# Final
# Report of Closure Activities
# Buildings W-221 and X-232
# Ravenna Army Ammunition Plant
# Ravenna, Ohio

**Contract No. DACA27-97-D-0005**
**Delivery Order 0006**

**Prepared for:**

**U.S. Army Corps of Engineers**
**Louisville District**

**Prepared by:**

**IT Corporation**
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**June 2000**

OhioEPA
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Bob Taft, Governor
Christopher Jones, Director

July 10, 2000

RE: RAVENNA ARMY AMMUNITION PLANT
OH5-210-020-736
PORTAGE/TRUMBULL COUNTIES
FINAL CLOSURE REPORT
BUILDINGS W-221 AND X-232

Mr. Mark Patterson
Environmental Program Manager
Ravenna Army Ammunition Plant
8451 State Route 5
Ravenna, OH 44266

Dear Mr. Patterson:

On July 7, 2000, the Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), received the document entitled: "Final Closure Report for Buildings W-221 and X-232, Ravenna Army Ammunition Plant, Ravenna, Ohio." This document, dated June 2000, was prepared by the contractor for the U.S. Army Corps of Engineers (USACE) - Louisville District, under contract number DACA27-97-D-0005, for the Ravenna Army Ammunition Plant (RVAAP), located at 8451 State Route 5, Ravenna, Ohio.

Buildings W-221 and X-232 were located in what is know as Area 5, a high-explosive storage area. The buildings are "igloo"-type structures, constructed of reinforced concrete. Explosive wastes were thought to have been temporarily stored in Building X-232, while solvents were thought to have been stored in Building W-221. Both building were <90 day storage areas.

The plan appears to meet with the performance standards of OAC rule 3745-66-11 & 14. Since "generator" closure requires no approval from the OEPA, no approval letter will be issued. However, RVAAP shall keep all closure documentation on-site which meets the generator closure performance standards of OAC rule 3745-66-11 & 14 for these units, until closure of the facility.

In the future, plan submittals should be addressed to the Ohio EPA. The Agency should not be carbon copied on submittals that RVAAP needs to have reviewed.

Should you have any questions or concerns, please do not hesitate to contact me at (330) 963-1189.

Sincerely,

Gregory Orr
Environmental Specialist
Division of Hazardous Waste Management

GO:ddb

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# CLOSURE PLAN CERTIFICATION

I certify under penalty of law that the Report of Closure Activities for Buildings W-221 and X-232, Ravenna Army Ammunitions Plant, Ravenna Ohio was prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, and of those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.


W. H. Scaife — 6/30/00

(Signature) (Registered Professional Engineer) (Date)

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## List of Acronyms

| | |
|---|---|
| ASTM | American Society for Testing and Materials |
| DNT | dinitrotoluene |
| DOT | Department of Transportation |
| EPA | U.S. Environmental Protection Agency |
| IDW | investigation-derived waste |
| IT | IT Corporation |
| µg/L | micrograms per liter |
| mg/kg | milligrams per kilogram |
| mg/L | milligrams per liter |
| RVAAP | Ravenna Army Ammunition Plant |
| SAIC | Science Applications International Corporation |
| SVOC | semivolatile organic compound |
| TAL | target analyte list |
| TNT | trinitrotoluene |
| USACE | U.S. Army Corps of Engineers |
| VOC | volatile organic compound |

# 1.0 Introduction

This report provides a summary of activities performed during the closure of Buildings W-221 and X-232 at the Ravenna Army Ammunitions Plant (RVAAP), Ravenna, Ohio. Closure activities at Buildings W-221 and X-232 were conducted under a Preplaced Remedial Action Contract (PRAC) with the U.S. Army Corps of Engineers (USACE), Louisville District. Full-time field oversight of the project was provided by Mr. Fred Tschop for the USACE. A majority of the site-specific activities were completed from September 1-22, 1998 and additional sampling activities were performed on November 22, 1999. Overall, closure activities involved removing debris (wooden pallets and metal wagons) from inside the buildings and pressure-washing the interior of the buildings to remove any residual contamination that might be present due to the buildings' past uses. Rinsate samples were collected after completing the interior decontamination. These samples, along with the samples of debris found inside the buildings, were analyzed for low level explosive compounds and target analyte list (TAL) metals. In addition, confirmatory samples from Building W-221 were analyzed for volatile organic compounds (VOC) and semivolatile organic compounds (SVOC) due to the nature of materials believed to have been stored there.

The remainder of this report presents detailed information concerning closure activities conducted at Buildings W-221 and X-232, including the handling and disposition of investigation-derived wastes (IDW) and the discussion of sample analytical results. All substantive work was performed as outlined in the August 1998 closure activities work plan (IT Corporation [IT], 1998) and in accordance with the approved October 1997 *Revised Closure Plan for Buildings W-221 and X-232* (Science Applications International Corporation [SAIC], 1997). Minor amendments to the approved plans are detailed within.

## 1.1 Facility Description

The RVAAP is located in northeast Ohio, approximately 20 miles east of Akron, Ohio near the city of Ravenna. The installation covers approximately 21,419 acres, and is 11 miles long and 3.5 miles wide. The facility is located within Portage and Trumbull counties, as shown on Figure 1-1. Activities for RVAAP began in August of 1940. During its operation, the primary purpose of RVAAP was to load explosives into medium and major caliber artillery ammunition, bombs, mines, fuses and boosters, primers, and percussion elements. Land use surrounding the facility is

primarily agricultural with sparse private residence. RVAAP is currently classified as an inactive facility.

Originally, RVAAP was divided into two separate units; one unit was designated as the Portage Ordnance Depot, with its primary mission being storage activity, while the other, designated as the Ravenna Ordnance Plant, has a primary mission of munitions loading. Over the years, RVAAP has handled and stored strategic and critical materials for various government agencies as well as received, stored, and maintained the capabilities to load, assemble, and pack military ammunition. Currently, these operations are inactive.

### *1.2 Site Description*

The RVAAP facility operated two 90-day temporary storage facilities, known as Building W-221 and Building X-232. These buildings are located in what is known as Area 5, a high-explosive storage area just off of Newton Falls Road (Figure 1-2). Buildings W-221 and X-232 are "igloo"-type structures constructed of reinforced concrete. Explosive wastes were thought to have been temporarily stored at Building X-232, while solvents were thought to have been stored at Building W-221. The volume of material routinely stored and the operating periods for each building are unknown.

# 2.0 Closure Activities

The following closure activities were performed at Buildings W-221 and X-232:

- Removal of debris and other material and equipment found within buildings, including wooden pallets from both buildings and metal wagons from Building W-221
- Decontamination of the interior of each building by high-pressure washing, scrubbing, and rinsing
- Collection and analysis of confirmatory rinsate samples from the decontaminated surfaces at each building
- Collection, characterization, and disposal of IDW generated during the previously listed activities.

## 2.1 Facility Preparation

Before closure activities were initiated, staging areas and building access pathways were cleared of brush and debris using a backhoe. Prior to beginning decontamination activities, all loose sediment and soil debris within Buildings W-221 and X-232 were collected by utilizing a portable shop vacuum. To prevent inhalation of airborne particles, a light mist of clean water was used for dust suppression. Wooden pallets found inside Buildings W-221 and X-232 were pressure-washed, removed from the buildings, and placed on and covered with poly sheeting. Along with the wooden pallets, several metal wagons were removed from Building W-221. The wagons were also decontaminated by pressure-washing, staged outside the building, and wrapped with poly sheeting.

The wooden pallets were cut into small pieces and placed into 55-gallon, U.S. Department of Transportation (DOT) rated drums, along with the loose sediment and dirt collected with the shop vacuum. Final disposition of the metal wagons will be decided by RVAAP personnel. Once the IDW material (wood scraps, sawdust, and dirt) was containerized, a composite sample was collected for disposal criteria. IDW sampling and analysis is discussed in Section 2.4.

### 2.2 Building Decontamination Procedures

The interior walls, ceiling, and floor of Buildings W-221 and X-232 were rinsed using a high-pressure wash, scrubbed with hard-bristle brooms and low-phosphate detergent, and pressure-washed again. The surfaces were then inspected for areas of visible staining and spot brushing was performed where necessary. The interiors were then completely rinsed again using the high-pressure method. After a final inspection by the USACE representative, the interior surfaces were rinsed a third time as the final rinse.

As the interior of the walls and ceiling were cleaned, the liquid spray was collected onto the floor. The building floors were not cracked or broken, so poly sheeting was not used to collect the decontamination waste water. A temporary dike was constructed along the doorway entrance to ensure that all generated waste was kept within the buildings. Once the ceiling and walls were decontaminated, the floor of each building was decontaminated in similar fashion. Liquid generated from the decontamination procedures was collected and pumped using an electric sump pump into a polyethylene holding tank (polytank) staged outside of each building as designated by RVAAP personnel. Sorbent material, along with brooms, squeegees, and a wet/dry shop vacuum, were used to collect the excess liquid.

### 2.3 Confirmatory Rinsate Sampling

Three rinsate samples were collected from each of the buildings after the final rinse to ensure that each facility was adequately decontaminated. These samples were collected from the walls, floors, and ceilings of each building by running deionized water over the surface features and collecting a portion for chemical analysis. Rinsate samples were collected from the walls and ceilings by pouring American Society for Testing and Materials (ASTM) Type I water from its original container over randomly selected sections of the decontaminated area, below which a piece of decontaminated aluminum foil was placed to channel the water into a decontaminated stainless-steel pan. After a sufficient amount of water was collected in the pan, it was transferred in equal parts to the appropriate sample containers. This method of sample collection was applied in multiple locations for composite samples. Rinsate samples were collected from the floors by pouring ASTM Type I water onto the floor and retrieving at edges where drain channels formed along the floor edge. Water was retrieved from the middle sections of the floors by sweeping up puddles using clean aluminum foil. To facilitate this collection method, water was collected first in sealable plastic bags and transferred in equal parts into the appropriate sample containers. Decontamination confirmation sampling results are discussed in Section 3.1.

### *2.4 Investigation-Derived Waste Handling Procedures*

Waste material generated during the activities conducted at Buildings X-232 and W-221 include the demolished wooden pallets, loose dust and dirt from sweeping/vacuuming the floor, plastic sheeting on which pallets were staged, and excess water from the pressure-washing and decontamination process. Solid phase IDW was placed in 55-gallon drums, which were staged close to the buildings. Liquid-phase IDW was containerized in poly tanks, also staged at each building site. Wooden pallet scrap and plastic sheeting were containerized in fourteen 55-gallon drums (five drums at X-232 and nine drums at W-221). Approximately 600 gallons of waste water were collected at each building, for a total of 1,200 gallons generated. Representative samples of both the solid and liquid IDW were collected for analyses to assist in determining final disposal methods. IDW sampling results are discussed in Section 3.3.

# 3.0 Analytical Results

The following sections provide and discuss the results of the analytical sampling conducted at Buildings X-232 and W-221. The sampling program at this site consisted of decontamination process confirmation sampling and waste disposal characterization sampling. The Buildings X-232 and W-221 samples were submitted to be analyzed for TAL metals by U.S. Environmental Protection Agency (EPA) Methods 6010B, 7470A, and 7841 and for explosive compounds by EPA Method 8330. Additionally, Building W-221 samples were analyzed for VOCs by EPA Method 8260 and SVOCs by EPA Method 8270C. Table 3-1 provides a listing of parameters included in the different analytical groups (VOCs, SVOCs, explosives, TAL metals, and cyanide) for which these samples were tested along with the site performance standards to which rinsate samples were compared. The following standards were used to determine the Established Site Clearance Levles. *EPA closure Plan Review Guidance for RCRA Facilities - March 1999* states that 15 times the public drinking water Maximum Contaminant Level (MCL) is less than 1000 µg/L. If the MCL is not available for a particular contaminant, then 15 times the Maximum Contaminant Level Goal (MCLG) is used as the clean standard provided that 15 times the practical quantitation limit (PQL) in groundwater provided that 15 times the PQL is less than or equal to 1000 µg/L. If the product of 15 times the MCL or MCLG exceeds 1000 µg/L or if neither an MCL or MCLG is available for a particular constituent, 1000 µg/L should be used as a clean standard. All certificates of analysis for Buildings X-232 and W-221 sampling are provided in Appendix B.

Data validation summary reports are presented in Appendix C. These data validation summary reports were prepared by Griffin-Schruers, Inc. using the U.S. Environmental Protection Agency (EPA) National Functional Guidelines (EPA and IT, 1994, 1993). The reports summarize the overall data findings as defined during the Level III data validation effort. The qualifiers applied to the data are incorporated into the summary tables in this chapter of this closure report and can also be reviewed in the analytical summaries presented in Appendix B.

## 3.1 Decontamination Confirmation Sampling Results

On September 3, 1999, three rinsate samples were collected from the interior of Building X-232 (Sample IDS: R7000, R7001 and R7003) and three rinsate samples were also collected from Building W-221 (Sample IDs: R7004, R7005 and R7006) on September 10, 1999. Table 3-2a

summarizes the results for these rinsate samples and provides the site performance standards for comparison. These results indicate the presence of very low concentrations of metals, typically one or more orders of magnitude below their respective performance standard. Cadmium, selenium, and silver were not detected in the six rinsate samples. Of the 12 explosive compounds analyzed, 7 were not detected and 5 were detected in one or more samples at very low concentrations (typically four orders of magnitude below their respective performance standard). In the Building W-221 VOC and SVOC analyses, methylene chloride was the only detected VOC and was detected in all three samples. The only SVOC detected, bis(2-Ethylhexyl)phthalate, was detected in only one rinsate sample. Both methylene chloride and bis(2-ethylhexyl)phthalate are common laboratory contaminants and their presence in the rinsate sample results could be the result of the analytical process or handling during sample collection.

Because of the presence of potential laboratory contaminants in the September 1999 rinsate samples, three additional rinsate samples (Sample IDS: RVAAP-W221-END, RVAAP-W221-FLOOR and RVAAP-W221-WALLS) were collected from Building W-221 on November 11, 1999 and analyzed for VOCs. Sample results are summarized in Table 3-2b. Carbon disulfide was detected in all three samples as well as in the field blank associated with these samples. Methylene chloride was detected in samples RVAAP-W221-END and RVAAP-W221-WALLS, as well as the trip blank associated with these samples. Both the carbon disulfide and methylene chloride found in these samples are considered to be laboratory contaminants. No other VOCs were detected in the samples.

### *3.2 Investigation-Derived Waste Sampling Results*

Samples of the two types of IDW generated as a result of decontamination and disposal activities at Buildings X-232 and W-221 were collected to aid in determining acceptable methods of disposal. Solid IDW was generated as a result of demolition of several wooden pallets stored in the buildings. Samples of the wood from each building were collected (as sawdust) and analyzed for TAL metals and explosives (Sample IDs: R7008 and R7009). Liquid IDW was generated as a result of collecting the overspray from the building decontamination efforts. Samples of the collected water (one from each building) were also submitted for TAL metals and explosives analysis (Sample IDs: R7011 for Building W-221 and R7012 for Building X-232). As with rinsate samples, Building W-221 liquid IDW samples were also analyzed for VOCs and SVOCs.

Table 3-3 provides a summary of the IDW sample analysis. Of the 23 inorganic parameters listed on Table 3-3, all but three (beryllium, cobalt, and selenium) were detected in a liquid IDW sample and all but five (beryllium, cadmium, cobalt, silver, and thallium) were detected in a solid IDW sample. Four explosive compounds were detected in the liquid IDW samples and include 2,4,6-trinitrotoluene (TNT) (1.6 milligrams per liter [mg/L]), RDX (240 mg/L), HMX (1,200 mg/L), and 2,6-dinitrotoluene (DNT) (13 mg/L). Six explosive compounds were detected in the solid IDW sample from Building X-232 and include 2,4-DNT (28 milligrams per kilogram [mg/kg]); 2,4,6-TNT (83 mg/kg); RDX (7.3 mg/kg); HMX (9.7 mg/kg); 1,3-dinitrobenzene (6.7 mg/kg); and m-nitrotoluene (1.2 mg/kg). No explosive compounds were detected in the solid IDW sample from Building W-221. Acetone and chloroform were the only VOCs detected in Building W-221 IDW samples and were detected only in the liquid IDW sample. Acetone was detected at 8.4 micrograms per liter (µg/L) and chloroform was detected at 3.7 µg/L. bis(2-Ethylhexyl)phthalate was the only SVOC detected and was found at a concentration of 2,900 micrograms per kilogram in the solid IDW sample from Building W-221. Acetone, chloroform, and bis(2-ethylhexyl)phthalate are also typical laboratory contaminants.

# 4.0 Investigation-Derived Waste Disposal

Waste types collected during activities conducted at the Buildings X-232 and W-221 sites include wastewater and wood/sawdust/plastic sheeting scrap. IDW volumes generated include the following:

- Approximately 1,200 gallons of wastewater (approximately 600 gallons per building)
- Fourteen drums of wood/sawdust and plastic waste (five from X-232 and nine from W-221).

Liquid IDW generated at Buildings X-232 and W-221 has been determined to be, and was disposed as, nonhazardous waste. Plastic sheeting and debris IDW has also been classified as nonhazardous. Wood/sawdust IDW required classification as hazardous waste due to levels of explosive compounds and were disposed as such. Nonhazardous solid IDW (plastic sheeting and debris) was transported off Base by Dart Trucking Company, Inc. and disposed at the Wayne Disposal, Inc. facility near Belleville, Michigan. Hazardous solid (wood and sawdust ) IDW drums were also transported by Dart Trucking Company, Inc., and were disposed at the City Environmental, Inc. facility in Detroit, Michigan. Nonhazardous liquid IDW was transported off Base by DFL Oilfield Services, LLC and disposed at the Everclear of Ohio, Ltd. facility near Austintown, Ohio. Copies of waste manifests are provided in Appendix D.

## 5.0 Conclusions

IT was tasked to remove and containerize material and debris found within Buildings X-232 and W-221, including removal of wooden pallets and metal wagons, and to decontaminate the interior of the buildings using a high-pressure wash and rinse. The decontamination effort was evaluated through the analysis of rinsate samples collected from the surfaces of the decontaminated surfaces. Disposition and disposal of IDW was determined by collection and analysis of representative samples of each IDW waste stream. On-site activities at Buildings X-232 and W-221 were conducted from September 1-22, 1998, with additional sampling efforts conducted on November 11, 1999.

A total of three rinsate samples were collected to evaluate the decontamination process at each of the two buildings (totaling six rinsate samples). Results of the rinsate samples were reviewed and concentrations of any detected analytes were compared to performance standards developed for the site. Although concentrations of metals and explosive compounds were detected in the rinsate samples, all concentrations were below their individual performance standards. Samples from Building W-221 were analyzed for VOCs and SVOCs due to the types of materials believed to have been stored there. Methylene chloride and bis(2-ethylhexyl)phthalate were the only detected VOC/SVOC. Both are common laboratory contaminants and their presence could be the result of the analytical process. Three samples were collected from Building W-221 on November 11, 1999 and analyzed for VOCs. Methylene chloride and carbon disulfide were present in these samples, as well as in the trip blank and field blank. Both the methylene chloride and carbon disulfide were considered to be laboratory contaminants and no other VOCs were noted in the samples. Based on the analytical data presented, requirements for site closure have been satisfied and Buildings X-232 and W-221 are recommended for closure. A summary of analytical data for rinsate samples is provided in Table 3-2.

Both solid and liquid IDW from both buildings were sampled to assist the disposal process. Sawdust from the demolition of wooden pallets was sampled, as was the containerized wash water from the decontamination process. Sample analyses indicate the presence of several metallic and explosive analytes in both sample types. VOC analyses performed on IDW samples from Building W-221 revealed concentrations of acetone and chloroform in the liquid IDW sample. SVOC analyses for Building W-221 IDW samples detected only bis(2-ethylhexyl)

phthalate in the solid IDW sample. These analytes are also typical laboratory contaminants. A summary of analytical data for IDW samples is provided in Table 3-3.

Liquid IDW, classified as a special waste, was transported and disposed off site on December 16, 1998 by DFL Oilfield Services, Inc.. Plastic sheeting and general debris IDW, classified non-hazardous, were transported and disposed off site on December 17, 1998 by Dart Trucking Company, Inc. Wood/sawdust IDW was classified as hazardous waste due to levels of explosive compounds and was transported and disposed off site by Dart Trucking Company, Inc. on December 18, 1998.

## 6.0 References

IT Corporation (IT), 1998, ***Closure Activities Work Plan for Buildings W-221 and X-232 at the Ravenna Army Ammunition Plant, Ravenna, Ohio,*** prepared for the U.S. Army Corps of Engineers, Nashville District, August.

Science Applications International Corporation, 1997, ***Revised Closure Plan for Buildings W-221 and X-232, Ravenna Army Ammunition Plant, Ravenna, Ohio***, prepared for the U.S. Army Corps of Engineers, Nashville District, October.

U.S. Environmental Protection Agency (EPA), 1994, ***Contract Laboratory Program National Functional Guidelines for Inorganic Data Review***, Office of Solid Waste and Emergency Response, Washington, DC, NTIS No. PB94-963502.

U.S. Environmental Protection Agency (EPA), 1993, ***Contract Laboratory Program National Functional Guidelines for Organic Data Review***, Office of Solid Waste and Emergency Response, Washington, DC, NTIS No. PB94-963501.

## Table 3-1

## Analytical Class and Specific Parameters
## Buildings X-232 and W-221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| Analytical Class | Analytical Parameter | Site Performance Standard[1] |
|---|---|---|
| EXPLOSIVES | 2,4-Dinitrotoluene | 1.95 ug/L |
| | 2,4,6-Trinitrotoluene | 3.0 ug/L |
| | RDX (Cyclonite) | 7.5 ug/L |
| | HMX (Homocyclonite) | 7.5 ug/L |
| | 1,3,5-Trinitrobenzene | 3.0 ug/L |
| | 1,3-Dinitrobenzene | 3.0 ug/L |
| | Tetryl | 3.0 ug/L |
| | Nitrobenzene | 3.0 ug/L |
| | Nitroglycerin | 37.5 ug/L |
| | 2,6-Dinitrotoluene | 1.95 ug/L |
| | o-Nitrotoluene | 3.0 ug/L |
| | m-Nitrotoluene | 3.0 ug/L |
| | p-Nitrotoluene | 3.0 ug/L |
| TARGET ANALYTE LIST METALS | Aluminum | 1 mg/L |
| | Antimony | 0.09 mg/L |
| | Arsenic | 0.75 mg/L |
| | Barium | 1 mg/L |
| | Beryllium | 0.06 mg/l |
| | Cadmium | 0.075 mg/L |
| | Calcium | 1 mg/L |
| | Chromium | 1 mg/L |
| | Cobalt | 0.75 mg/L |
| | Copper | 1 mg/L |
| | Iron | 1 mg/L |
| | Lead | 0.225 mg/L |
| | Magnesium | 1 mg/L |
| | Manganese | 1 mg/L |
| | Mercury | 0.03 mg/L |
| | Nickel | 1 mg/L |
| | Potassium | 1 mg/L |
| | Selenium | 0.75 mg/L |
| | Silver | 0.15 mg/L |
| | Sodium | 1 mg/L |
| | Thallium | 0.03 mg/L |
| | Vanadium | 0.75 mg/L |
| | Zinc | 0.3 mg/L |
| VOLATILE ORGANIC COMPOUNDS (Building W-221 only) | 1,1,1-Trichloroethane | 1000 ug/L |
| | 1,1,2,2-Tetrachloroethane | 75 ug/L |
| | 1,1,2-Trichloroethane | 75 ug/L |
| | 1,1-Dichloroethane | 75 ug/L |
| | 1,1-Dichloroethylene | 105 ug/L |
| | 1,2-Dichloroethane | 75 ug/L |
| | 1,2-Dichloroethylene | 75 ug/L |

## Table 3-1

## Analytical Class and Specific Parameters
## Buildings X-232 and W-221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| Analytical Class | Analytical Parameter | Site Performance Standard[1] |
|---|---|---|
| VOLATILE ORGANIC COMPOUNDS (Building W-221 only) (continued) | 1,2-Dichloropropane | 75 ug/L |
| | 1,3-Dichloropropane | 75 ug/L |
| | 2-Hexanone | 150 ug/L |
| | Acetone | 150 ug/L |
| | Benzene | 75 ug/L |
| | Bromodichloromethane | 1000 ug/L |
| | Bromoform | 100 ug/L |
| | Bromomethane | 150 ug/L |
| | Carbon Disulfide | 75 ug/L |
| | Carbon Tetrachloride | 75 ug/L |
| | Chlorobenzene | 1000 ug/L |
| | Chloroethane | 150 ug/L |
| | Chloroform | 75 ug/L |
| | Chloromethane | 100 ug/L |
| | Dibromochloromethane | 75 ug/L |
| | Ethylbenzene | 1000 ug/L |
| | Methyl Ethyl Ketone | 150 ug/L |
| | Methyl Isobutyl Ketone | 150 ug/L |
| | Methylene Chloride | 75 ug/L |
| | Styrene | 1000 ug/L |
| | Tetrachloroethylene | 75 ug/L |
| | Toluene | 1000 ug/L |
| | Trichloroethylene | 75 ug/L |
| | Vinyl Chloride | 30 ug/L |
| | Xylene, (Total) | 1000 ug/L |
| | cis-1,3-Dichloropropene | 75 ug/L |
| | trans-1,3-Dichloropropene | 75 ug/L |
| SEMIVOLATILE ORGANIC COMPOUNDS (Building W-221 only) | 1,2,4-Trichlorobenzene | 1000 ug/L |
| | 1,2-Dichlorobenzene | 1000 ug/L |
| | 1,3-Dichlorobenzene | 150 ug/L |
| | 1,4-Dichlorobenzene | 1000 ug/L |
| | 2,4,5-Trichlorophenol | 375 ug/L |
| | 2,4,6-Trichlorophenol | 150 ug/L |
| | 2,4-Dichlorophenol | 150 ug/L |
| | 2,4-Dimethylphenol | 150 ug/L |
| | 2,4-Dinitrophenol | 375 ug/L |
| | 2,4-Dinitrotoluene | 150 ug/L |
| | 2,6-Dinitrotoluene | 150 ug/L |
| | 2-Chloronaphthalene | 150 ug/L |
| | 2-Chlorophenol | 150 ug/L |
| | 2-Methylnaphthalene | 150 ug/L |
| | 2-Nitroaniline | 375 ug/L |
| | 2-Nitrophenol | 150 ug/L |
| | 3,3'-Dichlorobenzidine | 150 ug/L |
| | 3-Nitroaniline | 375 ug/L |
| | 4,6-Dinitro-2-Methylphenol | 375 ug/L |

## Table 3-1

## Analytical Class and Specific Parameters
## Buildings X-232 and W-221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| Analytical Class | Analytical Parameter | Site Performance Standard[1] |
|---|---|---|
| SEMIVOLATILE ORGANIC COMPOUNDS (Building W-221 only) (continued) | 4-Bromophenyl Phenyl Ether | 150 ug/L |
| | 4-Chloro-3-Methylphenol | 150 ug/L |
| | 4-Chloroaniline | 150 ug/L |
| | 4-Chlorophenyl Phenyl Ether | 150 ug/L |
| | 4-Nitroaniline | 375 ug/L |
| | 4-Nitrophenol | 25 ug/L |
| | Acenaphthene | 150 ug/L |
| | Acenaphthylene | 150 ug/L |
| | Anthracene | 150 ug/L |
| | Benzo(a)Anthracene | 150 ug/L |
| | Benzo(a)Pyrene | 3 ug/L |
| | Benzo(b)Fluoranthene | 150 ug/L |
| | Benzo(ghi)Perylene | 150 ug/L |
| | Benzo(k)Fluoranthene | 150 ug/L |
| | Bis(2-Chloroethoxy)Methane | 150 ug/L |
| | Bis(2-Chloroethyl)Ether | 150 ug/L |
| | Bis(2-Chloroisopropyl)Ether | 150 ug/L |
| | Bis(2-Ethylhexyl)Phthalate | 150 ug/L |
| | Butyl Benzyl Phthalate | 150 ug/L |
| | Carbazole | 150 ug/L |
| | Chrysene | 150 ug/L |
| | Di-n-Butyl Phthalate | 150 ug/L |
| | Di-n-Octyl Phthalate | 75 ug/L |
| | Dibenzo(a,h)Anthracene | 150 ug/L |
| | Dibenzofuran | 10 ug/L |
| | Diethyl Phthalate | 150 ug/L |
| | Dimethyl Phthalate | 150 ug/L |
| | Fluoranthene | 150 ug/L |
| | Fluorene | 150 ug/L |
| | Hexachlorobenzene | 15 ug/L |
| | Hexachlorobutadiene | 15 ug/L |
| | Hexachlorocyclopentadiene | 750 ug/L |
| | Hexachloroethane | 150 ug/L |
| | Indeno(1,2,3-cd)Pyrene | 150 ug/L |
| | Isophorone | 150 ug/L |
| | N-Nitroso-Di-n-Propylamine | 75 ug/L |
| | N-Nitrosodiphenylamine | 150 ug/L |
| | Naphthalene | 150 ug/L |
| | Nitrobenzene | 150 ug/L |
| | Pentachlorophenol | 15 ug/L |
| | Phenanthrene | 150 ug/L |
| | Phenol | 150 ug/L |
| | Pyrene | 150 ug/L |

## Table 3-1

## Analytical Class and Specific Parameters
## Buildings X-232 and W-221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| Analytical Class | Analytical Parameter | Site Performance Standard[1] |
|---|---|---|

Notes:

mg/L - Milligrams per liter.
ug/L - Microgram per liter.

