louisville Dist.

Address: 600 Martin Luther King Louisville, KY 40202

QA/QC Provided: MS/MSD - Duplicate - (Trip Blanks) - Field Blanks

Parameters: (Same as Above) As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: Mark Dunlevy (Please Print)

Signature: Mark D. Dunlevy

Reviewed by: J. Panozzo (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-005-0001-50

Ravenna Army Ammunition Plant
LL 11 IRA

ıte: 02-21-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1402 hrs Sample Type: Composite - ~~Grab~~ Location: Plotted on Map - Staked in Field

Sample Depth: 6 FT (below surface) Decon: Dedicated - Each Day - Each Location Estimated - Measured - Surveyed

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
ıter Level	FT	VOC	X	TAL Metals	X	Ignitability			
Temperature	°C	SVOC	X	Cyanide	X	QA Samples			
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	MS/MSD	Yes / No		NA
pH	units	Propellants	X	Nitrate	X	Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

brown silty clay - grey mottling
soft & pliable

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GILLMEN (Please Print)

Signature: _____

Reviewed by: J. Panozzo (Please Print)

Signature: _____ Date: 4/24/02

Field Sampling Report

Location ID: LL11GS-006-0001-SD

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 0835 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		(NA)
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

~~Brown sandy (40) - coarse to med, clayey (10) silt (30) wt grey mottling present, wet~~ ALL

Dark brown clayey (20) sandy (5) silt w/ organic material. med to little plasticity

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)

Signature: [illegible] 21 Mar 01

Reviewed by: J. Panozzo (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-007-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 0940 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field ~~Estimated~~ - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		(NA)
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown ~~silty~~ Sandy(40)-coarse-med, poorly sorted; Clay(10), Silt(50) Some grey mottling present - little plasticity. 10YR 5/4

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Andrew C Mauer (Please Print)

Signature: 21 Mar 01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-008-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 0845 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location) (Estimated) - Measured - Surveyed

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC	X	TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No		NA
pH	units	Propellants		Nitrate		Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

Brownish gray silty, sandy (30) fine to med, clayey (10) silt, wet little plasticity; iron mottling present

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUILLAUEN (Please Print)

Signature: Amelia Guillauen 21 Mar 01

Reviewed by: J. Panozzo (Please Print)

Signature: _____ Date: 4/24/02

Field Sampling Report

Location ID: LLICS-009-0001-SO

Date: 21 Mar 01

Ravenna Army Ammunition Plant
LL 11 IRA

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 0850 hrs

Sample Type: Composite - (Grab)

Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface)

Decon: Dedicated - Each Day - (Each Location)

Field Parameters
(at time of sample)

PID / FID Readings:	
Background:	ppm
Sample:	ppm
Water Level	FT
Temperature	°C
Sp. Conductance:	uMHOs
pH	units
Turbidity	N.T.U.

Analytical Parameters

PP / RCRA Metals		TCLP	
Soluble			
Totals			
VOC	X	TAL Metals	X
SVOC		Cyanide	
Explosives		Pest/PCB	
Propellants		Nitrate	
TOC		Sulfide/Sulfate	

Other Parameters

Corrosivity	
Reactivity Sulfide/Cyanide	
Ignitability	

QA Samples

MS/MSD	Yes / No	(NA)
Duplicate ID		(NA)
Field Blank ID		(NA)
Trip Blank ID		(NA)

Sample Description

Brown clayey (40) sandy (5)-fine) to very fine silt (55); grey mottling
Moderately plastic
10YR 5/3

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA GUANIER (Please Print)

Signature: 21 Mar 01

Reviewed by: J. Pantano (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-010-0001-SD

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					stainless steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 0855 hrs   Sample Type: Composite - Grab (circled)   Location: Plotted on Map - Staked in Field - Estimated (circled) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface)   Decon: Dedicated - Each Day - Each Location (circled)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters	
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity	
						Reactivity Sulfide/Cyanide	
Sample:	ppm	Totals				Ignitability	
Water Level	FT	VOC	X	TAL Metals	X	**QA Samples**	
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID	NA
pH	units	Propellants		Nitrate		Field Blank ID	NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID	NA

Sample Description

~~Dark Brown Gray sand (med to fine) clayey (20) silt w/ lt grey mottling organic material present; wet little plasticity~~

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: ______

Name: ______
Agency/Company: ______
Address: ______

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks
Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)   Reviewed by: J. Panozzo (Please Print)

Signature: [signature] 21 Mar 01   Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LLIICS-011-0001-SD

Ravenna Army Ammunition Plant
LL II IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1306 hrs Sample Type: Composite / Grab Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed

Sample Depth: 0-1 FT (below surface) Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID	LLIICS-011-0001-FD		NA
pH	units	Propellants		Nitrate		Field Blank ID (EQUIPMENT)	LLIICS-011-0001-ER		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Dark Brown Sandy (40) clayey (5) silt; mod. plasticity; wet, soft to slightly firm; organic material present.

10YR 4/2

Split Sample

Split Sample ID: LLIICS-011-0001-SD

Name: John Jent

Agency/Company: USACE

Address: 600 Martin Luther King
Louisville, KY

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA GILMAN (Please Print)

Signature: 23Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL1CS-012-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1313 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Brown sandy(5)-fine; clayey(40) silt(55) w/ grey & tan mottling, med-plasticity, somewhat firm SAR S/O

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA GILMANEN (Please Print)

Signature: 23Mar01

Reviewed by: J. Pan 02/20 (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-018-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1440 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field (Estimated) Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Brown Sandy (S) fine to very fine), clayey (40) silt (55) w/ grey mottling firm, mod. plasticity 10 YR 6/5

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUANER (Please Print)

Signature: 23Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LLICS-014-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					stainless steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1450 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Brown clayey (45) silt (55) w/tr sand - fine; grey mottling present slightly firm; med. plasticity 10YR 5/5

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GILMAN (Please Print)

Signature: 23Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LLIICS-015-0001-SD

Ravenna Army Ammunition Plant
LL II IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils (Sediments) / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1444 hrs Sample Type: Composite - Grab Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Dark Brown sandy (40) - fine to med (poorly sorted) clayey(s) silt(55) w/ organic matter; wet; mod plasticity 10YR 3/1

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA COLLINEN (Please Print)

Signature: [signature] 23Mar01

Reviewed by: J. Lanoza (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LLICS-016-0001-SD

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / (Sediments) / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					stainless steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1600 hrs Sample Type: Composite- (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals		QA Samples			
Temperature	°C	SVOC	X	Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Dark Brown Sand(35) poorly sorted fine to medium; clay(20) silt(45) w/ organic matter, little plasticity spongy 10YR 3/1

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA GILIANEN (Please Print)

Signature: 23Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-017-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1555 hrs Sample Type: Composite- (Grab) Location: (Plotted on Map) - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals		QA Samples			
Temperature	°C	SVOC	X	Cyanide		MS/MSD	(Yes) No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB	X	Duplicate ID	LL11CS-017-0001-FD		NA
pH	units	Propellants		Nitrate		~~Field~~ EQUIPMENT Blank ID	LL11CS-017-0001-ER		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID	LL11CS-017-0001-TB		NA

Sample Description

Brown sandy (30) Clayey (10) Silt (60) w/ grey mottling, sand fine & well sorted mod. plasticity 10YR 5/6

Split Sample

Split Sample ID: LL11CS-017-0001-SO

Name: John Jent

Agency/Company: USACE

Address: 600 MLK Louisville, KY

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: (Same as Above) - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA GILLANEN (Please Print)

Signature: Amelia Gillanen 23Mar01

Reviewed by: J. Pantano (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LLIICS-018-0001-SO

Ravenna Army Ammunition Plant
LL II IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1650 hrs Sample Type: Composite- (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters	
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity	
Background:	ppm	Soluble					
						Reactivity Sulfide/Cyanide	
Sample:	ppm	Totals				Ignitability	
Water Level	FT	VOC	X	TAL Metals		QA Samples	
Temperature	°C	SVOC	X	Cyanide		MS/MSD	Yes / No / NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB (X)	X	Duplicate ID	NA
pH	units	Propellants		Nitrate		Field Blank ID	NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID	NA

Sample Description

Brown sandy (15) clay (30) silt (55) w/ grey mottling, soft, med plasticity 10YR 5/6