[1] The following standards were used to determine the Established Site Clearance Levels. *EPA Closure Plan Review Guidance for RCRA Facilities - March 1999* states that 15 times the public drinking water Maximum Contaminant Level (MCL) for hazardous constituents for organics provided that 15 times the MCl is less than 1000 ug/L. If the MCL is not available for a particular contaminant, then 15 times the Maximum Contaminant Level Goal (MCLG) is used as the clean standard provided that 15 times the MCLG is less than or equal to 1000 ug/L. If the MCLG is zero, use 15 times the practical quantitation limit (PQL) in groundwater provided that 15 times the PQL is less than or equal to 1000 ug/L. If the product of 15 times the MCl or MCLG exceeds 1000 ug/L or if neither an MCL or MCLG is available for a particular constituent, 1000 ug/L should be used as a clean standard.

## Table 3-2a

## Analytical Summary for Rinsate Samples, September 1998
## Buildings X232 and W221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| | Site: | | Bldg. X232 | | | Bldg. W221 | | |
|---|---|---|---|---|---|---|---|---|
| | Sample Number: | | R7000 | R7001 | R7003 | R7004 | R7005 | R7006 |
| | Sample Location: | | BX232R001 | BX232R002 | BX232R003 | BW221R004 | BW221R005 | BW221R006 |
| Analyte | PS | Units | | | | | | |
| Diethyl Phthalate | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Dimethyl Phthalate | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Fluoranthene | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Fluorene | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Hexachlorobenzene | 15 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Hexachlorobutadiene | 15 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Hexachlorocyclopentadiene | 750 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Hexachloroethane | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Indeno(1,2,3-cd)Pyrene | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Isophorone | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| N-Nitroso-di-n-Propylamine | 75 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| N-Nitrosodiphenylamine | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Naphthalene | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Pentachlorophenol | 15 | ug/L | na | na | na | 25 UJ | 25 UJ | 25 UJ |
| Phenanthrene | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Phenol | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Pyrene | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Bis(2-Chloroethoxy)Methane | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Bis(2-Chloroethyl)Ether | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |
| Bis(2-Ethylhexyl)Phthalate | 150 | ug/L | na | na | na | 10 UJ | 10 UJ | 5.2 J |
| 2,2'-oxybis(1-chloropropane) | 75 | ug/L | na | na | na | 10 UJ | 10 UJ | 10 UJ |

PS - Performance Standards
na - Not applicable.
U - undetected; the analyte was not detected above the quantitation limit
UJ - undetected but the number that is reported as the quantitation limit is an estimated value
J - estimated

**Table 3-2b**

**Analytical Summary for Rinsate Samples, November 1999**
**Buildings X232 and W221 Sites**
**Ravenna Army Ammunition Plant, Ravenna, Ohio**



| Analyte | Site: / Sample Number: / Sample Location: | | Bldg. W221 | | | | |
|---|---|---|---|---|---|---|---|
| | PS | Units | RVAAP-W221-END | RVAAP-W221-FLOOR | RVAAP-W221-WALL | RVAAP-W221-FB | RVAAP-W221-TB |
| 1,1,1-Trichloroethane | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,1,2,2-Tetrachloroethane | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,1,2-Trichloroethane | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,1-Dichloroethane | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,1-Dichloroethene | 105 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,2-Dichloroethane | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,2-Dichloroethene (total) | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 1,2-Dichloropropane | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| 2-Butanone | 150 | ug/L | 33 UJ | 10 UJ | 62 UJ | 100UJ | 10UJ |
| 2-Hexanone | 150 | ug/L | 33 U | 10 U | 62 U | 100U | 10U |
| 4-Methyl-2-pentanone | 150 | ug/L | 33 U | 10 U | 62 U | 100U | 10U |
| Acetone | 150 | ug/L | 16 UJ | 10 UJ | 62 UJ | 100UJ | 10UJ |
| Benzene | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Bromodichloromethane | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Bromoform | 100 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Bromomethane | 150 | ug/L | 33 U | 10 U | 62 U | 100U | 10U |
| Carbon Disulfide | 75 | ug/L | 380 U | 52 U | 650 U | 1300 | 5.0U |
| Carbon Tetrachloride | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Chlorobenzene | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Chloroethane | 150 | ug/L | 33 U | 10 U | 62 U | 100U | 10U |
| Chloroform | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Chloromethane | 100 | ug/L | 33 U | 10 U | 62 U | 100U | 10U |
| Dibromochloromethane | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Ethylbenzene | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Methylene Chloride | 75 | ug/L | 14 UJ | 5.0 UJ | 17 UJ | 18UJ | 2.3J |
| Styrene | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Tetrachloroethene | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Toluene | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Trichloroethene | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| Vinyl Chloride | 30 | ug/L | 33 U | 10 U | 62 U | 100U | 10U |
| Xylene, (Total) | 1000 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| cis-1,3-Dichloropropene | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |
| trans-1,3-Dichloropropene | 75 | ug/L | 17 U | 5.0 U | 31 U | 50U | 5.0U |

PS-Performance Standards
U - undetected; the analyte was not detected above the quantitation limit
UJ - undetected but the number that is reported as the quantitation limit is an estimated value
J - estimated

## Table 3-3

## Analytical Summary for Investigation-Derived Waste Samples
## Buildings X232 and W221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| Site: | | Bldg. X232 | Bldg. W221 | | Bldg. X232 | Bldg. W221 |
|---|---|---|---|---|---|---|
| Sample Number: | | R7012 | R7011 | | R7008 | R7009 |
| Sample Location: | | BX232IDW02 | BW221IDW01 | | BX232R7008 | BW221R7009 |
| Analyte | Units | Water IDW | Water IDW | Units | Sawdust | Sawdust |
| Aluminum | mg/L | 1.43 J | 2.78 J | mg/kg | 744 J | 179 J |
| Antimony | mg/L | 0.005 U | 0.0068 | mg/kg | 0.71 J | 8.4 J |
| Arsenic | mg/L | 0.0213 | 0.0899 | mg/kg | 1.6 J | 1760 J |
| Barium | mg/L | 0.0377 | 0.0625 | mg/kg | 25.4 J | 15.6 J |
| Beryllium | mg/L | 0.004 U | 0.004 U | mg/kg | 0.74 UJ | 0.69 UJ |
| Cadmium | mg/L | 0.0041 | 0.0041 | mg/kg | 0.74 UJ | 0.69 UJ |
| Calcium | mg/L | 21.6 | 31.3 | mg/kg | 3850 J | 1680 J |
| Chromium | mg/L | 0.021 | 0.186 | mg/kg | 4.2 J | 1880 J |
| Cobalt | mg/L | 0.050 U | 0.050 U | mg/kg | 7.4 UJ | 6.9 UJ |
| Copper | mg/L | 0.12 | 0.22 | mg/kg | 14.6 J | 1040 J |
| Iron | mg/L | 5.48 J | 10.6 J | mg/kg | 5080 J | 1440 J |
| Lead | mg/L | 0.075 | 0.57 | mg/kg | 15 J | 12.8 J |
| Magnesium | mg/L | 3.58 | 4.01 | mg/kg | 455 J | 313 J |
| Manganese | mg/L | 0.171 | 0.231 | mg/kg | 126 J | 139 J |
| Mercury | mg/L | 0.0119 | 0.0034 | mg/kg | 0.017 J | 0.075 J |
| Nickel | mg/L | 0.0227 | 0.0355 | mg/kg | 4.8 J | 1.5 J |
| Potassium | mg/L | 343 | 355 | mg/kg | 1640 J | 725 J |
| Selenium | mg/L | 0.005 U | 0.005 U | mg/kg | 1.2 J | 1.6 J |
| Silver | mg/L | 0.010 U | 0.0028 | mg/kg | 1.5 UJ | 1.4 UJ |
| Sodium | mg/L | 78.6 | 107 | mg/kg | 472 J | 923 J |
| Thallium | mg/L | 0.002 U | 0.002 J | mg/kg | 0.96 UJ | 0.90 UJ |
| Vanadium | mg/L | 0.0263 | 0.0277 | mg/kg | 1.5 J | 6.9 UJ |
| Zinc | mg/L | 0.279 | 0.533 | mg/kg | 91.6 J | 41.8 J |
| 1,3,5-trinitrobenzene | ug/L | 4.0 U | 2.0 U | mg/kg | 2.5 UJ | 3.7 UJ |
| 1,3-dinitrobenzene | ug/L | 4.0 U | 2.0 U | mg/kg | 6.7 J | 1.6 UJ |
| 2,4,6-trinitrotoluene | ug/L | 4.0 U | 1.6 | mg/kg | 83 J | 1.2 UJ |
| 2,4-dinitrotoluene | ug/L | 2.6 U | 1.3 U | mg/kg | 28 J | 1.2 UJ |
| 2,6-Dinitrotoluene | ug/L | 2.6 U | 13 | mg/kg | 2.5 UJ | 2.2 UJ |
| 2-nitrotoluene | ug/L | 4.0 U | 2.0 U | mg/kg | 2.5 UJ | 1.2 UJ |
| 3-nitrotoluene | ug/L | 4.0 U | 2.0 U | mg/kg | 1.2 J | 1.6 UJ |
| 4-nitrotoluene | ug/L | 4.0 U | 2.0 U | mg/kg | 2.5 UJ | 1.2 UJ |
| HMX | ug/L | 1200 | 23 | mg/kg | 9.7 J | 2.5 UJ |
| Nitrobenzene | ug/L | 4.0 U | 2.0 U | mg/kg | 2.5 UJ | 7.2 UJ |
| Nitroglycerin | ug/L | 50 U | 25 U | mg/kg | 25 UJ | 12 UJ |
| RDX | ug/L | 240 | 5.0 U | mg/kg | 7.3 J | 3.2 UJ |
| Tetryl | ug/L | 4.0 U | 2.0 U | mg/kg | 6.5 UJ | 3.2 UJ |
| 1,1,1-Trichloroethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,1,2,2-Tetrachloroethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,1,2-Trichloroethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,1-Dichloroethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,1-Dichloroethene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,2-Dichloroethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |

## Table 3-3

## Analytical Summary for Investigation-Derived Waste Samples
## Buildings X232 and W221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



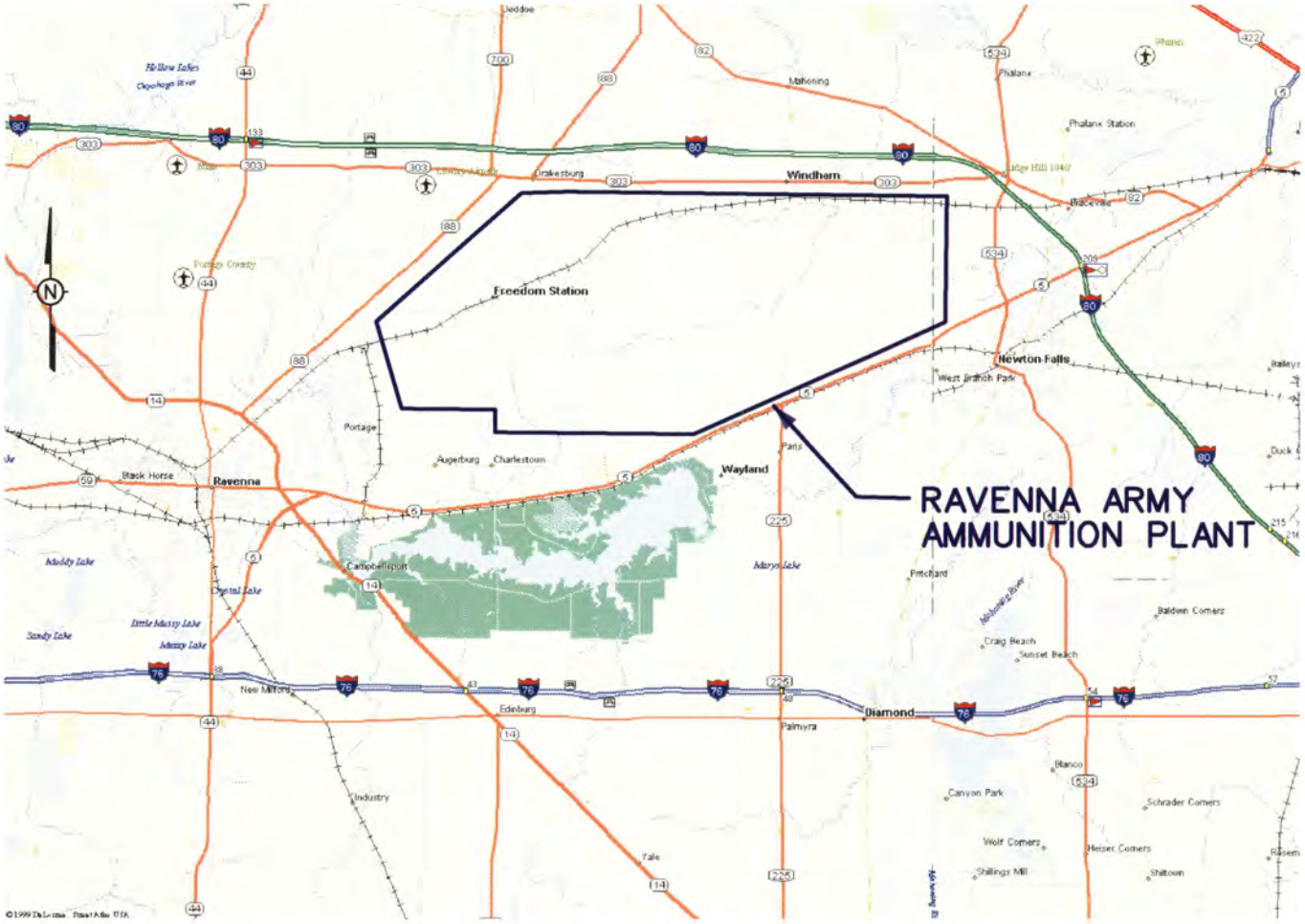
| Site: | | Bldg. X232 | Bldg. W221 | | Bldg. X232 | Bldg. W221 |
|---|---|---|---|---|---|---|
| Sample Number: | | R7012 | R7011 | | R7008 | R7009 |
| Sample Location: | | BX232IDW02 | BW221IDW01 | | BX232R7008 | BW221R7009 |
| Analyte | Units | Water IDW | Water IDW | Units | Sawdust | Sawdust |
| 1,2-Dichloroethene (total) | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,2-Dichloropropane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 2-Butanone | ug/L | na | 10 UJ | ug/kg | na | 69000 UJ |
| 2-Hexanone | ug/L | na | 10 UJ | ug/kg | na | 69000 UJ |
| 4-Methyl-2-pentanone | ug/L | na | 10 UJ | ug/kg | na | 69000 UJ |
| Acetone | ug/L | na | 8.4 J | ug/kg | na | 69000 UJ |
| Benzene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Bromodichloromethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Bromoform | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Bromomethane | ug/L | na | 5.0 U | ug/kg | na | 35000 UJ |
| Carbon Disulfide | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Carbon Tetrachloride | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Chlorobenzene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Chloroethane | ug/L | na | 10.0 U | ug/kg | na | 35000 UJ |
| Chloroform | ug/L | na | 3.7 | ug/kg | na | 17000 UJ |
| Chloromethane | ug/L | na | 5.0 U | ug/kg | na | 35000 UJ |
| Dibromochloromethane | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Ethylbenzene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Methylene Chloride | ug/L | na | 5.0 U | ug/kg | na | 2900 J |
| Styrene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Tetrachloroethene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Toluene | ug/L | na | 5.0 U | ug/kg | na | 2000 J |
| Trichloroethene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| Vinyl Chloride | ug/L | na | 5.0 U | ug/kg | na | 35000 UJ |
| Xylene, (Total) | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| cis-1,3-Dichloropropene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| trans-1,3-Dichloropropene | ug/L | na | 5.0 U | ug/kg | na | 17000 UJ |
| 1,2,4-Trichlorobenzene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 1,2-Dichlorobenzene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 1,3-Dichlorobenzene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 1,4-Dichlorobenzene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2,4,5-Trichlorophenol | ug/L | na | 25 U | ug/kg | na | 9100 UJ |
| 2,4,6-Trichlorophenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2,4-Dichlorophenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2,4-Dimethylphenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2,4-Dinitrophenol | ug/L | na | 25 U | ug/kg | na | 22000 UJ |
| 2,4-Dinitrotoluene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2,6-Dinitrotoluene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2-Chloronaphthalene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2-Chlorophenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2-Methylnaphthalene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2-Methylphenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 2-Nitroaniline | ug/L | na | 25 U | ug/kg | na | 22000 UJ |
| 2-Nitrophenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 3,3'-Dichlorobenzidine | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 3-Nitroaniline | ug/L | na | 25 UJ | ug/kg | na | 22000 UJ |
| 4,6-Dinitro-2-Methylphenol | ug/L | na | 25 U | ug/kg | na | 22000 UJ |
| 4-Bromophenyl Phenyl Ether | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 4-Chloro-3-Methylphenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |

## Table 3-3

## Analytical Summary for Investigation-Derived Waste Samples
## Buildings X232 and W221 Sites
## Ravenna Army Ammunition Plant, Ravenna, Ohio



| Site: | | Bldg. X232 | Bldg. W221 | | Bldg. X232 | Bldg. W221 |
|---|---|---|---|---|---|---|
| Sample Number: | | R7012 | R7011 | | R7008 | R7009 |
| Sample Location: | | BX232IDW02 | BW221IDW01 | | BX232R7008 | BW221R7009 |
| Analyte | Units | Water IDW | Water IDW | Units | Sawdust | Sawdust |
| 4-Chloroaniline | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 4-Chlorophenyl Phenyl Ether | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 4-Methylphenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| 4-Nitroaniline | ug/L | na | 25 UJ | ug/kg | na | 22000 UJ |
| 4-Nitrophenol | ug/L | na | 25 UJ | ug/kg | na | 22000 UJ |
| Acenaphthene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Acenaphthylene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Anthracene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Benzo(a)Anthracene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Benzo(a)Pyrene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Benzo(b)Fluoranthene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Benzo(ghi)Perylene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Benzo(k)Fluoranthene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Butyl Benzyl Phthalate | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Carbazole | ug/L | na | 10 UJ | ug/kg | na | 9100 UJ |
| Chrysene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Di-n-Butyl Phthalate | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Di-n-Octyl Phthalate | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Dibenzo(a,h)Anthracene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Dibenzofuran | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Diethyl Phthalate | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Dimethyl Phthalate | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Fluoranthene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Fluorene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Hexachlorobenzene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Hexachlorobutadiene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Hexachlorocyclopentadiene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Hexachloroethane | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Indeno(1,2,3-cd)Pyrene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Isophorone | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| N-Nitroso-di-n-Propylamine | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| N-Nitrosodiphenylamine | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Naphthalene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Nitrobenzene | ug/L | na | na | ug/kg | na | 9100 UJ |
| Pentachlorophenol | ug/L | na | 10 | ug/kg | na | 9100 UJ |
| Phenanthrene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Phenol | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Pyrene | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Bis(2-Chloroethoxy)Methane | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Bis(2-Chloroethyl)Ether | ug/L | na | 10 U | ug/kg | na | 9100 UJ |
| Bis(2-Ethylhexyl)Phthalate | ug/L | na | 4.2 | ug/kg | na | 1200 J |
| 2,2'-oxybis(1-chloropropane) | ug/L | na | 10 U | ug/kg | na | 9100 UJ |





NOT TO SCALE

FIGURE 1-1
RAVENNA ARMY AMMUNITION PLANT & VICINITY

*U.S. ARMY CORPS OF ENGINEERS*
*LOUISVILLE DISTRICT*
*RAVENNA ARMY AMMUNITION PLANT*
*RAVENNA, OHIO*

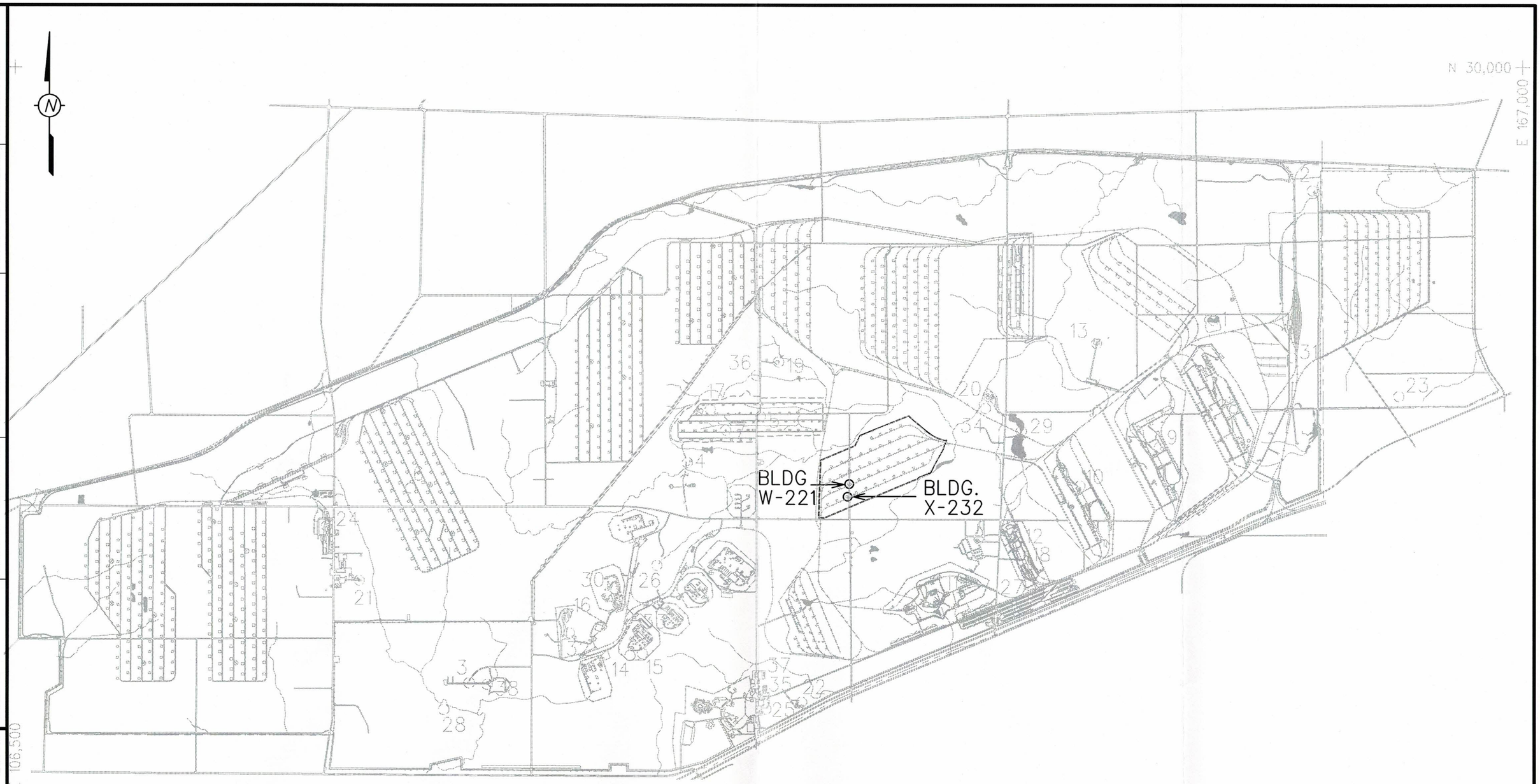
IT CORPORATION
A Member of the IT Group

DWG. NO.: 2000 11-07.DGN
PROJ. NO.:775574
INITIATOR: S. CORTINA
PRJ MGR: K. VANKEUREN
DRAFT. CHCK. BY: C. TUMLIN
ENGR. CHCK. BY:
DATE LAST REV.: 6/16/00
DRAWN BY: GWTHOMPSON
STARTING DATE: 6/18/98
DRAWN BY: M. CRAFT
12:30:00
23 JUN 2000
GWTHOMPSON
2000 11-07.DGN

| | | | | |
|---|---|---|---|---|
| DATE LAST REV.: 6/19/00 | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: S. CORTINA | DWG. NO.: 2000 11-08.DGN |
| DRAWN BY: GWTHOMPSON | ENGR. CHCK. BY: | PRJ MGR: K. VANKEUREN | PROJ. NO.:775574 |
| STARTING DATE: | | | |
| DRAWN BY: M. CRAFT | | | |

23 JUN 2000
12:37:00

GWTHOMPSON
2000 11-08.DGN




SCALE:

0 4000 8000 FEET

## LEGEND OF SITES:

1 .....RAMSDELL QUARRY LANDFILL
2 .....ERIE BURNING GROUNDS
3 .....DEMOLITIONS AREA #1
4 .....DEMOLITIONS AREA #2
5 .....WINKLEPECK BURNING GROUNDS
6 .....C BLOCK QUARRY
7 ....BLDG 1601 HAZARDOUS WASTE STORAGE QUARRY LANDFILL/FORMER
8 . LOAD LINE 1 AND DILUTION/SETTLING POND
9 .LOAD LINE 2 AND DILUTION/SETTLING POND
10 .LOAD LINE 3 AND DILUTION/SETTLING POND
.LOAD LINE 4 AND DILUTION/SETTLING POND
12 LOAD LINE 12 AND DILUTION/SETTLING POND
13 ..BLDG 1200 AND DILUTION/SETTLING POND
14 .....LOAD LINE 6, EVAPORATION UNIT
15 .....LOAD LINE 6, TREATMENT PLANT
16 .....FUZE & BOOSTER BURNING PITS
17 .....DEACTIVATION FURNACE
18 ....LOAD LINE 12 PINK WASTE WATER TREATMENT
19 LANDFILL NORTH OF WINKLEPECK BURNING GROUND
20 .....SAND CREEK SEWAGE TREATMENT PLANT
21 .....DEPOT SEWAGE TREATMENT PLANT
22 .....GEORGE ROAD SEWAGE TREATMENT PLANT
23 .....UNIT TRAINING SITE WASTE OIL TANK
24 RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK
25 .....BLDG 1034 MOTOR POOL WASTE OIL TANK
26 .....FUZE BOOSTER AREA SETTLING TANKS
27 .....BLDG 854-PCB STORAGE
28 .....MUSTARD AGENT BURIAL SITE
29 ...UPPER AND LOWER COBBS POND COMPLEX
30 .LOAD LINE 7 PINK WATER TREATMENT PLANT
31 .....ORE PILE RETENTION POND
32 .....40 AND 60 MM FIRING RANGE
33 ..... FIRESTONE TEST FACILITY
34 .....SAND CREEK DISPOSAL ROAD LANDFILL
35 ..1037 BUILDING-LAUNDRY WASTEWATER SUMP
36 .....PISTOL RANGE
37 ..PESTICIDE BUILDING S-44S2
38 .....NACA TEST AREA

# FIGURE 1-2
## SITE LOCATION
## BUILDING W-221 AND X-232

*U.S. ARMY CORPS OF ENGINEERS*
*LOUISVILLE DISTRICT*
*RAVENNA ARMY AMMUNITION PLANT*
*RAVENNA, OHIO*

IT CORPORATION
*A Member of the IT Group*

# APPENDIX A

# CERTIFICATES OF ANALYSIS

Lab Name:QUANTERRA SDG Number:

Matrix: (soil/water) WATER Lab Sample ID:A8I110156 001
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL Date Received: 09/10/98
Work Order: CLE51101 Date Extracted:09/21/98
Dilution factor: 1 Date Analyzed: 09/21/98
Moisture %:NA

QC Batch: 8265164

Client Sample Id: R7004

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| **75-09-2** | **Methylene chloride** | **2.2** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| 67-64-1 | Acetone | 10 | U |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 001

Sample WT/Vol: 5 / mL
Work Order: CLE51101
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/21/98
Date Analyzed: 09/21/98

QC Batch: 8265164

Client Sample Id: R7004

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 002

Sample WT/Vol: 5 / mL
Work Order: CLE54101
Dilution factor: 2.5
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/21/98
Date Analyzed: 09/21/98

QC Batch: 8265164

Client Sample Id: R7005

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 12 | U |
| 78-87-5 | 1,2-Dichloropropane | 12 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 12 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 12 | U |
| 100-41-4 | Ethylbenzene | 12 | U |
| 591-78-6 | 2-Hexanone | 25 | U |
| **75-09-2** | **Methylene chloride** | **62** | |
| 108-10-1 | 4-Methyl-2-pentanone | 25 | U |
| 100-42-5 | Styrene | 12 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 12 | U |
| 127-18-4 | Tetrachloroethene | 12 | U |
| 108-88-3 | Toluene | 12 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 12 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 12 | U |
| 79-01-6 | Trichloroethene | 12 | U |
| 75-01-4 | Vinyl chloride | 25 | U |
| 1330-20-7 | Xylenes (total) | 12 | U |
| 67-64-1 | Acetone | 25 | U |
| 71-43-2 | Benzene | 12 | U |
| 75-27-4 | Bromodichloromethane | 12 | U |
| 75-25-2 | Bromoform | 12 | U |
| 74-83-9 | Bromomethane | 25 | U |
| 78-93-3 | 2-Butanone | 25 | U |
| 75-15-0 | Carbon disulfide | 12 | U |
| 56-23-5 | Carbon tetrachloride | 12 | U |
| 108-90-7 | Chlorobenzene | 12 | U |
| 124-48-1 | Dibromochloromethane | 12 | U |
| 75-00-3 | Chloroethane | 25 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 002

Sample WT/Vol: 5 / mL
Work Order: CLE54101
Dilution factor: 2.5
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/21/98
Date Analyzed: 09/21/98

QC Batch: 8265164

Client Sample Id: R7005

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 12 | U |
| 74-87-3 | Chloromethane | 25 | U |
| 75-34-3 | 1,1-Dichloroethane | 12 | U |
| 107-06-2 | 1,2-Dichloroethane | 12 | U |
| 75-35-4 | 1,1-Dichloroethene | 12 | U |

Lab Name:QUANTERRA SDG Number:

Matrix: (soil/water) WATER Lab Sample ID:A8I110156 002
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL Date Received: 09/10/98
Work Order: CLE54201 Date Extracted:09/22/98
Dilution factor: 2.5 Date Analyzed: 09/22/98
Moisture %:NA

QC Batch: 8266194

Client Sample Id: R7005 -RE 1

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 12 | U |
| 78-87-5 | 1,2-Dichloropropane | 12 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 12 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 12 | U |
| 100-41-4 | Ethylbenzene | 12 | U |
| 591-78-6 | 2-Hexanone | 25 | U |
| **75-09-2** | **Methylene chloride** | **210** | **E** |
| 108-10-1 | 4-Methyl-2-pentanone | 25 | U |
| 100-42-5 | Styrene | 12 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 12 | U |
| 127-18-4 | Tetrachloroethene | 12 | U |
| 108-88-3 | Toluene | 12 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 12 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 12 | U |
| 79-01-6 | Trichloroethene | 12 | U |
| 75-01-4 | Vinyl chloride | 25 | U |
| 1330-20-7 | Xylenes (total) | 12 | U |
| 67-64-1 | Acetone | 25 | U |
| 71-43-2 | Benzene | 12 | U |
| 75-27-4 | Bromodichloromethane | 12 | U |
| 75-25-2 | Bromoform | 12 | U |
| 74-83-9 | Bromomethane | 25 | U |
| 78-93-3 | 2-Butanone | 25 | U |
| 75-15-0 | Carbon disulfide | 12 | U |
| 56-23-5 | Carbon tetrachloride | 12 | U |
| 108-90-7 | Chlorobenzene | 12 | U |
| 124-48-1 | Dibromochloromethane | 12 | U |
| 75-00-3 | Chloroethane | 25 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 002

Sample WT/Vol: 5 / mL
Work Order: CLE54201
Dilution factor: 2.5
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/22/98
Date Analyzed: 09/22/98

QC Batch: 8266194

Client Sample Id: R7005 -RE 1

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 12 | U |
| 74-87-3 | Chloromethane | 25 | U |
| 75-34-3 | 1,1-Dichloroethane | 12 | U |
| 107-06-2 | 1,2-Dichloroethane | 12 | U |
| 75-35-4 | 1,1-Dichloroethene | 12 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 5 / mL
Work Order: CLE55101
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/21/98
Date Analyzed: 09/21/98

QC Batch: 8265164

Client Sample Id: R7006

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| **75-09-2** | **Methylene chloride** | **1.8** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| 67-64-1 | Acetone | 10 | U |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 5 / mL
Work Order: CLE55101
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/21/98
Date Analyzed: 09/21/98

QC Batch: 8265164

Client Sample Id: R7006

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 5 / mL
Work Order: CLE55201
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/22/98
Date Analyzed: 09/22/98

QC Batch: 8266194

Client Sample Id: R7006 -RE 1

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| **75-09-2** | **Methylene chloride** | **130** | **B** |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| 67-64-1 | Acetone | 10 | U |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 5 / mL
Work Order: CLE55201
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/22/98
Date Analyzed: 09/22/98

QC Batch: 8266194

Client Sample Id: R7006 -RE 1

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name: QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID: A8I110156 004

Sample WT/Vol: 5 / mL
Work Order: CLE57101
Dilution factor: 1
Moisture %: NA

Date Received: 09/10/98
Date Extracted: 09/20/98
Date Analyzed: 09/20/98

QC Batch: 8264187

Client Sample Id: R7007TB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| **75-09-2** | **Methylene chloride** | **0.64** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| 67-64-1 | Acetone | 10 | U |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I110156 004

Sample WT/Vol: 5 / mL
Work Order: CLE57101
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/20/98
Date Analyzed: 09/20/98

QC Batch: 8264187

Client Sample Id: R7007TB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 001

Sample WT/Vol: 5 / mL
Work Order: D5G46101
Dilution factor: 1
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-FLOOR

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 75-09-2 | Methylene chloride | 5.0 | U |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| **67-64-1** | **Acetone** | **6.2** | **J B** |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| **75-15-0** | **Carbon disulfide** | **52** | |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 001

Sample WT/Vol: 5 / mL
Work Order: D5G46101
Dilution factor: 1
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-FLOOR

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

IT CORPORATION - CINCINNATI

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 002

Sample WT/Vol: 5 / mL
Work Order: D5G48101
Dilution factor: 3.33
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-END

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 17 | U |
| 78-87-5 | 1,2-Dichloropropane | 17 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 17 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 17 | U |
| 100-41-4 | Ethylbenzene | 17 | U |
| 591-78-6 | 2-Hexanone | 33 | U |
| **75-09-2** | **Methylene chloride** | **14** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 33 | U |
| 100-42-5 | Styrene | 17 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 17 | U |
| 127-18-4 | Tetrachloroethene | 17 | U |
| 108-88-3 | Toluene | 17 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 17 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 17 | U |
| 79-01-6 | Trichloroethene | 17 | U |
| 75-01-4 | Vinyl chloride | 33 | U |
| 1330-20-7 | Xylenes (total) | 17 | U |
| **67-64-1** | **Acetone** | **16** | **J B** |
| 71-43-2 | Benzene | 17 | U |
| 75-27-4 | Bromodichloromethane | 17 | U |
| 75-25-2 | Bromoform | 17 | U |
| 74-83-9 | Bromomethane | 33 | U |
| 78-93-3 | 2-Butanone | 33 | U |
| **75-15-0** | **Carbon disulfide** | **380** | |
| 56-23-5 | Carbon tetrachloride | 17 | U |
| 108-90-7 | Chlorobenzene | 17 | U |
| 124-48-1 | Dibromochloromethane | 17 | U |
| 75-00-3 | Chloroethane | 33 | U |

IT CORPORATION - CINCINNATI

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 002

Sample WT/Vol: 5 / mL
Work Order: D5G48101
Dilution factor: 3.33
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-END

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 17 | U |
| 74-87-3 | Chloromethane | 33 | U |
| 75-34-3 | 1,1-Dichloroethane | 17 | U |
| 107-06-2 | 1,2-Dichloroethane | 17 | U |
| 75-35-4 | 1,1-Dichloroethene | 17 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 003

Sample WT/Vol: 5 / mL
Work Order: D5G49101
Dilution factor: 6.25
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-WALLS

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 31 | U |
| 78-87-5 | 1,2-Dichloropropane | 31 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 31 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 31 | U |
| 100-41-4 | Ethylbenzene | 31 | U |
| 591-78-6 | 2-Hexanone | 62 | U |
| **75-09-2** | **Methylene chloride** | **17** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 62 | U |
| 100-42-5 | Styrene | 31 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 31 | U |
| 127-18-4 | Tetrachloroethene | 31 | U |
| 108-88-3 | Toluene | 31 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 31 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 31 | U |
| 79-01-6 | Trichloroethene | 31 | U |
| 75-01-4 | Vinyl chloride | 62 | U |
| 1330-20-7 | Xylenes (total) | 31 | U |
| 67-64-1 | Acetone | 62 | U |
| 71-43-2 | Benzene | 31 | U |
| 75-27-4 | Bromodichloromethane | 31 | U |
| 75-25-2 | Bromoform | 31 | U |
| 74-83-9 | Bromomethane | 62 | U |
| 78-93-3 | 2-Butanone | 62 | U |
| **75-15-0** | **Carbon disulfide** | **650** | |
| 56-23-5 | Carbon tetrachloride | 31 | U |
| 108-90-7 | Chlorobenzene | 31 | U |
| 124-48-1 | Dibromochloromethane | 31 | U |
| 75-00-3 | Chloroethane | 62 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER

Lab Sample ID:A9K240107 003

Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL

Date Received: 11/23/99

Work Order: D5G49101

Date Extracted:12/04/99

Dilution factor: 6.25

Date Analyzed: 12/04/99

Moisture %:NA

QC Batch: 9340355

Client Sample Id: RVAAP-W221-WALLS

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 31 | U |
| 74-87-3 | Chloromethane | 62 | U |
| 75-34-3 | 1,1-Dichloroethane | 31 | U |
| 107-06-2 | 1,2-Dichloroethane | 31 | U |
| 75-35-4 | 1,1-Dichloroethene | 31 | U |

Lab Name:QUANTERRA SDG Number:

Matrix: (soil/water) WATER Lab Sample ID:A9K240107 004
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL Date Received: 11/23/99
Work Order: D5G4A101 Date Extracted:12/04/99
Dilution factor: 10 Date Analyzed: 12/04/99
Moisture %:NA

QC Batch: 9340355

Client Sample Id: RVAAP-W221-FB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 50 | U |
| 78-87-5 | 1,2-Dichloropropane | 50 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 50 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 50 | U |
| 100-41-4 | Ethylbenzene | 50 | U |
| 591-78-6 | 2-Hexanone | 100 | U |
| **75-09-2** | **Methylene chloride** | **18** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 100 | U |
| 100-42-5 | Styrene | 50 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 50 | U |
| 127-18-4 | Tetrachloroethene | 50 | U |
| 108-88-3 | Toluene | 50 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 50 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 50 | U |
| 79-01-6 | Trichloroethene | 50 | U |
| 75-01-4 | Vinyl chloride | 100 | U |
| 1330-20-7 | Xylenes (total) | 50 | U |
| 67-64-1 | Acetone | 100 | U |
| 71-43-2 | Benzene | 50 | U |
| 75-27-4 | Bromodichloromethane | 50 | U |
| 75-25-2 | Bromoform | 50 | U |
| 74-83-9 | Bromomethane | 100 | U |
| 78-93-3 | 2-Butanone | 100 | U |
| **75-15-0** | **Carbon disulfide** | **1300** | |
| 56-23-5 | Carbon tetrachloride | 50 | U |
| 108-90-7 | Chlorobenzene | 50 | U |
| 124-48-1 | Dibromochloromethane | 50 | U |
| 75-00-3 | Chloroethane | 100 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 004

Sample WT/Vol: 5 / mL
Work Order: D5G4A101
Dilution factor: 10
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-FB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 50 | U |
| 74-87-3 | Chloromethane | 100 | U |
| 75-34-3 | 1,1-Dichloroethane | 50 | U |
| 107-06-2 | 1,2-Dichloroethane | 50 | U |
| 75-35-4 | 1,1-Dichloroethene | 50 | U |

IT CORPORATION - CINCINNATI

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A9K240107 005

Sample WT/Vol: 5 / mL
Work Order: D5G4C101
Dilution factor: 1
Moisture %:NA

Date Received: 11/23/99
Date Extracted:12/04/99
Date Analyzed: 12/04/99

QC Batch: 9340355

Client Sample Id: RVAAP-W221-TB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| **75-09-2** | **Methylene chloride** | **2.3** | **J** |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| **67-64-1** | **Acetone** | **4.8** | **J B** |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER

Lab Sample ID:A9K240107 005

Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL

Date Received: 11/23/99

Work Order: D5G4C101

Date Extracted:12/04/99

Dilution factor: 1

Date Analyzed: 12/04/99

Moisture %:NA

QC Batch: 9340355

Client Sample Id: RVAAP-W221-TB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 001

Sample WT/Vol: 1000 / mL
Work Order: CLE51102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7004

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 83-32-9 | Acenaphthene | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 191-24-2 | Benzo(ghi)perylene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 111-44-4 | bis(2-Chloroethyl) ether | 10 | U |
| 108-60-1 | 2,2'-Oxybis(1-Chloropropane) | 10 | U |
| 117-81-7 | bis(2-Ethylhexyl) phthalate | 10 | U |
| 101-55-3 | 4-Bromophenyl phenyl ether | 10 | U |
| 85-68-7 | Butyl benzyl phthalate | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 7005-72-3 | 4-Chlorophenyl phenyl ether | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 84-74-2 | Di-n-butyl phthalate | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |

IT CORPORATION - KNOXVILLE

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 001

Sample WT/Vol: 1000 / mL
Work Order: CLE51102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7004

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 84-66-2 | Diethyl phthalate | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 131-11-3 | Dimethyl phthalate | 10 | U |
| 117-84-0 | Di-n-octyl phthalate | 10 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 621-64-7 | N-Nitrosodi-n-propylamine | 10 | U |
| 86-30-6 | N-Nitrosodiphenylamine | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 001

Sample WT/Vol: 1000 / mL
Work Order: CLE51102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7004

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 85-01-8 | Phenanthrene | 10 | U |
| 108-95-2 | Phenol | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 002

Sample WT/Vol: 1000 / mL
Work Order: CLE54102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7005

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 83-32-9 | Acenaphthene | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 191-24-2 | Benzo(ghi)perylene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 111-44-4 | bis(2-Chloroethyl) ether | 10 | U |
| 108-60-1 | 2,2'-Oxybis(1-Chloropropane) | 10 | U |
| 117-81-7 | bis(2-Ethylhexyl) phthalate | 10 | U |
| 101-55-3 | 4-Bromophenyl phenyl ether | 10 | U |
| 85-68-7 | Butyl benzyl phthalate | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 7005-72-3 | 4-Chlorophenyl phenyl ether | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 84-74-2 | Di-n-butyl phthalate | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |

IT CORPORATION - KNOXVILLE

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 002

Sample WT/Vol: 1000 / mL
Work Order: CLE54102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7005

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 84-66-2 | Diethyl phthalate | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 131-11-3 | Dimethyl phthalate | 10 | U |
| 117-84-0 | Di-n-octyl phthalate | 10 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 621-64-7 | N-Nitrosodi-n-propylamine | 10 | U |
| 86-30-6 | N-Nitrosodiphenylamine | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 002

Sample WT/Vol: 1000 / mL
Work Order: CLE54102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7005

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 85-01-8 | Phenanthrene | 10 | U |
| 108-95-2 | Phenol | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 1000 / mL
Work Order: CLE55102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7006

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 83-32-9 | Acenaphthene | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 191-24-2 | Benzo(ghi)perylene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 111-44-4 | bis(2-Chloroethyl) ether | 10 | U |
| 108-60-1 | 2,2'-Oxybis(1-Chloropropane) | 10 | U |
| **117-81-7** | **bis(2-Ethylhexyl) phthalate** | **5.2** | **J** |
| 101-55-3 | 4-Bromophenyl phenyl ether | 10 | U |
| 85-68-7 | Butyl benzyl phthalate | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 7005-72-3 | 4-Chlorophenyl phenyl ether | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 84-74-2 | Di-n-butyl phthalate | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |

IT CORPORATION - KNOXVILLE

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 1000 / mL
Work Order: CLE55102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7006

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 84-66-2 | Diethyl phthalate | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 131-11-3 | Dimethyl phthalate | 10 | U |
| 117-84-0 | Di-n-octyl phthalate | 10 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 621-64-7 | N-Nitrosodi-n-propylamine | 10 | U |
| 86-30-6 | N-Nitrosodiphenylamine | 10 | U |
| 87-86-5 | Pentachlorophenol | 25 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I110156 003

Sample WT/Vol: 1000 / mL
Work Order: CLE55102
Dilution factor: 1
Moisture %:NA

Date Received: 09/10/98
Date Extracted:09/14/98
Date Analyzed: 09/21/98

QC Batch: 8257121

Client Sample Id: R7006

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 85-01-8 | Phenanthrene | 10 | U |
| 108-95-2 | Phenol | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |

IT CORPORATION - KNOXVILLE

Client Sample ID: R7000

HPLC

Lot-Sample #...: A8I040101-001 Work Order #...: CL87N101 Matrix.....: WATER
Date Sampled...: 09/03/98 10:20 Date Received..: 09/03/98
Prep Date.....: 09/09/98 Analysis Date..: 09/10/98
Prep Batch #...: 8252214
Dilution Factor: 1 Method.....: SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| **HMX** | **0.14 J** | **0.50** | **ug/L** |
| RDX | ND | 0.50 | ug/L |
| 1,3,5-Trinitrobenzene | ND | 0.20 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.20 | ug/L |
| Tetryl | ND | 0.20 | ug/L |
| **Nitrobenzene** | **0.25** | **0.20** | **ug/L** |
| 2,4,6-Trinitrotoluene | ND | 0.20 | ug/L |
| 2-Nitrotoluene | ND | 0.20 | ug/L |
| **2,4-Dinitrotoluene** | **0.78** | **0.13** | **ug/L** |
| 3-Nitrotoluene | ND | 0.20 | ug/L |
| 4-Nitrotoluene | ND | 0.20 | ug/L |
| **2,6-Dinitrotoluene** | **0.24** | **0.13** | **ug/L** |
| Nitroglycerin | ND | 2.5 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 97 | (39 - 157) |

NOTE(S):

J Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7001

HPLC

**Lot-Sample #...:** A8I040101-002 **Work Order #...:** CL87P101 **Matrix.....:** WATER
**Date Sampled...:** 09/03/98 11:00 **Date Received..:** 09/03/98
**Prep Date.....:** 09/09/98 **Analysis Date..:** 09/10/98
**Prep Batch #...:** 8252214
**Dilution Factor:** 1 **Method.....:** SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| **HMX** | **0.14 J** | **0.50** | **ug/L** |
| RDX | ND | 0.50 | ug/L |
| 1,3,5-Trinitrobenzene | ND | 0.20 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.20 | ug/L |
| Tetryl | ND | 0.20 | ug/L |
| Nitrobenzene | ND | 0.20 | ug/L |
| 2,4,6-Trinitrotoluene | ND | 0.20 | ug/L |
| 2-Nitrotoluene | ND | 0.20 | ug/L |
| **2,4-Dinitrotoluene** | **0.66** | **0.13** | **ug/L** |
| 3-Nitrotoluene | ND | 0.20 | ug/L |
| 4-Nitrotoluene | ND | 0.20 | ug/L |
| **2,6-Dinitrotoluene** | **0.18** | **0.13** | **ug/L** |
| Nitroglycerin | ND | 2.5 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 88 | (39 - 157) |

**NOTE(S):**

J Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7002FD

HPLC

**Lot-Sample #...:** A8I040101-003 **Work Order #...:** CL87W101 **Matrix.....:** WATER
**Date Sampled...:** 09/03/98 11:00 **Date Received..:** 09/03/98
**Prep Date.....:** 09/09/98 **Analysis Date..:** 09/10/98
**Prep Batch #...:** 8252214
**Dilution Factor:** 1 **Method.....:** SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| **HMX** | **0.14 J** | **0.50** | **ug/L** |
| RDX | ND | 0.50 | ug/L |
| 1,3,5-Trinitrobenzene | ND | 0.20 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.20 | ug/L |
| Tetryl | ND | 0.20 | ug/L |
| Nitrobenzene | ND | 0.20 | ug/L |
| 2,4,6-Trinitrotoluene | ND | 0.20 | ug/L |
| 2-Nitrotoluene | ND | 0.20 | ug/L |
| **2,4-Dinitrotoluene** | **0.50** | **0.13** | **ug/L** |
| 3-Nitrotoluene | ND | 0.20 | ug/L |
| 4-Nitrotoluene | ND | 0.20 | ug/L |
| **2,6-Dinitrotoluene** | **0.21** | **0.13** | **ug/L** |
| Nitroglycerin | ND | 2.5 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 92 | (39 - 157) |

NOTE(S):

J Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7003

HPLC

Lot-Sample #...: A8I040101-004 Work Order #...: CL880101 Matrix.....: WATER
Date Sampled...: 09/03/98 11:50 Date Received..: 09/03/98
Prep Date.....: 09/09/98 Analysis Date..: 09/10/98
Prep Batch #...: 8252214
Dilution Factor: 1 Method.....: SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| **HMX** | **0.32 J** | **0.50** | **ug/L** |
| RDX | ND | 0.50 | ug/L |
| 1,3,5-Trinitrobenzene | ND | 0.20 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.20 | ug/L |
| Tetryl | ND | 0.20 | ug/L |
| Nitrobenzene | ND | 0.20 | ug/L |
| 2,4,6-Trinitrotoluene | ND | 0.20 | ug/L |
| 2-Nitrotoluene | ND | 0.20 | ug/L |
| **2,4-Dinitrotoluene** | **1.6** | **0.13** | **ug/L** |
| 3-Nitrotoluene | ND | 0.20 | ug/L |
| 4-Nitrotoluene | ND | 0.20 | ug/L |
| **2,6-Dinitrotoluene** | **0.19** | **0.13** | **ug/L** |
| Nitroglycerin | ND | 2.5 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 92 | (39 - 157) |

NOTE(S):

J Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7004

HPLC

**Lot-Sample #...:** A8I110156-001 **Work Order #...:** CLE51103 **Matrix.....:** WATER
**Date Sampled...:** 09/10/98 10:00 **Date Received..:** 09/10/98
**Prep Date.....:** 09/15/98 **Analysis Date..:** 09/15/98
**Prep Batch #...:** 8258147
**Dilution Factor:** 1 **Method.....:** SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| **HMX** | **0.36 J** | **1.5** | **ug/L** |
| RDX | ND | 1.5 | ug/L |
| 1,3,5-Trinitrobenzene | ND | 0.59 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.59 | ug/L |
| Tetryl | ND | 0.59 | ug/L |
| Nitrobenzene | ND | 0.59 | ug/L |
| 2,4,6-Trinitrotoluene | ND | 0.59 | ug/L |
| 2-Nitrotoluene | ND | 0.59 | ug/L |
| 2,4-Dinitrotoluene | ND | 0.38 | ug/L |
| 3-Nitrotoluene | ND | 0.59 | ug/L |
| 4-Nitrotoluene | ND | 0.59 | ug/L |
| 2,6-Dinitrotoluene | ND | 0.38 | ug/L |
| Nitroglycerin | ND | 7.4 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 49 | (39 - 157) |

NOTE(S):

J Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7005

HPLC

**Lot-Sample #...:** A8I110156-002 **Work Order #...:** CLE54103 **Matrix.....:** WATER
**Date Sampled...:** 09/10/98 10:36 **Date Received..:** 09/10/98
**Prep Date.....:** 09/15/98 **Analysis Date..:** 09/16/98
**Prep Batch #...:** 8258147
**Dilution Factor:** 1 **Method.....:** SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| HMX | ND | 0.50 | ug/L |
| **RDX** | **0.078 J** | **0.50** | **ug/L** |
| 1,3,5-Trinitrobenzene | ND | 0.20 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.20 | ug/L |
| Tetryl | ND | 0.20 | ug/L |
| Nitrobenzene | ND | 0.20 | ug/L |
| 2,4,6-Trinitrotoluene | ND | 0.20 | ug/L |
| 2-Nitrotoluene | ND | 0.20 | ug/L |
| **2,4-Dinitrotoluene** | **0.36** | **0.13** | **ug/L** |
| 3-Nitrotoluene | ND | 0.20 | ug/L |
| 4-Nitrotoluene | ND | 0.20 | ug/L |
| 2,6-Dinitrotoluene | ND | 0.13 | ug/L |
| Nitroglycerin | ND | 2.5 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 49 | (39 - 157) |

**NOTE(S):**

J Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7006

HPLC

**Lot-Sample #...:** A8I110156-003 **Work Order #...:** CLE55103 **Matrix.....:** WATER
**Date Sampled...:** 09/10/98 11:10 **Date Received..:** 09/10/98
**Prep Date.....:** 09/15/98 **Analysis Date..:** 09/16/98
**Prep Batch #...:** 8258147
**Dilution Factor:** 1 **Method.....:** SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| HMX | ND | 0.50 | ug/L |
| **RDX** | **0.062 J** | **0.50** | **ug/L** |
| 1,3,5-Trinitrobenzene | ND | 0.20 | ug/L |
| 1,3-Dinitrobenzene | ND | 0.20 | ug/L |
| Tetryl | ND | 0.20 | ug/L |
| Nitrobenzene | ND | 0.20 | ug/L |
| 2,4,6-Trinitrotoluene | ND | 0.20 | ug/L |
| 2-Nitrotoluene | ND | 0.20 | ug/L |
| **2,4-Dinitrotoluene** | **0.18** | **0.13** | **ug/L** |
| 3-Nitrotoluene | ND | 0.20 | ug/L |
| 4-Nitrotoluene | ND | 0.20 | ug/L |
| 2,6-Dinitrotoluene | ND | 0.13 | ug/L |
| Nitroglycerin | ND | 2.5 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | 56 | (39 - 157) |

**NOTE(S):**

J Estimated result. Result is less than RL.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7000**

**TOTAL Metals**

**Lot-Sample #...:** A8I040101-001 **Matrix.....:** WATER
**Date Sampled...:** 09/03/98 10:20 **Date Received..:** 09/03/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8254124 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N102 |
| **Aluminum** | **230** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87N10C** |
| Arsenic | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N103 |
| Barium | ND | 200<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10D |
| Cadmium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N104 |
| eryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10E |
| Chromium | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N105 |
| **Calcium** | **762 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87N10F** |
| Lead | ND | 3.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N106 |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10G |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N107 |
| Copper | ND | 25.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10H |
| Mercury | ND | 0.20<br>Dilution Factor: 1 | ug/L | SW846 7470A | 09/11-09/12/98 | CL87N10A |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N108 |

(Continued on next page)

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7000**

**TOTAL Metals**

**Lot-Sample #...:** A8I040101-001 **Matrix.....:** WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/11-09/13/98 | CL87N109 |
| | | Dilution Factor: 1 | | | | |
| Iron | ND | 100 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10J |
| | | Dilution Factor: 1 | | | | |
| **Potassium** | **2940 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87N10K** |
| | | Dilution Factor: 1 | | | | |
| **Magnesium** | **62.3 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87N10L** |
| | | Dilution Factor: 1 | | | | |
| Manganese | ND | 15.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10M |
| | | Dilution Factor: 1 | | | | |
| **Sodium** | **674 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87N10N** |
| | | Dilution Factor: 1 | | | | |
| Nickel | ND | 40.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87N10Q |
| | | Dilution Factor: 1 | | | | |
| **Zinc** | **23.6 L** | **20.0** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87N10R** |
| | | Dilution Factor: 1 | | | | |

**NOTE(S):**

B Estimated result. Result is less than RL.