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUIANEN (Please Print)

Signature: _____ 23Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: _____ Date: 4/24/02

Location ID: LLICS-019-0001-SO

Field Sampling Report

Ravenna Army Ammunition Plant
LL II IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1850 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals		QA Samples			
Temperature	°C	SVOC	X	Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		(Pest/PCB)	X	Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Brown sandy (20) clayey (30); silt (50) w/grey mottling; firm - mod. plasticity

7.5YR 5/6

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GILIANO (Please Print)

Signature: 23Mar01

Reviewed by: T. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LLICS-020-0001-SD

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 23Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils (Sediments) / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1540 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC	X	TAL Metals		QA Samples			
Temperature	°C	SVOC	X	Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants		Nitrate		Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA

Sample Description

Dark Brown Sandy (30) - well sorted fine to med fine; clayey (20), silt (50); Saturated; organic matter present little plasticity

10YR 4/1

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: A. MELLAGUANEN (Please Print)

Signature: 23Mar01

Reviewed by: J. Pastore (Please Print)

Signature: Date: 4/24/02

LL11CS-021-0001-SD

Field Sampling Report

Location ID: ~~LL11CS-015-0001-SD~~ 021

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / (Sediments) / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	✓
	Pump		Bacon Bomb		Bowl	✓	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1100 hrs   Sample Type: Composite (Grab)   Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface)   Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters		
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity		
						Reactivity Sulfide/Cyanide		
Sample:	ppm	Totals				Ignitability		
Water Level	FT	VOC		TAL Metals	X	**QA Samples**		
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No	NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID		NA
pH	units	Propellants		Nitrate		Field Blank ID		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID		NA

Sample Description

Dark brown clayey (25) sand (10) silt (65) no mottling, organic root matter present

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:
Agency/Company:
Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks
Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)

Signature: [signature] 21 Mar 01

Reviewed by: J. Panozzo (Please Print)

Signature: [signature] Date: 4/24/02

LL11CS-022-0001-SO

Field Sampling Report

Location ID: LL11CS-~~014~~-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1055 hrs Sample Type: Composite - Grab Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No	—	NA
pH	units	Propellants		Nitrate		Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

Brown Clayey (35) (65) → silt no sand; grey mottling - mod plasticity

10YR 5/2

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: ANGELA GILLHAM (Please Print)

Signature: _____ 21 Mar 01

Reviewed by: J. Panzarino (Please Print)

Signature: _____ Date: 4/24/02

LL11CS-023-0001-SO

Field Sampling Report

Location ID: LL11CS-~~013~~ 023-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge (circled: Soils)			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 048 hrs

Sample Type: Composite - Grab (circled)

Location: ~~Plotted on Map~~ - Staked in Field - Estimated (circled) - Measured - Surveyed

Sample Depth: 2 FT (below surface)

Decon: Dedicated - Each Day - Each Location (circled)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters	
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity	
						Reactivity Sulfide/Cyanide	
Sample:	ppm	Totals				Ignitability	
Water Level	FT	VOC		TAL Metals	X	**QA Samples**	
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No NA (circled)
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID	NA (circled)
pH	units	Propellants		Nitrate		Field Blank ID	NA (circled)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID	NA (circled)

Sample Description

Brown clayey (45) silt (55) no sand grey mottling, elastic somewhat firm

10YR 6/3

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)

Signature: [signature] 21 Mar 01

Reviewed by: J. Panozzo (Please Print)

Signature: [signature] Date: 4/24/02

LL11CS-024-0001-SO

Field Sampling Report

Location ID: LL11CS-~~012~~ 024-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge (Soils circled)			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1044 hrs

Sample Type: Composite - Grab (circled)

Location: Plotted on Map - Staked in Field - Estimated (circled) - Measured - Surveyed

Sample Depth: 2 FT (below surface)

Decon: Dedicated - Each Day - Each Location (circled)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	**QA Samples**			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No	NA	
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID		NA	
pH	units	Propellants		Nitrate		Field Blank ID		NA	
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID		NA	

Sample Description

Brown Clay (40) silt (60) no Sand [illegible] Mottling present 11 YR 5/4 plastic ~~[illegible]~~ plastic

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)