L Serial dilution of a digestate in the analytical batch indicates that physical and chemical interferences are present.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7001**

**TOTAL Metals**

**Lot-Sample #...:** A8I040101-002 **Matrix.....:** WATER
**Date Sampled...:** 09/03/98 11:00 **Date Received..:** 09/03/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8254124 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P102 |
| **Aluminum** | **149 B** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87P10C** |
| Arsenic | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P103 |
| Barium | ND | 200<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10D |
| Cadmium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P104 |
| Beryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10E |
| Chromium | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P105 |
| **Calcium** | **920 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87P10F** |
| Lead | ND | 3.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P106 |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10G |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P107 |
| Copper | ND | 25.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10H |
| Mercury | ND | 0.20<br>Dilution Factor: 1 | ug/L | SW846 7470A | 09/11-09/12/98 | CL87P10A |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P108 |

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IT CORPORATION - KNOXVILLE

Client Sample ID: R7001

TOTAL Metals

Lot-Sample #...: A8I040101-002 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/11-09/13/98 | CL87P109 |
| | | Dilution Factor: 1 | | | | |
| Iron | ND | 100 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10J |
| | | Dilution Factor: 1 | | | | |
| **Potassium** | **9660** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87P10K** |
| | | Dilution Factor: 1 | | | | |
| **Magnesium** | **87.8 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87P10L** |
| | | Dilution Factor: 1 | | | | |
| Manganese | ND | 15.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10M |
| | | Dilution Factor: 1 | | | | |
| **Sodium** | **1430 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87P10N** |
| | | Dilution Factor: 1 | | | | |
| ckel | ND | 40.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87P10Q |
| | | Dilution Factor: 1 | | | | |
| **Zinc** | **32.2** | **20.0** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87P10R** |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7002FD**

**TOTAL Metals**

**Lot-Sample #...:** A8I040101-003 **Matrix.....:** WATER
**Date Sampled...:** 09/03/98 11:00 **Date Received..:** 09/03/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8254124 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W102 |
| **Aluminum** | **164 B** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87W10C** |
| Arsenic | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W103 |
| Barium | ND | 200<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10D |
| Cadmium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W104 |
| Beryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10E |
| Chromium | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W105 |
| **Calcium** | **445 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87W10F** |
| Lead | ND | 3.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W106 |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10G |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W107 |
| Copper | ND | 25.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10H |
| Mercury | ND | 0.20<br>Dilution Factor: 1 | ug/L | SW846 7470A | 09/11-09/12/98 | CL87W10A |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W108 |

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IT CORPORATION - KNOXVILLE

Client Sample ID: R7002FD

TOTAL Metals

Lot-Sample #...: A8I040101-003 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/11-09/13/98 | CL87W109 |
| | | Dilution Factor: 1 | | | | |
| **Iron** | **81.7 B** | **100** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87W10J** |
| | | Dilution Factor: 1 | | | | |
| **Potassium** | **8050** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87W10K** |
| | | Dilution Factor: 1 | | | | |
| Magnesium | ND | 5000 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10L |
| | | Dilution Factor: 1 | | | | |
| Manganese | ND | 15.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10M |
| | | Dilution Factor: 1 | | | | |
| **Sodium** | **1130 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL87W10N** |
| | | Dilution Factor: 1 | | | | |
| ckel | ND | 40.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL87W10Q |
| | | Dilution Factor: 1 | | | | |
| **Zinc** | **13.6 B** | **20.0** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL87W10R** |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7003

TOTAL Metals

Lot-Sample #...: A8I040101-004 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/11-09/13/98 | CL880109 |
| | | Dilution Factor: 1 | | | | |
| **Iron** | **108** | **100** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL88010J** |
| | | Dilution Factor: 1 | | | | |
| **Potassium** | **4700 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL88010K** |
| | | Dilution Factor: 1 | | | | |
| Magnesium | ND | 5000 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010L |
| | | Dilution Factor: 1 | | | | |
| **Manganese** | **3.3 B** | **15.0** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL88010M** |
| | | Dilution Factor: 1 | | | | |
| **Sodium** | **658 B** | **5000** | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL88010N** |
| | | Dilution Factor: 1 | | | | |
| ckel | ND | 40.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010Q |
| | | Dilution Factor: 1 | | | | |
| **Zinc** | **23.1** | **20.0** | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL88010R** |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7003**

**TOTAL Metals**

**Lot-Sample #...:** A8I040101-004 **Matrix.....:** WATER
**Date Sampled...:** 09/03/98 11:50 **Date Received..:** 09/03/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8254124 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880102 |
| **Aluminum** | **146 B** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/17/98** | **CL88010C** |
| Arsenic | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880103 |
| Barium | ND | 200<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010D |
| Cadmium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880104 |
| eryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010E |
| Chromium | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880105 |
| **Calcium** | **998 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/11-09/15/98** | **CL88010F** |
| Lead | ND | 3.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880106 |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010G |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880107 |
| Copper | ND | 25.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL88010H |
| Mercury | ND | 0.20<br>Dilution Factor: 1 | ug/L | SW846 7470A | 09/11-09/12/98 | CL88010A |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/11-09/15/98 | CL880108 |

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**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7004**

**TOTAL Metals**

**Lot-Sample #...:** A8I110156-001 **Matrix.....:** WATER
**Date Sampled...:** 09/10/98 10:00 **Date Received..:** 09/10/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8260112 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE51104 |
| **Aluminum** | **809** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/18/98** | **CLE5110C** |
| Arsenic | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE51105 |
| **Barium** | **6.0 B** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5110D** |
| Beryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110E |
| 'admium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE51106 |
| **Calcium** | **2650 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5110F** |
| **Chromium** | **4.3 B** | **10.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE51107** |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110G |
| **Lead** | **26.0** | **3.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE51108** |
| **Copper** | **6.3 B** | **25.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5110H** |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE51109 |
| **Iron** | **2560** | **100**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5110J** |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110A |

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IT CORPORATION - KNOXVILLE

Client Sample ID: R7004

TOTAL Metals

Lot-Sample #...: A8I110156-001 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Potassium | 12700 | 5000 | ug/L | SW846 6010B | 09/17-09/18/98 | CLE5110K |
| | | Dilution Factor: 1 | | | | |
| Magnesium | 185 B | 5000 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110L |
| | | Dilution Factor: 1 | | | | |
| Manganese | 26.9 | 15.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110M |
| | | Dilution Factor: 1 | | | | |
| Sodium | 5330 | 5000 | ug/L | SW846 6010B | 09/17-09/18/98 | CLE5110N |
| | | Dilution Factor: 1 | | | | |
| Nickel | ND | 40.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110Q |
| | | Dilution Factor: 1 | | | | |
| rcury | ND | 0.20 | ug/L | SW846 7470A | 09/17-09/18/98 | CLE5110U |
| | | Dilution Factor: 1 | | | | |
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/17-09/20/98 | CLE5110T |
| | | Dilution Factor: 1 | | | | |
| Zinc | 51.1 | 20.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5110R |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7005**

**TOTAL Metals**

**Lot-Sample #...:** A8I110156-002 **Matrix.....:** WATER
**Date Sampled...:** 09/10/98 10:36 **Date Received..:** 09/10/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8260112 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE54104 |
| **Aluminum** | **322** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/18/98** | **CLE5410C** |
| **Arsenic** | **4.2 B** | **5.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE54105** |
| Barium | ND | 200<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410D |
| Beryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410E |
| 'admium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE54106 |
| **Calcium** | **1460 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5410F** |
| Chromium | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE54107 |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410G |
| **Lead** | **9.0** | **3.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE54108** |
| Copper | ND | 25.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410H |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE54109 |
| **Iron** | **271** | **100**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5410J** |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410A |

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IT CORPORATION - KNOXVILLE

Client Sample ID: R7005

TOTAL Metals

Lot-Sample #...: A8I110156-002 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Potassium | 5310 | 5000 | ug/L | SW846 6010B | 09/17-09/18/98 | CLE5410K |
| | | Dilution Factor: 1 | | | | |
| Magnesium | 114 B | 5000 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410L |
| | | Dilution Factor: 1 | | | | |
| Manganese | 12.3 B | 15.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410M |
| | | Dilution Factor: 1 | | | | |
| Sodium | 1130 B | 5000 | ug/L | SW846 6010B | 09/17-09/18/98 | CLE5410N |
| | | Dilution Factor: 1 | | | | |
| Nickel | ND | 40.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410Q |
| | | Dilution Factor: 1 | | | | |
| rcury | ND | 0.20 | ug/L | SW846 7470A | 09/17-09/18/98 | CLE5410U |
| | | Dilution Factor: 1 | | | | |
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/17-09/20/98 | CLE5410T |
| | | Dilution Factor: 1 | | | | |
| Zinc | 22.0 | 20.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5410R |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7006**

**TOTAL Metals**

**Lot-Sample #...:** A8I110156-003 **Matrix.....:** WATER
**Date Sampled...:** 09/10/98 11:10 **Date Received..:** 09/10/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8260112 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE55104 |
| **Aluminum** | **213** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/18/98** | **CLE5510C** |
| Arsenic | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE55105 |
| Barium | ND | 200<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510D |
| Beryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510E |
| Cadmium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE55106 |
| **Calcium** | **474 B** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5510F** |
| Chromium | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE55107 |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510G |
| Lead | ND | 3.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE55108 |
| Copper | ND | 25.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510H |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE55109 |
| **Iron** | **56.4 B** | **100**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5510J** |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510A |

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**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7006**

**TOTAL Metals**

**Lot-Sample #...:** A8I110156-003 **Matrix.....:** WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Potassium** | **7210** | **5000** | **ug/L** | **SW846 6010B** | **09/17-09/18/98** | **CLE5510K** |
| | | Dilution Factor: 1 | | | | |
| Magnesium | ND | 5000 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510L |
| | | Dilution Factor: 1 | | | | |
| Manganese | ND | 15.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510M |
| | | Dilution Factor: 1 | | | | |
| **Sodium** | **1230 B** | **5000** | **ug/L** | **SW846 6010B** | **09/17-09/18/98** | **CLE5510N** |
| | | Dilution Factor: 1 | | | | |
| Nickel | ND | 40.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | ND | 50.0 | ug/L | SW846 6010B | 09/17-09/21/98 | CLE5510Q |
| | | Dilution Factor: 1 | | | | |
| **:curv** | **0.078 B** | **0.20** | **ug/L** | **SW846 7470A** | **09/17-09/18/98** | **CLE5510U** |
| | | Dilution Factor: 1 | | | | |
| Thallium | ND | 2.0 | ug/L | SW846 7841 | 09/17-09/20/98 | CLE5510T |
| | | Dilution Factor: 1 | | | | |
| **Zinc** | **34.1** | **20.0** | **ug/L** | **SW846 6010B** | **09/17-09/21/98** | **CLE5510R** |
| | | Dilution Factor: 1 | | | | |

**NOTE(S):**

B Estimated result. Result is less than RL.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7011

TOTAL Metals

Lot-Sample #...: A8I230103-002 Matrix.....: WATER
Date Sampled...: 09/22/98 10:05 Date Received..: 09/22/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Prep Batch #...: 8267106 | | | | | | |
| Silver | 2.8 B | 10.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP92104 |
| Aluminum | 2780 | 200 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/29/98 | CLP9210C |
| Arsenic | 89.9 | 5.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP92105 |
| Barium | 62.5 B | 200 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210D |
| Beryllium | ND | 4.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210E |
| Cadmium | 4.1 B | 5.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP92106 |
| Calcium | 31300 | 5000 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210F |
| Chromium | 186 | 10.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP92107 |
| Cobalt | ND | 50.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210G |
| Lead | 570 | 3.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP92108 |
| Copper | 220 | 25.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210H |
| Antimony | 6.8 | 5.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP92109 |
| Iron | 10600 | 100 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210J |
| Selenium | ND | 5.0 Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210A |

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: R7011

TOTAL Metals

Lot-Sample #...: A8I230103-002 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Potassium | 355000 | 5000 | ug/L | SW846 6010B | 09/24-09/29/98 | CLP9210K |
| | | Dilution Factor: 1 | | | | |
| Magnesium | 4010 B | 5000 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210L |
| | | Dilution Factor: 1 | | | | |
| Manganese | 231 | 15.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210M |
| | | Dilution Factor: 1 | | | | |
| Sodium | 107000 | 5000 | ug/L | SW846 6010B | 09/24-09/29/98 | CLP9210N |
| | | Dilution Factor: 1 | | | | |
| Nickel | 35.5 B | 40.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210P |
| | | Dilution Factor: 1 | | | | |
| Vanadium | 27.7 B | 50.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210Q |
| | | Dilution Factor: 1 | | | | |
| rcury | 3.4 | 0.20 | ug/L | SW846 7470A | 09/24-09/25/98 | CLP9210U |
| | | Dilution Factor: 1 | | | | |
| Thallium | 2.0 B,G,Wa | 4.0 | ug/L | SW846 7841 | 09/24-09/29/98 | CLP9210T |
| | | Dilution Factor: 2 | | | | |
| Zinc | 533 | 20.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9210R |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

G Elevated reporting limit. The reporting limit is elevated due to matrix interference.

Wa Post digestion spike recovery fell between 40-85% due to matrix interference.

IT CORPORATION - KNOXVILLE

Client Sample ID: R7012

HPLC

Lot-Sample #...: A8I230103-003 Work Order #...: CLP93201 Matrix.....: WATER
Date Sampled...: 09/22/98 10:30 Date Received..: 09/22/98
Prep Date.....: 09/28/98 Analysis Date..: 09/30/98
Prep Batch #...: 8271177
Dilution Factor: 250 Method.....: SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| HMX | 1200 | 120 | ug/L |
| RDX | 240 | 120 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | NC,DIL | (39 - 157) |

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

**IT CORPORATION - KNOXVILLE**

**Client Sample ID: R7012**

**TOTAL Metals**

**Lot-Sample #...:** A8I230103-003 **Matrix.....:** WATER
**Date Sampled...:** 09/22/98 10:30 **Date Received..:** 09/22/98

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| **Prep Batch #...:** 8267106 | | | | | | |
| Silver | ND | 10.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP93102 |
| **Aluminum** | **1430** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/29/98** | **CLP93109** |
| **Arsenic** | **21.3** | **5.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP93103** |
| **Barium** | **37.7 B** | **200**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP9310A** |
| Beryllium | ND | 4.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310C |
| **Cadmium** | **4.1 B** | **5.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP93104** |
| **Calcium** | **21600** | **5000**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP9310D** |
| **Chromium** | **21.0** | **10.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP93105** |
| Cobalt | ND | 50.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310E |
| **Lead** | **75.1** | **3.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP93106** |
| **Copper** | **120** | **25.0**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP9310F** |
| Antimony | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP93107 |
| **Iron** | **5480** | **100**<br>Dilution Factor: 1 | **ug/L** | **SW846 6010B** | **09/24-09/28/98** | **CLP9310G** |
| Selenium | ND | 5.0<br>Dilution Factor: 1 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP93108 |

(Continued on next page)

IT CORPORATION - KNOXVILLE

Client Sample ID: R7012

TOTAL Metals

Lot-Sample #...: A8I230103-003 Matrix.....: WATER

| PARAMETER | RESULT | REPORTING LIMIT | UNITS | METHOD | PREPARATION-ANALYSIS DATE | WORK ORDER # |
|---|---|---|---|---|---|---|
| Potassium | 343000 | 5000 | ug/L | SW846 6010B | 09/24-09/29/98 | CLP9310H |
| | | Dilution Factor: 1 | | | | |
| Magnesium | 3580 B | 5000 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310J |
| | | Dilution Factor: 1 | | | | |
| Manganese | 171 | 15.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310K |
| | | Dilution Factor: 1 | | | | |
| Sodium | 78600 | 5000 | ug/L | SW846 6010B | 09/24-09/29/98 | CLP9310L |
| | | Dilution Factor: 1 | | | | |
| Nickel | 22.7 B | 40.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310M |
| | | Dilution Factor: 1 | | | | |
| Vanadium | 26.3 B | 50.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310N |
| | | Dilution Factor: 1 | | | | |
| Mercury | 11.9 | 0.40 | ug/L | SW846 7470A | 09/24-09/25/98 | CLP9310R |
| | | Dilution Factor: 2 | | | | |
| Thallium | ND Wa | 2.0 | ug/L | SW846 7841 | 09/24-09/28/98 | CLP9310Q |
| | | Dilution Factor: 1 | | | | |
| Zinc | 279 | 20.0 | ug/L | SW846 6010B | 09/24-09/28/98 | CLP9310P |
| | | Dilution Factor: 1 | | | | |

NOTE(S):

B Estimated result. Result is less than RL.

Wa Post digestion spike recovery fell between 40-85% due to matrix interference.

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I230103 001

Sample WT/Vol: 5 / mL
Work Order: CLP91101
Dilution factor: 1
Moisture %:NA

Date Received: 09/22/98
Date Extracted:09/25/98
Date Analyzed: 09/25/98

QC Batch: 8270104

Client Sample Id: R7010TB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 75-09-2 | Methylene chloride | 5.0 | U |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| 67-64-1 | Acetone | 10 | U |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER

Lab Sample ID:A8I230103 001

Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL

Date Received: 09/22/98

Work Order: CLP91101

Date Extracted:09/25/98

Dilution factor: 1

Date Analyzed: 09/25/98

Moisture %:NA

QC Batch: 8270104

Client Sample Id: R7010TB

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | Chloroform | 5.0 | U |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Lab Sample ID:A8I230103 002

Sample WT/Vol: 5 / mL
Work Order: CLP92101
Dilution factor: 1
Moisture %:NA

Date Received: 09/22/98
Date Extracted:09/25/98
Date Analyzed: 09/25/98

QC Batch: 8270104

Client Sample Id: R7011

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 540-59-0 | 1,2-Dichloroethene (total) | 5.0 | U |
| 78-87-5 | 1,2-Dichloropropane | 5.0 | U |
| 10061-01-5 | cis-1,3-Dichloropropene | 5.0 | U |
| 10061-02-6 | trans-1,3-Dichloropropene | 5.0 | U |
| 100-41-4 | Ethylbenzene | 5.0 | U |
| 591-78-6 | 2-Hexanone | 10 | U |
| 75-09-2 | Methylene chloride | 5.0 | U |
| 108-10-1 | 4-Methyl-2-pentanone | 10 | U |
| 100-42-5 | Styrene | 5.0 | U |
| 79-34-5 | 1,1,2,2-Tetrachloroethane | 5.0 | U |
| 127-18-4 | Tetrachloroethene | 5.0 | U |
| 108-88-3 | Toluene | 5.0 | U |
| 71-55-6 | 1,1,1-Trichloroethane | 5.0 | U |
| 79-00-5 | 1,1,2-Trichloroethane | 5.0 | U |
| 79-01-6 | Trichloroethene | 5.0 | U |
| 75-01-4 | Vinyl chloride | 10 | U |
| 1330-20-7 | Xylenes (total) | 5.0 | U |
| **67-64-1** | **Acetone** | **8.4** | **J** |
| 71-43-2 | Benzene | 5.0 | U |
| 75-27-4 | Bromodichloromethane | 5.0 | U |
| 75-25-2 | Bromoform | 5.0 | U |
| 74-83-9 | Bromomethane | 10 | U |
| 78-93-3 | 2-Butanone | 10 | U |
| 75-15-0 | Carbon disulfide | 5.0 | U |
| 56-23-5 | Carbon tetrachloride | 5.0 | U |
| 108-90-7 | Chlorobenzene | 5.0 | U |
| 124-48-1 | Dibromochloromethane | 5.0 | U |
| 75-00-3 | Chloroethane | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER

Lab Sample ID:A8I230103 002

Method: SW846 8260B
Volatile Organics, GC/MS (8260B)

Sample WT/Vol: 5 / mL

Date Received: 09/22/98

Work Order: CLP92101

Date Extracted:09/25/98

Dilution factor: 1

Date Analyzed: 09/25/98

Moisture %:NA

QC Batch: 8270104

Client Sample Id: R7011

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 67-66-3 | **Chloroform** | 3.7 | J |
| 74-87-3 | Chloromethane | 10 | U |
| 75-34-3 | 1,1-Dichloroethane | 5.0 | U |
| 107-06-2 | 1,2-Dichloroethane | 5.0 | U |
| 75-35-4 | 1,1-Dichloroethene | 5.0 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I230103 002

Sample WT/Vol: 1000 / mL
Work Order: CLP92102
Dilution factor: 1
Moisture %:NA

Date Received: 09/22/98
Date Extracted:09/29/98
Date Analyzed: 10/09/98

QC Batch: 8272114

Client Sample Id: R7011

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 83-32-9 | Acenaphthene | 10 | U |
| 208-96-8 | Acenaphthylene | 10 | U |
| 120-12-7 | Anthracene | 10 | U |
| 56-55-3 | Benzo(a)anthracene | 10 | U |
| 205-99-2 | Benzo(b)fluoranthene | 10 | U |
| 207-08-9 | Benzo(k)fluoranthene | 10 | U |
| 191-24-2 | Benzo(ghi)perylene | 10 | U |
| 50-32-8 | Benzo(a)pyrene | 10 | U |
| 111-91-1 | bis(2-Chloroethoxy)methane | 10 | U |
| 111-44-4 | bis(2-Chloroethyl) ether | 10 | U |
| 108-60-1 | 2,2'-Oxybis(1-Chloropropane) | 10 | U |
| **117-81-7** | **bis(2-Ethylhexyl) phthalate** | **4.2** | **J** |
| 101-55-3 | 4-Bromophenyl phenyl ether | 10 | U |
| 85-68-7 | Butyl benzyl phthalate | 10 | U |
| 106-47-8 | 4-Chloroaniline | 10 | U |
| 59-50-7 | 4-Chloro-3-methylphenol | 10 | U |
| 91-58-7 | 2-Chloronaphthalene | 10 | U |
| 95-57-8 | 2-Chlorophenol | 10 | U |
| 7005-72-3 | 4-Chlorophenyl phenyl ether | 10 | U |
| 218-01-9 | Chrysene | 10 | U |
| 53-70-3 | Dibenz(a,h)anthracene | 10 | U |
| 132-64-9 | Dibenzofuran | 10 | U |
| 84-74-2 | Di-n-butyl phthalate | 10 | U |
| 95-50-1 | 1,2-Dichlorobenzene | 10 | U |
| 541-73-1 | 1,3-Dichlorobenzene | 10 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 10 | U |
| 91-94-1 | 3,3'-Dichlorobenzidine | 10 | U |
| 120-83-2 | 2,4-Dichlorophenol | 10 | U |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I230103 002

Sample WT/Vol: 1000 / mL
Work Order: CLP92102
Dilution factor: 1
Moisture %:NA

Date Received: 09/22/98
Date Extracted:09/29/98
Date Analyzed: 10/09/98

QC Batch: 8272114

Client Sample Id: R7011

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 84-66-2 | Diethyl phthalate | 10 | U |
| 105-67-9 | 2,4-Dimethylphenol | 10 | U |
| 131-11-3 | Dimethyl phthalate | 10 | U |
| 117-84-0 | Di-n-octyl phthalate | 10 | U |
| 534-52-1 | 4,6-Dinitro-2-methylphenol | 25 | U |
| 51-28-5 | 2,4-Dinitrophenol | 25 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 10 | U |
| 606-20-2 | 2,6-Dinitrotoluene | 10 | U |
| 206-44-0 | Fluoranthene | 10 | U |
| 86-73-7 | Fluorene | 10 | U |
| 118-74-1 | Hexachlorobenzene | 10 | U |
| 87-68-3 | Hexachlorobutadiene | 10 | U |
| 77-47-4 | Hexachlorocyclopentadiene | 10 | U |
| 67-72-1 | Hexachloroethane | 10 | U |
| 193-39-5 | Indeno(1,2,3-cd)pyrene | 10 | U |
| 78-59-1 | Isophorone | 10 | U |
| 91-57-6 | 2-Methylnaphthalene | 10 | U |
| 95-48-7 | 2-Methylphenol | 10 | U |
| 91-20-3 | Naphthalene | 10 | U |
| 88-74-4 | 2-Nitroaniline | 25 | U |
| 99-09-2 | 3-Nitroaniline | 25 | U |
| 100-01-6 | 4-Nitroaniline | 25 | U |
| 98-95-3 | Nitrobenzene | 10 | U |
| 88-75-5 | 2-Nitrophenol | 10 | U |
| 100-02-7 | 4-Nitrophenol | 25 | U |
| 621-64-7 | N-Nitrosodi-n-propylamine | 10 | U |
| 86-30-6 | N-Nitrosodiphenylamine | 10 | U |
| **87-86-5** | **Pentachlorophenol** | **10** | **J** |

Lab Name:QUANTERRA

SDG Number:

Matrix: (soil/water) WATER
Method: SW846 8270C
Base/Neutrals and Acids (8270C)

Lab Sample ID:A8I230103 002

Sample WT/Vol: 1000 / mL
Work Order: CLP92102
Dilution factor: 1
Moisture %:NA

Date Received: 09/22/98
Date Extracted:09/29/98
Date Analyzed: 10/09/98

QC Batch: 8272114

Client Sample Id: R7011

| CAS NO. | COMPOUND | CONCENTRATION UNITS: (ug/L or ug/kg) ug/L | Q |
|---|---|---|---|
| 85-01-8 | Phenanthrene | 10 | U |
| 108-95-2 | Phenol | 10 | U |
| 129-00-0 | Pyrene | 10 | U |
| 120-82-1 | 1,2,4-Trichlorobenzene | 10 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 25 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 10 | U |
| 86-74-8 | Carbazole | 10 | U |
| 106-44-5 | 4-Methylphenol | 10 | U |

IT CORPORATION - KNOXVILLE

Client Sample ID: R7011

HPLC

Lot-Sample #...: A8I230103-002 Work Order #...: CLP92103 Matrix.....: WATER
Date Sampled...: 09/22/98 10:05 Date Received..: 09/22/98
Prep Date.....: 09/28/98 Analysis Date..: 09/30/98
Prep Batch #...: 8271177
Dilution Factor: 10 Method.....: SW846 8330

| PARAMETER | RESULT | REPORTING LIMIT | UNITS |
|---|---|---|---|
| HMX | 23 | 5.0 | ug/L |
| RDX | ND | 5.0 | ug/L |
| 1,3,5-Trinitrobenzene | ND | 2.0 | ug/L |
| 1,3-Dinitrobenzene | ND G | 2.0 | ug/L |
| Tetryl | ND | 2.0 | ug/L |
| Nitrobenzene | ND | 2.0 | ug/L |
| 2,4,6-Trinitrotoluene | 1.6 J | 2.0 | ug/L |
| 2-Nitrotoluene | ND | 2.0 | ug/L |
| 2,4-Dinitrotoluene | ND | 1.3 | ug/L |
| 3-Nitrotoluene | ND | 2.0 | ug/L |
| 4-Nitrotoluene | ND | 2.0 | ug/L |
| 2,6-Dinitrotoluene | 13 | 1.3 | ug/L |
| Nitroglycerin | ND | 25 | ug/L |

| SURROGATE | PERCENT RECOVERY | RECOVERY LIMITS |
|---|---|---|
| 1-Chloro-3-nitrobenzene | NC,DIL | (39 - 157) |

NOTE(S):

NC The recovery and/or RPD were not calculated.

DIL The concentration is estimated or not reported due to dilution or the presence of interfering analytes.

G Elevated reporting limit. The reporting limit is elevated due to matrix interference.

J Estimated result. Result is less than RL.