Signature: [signature] 21Mar01

Reviewed by: J. Ambrozzo (Please Print)

Signature: [signature] Date: 4/24/02

Location ID: LL11CS-025-0001-SD

Field Sampling Report

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 02

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1040 hrs

Sample Type: Composite - Grab

Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed

Sample Depth: 0-1 FT (below surface)

Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No		NA
pH	units	Propellants		Nitrate		Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

Dark Brown Clayey(20) Sandy(10) silt(70) w/ organic root matter; little plasticity; wet

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)

Signature:

Reviewed by: T. Lawson (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-026-0001-SD

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					stainless steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1015 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No		NA
pH	units	Propellants		Nitrate		Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

Brown (Dark) clayey (15) sandy (20) Silty; wet - little plasticity

10YR 6/2

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: ANGELA GUANEN (Please Print)

Signature: 21 Mar 01

Reviewed by: J. Pastorazo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-027-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1007 hrs Sample Type: Composite - Grab Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No		NA
pH	units	Propellants		Nitrate		Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

Brown clayey (40) silt (60) w/ grey mottling - mod plasticity - pliable not firm

10YR 5/4

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA GUIANEN (Please Print)

Signature: _____ 21 Mar 01

Reviewed by: J. Ramazzo (Please Print)

Signature: _____ Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-028-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		(Soils) / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1010 hrs

Sample Type: Composite - (Grab)

Location: Plotted on Map - Staked in Field
~~Estimated~~ - Measured - Surveyed

Sample Depth: 2 FT (below surface)

Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No		(NA)
pH	units	Propellants		Nitrate		Duplicate ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			(NA)
						Trip Blank ID			(NA)

Sample Description

Brown 10YR 5/3 clayey (45) silt (55) w/ grey mottling; moderately plastic not firm

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: [signature] (Please Print)

Signature: [signature]

Reviewed by: J. Hargrove (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LLICS-029-0001-SO

ate: 21 Mar 01

Ravenna Army Ammunition Plant
LL 11 IRA

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 019 hrs Sample Type: Composite - Grab Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / No		NA
pH	units	Propellants		Nitrate		Duplicate ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			NA
						Trip Blank ID			NA

Sample Description

Brown clayey (45) silty (55); Mod plastic w/ Grey mottling; tr sand (fine sand) 10YR 5/4

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Logged By: AMELIA WHITTEN (Please Print)

Signature: 21 Mar 01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Location ID: LL11CS-030-0001-SD

Field Sampling Report

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 21 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1025 hrs
Sample Depth: 0-1 FT (below surface)

Sample Type: Composite - Grab (circled)
Decon: Dedicated - Each Day - Each Location (circled)

Location: ~~Plotted on Map - Staked in Field~~
Estimated (circled) - Measured - Surveyed

Field Parameters (at time of sample)

PID / FID Readings:	
Background:	ppm
Sample:	ppm
Water Level	FT
Temperature	°C
Sp. Conductance:	uMHOs
pH	units
Turbidity	N.T.U.

Analytical Parameters

PP / RCRA Metals		TCLP	
Soluble			
Totals			
VOC		TAL Metals	X
SVOC		Cyanide	
Explosives		Pest/PCB	
Propellants		Nitrate	
TOC		Sulfide/Sulfate	

Other Parameters

Corrosivity			
Reactivity Sulfide/Cyanide			
Ignitability			

QA Samples

MS/MSD	Yes / No	NA
Duplicate ID		NA
Field Blank ID		NA
Trip Blank ID		NA

Sample Description

Dark Brown Silt (90) w/ fine sand (10)
and clay; little plasticity
10YR 6/1

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:
Agency/Company:
Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks
Parameters: Same as Above - As Listed

Logged By: Mark Dunleavy (Please Print)
Signature: [signature]

Reviewed by: J. Parrozzo (Please Print)
Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-031-0001-SD

ate: 20 Mar 01

Ravenna Army Ammunition Plant
LL 11 IRA

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

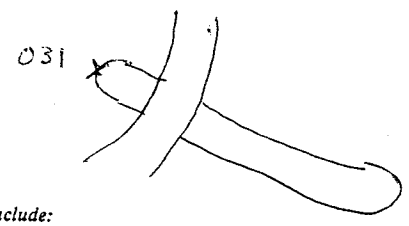
Time of Sample Collection: 1445 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 0-1 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
'ater Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID	LL11CS-031-0001-FD		NA
pH	units	Propellants		Nitrate		~~Equipment~~ Field Blank ID	LL11CS-031-0001-EB2		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Dark Brown MOIST Clayey (40) silt (55) w/ F sand (fine to med.) (5), grav. Nothing present, mod plasticity



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample ID: LL11CS-031-0001-~~FS~~ SD

Name: John Jent

Agency/Company: USACE

Address: 600 MLK
Louisville, KY

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: (Same as Above) - As Listed

Logged By: AMEL HAGUANEN (Please Print)

Signature: [signature] 20Mar01

Reviewed by: J. Pazzaglia (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-032-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 20 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		(Soils) / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

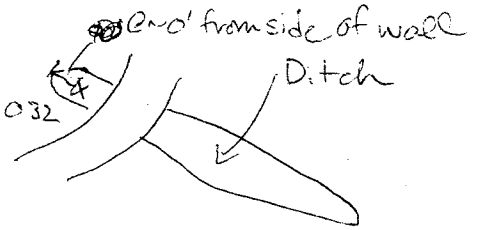
Time of Sample Collection: 1450 hrs Sample Type: Composite - (Grab) ~~Location~~ - Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown sandy (coarse to med.) poorly sorted) (35) clayey (15) Silt (50) w/ grey mottling little Plasticity



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: [illegible] (Please Print)

Signature: [illegible] 20Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: [illegible] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-033-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 20 Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

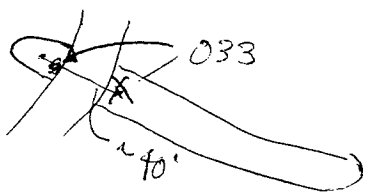
Time of Sample Collection: 1451 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
'ater Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown clayey (35) sandy (5) silt (60) mod. plastic w/ grey mottling



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUIMAEN (Please Print)

Signature: 20Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: _____ Date: 4/24/02

Field Sampling Report

Location ID: LL1CS-034-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 20 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

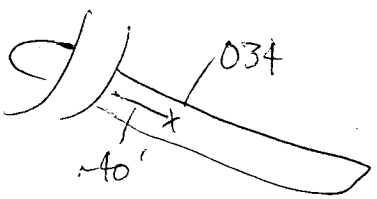
Time of Sample Collection: 1117 hrs Sample Type: Composite - (Grab) Location: ~~Plotted on Map~~ - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / (No)		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown, Sandy, Silty Clay, No Odor, No Staining, Low Plasticity, Low Moisture



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mike Sommerlatte (Please Print)

Signature: Michael Sommerlatte

Reviewed by: J. Panozzo (Please Print)

Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-035-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 20 Mar

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge (Soils circled)			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

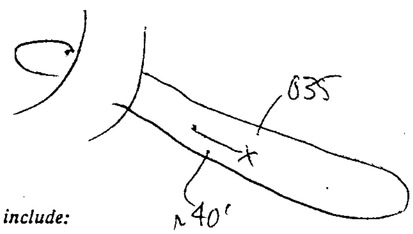
Time of Sample Collection: 1103 hrs — Sample Type: Composite - Grab (Grab circled) — Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed (Estimated circled)

Sample Depth: 2 FT (below surface) — Decon: Dedicated - Each Day - Each Location (Each Location circled)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble				Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	**QA Samples**			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / No (No circled)		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			NA (circled)
pH	units	Propellants		Nitrate		Field Blank ID			NA (circled)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			NA (circled)

Sample Description

Brown, Sandy, Silty (40%) Clay (60%), No Odor, No staining, Gray Mottelling, Low Plasticity, Low Moisture



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:
Agency/Company:
Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks
Parameters: Same as Above - As Listed

Logged By: Mike Sumeliak (Please Print)
Signature: [signature]

Reviewed by: J. Panozzo (Please Print)
Signature: [signature] Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-036-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 20 Mar

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

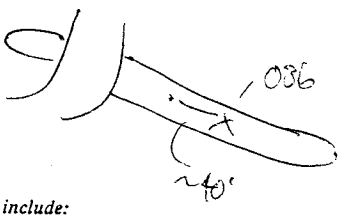
Time of Sample Collection: 1020 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / (No)		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown, Sandy, Silty, Clay, No Odor, No Staining, Low Moisture, Low Plasticity