# APPENDIX B

# SUMMARY OF VALIDATED RESULTS

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7000 | | R7001 | | R7002FD | | R7003 | | R7004 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 09/03/98 | | 09/03/98 | | 09/03/98 | | 09/03/98 | | 09/10/98 | |
| **EXPLOSIVE** | | | | | | | | | | | |
| 1,3,5-Trinitrobenzene | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| 1,3-Dinitrobenzene | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| 2,4,6-Trinitrotoluene | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| 2,4-Dinitrotoluene | (ug/L) | 0.78 | U | 0.66 | UJ | 0.50 | UJ | 1.6 | J | 0.59 | UJ |
| 2,6-Dinitrotoluene | (ug/L) | 0.24 | | 0.18 | | 0.21 | = | 0.19 | | 0.38 | UJ |
| 2-Nitrotoluene | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| 3-Nitrotoluene | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| 4-Nitrotoluene | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| HMX | (ug/L) | 0.14 | U | 0.14 | U | 0.14 | U | 0.32 | U | 0.36 | UJ |
| Nitrobenzene | (ug/L) | 0.25 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| Nitroglycerin | (ug/L) | 2.5 | U | 2.5 | U | 2.5 | U | 2.5 | U | 7.4 | UJ |
| RDX | (ug/L) | 0.50 | U | 0.50 | U | 0.50 | U | 0.50 | U | 1.5 | UJ |
| Tetryl | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.59 | UJ |
| **METAL** | | | | | | | | | | | |
| Aluminum | (ug/L) | 230 | | 149 | | 164 | = | 146 | | 809 | J |
| Antimony | (ug/L) | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | UJ |
| Arsenic | (ug/L) | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | UJ |
| Barium | (ug/L) | 200 | U | 200 | U | 200 | U | 200 | U | 6.0 | J |
| Beryllium | (ug/L) | 4.0 | U | 4.0 | U | 4.0 | U | 4.0 | U | 4.0 | UJ |
| Cadmium | (ug/L) | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | UJ |
| Calcium | (ug/L) | 762 | | 920 | | 445 | = | 998 | | 2650 | J |
| Chromium | (ug/L) | 10.0 | U | 10.0 | U | 10.0 | U | 10.0 | U | 4.3 | J |
| Cobalt | (ug/L) | 50.0 | U | 50.0 | U | 50.0 | U | 50.0 | U | 50.0 | UJ |
| Copper | (ug/L) | 25.0 | U | 25.0 | U | 25.0 | U | 25.0 | U | 6.3 | J |
| Iron | (ug/L) | 100 | U | 100 | U | 81.7 | = | 108 | | 2560 | J |
| Lead | (ug/L) | 3.0 | U | 3.0 | U | 3.0 | U | 3.0 | U | 26.0 | J |
| Magnesium | (ug/L) | 62.3 | | 87.8 | | 5000 | U | 5000 | U | 185 | J |
| Manganese | (ug/L) | 15.0 | U | 15.0 | U | 15.0 | U | 3.3 | | 26.9 | J |
| Mercury | (ug/L) | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | U | 0.20 | UJ |
| Nickel | (ug/L) | 40.0 | U | 40.0 | U | 40.0 | U | 40.0 | U | 40.0 | UJ |
| Potassium | (ug/L) | 2940 | | 9660 | | 8050 | = | 4700 | | 12700 | |
| Selenium | (ug/L) | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | U | 5.0 | UJ |
| Silver | (ug/L) | 10.0 | U | 10.0 | U | 10.0 | U | 10.0 | U | 10.0 | UJ |
| Sodium | (ug/L) | 674 | | 1430 | | 1130 | = | 658 | | 5330 | J |
| Thallium | (ug/L) | 2.0 | U | 2.0 | U | 2.0 | U | 2.0 | U | 2.0 | UJ |
| Vanadium | (ug/L) | 50.0 | U | 50.0 | U | 50.0 | U | 50.0 | U | 50.0 | UJ |
| Zinc | (ug/L) | 23.6 | UJ | 32.2 | UJ | 13.6 | UJ | 23.1 | UJ | 51.1 | J |
| **SVOC** | | | | | | | | | | | |
| 1,2,4-Trichlorobenzene | (ug/L) | -- | | -- | | -- | | -- | | 10 | UJ |
| 1,2-Dichlorobenzene | (ug/L) | -- | | -- | | -- | | -- | | 10 | UJ |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7000 | R7001 | R7002FD | R7003 | R7004 | |
|---|---|---|---|---|---|---|---|
| Sample Date | | 09/03/98 | 09/03/98 | 09/03/98 | 09/03/98 | 09/10/98 | |
| **SVOC** | | | | | | | |
| 1,3-Dichlorobenzene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 1,4-Dichlorobenzene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2,2'-Oxybis(1-Chloropropane) | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2,4,5-Trichlorophenol | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| 2,4,6-Trichlorophenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2,4-Dichlorophenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2,4-Dimethylphenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2,4-Dinitrophenol | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| 2-Chloronaphthalene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2-Chlorophenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2-Methylnaphthalene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2-Methylphenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2-Nitroaniline | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| 2-Nitrophenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 3,3'-Dichlorobenzidine | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 3-Nitroaniline | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| 4,6-Dinitro-2-methylphenol | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| 4-Bromophenyl phenyl ether | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 4-Chloro-3-methylphenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 4-Chloroaniline | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 4-Chlorophenyl phenyl ether | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 4-Methylphenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 4-Nitroaniline | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| 4-Nitrophenol | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| Acenaphthene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Acenaphthylene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Anthracene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Benzo(a)anthracene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Benzo(a)pyrene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Benzo(b)fluoranthene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Benzo(ghi)perylene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Benzo(k)fluoranthene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Butyl benzyl phthalate | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Carbazole | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Chrysene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Di-n-butyl phthalate | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Di-n-octyl phthalate | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Dibenz(a,h)anthracene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Dibenzofuran | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Diethyl phthalate | (ug/L) | -- | -- | -- | -- | 10 | UJ |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7000 | R7001 | R7002FD | R7003 | R7004 | |
|---|---|---|---|---|---|---|---|
| Sample Date | | 09/03/98 | 09/03/98 | 09/03/98 | 09/03/98 | 09/10/98 | |
| **SVOC** | | | | | | | |
| Dimethyl phthalate | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Fluoranthene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Fluorene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Hexachlorobenzene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Hexachlorobutadiene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Hexachlorocyclopentadiene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Hexachloroethane | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Indeno(1,2,3-cd)pyrene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Isophorone | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| N-Nitrosodi-n-propylamine | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| N-Nitrosodiphenylamine | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Naphthalene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Pentachlorophenol | (ug/L) | -- | -- | -- | -- | 25 | UJ |
| Phenanthrene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Phenol | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Pyrene | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| bis(2-Chloroethoxy)methane | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| bis(2-Chloroethyl) ether | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| bis(2-Ethylhexyl) phthalate | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| **VOC** | | | | | | | |
| 1,1,1-Trichloroethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,1,2,2-Tetrachloroethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,1,2-Trichloroethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,1-Dichloroethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,1-Dichloroethene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,2-Dichloroethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,2-Dichloroethene (total) | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 1,2-Dichloropropane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| 2-Butanone | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 2-Hexanone | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| 4-Methyl-2-pentanone | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Acetone | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Benzene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Bromodichloromethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Bromoform | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Bromomethane | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Carbon disulfide | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Carbon tetrachloride | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Chlorobenzene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Chloroethane | (ug/L) | -- | -- | -- | -- | 10 | UJ |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7000 | R7001 | R7002FD | R7003 | R7004 | |
|---|---|---|---|---|---|---|---|
| Sample Date | | 09/03/98 | 09/03/98 | 09/03/98 | 09/03/98 | 09/10/98 | |
| **VOC** | | | | | | | |
| Chloroform | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Chloromethane | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Dibromochloromethane | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Ethylbenzene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Methylene chloride | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Styrene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Tetrachloroethene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Toluene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Trichloroethene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| Vinyl chloride | (ug/L) | -- | -- | -- | -- | 10 | UJ |
| Xylenes (total) | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| cis-1,3-Dichloropropene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |
| trans-1,3-Dichloropropene | (ug/L) | -- | -- | -- | -- | 5.0 | UJ |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7005 | | R7006 | | R7007TB | R7010TB | R7011 | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 09/10/98 | | 09/10/98 | | 09/10/98 | 09/22/98 | 09/22/98 | |
| **EXPLOSIVE** | | | | | | | | | |
| 1,3,5-Trinitrobenzene | (ug/L) | 0.20 | U | 0.20 | UJ | -- | -- | 2.0 | U |
| 1,3-Dinitrobenzene | (ug/L) | 0.20 | U | 0.20 | UJ | -- | -- | 2.0 | U |
| 2,4,6-Trinitrotoluene | (ug/L) | 0.20 | UJ | 0.20 | UJ | -- | -- | 1.6 | = |
| 2,4-Dinitrotoluene | (ug/L) | 0.36 | J | 0.18 | J | -- | -- | 1.3 | U |
| 2,6-Dinitrotoluene | (ug/L) | 0.13 | UJ | 0.13 | UJ | -- | -- | 13 | |
| 2-Nitrotoluene | (ug/L) | 0.20 | UJ | 0.20 | UJ | -- | -- | 2.0 | U |
| 3-Nitrotoluene | (ug/L) | 0.20 | UJ | 0.20 | UJ | -- | -- | 2.0 | U |
| 4-Nitrotoluene | (ug/L) | 0.20 | UJ | 0.20 | UJ | -- | -- | 2.0 | U |
| HMX | (ug/L) | 0.50 | UJ | 0.50 | UJ | -- | -- | 23 | = |
| Nitrobenzene | (ug/L) | 0.20 | UJ | 0.20 | UJ | -- | -- | 2.0 | U |
| Nitroglycerin | (ug/L) | 2.5 | UJ | 2.5 | UJ | -- | -- | 25 | U |
| RDX | (ug/L) | 0.078 | J | 0.062 | J | -- | -- | 5.0 | U |
| Tetryl | (ug/L) | 0.20 | UJ | 0.20 | UJ | -- | -- | 2.0 | U |
| **METAL** | | | | | | | | | |
| Aluminum | (ug/L) | 322 | J | 213 | J | -- | -- | 2780 | J |
| Antimony | (ug/L) | 5.0 | UJ | 5.0 | UJ | -- | -- | 6.8 | = |
| Arsenic | (ug/L) | 4.2 | J | 5.0 | UJ | -- | -- | 89.9 | = |
| Barium | (ug/L) | 200 | UJ | 200 | UJ | -- | -- | 62.5 | = |
| Beryllium | (ug/L) | 4.0 | UJ | 4.0 | UJ | -- | -- | 4.0 | U |
| Cadmium | (ug/L) | 5.0 | UJ | 5.0 | UJ | -- | -- | 4.1 | = |
| Calcium | (ug/L) | 1460 | J | 474 | J | -- | -- | 31300 | = |
| Chromium | (ug/L) | 10.0 | UJ | 10.0 | UJ | -- | -- | 186 | = |
| Cobalt | (ug/L) | 50.0 | UJ | 50.0 | UJ | -- | -- | 50.0 | U |
| Copper | (ug/L) | 25.0 | UJ | 25.0 | UJ | -- | -- | 220 | = |
| Iron | (ug/L) | 271 | J | 56.4 | J | -- | -- | 10600 | J |
| Lead | (ug/L) | 9.0 | J | 3.0 | UJ | -- | -- | 570 | = |
| Magnesium | (ug/L) | 114 | J | 5000 | UJ | -- | -- | 4010 | = |
| Manganese | (ug/L) | 12.3 | J | 15.0 | UJ | -- | -- | 231 | = |
| Mercury | (ug/L) | 0.20 | UJ | 0.078 | J | -- | -- | 3.4 | = |
| Nickel | (ug/L) | 40.0 | UJ | 40.0 | UJ | -- | -- | 35.5 | = |
| Potassium | (ug/L) | 5310 | J | 7210 | J | -- | -- | 355000 | = |
| Selenium | (ug/L) | 5.0 | UJ | 5.0 | UJ | -- | -- | 5.0 | U |
| Silver | (ug/L) | 10.0 | UJ | 10.0 | UJ | -- | -- | 2.8 | = |
| Sodium | (ug/L) | 1130 | J | 1230 | J | -- | -- | 107000 | = |
| Thallium | (ug/L) | 2.0 | UJ | 2.0 | UJ | -- | -- | 2.0 | J |
| Vanadium | (ug/L) | 50.0 | UJ | 50.0 | UJ | -- | -- | 27.7 | = |
| Zinc | (ug/L) | 22.0 | UJ | 34.1 | UJ | -- | -- | 533 | = |
| **SVOC** | | | | | | | | | |
| 1,2,4-Trichlorobenzene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 1,2-Dichlorobenzene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7005 | | R7006 | | R7007TB | R7010TB | R7011 | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 09/10/98 | | 09/10/98 | | 09/10/98 | 09/22/98 | 09/22/98 | |
| **SVOC** | | | | | | | | | |
| 1,3-Dichlorobenzene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 1,4-Dichlorobenzene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2,2'-Oxybis(1-Chloropropane) | (ug/L) | 10 | | 10 | | -- | -- | 10 | |
| 2,4,5-Trichlorophenol | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | U |
| 2,4,6-Trichlorophenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2,4-Dichlorophenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2,4-Dimethylphenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2,4-Dinitrophenol | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | U |
| 2-Chloronaphthalene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2-Chlorophenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2-Methylnaphthalene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2-Methylphenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 2-Nitroaniline | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | U |
| 2-Nitrophenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 3,3'-Dichlorobenzidine | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 3-Nitroaniline | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | UJ |
| 4,6-Dinitro-2-methylphenol | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | U |
| 4-Bromophenyl phenyl ether | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 4-Chloro-3-methylphenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 4-Chloroaniline | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 4-Chlorophenyl phenyl ether | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 4-Methylphenol | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| 4-Nitroaniline | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | UJ |
| 4-Nitrophenol | (ug/L) | 25 | UJ | 25 | UJ | -- | -- | 25 | UJ |
| Acenaphthene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Acenaphthylene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Anthracene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Benzo(a)anthracene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Benzo(a)pyrene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Benzo(b)fluoranthene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Benzo(ghi)perylene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Benzo(k)fluoranthene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Butyl benzyl phthalate | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Carbazole | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | UJ |
| Chrysene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Di-n-butyl phthalate | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Di-n-octyl phthalate | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Dibenz(a,h)anthracene | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Dibenzofuran | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |
| Diethyl phthalate | (ug/L) | 10 | UJ | 10 | UJ | -- | -- | 10 | U |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7005 | | R7006 | | R7007TB | | R7010TB | | R7011 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 09/10/98 | | 09/10/98 | | 09/10/98 | | 09/22/98 | | 09/22/98 | |
| **SVOC** | | | | | | | | | | | |
| Dimethyl phthalate | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Fluoranthene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Fluorene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Hexachlorobenzene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Hexachlorobutadiene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Hexachlorocyclopentadiene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Hexachloroethane | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Indeno(1,2,3-cd)pyrene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Isophorone | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| N-Nitrosodi-n-propylamine | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| N-Nitrosodiphenylamine | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Naphthalene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Pentachlorophenol | (ug/L) | 25 | UJ | 25 | UJ | -- | | -- | | 10 | = |
| Phenanthrene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Phenol | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| Pyrene | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| bis(2-Chloroethoxy)methane | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| bis(2-Chloroethyl) ether | (ug/L) | 10 | UJ | 10 | UJ | -- | | -- | | 10 | U |
| bis(2-Ethylhexyl) phthalate | (ug/L) | 10 | UJ | 5.2 | J | -- | | -- | | 4.2 | = |
| **VOC** | | | | | | | | | | | |
| 1,1,1-Trichloroethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,1,2,2-Tetrachloroethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,1,2-Trichloroethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,1-Dichloroethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,1-Dichloroethene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,2-Dichloroethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,2-Dichloroethene (total) | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 1,2-Dichloropropane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| 2-Butanone | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | UJ | 10 | UJ |
| 2-Hexanone | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | UJ | 10 | UJ |
| 4-Methyl-2-pentanone | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | UJ | 10 | UJ |
| Acetone | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | UJ | 8.4 | J |
| Benzene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Bromodichloromethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Bromoform | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Bromomethane | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | U | 10 | U |
| Carbon disulfide | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Carbon tetrachloride | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Chlorobenzene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Chloroethane | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | U | 10 | U |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | R7005 | | R7006 | | R7007TB | | R7010TB | | R7011 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 09/10/98 | | 09/10/98 | | 09/10/98 | | 09/22/98 | | 09/22/98 | |
| **VOC** | | | | | | | | | | | |
| Chloroform | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 3.7 | U |
| Chloromethane | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | U | 10 | U |
| Dibromochloromethane | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Ethylbenzene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Methylene chloride | (ug/L) | 62 | J | 5.0 | UJ | 0.64 | J | 5.0 | U | 5.0 | U |
| Styrene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Tetrachloroethene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Toluene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Trichloroethene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| Vinyl chloride | (ug/L) | 25 | UJ | 10 | UJ | 10 | UJ | 10 | U | 10 | U |
| Xylenes (total) | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| cis-1,3-Dichloropropene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |
| trans-1,3-Dichloropropene | (ug/L) | 12 | UJ | 5.0 | UJ | 5.0 | UJ | 5.0 | U | 5.0 | U |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| | | | |
|---|---|---|---|
| Sample Number | | R7012 | |
| Sample Date | | 09/22/98 | |
| **EXPLOSIVE** | | | |
| 1,3,5-Trinitrobenzene | (ug/L) | 4.0 | U |
| 1,3-Dinitrobenzene | (ug/L) | 4.0 | U |
| 2,4,6-Trinitrotoluene | (ug/L) | 4.0 | U |
| 2,4-Dinitrotoluene | (ug/L) | 2.6 | U |
| 2,6-Dinitrotoluene | (ug/L) | 2.6 | U |
| 2-Nitrotoluene | (ug/L) | 4.0 | U |
| 3-Nitrotoluene | (ug/L) | 4.0 | U |
| 4-Nitrotoluene | (ug/L) | 4.0 | U |
| HMX | (ug/L) | 1200 | = |
| Nitrobenzene | (ug/L) | 4.0 | U |
| Nitroglycerin | (ug/L) | 50 | U |
| RDX | (ug/L) | 240 | = |
| Tetryl | (ug/L) | 4.0 | U |
| **METAL** | | | |
| Aluminum | (ug/L) | 1430 | J |
| Antimony | (ug/L) | 5.0 | U |
| Arsenic | (ug/L) | 21.3 | = |
| Barium | (ug/L) | 37.7 | = |
| Beryllium | (ug/L) | 4.0 | U |
| Cadmium | (ug/L) | 4.1 | = |
| Calcium | (ug/L) | 21600 | = |
| Chromium | (ug/L) | 21.0 | = |
| Cobalt | (ug/L) | 50.0 | U |
| Copper | (ug/L) | 120 | = |
| Iron | (ug/L) | 5480 | J |
| Lead | (ug/L) | 75.1 | = |
| Magnesium | (ug/L) | 3580 | = |
| Manganese | (ug/L) | 171 | = |
| Mercury | (ug/L) | 11.9 | = |
| Nickel | (ug/L) | 22.7 | = |
| Potassium | (ug/L) | 343000 | = |
| Selenium | (ug/L) | 5.0 | U |
| Silver | (ug/L) | 10.0 | U |
| Sodium | (ug/L) | 78600 | = |
| Thallium | (ug/L) | 2.0 | U |
| Vanadium | (ug/L) | 26.3 | = |
| Zinc | (ug/L) | 279 | = |
| **SVOC** | | | |
| 1,2,4-Trichlorobenzene | (ug/L) | -- | |
| 1,2-Dichlorobenzene | (ug/L) | -- | |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| | |
|---|---|
| Sample Number | R7012 |
| Sample Date | 09/22/98 |

| SVOC | | |
|---|---|---|
| 1,3-Dichlorobenzene | (ug/L) | -- |
| 1,4-Dichlorobenzene | (ug/L) | -- |
| 2,2'-Oxybis(1-Chloropropane) | (ug/L) | -- |
| 2,4,5-Trichlorophenol | (ug/L) | -- |
| 2,4,6-Trichlorophenol | (ug/L) | -- |
| 2,4-Dichlorophenol | (ug/L) | -- |
| 2,4-Dimethylphenol | (ug/L) | -- |
| 2,4-Dinitrophenol | (ug/L) | -- |
| 2-Chloronaphthalene | (ug/L) | -- |
| 2-Chlorophenol | (ug/L) | -- |
| 2-Methylnaphthalene | (ug/L) | -- |
| 2-Methylphenol | (ug/L) | -- |
| 2-Nitroaniline | (ug/L) | -- |
| 2-Nitrophenol | (ug/L) | -- |
| 3,3'-Dichlorobenzidine | (ug/L) | -- |
| 3-Nitroaniline | (ug/L) | -- |
| 4,6-Dinitro-2-methylphenol | (ug/L) | -- |
| 4-Bromophenyl phenyl ether | (ug/L) | -- |
| 4-Chloro-3-methylphenol | (ug/L) | -- |
| 4-Chloroaniline | (ug/L) | -- |
| 4-Chlorophenyl phenyl ether | (ug/L) | -- |
| 4-Methylphenol | (ug/L) | -- |
| 4-Nitroaniline | (ug/L) | -- |
| 4-Nitrophenol | (ug/L) | -- |
| Acenaphthene | (ug/L) | -- |
| Acenaphthylene | (ug/L) | -- |
| Anthracene | (ug/L) | -- |
| Benzo(a)anthracene | (ug/L) | -- |
| Benzo(a)pyrene | (ug/L) | -- |
| Benzo(b)fluoranthene | (ug/L) | -- |
| Benzo(ghi)perylene | (ug/L) | -- |
| Benzo(k)fluoranthene | (ug/L) | -- |
| Butyl benzyl phthalate | (ug/L) | -- |
| Carbazole | (ug/L) | -- |
| Chrysene | (ug/L) | -- |
| Di-n-butyl phthalate | (ug/L) | -- |
| Di-n-octyl phthalate | (ug/L) | -- |
| Dibenz(a,h)anthracene | (ug/L) | -- |
| Dibenzofuran | (ug/L) | -- |
| Diethyl phthalate | (ug/L) | -- |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| | | |
|---|---|---|
| Sample Number | | R7012 |
| Sample Date | | 09/22/98 |
| **SVOC** | | |
| Dimethyl phthalate | (ug/L) | -- |
| Fluoranthene | (ug/L) | -- |
| Fluorene | (ug/L) | -- |
| Hexachlorobenzene | (ug/L) | -- |
| Hexachlorobutadiene | (ug/L) | -- |
| Hexachlorocyclopentadiene | (ug/L) | -- |
| Hexachloroethane | (ug/L) | -- |
| Indeno(1,2,3-cd)pyrene | (ug/L) | -- |
| Isophorone | (ug/L) | -- |
| N-Nitrosodi-n-propylamine | (ug/L) | -- |
| N-Nitrosodiphenylamine | (ug/L) | -- |
| Naphthalene | (ug/L) | -- |
| Pentachlorophenol | (ug/L) | -- |
| Phenanthrene | (ug/L) | -- |
| Phenol | (ug/L) | -- |
| Pyrene | (ug/L) | -- |
| bis(2-Chloroethoxy)methane | (ug/L) | -- |
| bis(2-Chloroethyl) ether | (ug/L) | -- |
| bis(2-Ethylhexyl) phthalate | (ug/L) | -- |
| **VOC** | | |
| 1,1,1-Trichloroethane | (ug/L) | -- |
| 1,1,2,2-Tetrachloroethane | (ug/L) | -- |
| 1,1,2-Trichloroethane | (ug/L) | -- |
| 1,1-Dichloroethane | (ug/L) | -- |
| 1,1-Dichloroethene | (ug/L) | -- |
| 1,2-Dichloroethane | (ug/L) | -- |
| 1,2-Dichloroethene (total) | (ug/L) | -- |
| 1,2-Dichloropropane | (ug/L) | -- |
| 2-Butanone | (ug/L) | -- |
| 2-Hexanone | (ug/L) | -- |
| 4-Methyl-2-pentanone | (ug/L) | -- |
| Acetone | (ug/L) | -- |
| Benzene | (ug/L) | -- |
| Bromodichloromethane | (ug/L) | -- |
| Bromoform | (ug/L) | -- |
| Bromomethane | (ug/L) | -- |
| Carbon disulfide | (ug/L) | -- |
| Carbon tetrachloride | (ug/L) | -- |
| Chlorobenzene | (ug/L) | -- |
| Chloroethane | (ug/L) | -- |

Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| | | |
|---|---|---|
| Sample Number | | R7012 |
| Sample Date | | 09/22/98 |
| **VOC** | | |
| Chloroform | (ug/L) | -- |
| Chloromethane | (ug/L) | -- |
| Dibromochloromethane | (ug/L) | -- |
| Ethylbenzene | (ug/L) | -- |
| Methylene chloride | (ug/L) | -- |
| Styrene | (ug/L) | -- |
| Tetrachloroethene | (ug/L) | -- |
| Toluene | (ug/L) | -- |
| Trichloroethene | (ug/L) | -- |
| Vinyl chloride | (ug/L) | -- |
| Xylenes (total) | (ug/L) | -- |
| cis-1,3-Dichloropropene | (ug/L) | -- |
| trans-1,3-Dichloropropene | (ug/L) | -- |

--=Not Analyzed

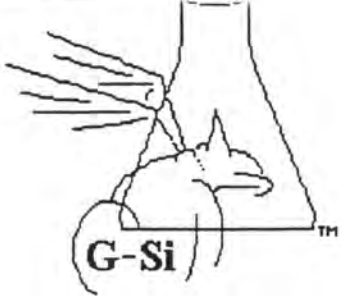
Ravenna
Building W221
Analytical Results Summary
Lab Matrix - Water

| Sample Number | | RVAAP-W221-END | | RVAAP-W221-FB | | RVAAP-W221-FLOOR | | RVAAP-W221-TB | | RVAAP-W221-WALLS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 11/22/99 | | 11/22/99 | | 11/22/99 | | 11/22/99 | | 11/22/99 | |
| **VOC** | | | | | | | | | | | |
| 1,1,1-Trichloroethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,1,2,2-Tetrachloroethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,1,2-Trichloroethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,1-Dichloroethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,1-Dichloroethene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,2-Dichloroethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,2-Dichloroethene (total) | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 1,2-Dichloropropane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| 2-Butanone | (ug/L) | 33 | UJ | 100 | UJ | 10 | UJ | 10 | UJ | 62 | UJ |
| 2-Hexanone | (ug/L) | 33 | U | 100 | U | 10 | U | 10 | U | 62 | U |
| 4-Methyl-2-pentanone | (ug/L) | 33 | U | 100 | U | 10 | U | 10 | U | 62 | U |
| Acetone | (ug/L) | 16 | UJ | 100 | UJ | 10 | UJ | 10 | UJ | 62 | UJ |
| Benzene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Bromodichloromethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Bromoform | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Bromomethane | (ug/L) | 33 | U | 100 | U | 10 | U | 10 | U | 62 | U |
| Carbon disulfide | (ug/L) | 380 | U | 1300 | = | 52 | U | 5.0 | U | 650 | U |
| Carbon tetrachloride | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Chlorobenzene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Chloroethane | (ug/L) | 33 | U | 100 | U | 10 | U | 10 | U | 62 | U |
| Chloroform | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Chloromethane | (ug/L) | 33 | U | 100 | U | 10 | U | 10 | U | 62 | U |
| Dibromochloromethane | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Ethylbenzene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Methylene chloride | (ug/L) | 14 | UJ | 18 | UJ | 5.0 | UJ | 2.3 | J | 17 | UJ |
| Styrene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Tetrachloroethene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Toluene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Trichloroethene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| Vinyl chloride | (ug/L) | 33 | U | 100 | U | 10 | U | 10 | U | 62 | U |
| Xylenes (total) | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| cis-1,3-Dichloropropene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |
| trans-1,3-Dichloropropene | (ug/L) | 17 | U | 50 | U | 5.0 | U | 5.0 | U | 31 | U |

--=Not Analyzed

# APPENDIX C

# DATA VALIDATION SUMMARY REPORTS




12/14/98

Joyce Dishner
IT Corporation
312 Directors Drive
Knoxville, TN 37923-4799
423-690-3211

Dear Joyce,

Please find enclosed a bound original and one copy of the Explosives data validation report and the Supplemental Attachment which contains Case Narratives, etc. for your Ravenna Army Ammunition Plant project. A copy of the invoice for this work is also being sent for your convenience. Per the contract, the original version is being sent via mail to Accounts Payable.

Thank you for the opportunity to work with you on this project. Please let me know if there is anything else we can do for you or if you have questions.