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Michael Sandak (Please Print)

Signature: Michael G Sandak

Reviewed by: J. Pan0220 (Please Print)

Signature: James Pan0220 Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-037-0001-00

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 20 Mar-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 0925 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings: Background:	ppm	PP / RCRA Metals Soluble		TCLP		Corrosivity			
Sample:	ppm	Totals				Reactivity Sulfide/Cyanide			
Water Level	FT	VOC		TAL Metals	X	Ignitability			
Temperature	°C	SVOC		Cyanide		QA Samples			
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		MS/MSD	Yes / (No)		NA
pH	units	Propellants		Nitrate		Duplicate ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Field Blank ID			(NA)
						Trip Blank ID			(NA)

Sample Description

Brown, Sandy, Silty, Clay, Moist, No Odor, No Staining, Low Plasticity,

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mike Samelak (Please Print)

Signature: Michael Samelak

Reviewed by: J. Runozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-038-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 20Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

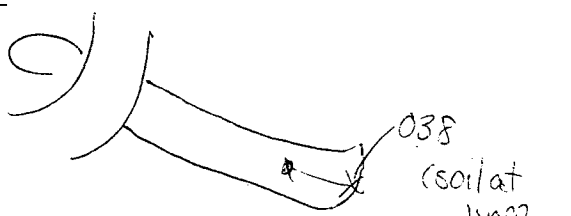
Time of Sample Collection: 0850 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - (Estimated) - Measured - Surveyed

Sample Depth: 2 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes / (No)		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown, Sandy, Silty Clay, No Odor, No Stainings, Low Plasticity, Moist



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mike Sample (Please Print)

Signature: Michael Sample

Reviewed by: J. Ryan 20 (Please Print)

Signature: James Ryan Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-039-0001-SD

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 28 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	MS
	Pump		Bacon Bomb		Bowl	X	Hand Auger	X
					Stainless steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

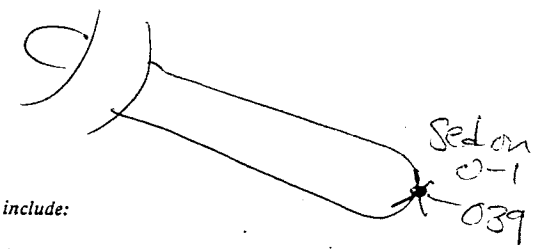
Time of Sample Collection: 0845 hrs Sample Type: Composite (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 1 FT (below surface) Decon: Dedicated - Each Day (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
						Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals				Ignitability			
Water Level	FT	VOC		TAL Metals	X	QA Samples			
Temperature	°C	SVOC		Cyanide		MS/MSD	Yes (No)		NA
Sp. Conductance:	uMHOs	Explosives		Pest/PCB		Duplicate ID			(NA)
pH	units	Propellants		Nitrate		Field Blank ID			(NA)
Turbidity	N.T.U.	TOC		Sulfide/Sulfate		Trip Blank ID			(NA)

Sample Description

Brown, ~~Sandy, Silty~~ Clayey, Silt + Sand, Moist, No plasticity, No Odor, No staining



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Michael Simecek (Please Print)

Signature: Michael Simecek

Reviewed by: J. Ramozzo (Please Print)

Signature: James Ramozzo Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-040-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 22 Mar 01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

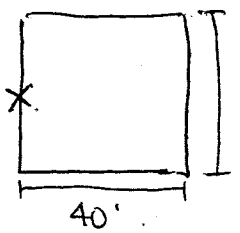
Time of Sample Collection: 1640 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 3-7 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH-DRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH GRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID	LL11CS-040-0001-FD		NA
pH	units	Propellants	X	Nitrate	X	Equipment ~~Field~~ Blank ID	LL11CS-040-0001-EB		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Brown clayey silt (50); silt (50) tr fine sand w/ gray mottling; mod. plasticity no visible staining or odor present 7.5 YR 5/6



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: LL11CS-040-0001-FS

Name: John Jent
Agency/Company: USACE
Address: 600 Martin Luther King
Louisville, KY

QA/QC Provided: MS/MSD - Duplicate - (Trip Blanks) - Field Blanks
Parameters: (Same as Above) - As Listed

Logged By: AMELIA GILLMEN (Please Print)
Signature: 23 Mar 01

Reviewed by: J. Hanover (Please Print)
Signature: Date: 4/24/02

Field Sampling Report

Location ID: LLICS-041-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 22Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

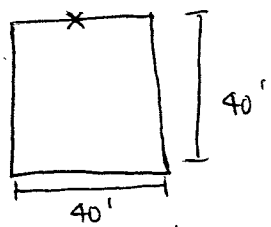
Time of Sample Collection: 1645 hrs Sample Type: Composite (Grab) Location: ~~Plotted on Map~~ - Staked in Field (Estimated) Measured - Surveyed

Sample Depth: 3-7 FT (below surface) Decon: Dedicated - Each Day (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH-DRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH-GRO	X	Ignitability			
'ater Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Brown sandy (10) fine, clayey (40) silt (50) w/ grey mottling; mod plasticity no visible staining or odor, firm 7.5YR 5/6



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUIANEN (Please Print)

Signature: 22Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11CS-042-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 22Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1720 hrs

Sample Type: Composite (Grab)

Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: 3-7 FT (below surface)

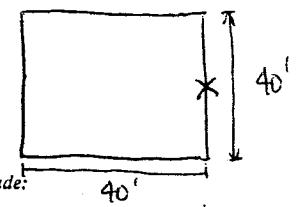
Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH - DRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH - GRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Brown Clayey (40), Sandy (fine) (10) Silt (50) w/grey mottling; no visible odor or staining present; firm, plastic 10YR 6/6

SAMPLE LOCATION



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GILIANEN (Please Print)

Signature: _____ 22Mar01

Reviewed by: J. Pahorse (Please Print)

Signature: _____ Date: 4/24/02

Field Sampling Report

Location ID: LLICS-043-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

Date: 22Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1110 hrs Sample Type: Composite - Grab Location: Plotted on Map - Staked in Field - Estimated - Measured - Surveyed

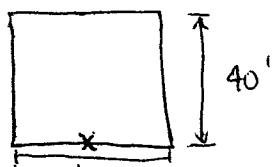
Sample Depth: 3-7 FT (below surface) Decon: Dedicated - Each Day - Each Location

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH - DRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH - GRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Brown clayey (30) Sandy fine (15) silt (55) w/ some grey mottling; no visible odor or staining present, plastic & firm 10YR 5/4

SAMPLE LOCATION



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUIHANEN (Please Print)

Signature: _____ 22Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: _____ Date: 4/24/02

Field Sampling Report

Location ID: LLIICS-044-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 22Mar01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop		Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1620 hrs Sample Type: Composite - (Grab) Location: ~~Plotted on Map~~ - Staked in Field (Estimated) - Measured - Surveyed

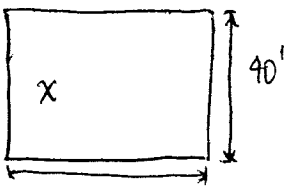
Sample Depth: 8 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH DRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH GRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Brown, Sandy(10) Clayey(35), Silt(55) w/ grey mottling, Soft & mod. Plasticity; no visible odor or staining
10YR 5/6

SAMPLE LOCATION



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID:

Name:

Agency/Company:

Address:

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: AMELIA GUANSEN (Please Print)

Signature: 22Mar01

Reviewed by: J. Panozzo (Please Print)

Signature: James E... Date: 4/24/02

Field Sampling Report

Location ID: LLIICS-045-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 22MarO1

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop AG	X	Trowel	X
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
					Stainless Steel			
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1630 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field - ~~Estimated~~ - Measured - Surveyed

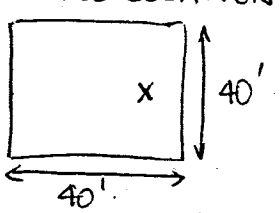
Sample Depth: 8 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH DRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH GRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID	LLIICS-045-0001-FD		NA
pH	units	Propellants	X	Nitrate	X	~~Field~~ Equipment Blank ID	LLIICS-045-0001-ER		NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			(NA)