Sincerely,

Roger Simon

*Griffin-Schruers, incorporated*
2215 S. Estes St.
Lakewood, CO 80227-2324
303-987-2801 (T) • 303-987-0317 (F) • 303-257-3982 (Cell)
ras@idcomm.com

# DATA VALIDATION REPORT

| | |
|---|---|
| Program: | U.S. Army Corps of Engineers, U.S. EPA |
| Site: | Ravenna Army Ammunition Plant |
| Sampling Date (Month/Year): | 9/98 |
| Client: | IT Corporation, Knoxville, TN |
| Analytical Laboratory: | Quanterra, North Canton, OH |
| Case No.: | N/A |
| Sample Delivery Group (SDG): | A8I110156, A8I110171-B, A8I230103, A8I240205, A8I110171-A, A8I190158, A8I190160, A8I230102, A8I030155, A8I040101 and A8I290101 |
| Analyses: | Explosives |

Signatures:

Data Reviewer: Roger Simon Date: 12/14/98

QA/QC Review: Doug Kolb Date: 12/14/98

Senior Approval: Roger Simon Date: 12/14/98

## Validation Summary Narrative

Although a number of minor qualifiers were present, the data maintained a high degree of quality. Low levels of HMX and 2-nitrotoluene were detected in the field blanks; 2,4-dinitrotoluene (DNT) was found slightly above the CRQL. Although these resulted in application of a 'B' flag to a number of low level sample results, all blank values were less than 2x the quantitation limit. Many samples arrived at temperatures greater than 6°C, which resulted in a large number of qualifiers. Since it is expected that appreciable cooling over ambient conditions was likely, these are considered to be very minor estimations. Detection limits for 2,4-DNT and 2,6-DNT (0.13 µg/L) failed to meet the QAPP specified criteria (0.10 µg/L), but were within rounding. Also, in three samples, 1,3,5-trinitrobenzene detection limits were not met. Minor accuracy and precision problems were noted for 2,4-DNT which resulted in qualification. Finally, in a number of samples, surrogates were diluted out due to high levels of target compounds.

## Table of Contents

## 1.0 Sample IDs

The following table summarizes sample IDs, matrix of each sample and analyses present in the data package for each sample.

| Sample Number | Matrix | Exp |
|---|---|---|
| **SDG A8I110156** | | |
| R7004 | W | X |
| R7005 | W | X |
| R7006 | W | X |
| *SDG subtotal:* | | 3 |
| **SDG A8I110171-B** | | |
| R7008 | Sawdust | X |
| R7009 | Sawdust | X |
| *SDG subtotal:* | | 2 |
| **SDG A8I230103** | | |
| R7011 | W | X |
| R7012 | W | X |
| *SDG subtotal:* | | 2 |
| **SDG A8I240205** | | |
| R1000 | W | X |
| R1001 | W | X |
| *SDG subtotal:* | | 2 |
| **SDG A8I110171-A** | | |
| R5107 | S | X |
| R5100 | S | X |
| R5109FB | QC | X |
| R5101 | S | X |
| R5102 | S | X |
| R5103FD | S | X |
| R5110 | S | X |
| R5111 | S | X |
| *SDG subtotal:* | | 8 |

| Sample Number | Matrix | Exp |
|---|---|---|
| **SDG A8I190158** | | |
| R9104FB | QC | X |
| *SDG subtotal:* | | 1 |
| **SDG A8I190160** | | |
| R5112 | Sawdust | X |
| *SDG subtotal:* | | 1 |
| **SDG A8I230102** | | |
| R5000 | W | X |
| R5001 | W | X |
| R5002 | W | X |
| R5003 | W | X |
| *SDG subtotal:* | | 4 |
| **SDG A8I030155** | | |
| R5104 | S | X |
| R5105 | S | X |
| R5106 | S | X |
| R5108ER | QC | X |
| *SDG subtotal:* | | 4 |
| **SDG A8I040101** | | |
| R7000 | W | X |
| R7001 | W | X |
| R7002FD | W | X |
| R7003 | W | X |
| *SDG subtotal:* | | 4 |

| Sample Number | Matrix | Exp | Sample Number | Matrix | Exp |
|---|---|---|---|---|---|
| **SDG A8I290101** | | | | | |
| R1100 | W | X | | | |
| R1101 | W | X | | | |
| R1102FD | W | X | | | |
| R1002 | W | X | | | |
| R1003 | W | X | | | |
| R1200 | W | X | | | |
| R1203 | W | X | | | |
| *SDG subtotal*: | | 7 | | | |

Laboratory QC Samples

Please see section 8.2.1

| | |
|---|---|
| Number of Samples Analyzed: | 38 |
| Total Number of Analyses: | 52 |

Exp = Explosives by SW-846 Method 8330

X: analysis was provided for validation
O: analysis was requested on Chain of Custody Record, but not provided for validation
NR: analysis was not requested on Chain of Custody Record

MS: matrix spike MSD: matrix spike duplicate Dup: matrix duplicate
RE: re-analysis DL: dilution analysis

W: water S: soil Sed: sediment QC: field blank (trip, equipment, rinseate, etc.)

## 2.0 Deliverables

With the exception of the following, all data deliverables as specified for Level III quality control were found in the package. The missing check standard summaries were provided as a resubmission.

- 9/21/98, 1738 Check Standard Report for SDGs A8I110171-A and A8I110171-B
- 9/15/98, 2041 and 9/16/98, 0018 Check Standard Reports for SDG A8I110171-A
- 9/25/98, 11:11 for SDG A8I240205
- 9/30/98, 1024 Check Standard Report for SDG A8I230103

## 2.1 Completeness Checklist

The following table summarizes the summary form information and raw data found in the package. Form numbers shown in parentheses refer to the

current U.S. EPA CLP Organics or Inorganics SOW; equivalent reporting of results in an alternate summary format has been determined to be acceptable.

| Exp | Deliverable |
|---|---|
| X | Case Narrative |
| X | Chain of Custody Records/Traffic Reports/Tracking Records |
| X | Preservation Information |
| X | Sample Cross Reference with Unique Identifiers |
| X | Sample Results Summary Form (Form 1) |
| X | CLP Flagging used on Results Summary |
| X | Initial Calibration (RSD, correlation coefficient) |
| X/RS | Continuing Calibration Summary |
| X | Method/Preparation Blank Results Summary (Form 3) |
| X | Matrix Spike/Matrix Spike Duplicate Results Summary (Form 5A) |
| NR | Matrix Duplicate Results (Form 6) |
| X | Laboratory Control Sample (LCS)/ Blank Spike Results Summary (Form 7) |
| O | Control Charts |
| X | Surrogate Recovery |
| NR | Internal Standard |
| X | Legible Pages |
| X | Pages in Package Numbered and in Sequence |
| O | Electronic Data Deliverable (EDD) |

X = Included in original Data Package  O = Not Included and/or Not Available
NR = Not Required  RS = Provided as a Resubmission

## 3.0 Detection Limits

The following is a table of samples and compounds having detection limits that do not meet the contract required or project-specific quantitation limits:

| Sample ID | Analyte | Reported Quantitation Limit | Contract Required Quantitation Limit |
|---|---|---|---|
| all waters | 2,4-dinitrotoluene | 0.13 µg/L | 0.1 µg/L |
| | 2,6-dinitrotoluene | 0.13 µg/L | 0.1 µg/L |
| R7008, R7009 | 1,3,5-trinitrobenzene | 3.2 µg/L | 2 µg/L |
| R5112 | 1,3,5-trinitrobenzene | 2.5 µg/L | 2 µg/L |

## 4.0 Holding Times

Samples were prepared and analyzed within holding times specified by the data validation guidelines. The holding time is from the date of sample collection to the date of analysis.

### 4.1 Sample Preservation

Sample temperatures in a number of coolers were greater than 6°C (4°C ± 2). The following table summarizes samples, SDGs, temperatures and qualifiers due to temperature preservation problems. pH requirements were met. All other samples were preserved properly.

| SDG | Samples Affected | Fractions Affected* | Temperature (°C) | Qualifier |
|---|---|---|---|---|
| A8I110171-B | R7008, R7009 | Exp | 8.2 | J-T/UJ-T |
| A8I190158 | R9104FB | Exp | 7.3, 10.4 | J-T/UJ-T |
| A8I240205 | R1000, R1001 | Exp | 6.7 | J-T/UJ-T |
| A8I110156 | R7004, R7005, R7006 | Exp | 7.4 | J-T/UJ-T |
| A8I110171-A | R5107, R5100, R5109FB, R5101, R5102, R5103FD, R5110, R5111 | Exp | 8.2 | J-T/UJ-T |

* all compounds in a fraction are qualified

For a few SDGs, the sampling temperature was ***slightly*** greater than 6°C (<6.3°C). In these cases no qualifiers were applied due to thermometer stem correction considerations and since significant cooling was demonstrated.

### 4.2 Chain of Custody Records

All Chain of Custody Records were present and completed properly.

## 5.0 Calibration Quality Control

### 5.1 Initial Calibration - Correlation Coefficient

The required summary forms/information were provided and information was present to determine that correlation coefficients ($r^2$) were greater than 0.995. The initial calibration was not, however, run in triplicate per method specifications.

## 5.2 Continuing Calibration - %D

The continuing calibration standard (CCV) analyses were reported as required and had recoveries reported to be within the Level III specified control limits.

## 6.0 Blank Quality Control

## 6.1 Method/Preparation Blanks

A preparation/method blank was prepared and analyzed at the specified frequency. Although 1,3-dinitrobenzene was detected in the method blank associated with sample analyses in SDG A8I110171-A and A8I110171-B, associated sample results were either not detected or were greater than five times the blank amount and were not impacted.

## 7.0 Field QC Blanks

## 7.1 Field Blanks

The following table summarizes field blanks, results present within them and their associated samples.

| SDG | Blank ID | Analyte | Amount (µg/L) | Associated Samples |
|---|---|---|---|---|
| A8I190158 | 9104FB | HMX<br>2-Nitrotoluene | 0.19 J<br>0.17 J | R1000, R1001, R1002, R1003, R1100, R1101, R1102, R1200, R1203FD, R5000, R5001, R5002, R5003, R5112, R7005, R7011, R7012 |
| A8I110171-A | 5109FB | HMX<br>2,4-dinitrotoluene | 0.25 J<br>0.19 | R5100, R5101, R5102, R5103, R5104, R5105, R5106, R5107, R5108, R5110, R5111, R7000, R7001, R7002, R7003, R7004, R7006, R7008, R7009, |

The following table summarizes samples and qualifiers associated with field blanks containing target analytes.

| Sample ID | Compound | Sample Amount (µg/L) | Blank Amount (µg/L) | Qualifier |
|---|---|---|---|---|
| R1000 | HMX | 0.76 | 0.19 J | B |
| R1001 | HMX | 0.73 | 0.19 J | B |
| R1003 | HMX | 0.19 J | 0.19 J | B |
| R1100 | HMX | 0.29 J | 0.19 J | B |
| R1101 | HMX | 0.39 J | 0.19 J | B |
| R1102FD | HMX | 0.33 J | 0.19 J | B |
| R5001 | HMX | 0.062 J | 0.19 J | B |
| R5002 | HMX | 0.16 J | 0.19 J | B |

| Sample ID | Compound | Sample Amount (µg/L) | Blank Amount (µg/L) | Qualifier |
|---|---|---|---|---|
| R5108 | HMX | 0.15 J | 0.25 J | B |
| R7000 | HMX | 0.14 J | 0.25 J | B |
| R7001 | HMX | 0.14 J | 0.25 J | B |
| R7002FD | HMX | 0.14 J | 0.25 J | B |
| R7003 | HMX | 0.32 J | 0.25 J | B |
| R7004 | HMX | 0.36 J | 0.25 J | B |
| R1000 | 2-Nitrotoluene | 0.11 J | 0.17 J | B |
| R1001 | 2-Nitrotoluene | 0.14 J | 0.17 J | B |
| R1101 | 2-Nitrotoluene | 0.14 J | 0.17 J | B |
| R1102FD | 2-Nitrotoluene | 0.14 J | 0.17 J | B |
| R1200 | 2-Nitrotoluene | 0.17 J | 0.17 J | B |
| R1203 | 2-Nitrotoluene | 0.36 | 0.17 J | B |
| R5000 | 2-Nitrotoluene | 0.10 J | 0.17 J | B |
| R5001 | 2-Nitrotoluene | 0.087 J | 0.17 J | B |
| R5002 | 2-Nitrotoluene | 0.073 J | 0.17 J | B |
| R5108 | 2,4-dinitrotoluene | 0.25 | 0.19 | B |
| R7000 | 2,4-dinitrotoluene | 0.78 | 0.19 | B |
| R7001 | 2,4-dinitrotoluene | 0.66 | 0.19 | B |
| R7002FD | 2,4-dinitrotoluene | 0.50 | 0.19 | B |
| R7006 | 2,4-dinitrotoluene | 0.18 | 0.19 | B |

## 7.2 Equipment Rinseate Blanks

The following table summarizes field blanks, results present within them and their associated samples.

| SDG | Blank ID | Analyte | Amount (µg/L) | Associated Samples |
|---|---|---|---|---|
| A81030155 | R5108ER | HMX | 0.15 J | R5104, R5105, R5106 |
| | | Tetryl | 22 | |
| | | 2,4,6-trinitrobenzene | 0.10 J | |
| | | 2-nitrotoluene | 0.51 | |
| | | 2,4-dinitrotoluene | 0.25 | |

No qualification was required since there were no detected results for the above compounds in associated samples.

## 8.0 Accuracy

## 8.1 Laboratory Control Samples/Blank Spikes

### 8.1.1 Frequency

Blank spikes/laboratory control samples (LCS) were prepared and analyzed with each sample batch and for each matrix in the data package.

### 8.1.2 Control Charts

Although laboratory control charts were not present in any data package, the laboratory did include their internal QC limits.

### 8.1.3 Recovery

Blank spike/LCS (and blank spike duplicate, when analyzed) recoveries met control limits for target compounds specified by the Ravenna QAPP. The laboratory flagged some results for *non-target* compounds as being outside of their internal QC limits; these results, however, met QAPP limits.

### 8.1.4 Reanalyses

No reanalyses based on LCS performance were required.

## 8.2 Matrix Spikes / Matrix Spike Duplicates

### 8.2.1 Frequency

The matrix (pre-digest) spike frequency requirement was not met. The following table summarizes samples used for matrix spiking, their matrices, parameters and samples associated with that matrix spike sample.

| Matrix Spike Sample | Matrix | Fraction | Associated Samples |
|---|---|---|---|
| R5102 | Soil | Explosives | SDG A8I110171-B, A8I110171-A |
| None | water | Explosives | A8I110171-A |
| H8I260153-002 | Soil | Explosives | SDG A8I190160 |
| R1003 | Water | Explosives | SDG A8I290101 |
| H8I090138-002 | Water | Explosives | SDG A8I110156 |
| R7003 | Water | Explosives | SDG A8I040101 |
| R5104 | Soil | Explosives | SDG A8I030155 |
| None | | Explosives | SDG A8I230102, A8I190158, A8I240205, A8I230103 |

For analyses where a matrix spike was not performed, LCS / LCS Duplicate analyses were performed. Since accuracy and precision could be assessed to some extent, no action was taken by the reviewer.

Some fractions in some packages contained a matrix QC analysisthat was found not to have been from the site in question. Although applied to samples per client specifications, application of matrix QC from other sites may result in qualifiers not completely representative of the sample's matrix since conditions are **not** expected to be consistent from site to site.

### 8.3.2 Recovery

Matrix spike / matrix spike duplicate recoveries were within QAPP specified control limits (75 - 125%) with the exception of the following. Only the compound in the sample used for spiking has been qualified per validation guidelines.

| Matrix Spike Sample | Compound | MS %R | MSD %R | %R limits | %RPD | %RPD limits | Qualifier |
|---|---|---|---|---|---|---|---|
| R1003 | tetryl* | 161 | 167 | 50-150 | -- | -- | none |
| R7003 | Tetryl* | 652 | 636 | 50-150 | -- | -- | none |
| | 1,3-dintrobenzene* | -- | 156 | 50-150 | -- | -- | none |
| | 2,4-dinitrotoluene | -- | 168 | 50-150 | 45 | 20 | J-SD |

* undetected results are not impacted by the high bias indicated by a high spike recovery; no qualifiers have been applied

## 9.0 Precision

## 9.1 Matrix Duplicates

### 9.1.1 Frequency

Matrix (pre-digest) duplicate analyses were not performed and are typically not a part of organics analyses.

### 9.1.2 Performance

Please see section 9.1.1.

## 9.2 Matrix Spike Duplicates

### 9.2.1 Frequency

Please see section 8.3.1 for a table summarizing matrix spike/matrix spike duplicate analyses.

### 9.2.2 Performance

Please see section 8.3.2 for a table summarizing matrix spike/matrix spiked duplicate analyses.

## 10.0 Surrogates

## 10.1 Frequency

Surrogates were analyzed at the specified frequency.

## 10.2 Recovery

With the exception of the following, surrogates met all criteria.

| Sample ID | Surrogate | %R | %R limits | Qualifier | Affected Compounds |
|---|---|---|---|---|---|
| 7008 | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |
| 7009 | 1-chloro-3-nitrobenzene | 147 | 72-129 | none[b] | All explosives |
| R5000DL | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |
| R5003DL | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |
| R5112 | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |
| 7011 | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |
| 7012 | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |
| 7012DL | 1-chloro-3-nitrobenzene | 0 D | | None[a] | All explosives |

[a] Results diluted out, no qualifiers applied.

[b] Undetected results are not impacted by the high bias indicated by a high surrogate recovery and have not been qualified.

## 10.3 Reanalysis

Reanalyses were performed as required.

## 11.0 Reanalyses

Reanalyses were performed when required. Please see sections 8.1.4 and 10.3.

## 12.0 Dilution Analyses

Secondary dilutions were performed when required. Please also see section 10.2.

Generally, undiluted analyses were not provided by the laboratory.

## 13.0 Case Narratives

Case narratives were generic for the most part and generally did a poor job of describing specific issues found in the data package. For some data packages, entire fractions were not addressed. In addition, in most cases where calibration problems existed, these were not addressed.

## 14.0 Field Duplicates

No detected results were reported in field duplicate pair R5102 and R5103FD. The results for other duplicate pairs and the RPD or duplicate difference value (Δ) for each analyte are summarized below. Qualifiers have been indicated for outliers.

| Compound | Sample ID: R7001 (µg/L) | Duplicate ID: R7002FD (µg/L) | Difference (Δ) or RPD | Qualifer |
|---|---|---|---|---|
| HMX | 0.14 J | 0.14 J | 0 % | |
| 2,4-DNT | 0.66 | 0.50 | 27.6 % | J-D |
| 2,6-DNT | 0.18 | 0.21 | 15.4 % | |

| Analyte | Sample ID: R1101 (µg/L) | Duplicate ID: R1102FD (µg/L) | Difference (Δ) or RPD | Qualifier |
|---|---|---|---|---|
| HMX | 0.39 J | 0.33 J | 16.7 % | |
| Nitrobenzene | 0.050 J | 0.20 U | NC | |
| 2-NT | 0.14 J | 0.14 J | 0 % | |

| Analyte | Sample ID: R1101 (µg/L) | Duplicate ID: R1102FD (µg/L) | Difference (Δ) or RPD | Qualifier |
|---|---|---|---|---|
| 2,6-NT | 0.21 | 0.17 | 21.0 % | ** |

* precision problem indicated, qualifiers have been applied to the impacted compound in the sample and its duplicate only

** precision problem indicated, however, due to the low level of results and since the duplicate difference (0.04 µg/L) is well less than the control limit when using differences (0.04 µg/L), no qualifiers have been applied.

NC = not calculated

## 15.0 System Performance

Except as noted previously, the instrumental and analytical systems used in the analysis of these samples maintained an acceptable level of performance.

## 16.0 Contract Requirements

Please see sections 3.0, 4.1 and 10.2 for information concerning non-compliant situations.

## 17.0 Additional Comments

Please see the addendum report for Ravenna for Project Correspondence, Case Narratives, Chain of Custody Records and Matrix Spike/Matrix Spike Duplicate Summary Forms. LCS/LSC Dup summary forms have been included when matrix spike analyses were not performed.

## 18.0 Sample Data Qualifier Table

Site Name: Ravenna

| Sample ID | R1000 | R1001 | R1002 | R1003 | R1100 | R1101 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | water | Water | water | water | water |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | BJT | BJT | | B | B | B |
| RDX | UJT | UJT | | | | |
| 1,3,5-trinitrobenzene | UJT | UJT | | | | |
| 1,3-dinitrobenzene | UJT | UJT | | | | |
| Tetryl | UJT | UJT | | | | |
| Nitrobenzene | UJT | UJT | | | | |
| 2,4,6-trinitrotoluene | UJT | UJT | | | | |
| 2-nitrotoluene | BJT | BJT | | | | B |
| 2,4,-dinitrotoluene | JT | JT | | | | |
| 3-nitrotoluene | UJT | UJT | | | | |
| 4-nitrotoluene | UJT | UJT | | | | |
| 2,6-dinitrotoluene | UJT | UJT | | | | |
| Nitroglycerin | UJT | UJT | | | | |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R1102FD | R1200 | R1203 | R1203DL | R5000 | R5000DL |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | water | water | water | water | water |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | B | | | | | |
| RDX | | | | | | |
| 1,3,5-trinitrobenzene | | | | | | |
| 1,3-dinitrobenzene | | | | | | |
| Tetryl | | | | | | |
| Nitrobenzene | | | | | | |
| 2,4,6-trinitrotoluene | | | | | | |
| 2-nitrotoluene | B | B | B | | B | |
| 2,4,-dinitrotoluene | | | | | | |
| 3-nitrotoluene | | | | | | |
| 4-nitrotoluene | | | | | | |
| 2,6-dinitrotoluene | | | | | | |
| Nitroglycerin | | | | | | |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R5001 | R5002 | R5003 | R5003DL | R5100 | R5101 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | water | water | water | soil | soil |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | B | B | | | UJT | UJT |
| RDX | | | | | UJT | UJT |
| 1,3,5-trinitrobenzene | | | | | UJT | UJT |
| 1,3-dinitrobenzene | | | | | UJT | UJT |
| Tetryl | | | | | UJT | UJT |
| Nitrobenzene | | | | | UJT | UJT |
| 2,4,6-trinitrotoluene | | | | | UJT | UJT |
| 2-nitrotoluene | B | B | | | UJT | UJT |
| 2,4,-dinitrotoluene | | | | | UJT | UJT |
| 3-nitrotoluene | | | | | UJT | UJT |
| 4-nitrotoluene | | | | | UJT | UJT |
| 2,6-dinitrotoluene | | | | | UJT | UJT |
| Nitroglycerin | | | | | UJT | UJT |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R5102 | R5103FD | R5104 | R5105 | R5106 | R5107 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | soil | soil | soil | soil | soil | soil |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | UJT | UJT | | | | UJT |
| RDX | UJT | UJT | | | | JT |
| 1,3,5-trinitrobenzene | UJT | UJT | | | | UJT |
| 1,3-dinitrobenzene | UJT | UJT | | | | JT |
| Tetryl | UJT | UJT | | | | JT |
| Nitrobenzene | UJT | UJT | | | | UJT |
| 2,4,6-trinitrotoluene | UJT | UJT | | | | UJT |
| 2-nitrotoluene | UJT | UJT | | | | JT |
| 2,4,-dinitrotoluene | UJT | UJT | | | | UJT |
| 3-nitrotoluene | UJT | UJT | | | | UJT |
| 4-nitrotoluene | UJT | UJT | | | | UJT |
| 2,6-dinitrotoluene | UJT | UJT | | | | UJT |
| Nitroglycerin | UJT | UJT | | | | UJT |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R5108 | R5109FB | R5110 | R5111 | R5112 | R7000 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | water | soil | soil | soil | water |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | B | JT | UJT | UJT | | B |
| RDX | | UJT | UJT | UJT | | |
| 1,3,5-trinitrobenzene | | UJT | UJT | UJT | | |
| 1,3-dinitrobenzene | | UJT | UJT | UJT | | |
| Tetryl | | UJT | UJT | UJT | | |
| Nitrobenzene | | UJT | UJT | UJT | | |
| 2,4,6-trinitrotoluene | | UJT | UJT | UJT | | |
| 2-nitrotoluene | | UJT | UJT | UJT | | |
| 2,4,-dinitrotoluene | B | JT | UJT | UJT | | B |
| 3-nitrotoluene | | UJT | UJT | UJT | | |
| 4-nitrotoluene | | UJT | UJT | UJT | | |
| 2,6-dinitrotoluene | | UJT | UJT | UJT | | |
| Nitroglycerin | | UJT | UJT | UJT | | |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R7001 | R7002FD | R7003 | R7004 | R7005 | R7006 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | water | water | water | water | water |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | B | B | B | BJT | UJT | UJT |
| RDX | | | | UJT | JT | JT |
| 1,3,5-trinitrobenzene | | | | UJT | UJT | UJT |
| 1,3-dinitrobenzene | | | | UJT | UJT | UJT |
| Tetryl | | | | UJT | UJT | UJT |
| Nitrobenzene | | | | UJT | UJT | UJT |
| 2,4,6-trinitrotoluene | | | | UJT | UJT | UJT |
| 2-nitrotoluene | | | | UJT | UJT | UJT |
| 2,4,-dinitrotoluene | BJD | BJD | JSD | UJT | JT | BJT |
| 3-nitrotoluene | | | | UJT | UJT | UJT |
| 4-nitrotoluene | | | | UJT | UJT | UJT |
| 2,6-dinitrotoluene | | | | UJT | UJT | UJT |
| Nitroglycerin | | | | UJT | UJT | UJT |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R7008 | R7009 | R7011 | R7012 | R7012DL | R9104FB |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | sawdust | sawdust | water | water | water | water |
| | | | | | | |
| **Explosives** | | | | | | |
| HMX | JT | UJT | | | | JT |
| RDX | JT | UJT | | | | UJT |
| 1,3,5-trinitrobenzene | UJT | UJT | | | | UJT |
| 1,3-dinitrobenzene | JT | UJT | | | | UJT |
| Tetryl | UJT | UJT | | | | UJT |
| Nitrobenzene | UJT | UJT | | | | UJT |
| 2,4,6-trinitrotoluene | JT | UJT | | | | UJT |
| 2-nitrotoluene | UJT | UJT | | | | JT |
| 2,4,-dinitrotoluene | JT | UJT | | | | UJT |
| 3-nitrotoluene | JT | UJT | | | | UJT |
| 4-nitrotoluene | UJT | UJT | | | | UJT |
| 2,6-dinitrotoluene | UJT | UJT | | | | UJT |
| Nitroglycerin | UJT | UJT | | | | UJT |
| | | | | | | |

## APPENDIX A – Data Qualifier Definitions

## Definitions of Data Qualifiers

The following codes are considered the "EPA" qualifiers and specified for use by the various Functional Guidelines for data validation.

**R**: Rejected - Data are unusable (Note: Analyte may or may not be present).

**U**: Undetected; the analyte was not detected above the MDA

**N**: Tentatively Identified

**J**: Estimated

**UJ**: Undetected, but the number that is reported as the quantitation limit (MDA) is an estimated value

**B**: Impacted by an associated blank

The following subqualifiers give further detail of the type and amount of qualification a given data point has received.

-H: Qualified due to holding time violation

-T: Qualified due to sample preservation problems

-I: Qualified due to interference problems / internal standard

-D: Qualified due to precision problems (duplicate control limits not met)

-S: Qualified due to accuracy problems (matrix spike recovery criteria not met)

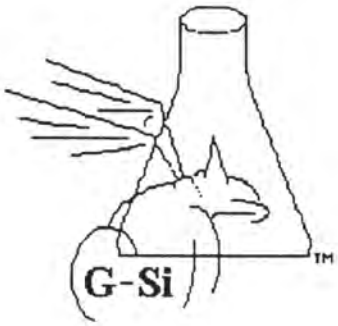
-C: Qualified due to instrument calibration problems

-L: Qualified due to accuracy problems (LCS recovery criteria not met)

-G: Qualified due to background problems

-K: Qualified due to negative blank value problems

-Q: Qualified for other reasons - refer to the text of the report




12/12/98

Joyce Dishner
IT Corporation
312 Directors Drive
Knoxville, TN 37923-4799
423-690-3211

Dear Joyce,

Please find enclosed the bound original and one copy of the Inorganics (Metals and Cyanide) data validation reports for your Ravenna Army Ammunition Plant project. I will send the invoice with the completed Explosives report once I receive the final laboratory responses.

Thank you for the opportunity to work with you on this project. Please let me know if there is anything else we can do for you or if you have questions.