Sample Description

Brown sandy(10) Clayey(40), Silt(50) W/grey mottling - somewhat firm, mod plasticity, no visible staining or odor present 0YRS/6

SAMPLE LOCATION



Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: LLIICS-045-0001-FS

Name: John Jent

Agency/Company: USACE

Address: 600 Martin Luther King
Louisville, KY

QA/QC Provided: ~~MS/MSD~~ - Duplicate - (Trip Blanks) - Field Blanks

Parameters: (Same as Above) - As Listed

Logged By: AMEGAN GUANEN (Please Print)

Signature: 22MarO1

Reviewed by: J. Runo220 (Please Print)

Signature: Date: 4/24/02

Field Sampling Report

Location ID: LL11 CS-046-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 3-21-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop	X	Trowel	
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1335 hrs Sample Type: Composite- (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: ~4 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPHGRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH-DRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Dark Brown Sandy-Silt dry

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mark Dunlevy (Please Print) Reviewed by: _____ (Please Print)

Signature: Mark R Dunlevy Signature: _____ Date: _____

Field Sampling Report

Location ID: LL11CS-047-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 3-21-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop	X	Trowel	
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1354 hrs

Sample Type: Composite- (Grab)

Location: Plotted on Map - Staked in Field
(Estimated) Measured - Surveyed

Sample Depth: ~4 FT (below surface)

Decon: Dedicated - Each Day (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble		TPH-GRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH-DRO	X	Ignitability			
'ater Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	℃	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

light brown silty sand w/ small gravel

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mark Dunlevy (Please Print)

Signature: Mark D. Dunlevy

Reviewed by: _____ (Please Print)

Signature: _____ Date: _____

Field Sampling Report

Location ID: LL11CS-048-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 3-21-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop	X	Trowel	
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1412 hrs Sample Type: Composite- (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: ~4 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH-GRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH-DRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

Light brown silty sand

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mark Dunlevy (Please Print)

Signature: Mark D. Dunlevy

Reviewed by: _____ (Please Print)

Signature: _____ Date: _____

Field Sampling Report

Location ID: LL11CS-049-0001-SO

Ravenna Army Ammunition Plant
LL 11 IRA

ate: 3-21-01

Sampling Information

Source	Groundwater / Product		Surface Water		Soils / Sediments / Sludge			
Method	Bailer		Sample Bottle		Scoop	X	Trowel	
	Pump		Bacon Bomb		Bowl	X	Hand Auger	
Type/Construction								
Miscellaneous	Well Purging Form Yes - No							

Time of Sample Collection: 1435 hrs Sample Type: Composite - (Grab) Location: Plotted on Map - Staked in Field (Estimated) - Measured - Surveyed

Sample Depth: ~4 FT (below surface) Decon: Dedicated - Each Day - (Each Location)

Field Parameters (at time of sample)		Analytical Parameters				Other Parameters			
PID / FID Readings:		PP / RCRA Metals		TCLP		Corrosivity			
Background:	ppm	Soluble							
				TPH-GRO	X	Reactivity Sulfide/Cyanide			
Sample:	ppm	Totals		TPH-DRO	X	Ignitability			
Water Level	FT	VOC	X	TAL Metals	X	QA Samples			
Temperature	°C	SVOC	X	Cyanide	X	MS/MSD	Yes / No		NA
Sp. Conductance:	uMHOs	Explosives	X	Pest/PCB	X	Duplicate ID			NA
pH	units	Propellants	X	Nitrate	X	Field Blank ID			NA
Turbidity	N.T.U.	TOC		Sulfide/Sulfate	X	Trip Blank ID			NA

Sample Description

light brown sandy silt

Soil sample description should include:

Munsell Color Odor Staining Texture Sorting Plasticity Moisture

Water sample description should include:

Color Odor Sheen Turbidity

Split Sample

Split Sample ID: _____

Name: _____

Agency/Company: _____

Address: _____

QA/QC Provided: MS/MSD - Duplicate - Trip Blanks - Field Blanks

Parameters: Same as Above - As Listed

Logged By: Mark Dunlay (Please Print) Reviewed by: _____ (Please Print)

Signature: Mark D Dunlay Signature: _____ Date: _____