Sincerely,

Roger Simon

*Griffin-Schruers, incorporated*
2215 S. Estes St.
Lakewood, CO 80227-2324
303-987-2801 (T) • 303-987-0317 (F) • 303-257-3982 (Cell)
ras@idcomm.com

# DATA VALIDATION REPORT

| | |
|---|---|
| Program: | U.S. Army Corps of Engineers, U.S. EPA |
| Site: | Ravenna Army Ammunition Plant |
| Sampling Date (Month/Year): | 9/98 |
| Client: | IT Corporation, Knoxville, TN |
| Analytical Laboratory: | Quanterra, North Canton, OH |
| Case No.: | N/A |
| Sample Delivery Group (SDG): | A8I030155, A8I110171-A, A8I110171-B, A8I190158, A8I190160, A8I230102, A8I230103, A8I240205, A8I290101, A8I040101 and A8I190156 |
| Analyses: | Total Metals, Cyanide |

Signatures:

Data Reviewer: Roger Simon Date: 12/11/98

QA/QC Review: Douglas J Kolb Doug Kolb Date: 12/11/98

Senior Approval: Roger Simon Date: 12/11/98

## Validation Summary Narrative

Due to the large number of minor qualifiers present, the data did not maintain as high a degree of quality as it could have. Many samples were impacted by temperatures greater than 6°C, which resulted in a large number of qualifiers. Since it is expected that appreciable cooling over ambient conditions was likely, these are considered to be minor estimations. Of more concern, however, was the laboratory's systematic problem with maintaining calibration integrity. Although many continuing calibration check outliers were found throughout the data, analyses were not terminated, problems corrected and affected samples reanlyzed. One calibration check standard for mercury had a 2% recovery. Therefore, mercury results in samples R1000 and R1001 were qualified as unusable (R). A number of matrix spike /matrix spike duplicate (MS/MSD) problems were found, most of which were minor with the exception of one cyanide MSD: the recovery for this standard was 3.5 %, which resulted in the cyanide result for sample R5108 being qualified as unusable. Although some minor documentation issues existed, the laboratory provided all missing data.

## Table of Contents

## 1.0 Sample IDs

The following table summarizes sample IDs, matrix of each sample and analyses present in the data package for each sample.

| Sample Number | Matrix | T | C |
|---|---|---|---|
| **SDG A8I190158** | | | |
| R9104FB | QC | X | X |
| *SDG subtotal:* | | 1 | 1 |
| **SDG A8I230103** | | | |
| R7011 | W | X | -- |
| R7012 | W | X | -- |
| *SDG subtotal:* | | 2 | 0 |
| **SDG A8I030155** | | | |
| R5104 | S | X | X |
| R5105 | S | X | X |
| R5106 | S | X | X |
| R5108ER | QC | X | X |
| *SDG subtotal:* | | 4 | 4 |
| **SDG A8I290101** | | | |
| R1100 | W | X | -- |
| R1101 | W | X | -- |
| R1102FD | W | X | -- |
| R1002 | W | X | -- |
| R1003 | W | X | -- |
| R1200 | W | X | -- |
| R1203 | W | X | -- |
| *SDG subtotal:* | | 7 | 0 |
| **SDG A8I110171-B** | | | |
| R7008 | Sawdust | X | -- |
| R7009 | Sawdust | X | -- |
| *SDG subtotal:* | | 2 | 0 |
| **SDG A8I040101** | | | |
| R7004 | W | X | -- |
| R7005 | W | X | -- |
| R7006 | W | X | -- |
| *SDG subtotal:* | | 3 | 0 |

| Sample Number | Matrix | T | C |
|---|---|---|---|
| **SDG A8I190160** | | | |
| R5112 | sawdust | X | X |
| *SDG subtotal:* | | 1 | 1 |
| **SDG A8I240205** | | | |
| R1000 | W | X | -- |
| R1001 | W | X | -- |
| *SDG subtotal:* | | 2 | 0 |
| **SDG A8I230102** | | | |
| R5000 | W | X | -- |
| R5001 | W | X | -- |
| R5002 | W | X | -- |
| R5003 | W | X | -- |
| *SDG subtotal:* | | 4 | 0 |
| **SDG A8I110171-A** | | | |
| R5107 | S | X | X |
| R5100 | S | X | X |
| R5109FB | QC | X | X |
| R5101 | S | X | X |
| R5102 | S | X | X |
| R5103FD | S | X | X |
| R5110 | S | X | X |
| R5111 | S | X | X |
| *SDG subtotal:* | | 8 | 8 |
| **SDG A8I190156** | | | |
| R7000 | W | X | -- |
| R7001 | W | X | -- |
| R7002FD | W | X | -- |
| R7003 | W | X | -- |
| *SDG subtotal:* | | 4 | 0 |

| Sample Number | Matrix | T | C | Sample Number | Matrix | T | C |
|---|---|---|---|---|---|---|---|

Laboratory QC Samples

Please see section 8.2.1

| | | |
|---|---|---|
| Number of Samples Analyzed: | 38 | 18 |
| Total Number of Analyses: | 56 | 30 |

T = Total Metals by SW-846 Methods 6010A, 7470A, 7841
C = Cyanide by SW-846 Method 9010A

X: analysis was provided for validation
O: analysis was requested on Chain of Custody Record, but not provided for validation
NR: analysis was not requested on Chain of Custody Record

MS: matrix spike MSD: matrix spike duplicate Dup: matrix duplicate
RE: re-analysis DL: dilution analysis

W: water S: soil Sed: sediment QC: field blank (trip, equipment, rinseate, etc.)

## 2.0 Deliverables

All data deliverables as specified for Level III quality control were found in the package, with the exception of the following, which the laboratory provided as a resubmission: cyanide calibration data for SDGs A8I230102, A8I190158 and A8I190160; metals calibration and GFAA data for SDGs A8I190158, A8I110171-A, A8I110171-B, A8I230102, A8I290101 and A8I190160.

## 2.1 Completeness Checklist

The following table summarizes the summary form information and raw data found in the package. Form numbers shown in parentheses refer to the current U.S. EPA CLP Inorganics SOW; equivalent reporting of results in an alternate summary format has been determined to be acceptable.

| ICP | GFAA | Hg | CN | Deliverable |
|---|---|---|---|---|
| X | X | X | X | Case Narrative |
| X | X | X | X | Chain of Custody Records/Traffic Reports/Tracking Records |
| X | X | X | X | Preservation Information |
| X | X | X | X | Sample Cross Reference with Unique Identifiers |
| X | X | X | X | Sample Results Summary Form (Form 1) |
| X | X | X | X | CLP Flagging used on Results Summary |
| X | X/RS | X/RS | X/RS | Initial Calibration: correlation coefficients, standards |
| X | X/RS | X/RS | X/RS | Initial and Continuing Calibration Verification (ICV/CCV Form 2A) |
| X | X | X | X | Method/Preparation Blank Results Summary (Form 3) |
| X | X | X | X | Matrix Spike/Matrix Spike Duplicate Results Summary (Form 5A) |

| ICP | GFAA | Hg | CN | Deliverable |
|---|---|---|---|---|
| O | O | O | O | Matrix Duplicate Results (Form 6) |
| X | X | X | X | Laboratory Control Sample (LCS) Summary (Form 7) |
| O | O | O | O | Control Charts |
| X | NR | NR | NR | Serial Dilution |
| X | X | X | X | GFAA Post-digestion spike results |
| O | O | O | O | Summary Preparation Log (Form 13) |
| O | O | O | O | Summary Run Log (Form 14) |
| X | X | X | X | Legible Pages |
| X | X | X | X | Pages in Package Numbered and in Sequence |
| NR | NR | NR | NR | Electronic Data Deliverable (EDD) |

X = Included in original Data Package
O = Not Included and/or Not Available
NR = Not Required
RS = Provided as a Resubmission

## 3.0 Detection Limits

Instrument/method detection limits (uncorrected for preparation factors, dilutions, etc.) met Ravenna QAPP specifications.

## 4.0 Holding Times

With the exception of those listed below, samples were prepared and analyzed within holding times specified by the data validation guidelines. The holding time is from the date of sample collection to the date of analysis.

| SDG | Sample | Fraction | Sampling Date | Analysis Date | Number of Days Out | Qualifier |
|---|---|---|---|---|---|---|
| A8I110171-A | R5107 | Cyanide | 9/11/98 | 10/1/98 | 6 | UJ-H |
| A8I110171-A | R5100 | Cyanide | 9/11/98 | 10/1/98 | 6 | UJ-H |
| A8I110171-A | R5102 | Cyanide | 9/11/98 | 10/1/98 | 6 | UJ-H |
| A8I110171-A | R5103FD | Cyanide | 9/11/98 | 10/1/98 | 6 | UJ-H |
| A8I110171-A | R5110 | Cyanide | 9/11/98 | 10/1/98 | 6 | UJ-H |
| A8I110171-A | R5111 | Cyanide | 9/11/98 | 10/1/98 | 6 | UJ-H |
| A8I190160 | R5112 | Cyanide | 9/17/98 | 10/7/98 | 6 | UJ-H |

## 4.1 Sample Preservation

Sample temperatures in a number of coolers were greater than 6°C (4°C ± 2). The following table summarizes samples, SDGs, temperatures and qualifiers due to temperature preservation problems. pH requirements were met. All other samples were preserved properly.

| SDG | Samples Affected | Fractions Affected* | Temperature (°C) | Qualifier |
|---|---|---|---|---|
| A8I190158 | R9104FB | Metals, Cyanide | 7.3, 10.4 | J-T/UJ-T |
| A8I110171-A | R5107, R5100, R5109FB, R5101, R5102, R5103FD, R5110, R5111 | Metals, Cyanide | 8.2 | J-T/UJ-T |
| A8I110171-B | R7008, R7009 | Metals | 8.2 | J-T/UJ-T |
| A8I240205 | R1000, R1001 | Metals | 6.7 | J-T/UJ-T |
| A8I110156 | R7004, R7005, R7006 | Metals | 7.4 | J-T/UJ-T |

* all analytes in a fraction are qualified

For a few SDGs, the sampling temperature was ***slightly*** greater than 6°C (<6.3°C). In these cases no qualifiers were applied due to thermometer stem correction considerations and since significant cooling was demonstrated.

### 4.2 Chain of Custody Records

All Chain of Custody Records were present and completed properly.

## 5.0 Calibration Quality Control

### 5.1 Initial Calibration

#### 5.1.1 Correlation Coefficient

The required summary forms/information were provided and information was present to determine that correlation coefficients ($r^2$) were greater than 0.995.

#### 5.1.2 ICP Initial Calibration

The required summary forms/information were provided and information was present to verify that ICP initial calibration included at least standard and one blank.

### 5.1.3 Calibration Factors/ICVs

The required summary forms/information were provided and information was present to verify calibration factors/%RSDs/initial calibration verifications (ICVs) met specified criteria.

## 5.2 Continuing Calibration (%D / %R)

Except as noted in the following table, the continuing calibration standard (CCV) analyses were reported as required and had recoveries reported to be within the Level III specified control limits. In cases where a CCV did not meet requirements, the laboratory failed to terminate the analysis, take corrective action, recalibrate and reanalyze samples.

| Samples Affected | Analyte | CCV | %R | Qualifier |
|---|---|---|---|---|
| R5109FB | Thallium | #3 | 112.5 | none[c] |
| R7000, R7001, R7002FD, R7003 | Thallium | #2 | 112.5 | none[c] |
| R5000, R5001, R5002 | Thallium | all | > 110.0 | none[c] |
| R5003 | Thallium | all | > 110.0 | J-C |
| R7012 | Thallium | all | > 110.0 | None[c] |
| None[a] | manganese | #4 | 111.9 | N/a |
| None[a] | manganese | #18 | 111.6 | N/a |
| None[a] | manganese | #22 | 111.7 | N/a |
| None[a] | Beryllium | #22 | 110.3 | N/a |
| None[a] | arsenic | #22 | 111.0 | N/a |
| None[a] | mercury | #2 | 79.8 | N/a |
| R1000 | Thallium | #1, #2 | 113.2, 112.5 | none[c] |
| R1001 | Thallium | #1, #2 | 113.2, 112.5 | J-C |
| R1000, R1001 | mercury | #1 | 2 | R-C[b] |
| R9104FB | Thallium | all | > 110.0 | none[c] |

[a] no samples were directly bracketed by these out of control standards, thus no qualifiers were applied. Termination and reanalysis was not, however, performed.

[b] due to the extreme recovery of CCV1, the entire analytical run is considered questionable, thus the rejection of undetected results.

[c] since undetected results are not impacted by the high bias indicated by a high spike recovery, no qualifiers were applied

## 6.0 Blank Quality Control

## 6.1 Instrument Blanks

Instrument blanks were not analyzed.

## 6.2 ICB/CCBs

Initial and continuing calibration blanks (ICB/CCB) are not specified for Level III review. However, cursory review of these blanks indicated that all analyte values were less than their respective CRDLs, with the exception of a number of CCBs in the ICP run which were significantly over the CRDL. Since these CCBs did not bracket sample analyses, no action was taken. Please also see section 6.2.

## 6.3 Method/Preparation Blanks

A preparation/method blank was prepared and analyzed at the specified frequency. The following is a table of samples and analytes requiring data qualifiers due to reported contaminants in the preparation blanks. The samples and analytes listed below were reported to be less than five times the amount reported in the associated blank.

| Sample ID | Analyte | Sample Amount (µg/L) | | Blank Amount (µg/L) | | Qualifier |
|---|---|---|---|---|---|---|
| R5109FB | Zinc | 14.0 | B | 14.1 | B | B |
| R7004 | Zinc | 51.1 | | 14.1 | B | B |
| R7005 | Sodium | 1130 | B | 508 | B | B |
| | Zinc | 22.0 | | 14.1 | B | B |
| R7006 | Sodium | 1230 | B | 508 | B | B |
| | Zinc | 34.1 | | 14.1 | B | B |
| R5001 | Aluminum | 336 | | 74.5 | B | B |
| | Mercury | 0.097 | B | 0.074 | B | B |
| | Zinc | 76.8 | | 15.2 | B | B |
| R5002 | Aluminum | 251 | | 74.5 | B | B |
| | Mercury | 0.083 | B | 0.074 | B | B |
| | Zinc | 42.7 | | 15.2 | B | B |
| R5003 | Mercury | 0.14 | B | 0.074 | B | B |
| R1100 | Zinc | 25.2 | | 17.5 | B | B |
| R1101 | Thallium | 1.8 | B | 1.1 | B | B |
| R1003 | Zinc | 47.0 | | 17.5 | B | B |
| R1002 | Zinc | 62.0 | | 17.5 | B | B |
| R1203 | Zinc | 68.1 | | 17.5 | B | B |
| R1001 | Thallium | 1.7 | B | 1.0 | B | B |

| Sample ID | Analyte | Sample Amount (µg/L) | Blank Amount (µg/L) | Qualifier |
|---|---|---|---|---|
| R9104FB | mercury | 0.075 B | 0.074 B | B |
| | calcium | 267 B | 247 B | B |
| | | (mg/kg) | | |
| R5106 | Calcium | 343 B | 92.2 B | B |

## 7.0 Field QC Blanks

### 7.1 Field Blanks

The following table summarizes field blanks, results present within them and their associated samples.

| SDG | Blank ID | Analyte | Amount (µg/L) | Associated Samples |
|---|---|---|---|---|
| A8I190158 | 9104FB | Mercury<br>Calcium | 0.075 B<br>267 B | R1000, R1001, R1002, R1003, R1100, R1101, R1102FD, R1200, R1203FD, R5000, R5001, R5002, R5003, R5112, R7005, R7011, R7012 |
| A8I110171-A | 5109FB | zinc | 14.0 B | R5100, R5101, R5102, R5103FD, R5104, R5105, R5106, R5107, R5108, R5110, R5111, R7000, R7001, R7002, R7003, R7004, R7006, R7008, R7009, |

The following table summarizes samples and qualifiers associated with field blanks containing target analytes.

| Sample ID | Analyte | Sample Amount (µg/L) | Blank Amount (µg/L) | Qualifier |
|---|---|---|---|---|
| R1100 | Calcium | 509 B | 267 B | B |
| R1203 | Mercury | 0.097 B | 0.075 B | B |
| R5001 | Mercury | 0.097 B | 0.075 B | B |
| R5002 | Mercury | 0.083 B | 0.075 B | B |
| R5003 | Mercury | 0.14 B | 0.075 B | B |
| R5108 | Zinc | 19.3 B | 14.0 B | B |
| R7000 | Zinc | 23.6 | 14.0 B | B |
| R7001 | Zinc | 32.2 | 14.0 B | B |
| R7002FD | Zinc | 13.6 B | 14.0 B | B |
| R7003 | Zinc | 23.1 | 14.0 B | B |
| R7004 | Zinc | 51.1 | 14.0 B | B |
| R7006 | Zinc | 34.1 | 14.0 B | B |
| | | (mg/kg) | | |
| R5112 | Mercury | 0.037 B | 0.075 B | B |

### 7.2 Equipment Rinseate Blanks

The following table summarizes field blanks, results present within them and their associated samples.

| SDG | Blank ID | Analyte | Amount (µg/L) | Associated Samples |
|---|---|---|---|---|
| A8I030155 | R5108ER | Calcium<br>Zinc | 261 B<br>19.3 B | R5104, R5105, R5106 |

No qualification was required since there were no detected results for the above compounds in associated samples.

| Sample ID | Analyte | Sample Amount (mg/kg) | Blank Amount (µg/L) | Qualifier |
|---|---|---|---|---|
| R5106 | calcium | 343 B | 261 B | B |

## 8.0 Accuracy

### 8.1 Laboratory Control Samples/Blank Spikes

#### 8.1.1 Frequency

Blank spikes/laboratory control samples (LCS) were prepared and analyzed with each sample batch and for each matrix in the data package.

#### 8.1.2 Control Charts

Although laboratory control charts were not present in any data package, the laboratory did include their internal QC limits.

#### 8.1.3 Recovery

Blank spike/LCS recoveries met control limits specified by the Ravenna QAPP.

### 8.1.4 Reanalyses

Batch re-preparation and reanalysis was performed when required based on LCS analysis.

## 8.2 Matrix Spikes / Matrix Spike Duplicates

### 8.2.1 Frequency

The matrix (pre-digest) spike frequency requirement was not met. The following table summarizes samples used for matrix spiking, their matrices, parameters and samples associated with that matrix spike sample.

| Matrix Spike Sample | Matrix | Fraction | Associated Samples |
|---|---|---|---|
| A8I110156-001 | Water | Metals | SDG A8I110171-A |
| R5107 (A8I110171-001) | Soil | Metals | SDG A8I110171-A, SDG A8I110171-B |
| R5104 (A8I030155-002) | Soil | Metals | SDG A8I030155 |
| R7003 (A8I040101-004) | water | Metals | SDG A8I030155 |
| R7004 | water | Metals | SDG A8I110156 |
| A8I170106-001 | Water | Metals | SDG A8I230102, A8I230103 |
| R1003 | water | metals | SDG A8I290101, A8I240205 |
| A8I180160-008 | Soil | Metals (-Hg) | SDG A8I190160 |
| A8I160154-001 | Soil | mercury | SDG A8I190160 |
| A8I170106-001 | water | Metals | SDG A8I190158 |
| A8J020212-003 | Water | Cyanide | SDG A8I230102 |
| None | water | Cyanide | SDG A8I190158 |
| A8I240135-003 | water | Cyanide | SDG A8I190160 |
| R5108, R5104 | soil | Cyanide | SDG A8I030155 |
| R5101, R5107 | soil | Cyanide | SDG A8I110171-A |

For analyses where a matrix spike was not performed, an LCS was performed. Since accuracy could be assessed to some extent, no action was taken by the reviewer.

Some fractions in some packages contained a matrix QC analysisthat was found not to have been from the site in question. Although applied to samples per client specifications, application of matrix QC from other sites may result in

qualifiers not completely representative of the sample's matrix since conditions are **not** expected to be consistent from site to site.

### 8.3.2 Recovery

Matrix spike / matrix spike duplicate recoveries were within the specified control limits (75 - 125%).

| Associated Samples | Matrix | Analyte | MS %R | MSD %R | % RPD | Qualifier |
|---|---|---|---|---|---|---|
| R5100, R5101, R5102, R5103, R5107, R5110, R5111, R7008, R7009 | s | Antimony | 52 | 56 | -- | J-S |
| | | Chromium | -- | 126 | -- | J-S |
| | | Copper | -- | 130 | -- | J-S |
| R5104, R5105, R5106 | S | Lead | 56 | 56 | -- | J-S |
| | | Antimony | 46 | 50 | -- | J-S/UJ-S |
| | | Calcium | 61 | 59 | -- | J-S |
| | | copper | 12 | 12 | -- | J-S |
| R5108ER | W | Iron | -- | 195 | 54 | J-SD |
| | | Thallium | -- | -- | 22 | UJ-D |
| R7004, R7005, R7006 | W | Iron | -- | 195 | 54 | J-SD |
| | | Thallium | -- | -- | 22 | UJ-D |
| R5000, R5001, R5002, R5003, R7011, R7012, R9104FB | W | Aluminum | 163 | 131 | -- | J-S/none |
| | | Iron | 130 | -- | -- | J-S/none |
| R1000, R1001 | W | Aluminum | 126 | -- | -- | J-S |
| | | Chromium | -- | -- | 21 | J-D |
| R5112 | S | Antimony | 61 | 59 | -- | J-S |
| | | Arsenic | 37 | 38 | -- | J-S |
| | | Beryllium | 73 | 74 | -- | UJ-S |
| | | Cadmium | 34 | 36 | -- | UJ-S |
| | | Cobalt | 51 | -- | 200 | J-SD |
| | | Copper | 0 | 12 | -- | J-S |
| | | Manganese | 14 | 15 | -- | J-S |
| | | Nickel | 24 | 33 | -- | J-S |
| | | Selenium | 44 | 44 | -- | J-S |
| | | Silver | 52 | 41 | -- | UJ-S |
| | | Thallium | 47 | 46 | -- | UJ-S |
| | | Vanadium | 40 | 38 | -- | UJ-S |
| | | Zinc | 9.5 | 0 | 200 | J-SD |
| R5000, R5001, R5002, R5003 | W | Cyanide | 130 | 145 | -- | None[a] |
| R5108 | W | Cyanide | -- | 3.5 | 188 | R-S |

[a] Undetected results are not impacted by the high bias indicated by a high matrix spike recovery; therefore, no qualifiers have been applied.

The following analytes in the MS/MSD samples listed below were greater than 4x the spike added; no qualifiers have been applied per validation guidelines.

R5107: Al, Fe, Mn, Na
R5104: Al, Fe, Mn
R1000: Fe
A8I180160-008: Al, Ba, Ca, Cr, Fe, Pb, Mn, Hg

In a number of cases, the laboratory has flagged results as being associated with an MS/MSD which did not meet *internal laboratory* limits. The reviewer has used the 75-125% recovery limits specified by the Ravenna QAPP as a basis for qualification.

## 9.0 Precision

### 9.1 Matrix Duplicates

#### 9.1.1 Frequency

Matrix duplicate analysis was not performed. Since MS/MSD analyses and field duplicate analyses were present and accuracy could be assessed to some extent, no action was taken by the reviewer.

#### 9.1.2 Performance

Not applicable; please see section 9.1.1.

### 9.2 Matrix Spike Duplicates

#### 9.2.1 Frequency

The matrix spike /matrix spike duplicate frequency requirement was met. Please see section 8.3.1 for a table summarizing matrix spike/matrix spiked duplicate analyses.

#### 9.2.2 Performance

Please see section 8.3.2 for a table summarizing matrix spike/matrix spiked duplicate analysis outliers; per the Ravenna QAPP, 20% RPD was used for waters while 35% RPD was used for soils.

## 10.0 GFAA Post-digestion spikes/MSA

### 10.1 Frequency

GFAA post-digestion analytical spikes and Method of Standard Additions (MSA) analyses all were performed at the specified frequency.

### 10.2 Recovery

With exceptions as noted in the following table, GFAA post-digestion analytical spike recoveries and Method of Standard Additions (MSA) correlation coefficients met all criteria.

| Sample ID | Analyte | GFAA PDS recovery (%) or MSA correlation coefficient ($r^2$) | Qualifier |
|---|---|---|---|
| R7011 | Thallium | 59.5 % | J-I |
| R5003 | Thallium | 58 % | J-I |
| R7006 | Thallium | 129.5 % | None[a] |
| R7000 | Thallium | 117 % | None[a] |
| R5109FB | Thallium | 125 % | None[a] |

[a] No qualifiers were applied since undetected sample results are not impacted by the high bias indicated by a high spike recovery.

### 10.3 Reanalyses at Dilution

Reanalyses at dilution were corrrectly performed on samples for which GFAA post-digestion analytical spike recoveries were less than 40%.

## 11.0 Reanalyses

Reanalyses were performed when required. Please see sections 8.1.4 and 10.3.

## 12.0 Dilution Analyses

### 12.1 Dilution Analyses

Secondary dilutions were performed when required. Please see section 10.3.

Undiluted analyses were not provided by the laboratory.

### 12.2 Serial Dilution

Although not specified by SW-846, the laboratory analyzed and reported serial dilution results for a number of SDGs. The following table summarizes serial dilution batching, out of control analytes and resultant qualifiers. When available, the reviewer used serial dilution results as a basis for data evaluation/qualification.

| Serial Dilution Sample | Matrix | Analyte | %D | Qualifier | Associated Samples |
|---|---|---|---|---|---|
| R5100 | Soil | Arsenic | 21.2 | J-I | R5100, R5101, R5102, R5103, R5107, R5110, R5111, R7008, R7009 |
| R5106 | Soil | zinc | 58.9 | J-I | R5104, R5105, R5106 |
| R7000 | Water | zinc | 100 | J-I | R7000, R7001, R7002FD, R7003 |
| R1100 | Water | Calcium | 24.8 | J-I | R1100, R1101, R1102FD, R1003, R1002, R1200, R1203 |
| | | zinc | 366 | J-I | |
| R1001 | Water | Aluminum | 22.2 | J-I | R1000, R1001 |
| | | Magnesium | 19.4 | J-I | |
| | | zinc | 78.1 | J-I | |
| SDG A8I110156 | | | | No serial dilution reported. | |
| SDG A8I230102 | | | | No serial dilution reported. | |
| SDG A8I190160 | | | | No serial dilution reported. | |
| SDG A8I190158 | | | | No serial dilution reported. | |

### 13.0 Case Narratives

Case narratives were for the most part generic and generally did a poor job of describing specific issues found in the data packages. For some data packages, entire fractions were not addressed. In addition, in most cases where calibration problems existed, these were not addressed.

### 14.0 Field Duplicates

### 14.1 Batching

The results for the duplicate pair and the RPD or duplicate difference value (Δ) for each analyte are summarized below. QAPP RPD criteria of less than 35% for waters and less than 50% for soils was applied when both the sample and duplicate values were greater than 5xCRDL. The duplicate difference (Δ; absolute value of sample value minus duplicate value) was used when either or both of the sample/duplicate values were less than the CRDL. For waters, the

both of the sample/duplicate values were less than the CRDL. For waters, the difference requirement was to be less than the CRDL, while for soils, the difference was to be less than 2xCRDL. Results outside of control limits have been marked with an "*", with the control limit shown in parentheses.

| Analyte | Sample ID: R5102 (mg/kg) | | Duplicate ID: R5103FD (mg/kg) | | Difference (Δ) or RPD | | |
|---|---|---|---|---|---|---|---|
| Silver | 1.2 | U | 1.2 | U | NC | | |
| Aluminum | 16500 | | 12600 | | 26.8 | % | |
| Arsenic | 8.7 | | 9.7 | | 10.9 | % | |
| Barium | 145 | | 96.3 | | 48.7 | Mg/kg | |
| Beryllium | 0.79 | | 0.43 | B | 0.36 | Mg/kg | |
| Cadmium | 0.59 | U | 0.58 | U | NC | | |
| Calcium | 54100 | | 26700 | | 67.8 | % | * (50) |
| Chromium | 15.7 | | 11.9 | | 27.5 | % | |
| Cobalt | 6.0 | | 5.9 | | 0.1 | Mg/kg | |
| Lead | 9.5 | | 10.3 | | 8.1 | % | |
| Copper | 11.3 | | 12.4 | | 1.1 | Mg/kg | |
| Antimony | 0.30 | B | 0.32 | B | 0.02 | Mg/kg | |
| Iron | 19800 | | 16400 | | 18.8 | % | |
| Selenium | 0.76 | | 0.96 | | 0.2 | Mg/kg | |
| Potassium | 1320 | | 999 | | 321 | Mg/kg | |
| Magnesium | 3940 | | 2530 | | 1410 | Mg/kg | |
| Manganese | 1760 | | 932 | | 6.2 | % | |
| Sodium | 244 | B | 109 | B | 135 | Mg/kg | |
| Nickel | 9.1 | | 10 | | 0.9 | Mg/kg | |
| Vanadium | 19.2 | | 17.3 | | 1.9 | Mg/kg | |
| Mercury | 0.037 | B | 0.035 | B | 0.002 | Mg/kg | |
| Thallium | 1.0 | | 0.76 | U | 0.24 | Mg/kg | |
| Zinc | 38.8 | | 41.9 | | 7.7 | % | |
| Total Cyanide | 0.59 | U | 0.66 | | 0.07 | Mg/kg | |
| Total Cyanide – RE1 | 0.99 | | 1.3 | | 0.31 | Mg/kg | |

| Analyte | Sample ID: R1101 (µg/L) | | Duplicate ID: R1102FD (µg/L) | | Difference (Δ) or RPD | | |
|---|---|---|---|---|---|---|---|
| Silver | 10.0 | U | 10.0 | U | NC | | |
| Aluminum | 562 | | 374 | | 188 | µg/L | |
| Arsenic | 3.5 | B | 5.0 | U | 1.5 | µg/L | |
| Barium | 10.8 | B | 7.2 | B | 3.2 | µg/L | |
| Beryllium | 4.0 | U | 4.0 | U | NC | | |
| Cadmium | 5.0 | U | 0.69 | B | 4.31 | µg/L | |
| Calcium | 3200 | B | 2280 | B | 920 | µg/L | |
| Chromium | 27.0 | | 64.5 | | 37.5 | µg/L | * (10) |
| Cobalt | 50.0 | U | 50.0 | U | NC | | |
| Lead | 11.1 | | 9.5 | | 1.6 | µg/L | |
| Copper | 11.8 | B | 7.6 | B | 3.2 | µg/L | |
| Antimony | 5.0 | U | 5.0 | U | NC | | |
| Iron | 21500 | | 18400 | | 15.5 | % | |
| Selenium | 5.0 | U | 5.0 | U | NC | | |
| Potassium | 540 | B | 653 | B | 113 | µg/L | |
| Magnesium | 568 | B | 422 | B | 146 | µg/L | |
| Manganese | 194 | | 161 | | 18.6 | % | |
| Sodium | 1390 | B | 587 | B | 803 | µg/L | |
| Nickel | 40.0 | U | 40.0 | U | NC | | |
| Vanadium | 50.0 | U | 50.0 | U | NC | | |
| Mercury | 0.20 | U | 0.20 | U | NC | | |

| Analyte | Sample ID: R1101 (µg/L) | | Duplicate ID: R1102FD (µg/L) | | Difference (Δ) or RPD | | |
|---|---|---|---|---|---|---|---|
| Thallium | 1.8 | B | 2.0 | U | 0.2 | µg/L | |
| Zinc | 140 | | 233 | | 45.7 | % | * (20) |

| Analyte | Sample ID: R7001 (µg/L) | | Duplicate ID: R7002FD (µg/L) | | Difference (Δ) or RPD | |
|---|---|---|---|---|---|---|
| Silver | 10.0 | U | 10.0 | U | NC | |
| Aluminum | 149 | B | 164 | B | 15 | µg/L |
| Arsenic | 5.0 | U | 10.0 | U | NC | |
| Barium | 200 | U | 50.0 | U | NC | |
| Beryllium | 4.0 | U | 3.0 | U | NC | |
| Cadmium | 5.0 | U | 25.0 | U | NC | |
| Calcium | 920 | B | 5.0 | U | 915 | µg/L |
| Chromium | 10.0 | U | 10.0 | U | NC | |
| Cobalt | 50.0 | U | 50.0 | U | NC | |
| Lead | 3.0 | U | 3.0 | U | NC | |
| Copper | 25.0 | U | 25.0 | U | NC | |
| Antimony | 5.0 | U | 5.0 | U | NC | |
| Iron | 100 | U | 81.7 | B | 19.3 | µg/L |
| Selenium | 5.0 | U | 5.0 | U | NC | |
| Potassium | 9660 | | 8050 | | 1610 | µg/L |
| Magnesium | 87.8 | B | 5000 | U | NC | |
| Manganese | 15.0 | U | 15.0 | U | NC | |
| Sodium | 1430 | B | 1130 | B | 300 | µg/L |
| Nickel | 40.0 | U | 40.0 | U | NC | |
| Vanadium | 50.0 | U | 50.0 | U | NC | |
| Mercury | 0.20 | U | 0.20 | U | NC | |
| Thallium | 2.0 | U | 2.0 | U | NC | |
| Zinc | 32.2 | | 13.6 | | 18.6 | µg/L |

NC = not calculated

## 14.2 Performance

The following table summarizes field duplicate analytes that did not meet criteria and associated samples and qualifiers.

| Affected Samples | Analyte | RPD or Δ | Control Limit | Qualifier |
|---|---|---|---|---|
| R5102, R5103FD | Calcium | 67.8 % | 50 % | J-D |
| R1101, R1102FD | Chromium | 37.5 µg/L | 10 µg/L | J-D |
| R1101, R1102FD | Zinc | 45.7 % | 35 % | J-D |

## 15.0 System Performance

Except as noted previously, the instrumental and analytical systems used in the analysis of these samples maintained an acceptable level of performance. In addition, it is noted that the 9/30 ICP run for SDG A8I290101 contained a large number of CCVs and CCBs that were badly out of control. The laboratory failed to terminate the run, perform corrective action and reanalyze samples analyzed after the outlier events.

## 16.0 Contract Requirements

Please see sections 4.0, 4.1, 5.2, 6.2 and 15.0 for information concerning non-compliant situations.

## 17.0 Additional Comments

Please see the addendum report for Ravenna for Project Correspondence, Case Narratives, Chain of Custody Records and Matrix Spike/Matrix Spike Duplicate Summary Forms. LCS/LSC Dup summary forms have been included when matrix spike analyses were not performed.

The laboratory reanalyzed a set of samples for cyanide due to an out of control LCS. The reanalysis results have been used by the reviewer, while the original analysis results have been marked out.

## 18.0 Sample Data Qualifier Table

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R1000 | R1001 | R1002 | R1003 | R1100 | R1101 | R1102FD |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | water | water | water | water | water | water |
| | | | | | | | |
| Silver | JT | UJT | | | | | |
| Aluminum | JTSI | JTSI | | | | | |
| Arsenic | UJT | UJT | | | | | |
| Barium | JT | JT | | | | | |
| Beryllium | UJT | UJT | | | | | |
| Cadmium | JT | JT | | | | | |
| Calcium | JT | JT | JI | JI | BJI | JI | JI |
| Chromium | JTD | JTD | | | | JD | JD |
| Cobalt | UJT | UJT | | | | | |
| Lead | JT | JT | | | | | |
| Copper | JT | JT | | | | | |
| Antimony | UJT | UJT | | | | | |
| Iron | JT | JT | | | | | |
| Selenium | UJT | UJT | | | | | |
| Potassium | JT | JT | | | | | |
| Magnesium | JTI | JTI | | | | | |
| Manganese | JT | JT | | | | | |
| Sodium | JT | JT | | | | | |
| Nickel | JT | UJT | | | | | |
| Vanadium | UJT | UJT | | | | | |
| Mercury | RC | RC | | | | | |
| Thallium | UJT | BJTC | | | | B | |
| Zinc | JTI | JTI | BJI | BJI | BJI | JDI | JDI |
| | | | | | | | |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R1200 | R1203 | R5000 | R5001 | R5002 | R5003 | R5100 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | water | water | water | water | water | Soil |
| | | | | | | | |
| Silver | | | | | | | UJT |
| Aluminum | | | JS | BJS | BJS | JS | JT |
| Arsenic | | | | | | | JTI |
| Barium | | | | | | | JT |
| Beryllium | | | | | | | JT |
| Cadmium | | | | | | | JT |
| Calcium | JI | JI | | | | | JT |
| Chromium | | | | | | | JTS |
| Cobalt | | | | | | | JT |
| Lead | | | | | | | JT |
| Copper | | | | | | | JTS |
| Antimony | | | | | | | JTS |
| Iron | | | JS | JS | JS | JS | JT |
| Selenium | | | | | | | JT |
| Potassium | | | | | | | JT |
| Magnesium | | | | | | | JT |
| Manganese | | | | | | | JT |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R1200 | R1203 | R5000 | R5001 | R5002 | R5003 | R5100 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | water | water | water | water | water | Soil |
| | | | | | | | |
| Sodium | | | | | | | JT |
| Nickel | | | | | | | JT |
| Vanadium | | | | | | | JT |
| Mercury | | B | | B | B | B | UJT |
| Thallium | | | | | | JCI | JT |
| Zinc | JI | BJI | | B | B | | JT |
| Total Cyanide | -- | -- | | | | | UJHT |
| | | | | | | | |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R5101 | R5102 | R5103FD | R5104 | R5105 | R5106 | R5107 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | soil | soil | soil | soil | soil | soil | Soil |
| | | | | | | | |
| Silver | UJT | UJT | UJT | | | | UJT |
| Aluminum | JT | JT | JT | | | | JT |
| Arsenic | JTI | JTI | JTI | | | | JTI |
| Barium | JT | JT | JT | | | | JT |
| Beryllium | JT | JT | JT | | | | JT |
| Cadmium | JT | UJT | UJT | | | | UJT |
| Calcium | JT | JTD | JTD | JS | JS | BJS | JT |
| Chromium | JTS | JTS | JTS | | | | JTS |
| Cobalt | JT | JT | JT | | | | JT |
| Lead | JT | JT | JT | JS | JS | JS | JT |
| Copper | JTS | JTS | JTS | JS | JS | JS | JTS |
| Antimony | JTS | JTS | JTS | JS | UJS | UJS | JTS |
| Iron | JT | JT | JT | | | | JT |
| Selenium | JT | JT | JT | | | | JT |
| Potassium | JT | JT | JT | | | | JT |
| Magnesium | JT | JT | JT | | | | JT |
| Manganese | JT | JT | JT | | | | JT |
| Sodium | JT | JT | JT | | | | JT |
| Nickel | JT | JT | JT | | | | JT |
| Vanadium | JT | JT | JT | | | | JT |
| Mercury | JT | JT | JT | | | | JT |
| Thallium | UJT | JT | UJT | | | JC | UJT |
| Zinc | JT | JT | JT | JI | JI | JI | JT |
| Total Cyanide | UJT | JHT | JHT | | | | UJHT |
| | | | | | | | |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R5108ER | R5109FB | R5110 | R5111 | R5112 | R7000 | R7001 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | Water | soil | soil | Soil | water | Water |
| | | | | | | | |
| Silver | | UJT | UJT | UJT | UJS | | |
| Aluminum | | UJT | JT | JT | | | |
| Arsenic | | UJT | JTI | JTI | JS | | |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R5108ER | R5109FB | R5110 | R5111 | R5112 | R7000 | R7001 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | Water | soil | soil | Soil | water | Water |
| | | | | | | | |
| Barium | | UJT | JT | JT | | | |
| Beryllium | | UJT | JT | JT | UJS | | |
| Cadmium | | UJT | UJT | JT | UJS | | |
| Calcium | | UJT | JT | JT | | | |
| Chromium | | UJT | JTS | JTS | | | |
| Cobalt | | UJT | JT | JT | JSD | | |
| Lead | | UJT | JT | JT | | | |
| Copper | | UJT | JTS | JTS | JS | | |
| Antimony | | UJT | JTS | JTS | JS | | |
| Iron | JSD | UJT | JT | JT | | | |
| Selenium | | UJT | JT | JT | JS | | |
| Potassium | | UJT | JT | JT | | | |
| Magnesium | | UJT | JT | JT | | | |
| Manganese | | UJT | JT | JT | JS | | |
| Sodium | | UJT | JT | JT | | | |
| Nickel | | UJT | JT | JT | JS | | |
| Vanadium | | UJT | JT | JT | UJS | | |
| Mercury | | UJT | JT | JT | B | | |
| Thallium | UJD | UJT | UJT | UJT | UJS | | |
| Zinc | B | BJT | JT | JT | JSD | BJI | BJI |
| Total Cyanide | RS | UJT | UJHT | UJHT | UJH | -- | -- |
| | | | | | | | |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R7002FD | R7003 | R7004 | R7005 | R7006 | R7008 | R7009 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | Water | water | water | water | Sawdust | Sawdust |
| | | | | | | | |
| Silver | | | UJT | UJT | UJT | UJT | UJT |
| Aluminum | | | JT | JT | JT | JT | JT |
| Arsenic | | | UJT | JT | UJT | JTI | JTI |
| Barium | | | JT | UJT | UJT | JT | JT |
| Beryllium | | | UJT | UJT | UJT | UJT | UJT |
| Cadmium | | | UJT | UJT | UJT | UJT | UJT |
| Calcium | | | JT | JT | JT | JT | JT |
| Chromium | | | JT | UJT | UJT | JTS | JTS |
| Cobalt | | | UJT | UJT | UJT | UJT | UJT |
| Lead | | | JT | JT | UJT | JT | JT |
| Copper | | | JT | UJT | UJT | JTS | JTS |
| Antimony | | | UJT | UJT | UJT | JTS | JTS |
| Iron | | | JTSD | JTSD | JTSD | JT | JT |
| Selenium | | | UJT | UJT | UJT | JT | JT |
| Potassium | | | JT | JT | JT | JT | JT |
| Magnesium | | | JT | JT | UJT | JT | JT |
| Manganese | | | JT | JT | UJT | JT | JT |
| Sodium | | | JT | BJT | BJT | JT | JT |
| Nickel | | | UJT | UJT | UJT | JT | JT |
| Vanadium | | | UJT | UJT | UJT | JT | UJT |
| Mercury | | | UJT | UJT | JT | JT | JT |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R7002FD | R7003 | R7004 | R7005 | R7006 | R7008 | R7009 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | Water | water | water | water | Sawdust | Sawdust |
| | | | | | | | |
| Thallium | | | UJTD | UJTD | UJTD | UJT | UJT |
| Zinc | BJI | BJI | BJT | BJT | BJT | JT | JT |
| | | | | | | | |

Site Name: Ravenna Army Ammunition Plant

| Sample ID | R7011 | R7012 | R9104FB | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Matrix | water | Water | Water | | | | |
| | | | | | | | |
| Silver | | | UJT | | | | |
| Aluminum | JS | JS | UJT | | | | |
| Arsenic | | | UJT | | | | |
| Barium | | | UJT | | | | |
| Beryllium | | | UJT | | | | |
| Cadmium | | | UJT | | | | |
| Calcium | | | BJT | | | | |
| Chromium | | | UJT | | | | |
| Cobalt | | | UJT | | | | |
| Lead | | | UJT | | | | |
| Copper | | | UJT | | | | |
| Antimony | | | UJT | | | | |
| Iron | JS | JS | UJT | | | | |
| Selenium | | | UJT | | | | |
| Potassium | | | UJT | | | | |
| Magnesium | | | UJT | | | | |
| Manganese | | | UJT | | | | |
| Sodium | | | UJT | | | | |
| Nickel | | | UJT | | | | |
| Vanadium | | | UJT | | | | |
| Mercury | | | BJT | | | | |
| Thallium | JI | | UJT | | | | |
| Zinc | | | UJT | | | | |
| Total Cyanide | -- | -- | UJT | | | | |
| | | | | | | | |

## APPENDIX A – Data Qualifier Definitions

## Definitions of Data Qualifiers

The following codes are considered the "EPA" qualifiers and specified for use by the various Functional Guidelines for data validation.

**R**: Rejected - Data are unusable (Note: Analyte may or may not be present).

**U**: Undetected; the analyte was not detected above the MDA

**N**: Tentatively Identified

**J**: Estimated

**UJ**: Undetected, but the number that is reported as the quantitation limit is an estimated value

**B**: Impacted by an associated blank

The following subqualifiers give further detail of the type and amount of qualification a given data point has received.

-H: Qualified due to holding time violation

-T: Qualified due to sample preservation problems

-I: Qualified due to interference problems

-D: Qualified due to precision problems (duplicate control limits not met)

-S: Qualified due to accuracy problems (matrix spike recovery criteria not met)

-C: Qualified due to instrument calibration problems

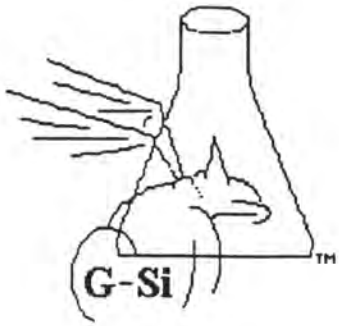
-L: Qualified due to accuracy problems (LCS recovery criteria not met)

-G: Qualified due to background problems

-K: Qualified due to negative blank value problems

-I: Qualified due to interferences (i.e., from serial dilution or GFAA post spikes)

-Q: Qualified for other reasons - refer to the text of the report




12/10/98

Joyce Dishner
IT Corporation
312 Directors Drive
Knoxville, TN 37923-4799
423-690-3211

Dear Joyce,

Please find enclosed a bound original and one copy, each, of the Organics and TCLP/Reactive Cyanide/Sulfide/Flashpoint/ Corrosivity data validation reports for your Ravenna Army Ammunition Plant project. The metals report will be sent under separate cover. I will send the invoice with the completed Explosives report once I receive the final laboratory responses.

Thank you for the opportunity to work with you on this project. Please let me know if there is anything else we can do for you or if you have questions.

Sincerely,

Roger Simon

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2215 S. Estes St.
Lakewood, CO 80227-2324
303-987-2801 (T) • 303-987-0317 (F) • 303-257-3982 (Cell)
ras@idcomm.com

# DATA VALIDATION REPORT

| | |
|---|---|
| Program: | U.S. Army Corps of Engineers, U.S. EPA |
| Site: | Ravenna Army Ammunition Plant |
| Sampling Date (Month/Year): | 9/98 |
| Client: | IT Corporation, Knoxville, TN |
| Analytical Laboratory: | Quanterra, North Canton, OH |
| Case No.: | N/A |
| Sample Delivery Group (SDG): | A8I230116 |
| Analyses: | TCLP Volatiles, Semivolatiles, Pesticides, Herbicides and Metals, Reactive Cyanide and Sulfide |

Signatures:

Data Reviewer: Roger Simon Date: 12/10/98

QA/QC Review: Doug Kolb Date: 12/10/98

Senior Approval: Roger Simon Date: 12/10/98

## Validation Summary Narrative

Aside from some minor calibration outliers and holding time violations, data were of reasonable quality. The laboratory's frequency of analysis of matrix QC (matrix spikes and matrix duplicates) was spotty; this resulted in no accuracy information being available for reactive cyanide and reactive sulfide. Although some minor documentation issues existed, these were not sufficient to impact data quality. The laboratory's reporting limit did not meet the regulatory level for chlordane.

## Table of Contents

## 1.0 Sample IDs

The following table summarizes sample IDs, matrix of each sample and analyses present in the data package for each sample.

| Sample Number | Matrix | TCLP V | TCLP B | TCLP P | TCLP H | TCLP M | R-C/S | Fp | Corr |
|---|---|---|---|---|---|---|---|---|---|
| **SDG A8I230116** | | | | | | | | | |
| R1201 | TCLP | X | X | X | X | X | X | X | X |
| R1202TB | QC | X | | | | | | | |

Laboratory QC Samples

Please see sections 8.2.1 and 9.1.1

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Number of Samples Analyzed: | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Total Number of Analyses: | 4 | 3 | 1 | 3 | 3 | 2 | 2 | 2 |

TCLP = Toxicity Characteristic Leachate Procedure
V = Volatiles by SW-846 Method 8260B B = Semivolatiles by SW-846 Method 8270C
P = Pesticdes by SW-846 Method 8081A H = Herbicides by SW-846 Method 8151A
M = Metals by SW-846 Method 6010B C = Cyanide by SW-846 Method 7.3.3
R = Reactive S = Sulfide by SW-846 Method 7.3.4 Fp = Flashpoint by ASTM Method D 92-90
Corr = Corrosivity (pH) by SW-846 Method 9045A

X: analysis was provided for validation
O: analysis was requested on Chain of Custody Record, but not provided for validation
NR: analysis was not requested on Chain of Custody Record

MS: matrix spike MSD: matrix spike duplicate Dup: matrix duplicate
RE: re-analysis DL: dilution analysis

W: water S: soil Sed: sediment QC: field blank (trip, equipment, rinseate, etc.)

## 2.0 Deliverables

With the exception of the Pesticide PEM from 10/7/98, 1112, all data deliverables as specified for Level III quality control were found in the package. The aforementioned PEM standard was provided by the laboratory in a raw data format.

## 2.1 Completeness Checklist

The following table summarizes the summary form information and raw data found in the package. Form numbers shown in parentheses refer to the current U.S. EPA CLP Organics or Inorganics SOW; equivalent reporting of results in an alternate summary format has been determined to be acceptable.

| Deliverable | |
|---|---|
| X | Case Narrative |
| X | Chain of Custody Records/Traffic Reports/Tracking Records |
| X | Preservation Information |
| X | Sample Cross Reference with Unique Identifiers |
| X | Sample Results Summary Form (Form 1) |
| X | CLP Flagging used on Results Summary |
| X | Initial Calibration (Corr. Coefficients, %RSD, min RRF, standards) |
| X/RS | Continuing Calibration Verification |
| X | Method/Preparation Blank Results Summary (Form 3) |
| X | Matrix Spike/Matrix Spike Duplicate Results Summary (Form 5A) |
| X | Matrix Duplicate Results (Form 6) |
| X | Laboratory Control Sample (LCS)/ Blank Spike Results Summary (Form 7) |
| O | Control Charts |
| X | Internal Standard (Form 8) |
| X | Surrogates (Form 2) |
| X | Legible Pages |
| X | Pages in Package Numbered and in Sequence |
| NR | Electronic Data Deliverable (EDD) |

X = Included in original Data Package
O = Not Included and/or Not Available
NR = Not Required
RS = Provided as a Resubmission

## 3.0 Detection Limits

The following is a table of samples and compounds having detection limits that do not meet regulatory limits:

| Sample ID | Compound/ Analyte | Reported Detection Limit (mg/L) | Regulatory Level (mg/L) |
|---|---|---|---|
| R1201 | Chlordane | 0.05 | 0.03 |

## 4.0 Holding Times

Samples were prepared and analyzed within holding times specified by the data validation guidelines except as noted in the following table. The holding time is from the date of sample collection to the date of analysis.

| Sample | Fraction* | Sampling Date | TCLP Extract Date | Number of Days Out | Qualifier |
|---|---|---|---|---|---|
| R1201 | Volatiles | 9/20/98 | 10/8/98 | 4 | J-H/UJ-H |
| R1202 | Volatiles | 9/20/98 | 10/8/98 | 4 | J-H/UJ-H |

* all compounds in a fraction are qualified

### 4.1 Sample Preservation

Samples were preserved properly.

### 4.2 Chain of Custody Records

All Chain of Custody Records were present and completed properly.

## 5.0 Calibration Quality Control

### 5.1 Initial Calibration

#### 5.1.1 Correlation Coefficient

The required summary forms/information were provided and information was present to determine that correlation coefficients ($r^2$) were greater than 0.995.

#### 5.1.2 ICP Initial Calibration

The required summary forms/information were provided and information was present to verify that ICP initial calibration included at least standard and one blank.

#### 5.1.3 GC/MS Tune

The required summary forms/information were provided and information was present to verify that GC/MS tuning requirements were met.

### 5.1.4 Calibration Factors/ICVs

Calibration factors/%RSDs/initial calibration verifications (ICVs) met specified criteria with the exception of toxaphene which had a %RSD = 21.0 on the second column and was qualified as estimated (UJ-C).

### 5.1.5 Minimum RRFs

The required summary forms/information were provided and information was present to verify that minimum RRFs for target compounds were obtained.

### 5.1.6 Other

No initial calibration information (standard normality verifications, etc.) was provided for titrimetric cyanide and sulfide analyses. Since these were titrimetric analyses and dependent primarily on previously titrated standard normalities, results have been qualified as estimated (UJ-Q) in lieu of rejected.

## 5.2 Continuing Calibration

### 5.2.1 %D / %R

Except as noted below, the continuing calibration standard (CCV) analyses were reported as required and had recoveries reported to be within the Level III specified control limits.

| Samples Affected | Compound/Analyte | Date/Time | %D or % R | Qualifier |
|---|---|---|---|---|
| None* | mercury | 9/30/98 | 79.8 % R | None |
| R1201 | 2,4-D | 10/17/98 1039 | 16.5 % D | UJ-C |
| R1201 | Lindane | 10/7/98 1900 | 19.8 % D (1°) | UJ-C |
| | Heptachlor | | 38.7, 18.2 % D (1°, 2°) | UJ-C |
| | Endrin | | 31.6 % D (2°) | UJ-C |
| | Methoxychlor | | 75.6 % D (2°) | UJ-C |

* an out of control mercury CCV was noted in the same run as sample R1201. Since sample R1201 was bracketed by CCV standards that met control criteria, no action was taken by the reviewer. The laboratory failed, however, to terminate the run and generate a new calibration curve after the out of control event.

Continuing check standards were not analyzed with reactive cyanide, flashpoint or reactive sulfide.

For volatiles, the laboratory quantitated directly off the initial calibration (i.e., no Form 7 check standard was available). The reviewer compared the mid-point standard responses of the ICAL with the ICAL average to verify calibration.

### 5.2.2 Minimum RRFs

The required summary forms/information were provided and information was present to verify that minimum RRFs were obtained.

## 6.0 Blank Quality Control

### 6.1 Instrument Blanks

Instrument blanks were not analyzed.

### 6.2 ICB/CCBs

Initial and continuing calibration blanks (ICB/CCB) are not specified for Level III review. However, cursory review of these blanks indicated that all analyte values were less than their respective CRDLs.

### 6.3 Method/Preparation Blanks

A preparation/method blank was prepared and analyzed at the specified frequency. With the exception of chloroform in the volatile method blank, no compounds/analytes were detected. No qualifiers were required since chloroform was not reported as detected in samples R1201 or R1202TB.

## 7.0 Field QC Blanks

### 7.1 Field Blanks

No field blanks were associated with samples in this SDG.

### 7.2 Equipment Rinseate Blanks

No rinseate blanks were associated with samples in this SDG.

### 7.3 Trip Blanks

Toluene (*not a target compound*) was reported as present (0.020 mg/L) in trip blank R1202TB. Since toluene was not reported in sample R1201, no qualification was required.

### 7.4 Ambient Conditions Blanks

Ambient conditions blanks were not sampled.

## 8.0 Accuracy

### 8.1 Laboratory Control Samples/Blank Spikes

#### 8.1.1 Frequency

Blank spikes/laboratory control samples (LCS) were prepared and analyzed with each sample batch and for each matrix in the data package with the exception of reactive cyanide and reactive sulfide. Since neither an LCS nor matrix spike analysis was provided and accuracy could not be assessed, all reactive cyanide and sulfide results have been qualified as estimated (UJ-Q).

#### 8.1.2 Control Charts

Although laboratory control charts were not present in any data package, the laboratory did include their internal QC limits.

#### 8.1.3 Recovery

Blank spike/LCS recoveries met control limits specified by the Ravenna QAPP.

#### 8.1.4 Reanalyses

No re-analyses based on LCS analyses were required.

## 8.2 Matrix Spikes / Matrix Spike Duplicates

### 8.2.1 Frequency

The matrix (pre-digest) spike frequency requirement was not met. The following table summarizes samples used for matrix spiking, their matrices, parameters and samples associated with that matrix spike sample.

| Matrix Spike Sample | Matrix | Fraction | Associated Samples |
|---|---|---|---|
| R1202TB | TCLP | Volatiles | R1201 |
| R1201 | TCLP | Semivolatiles, herbicides | R1201 |
| none | TCLP | Pesticide, Reactive Cyanide, Reactive Sulfide, Flashpoint, Corrosivity | R1201 |
| A8I260167-002 | TCLP | Metals | R1201 |

For Pesticides and corrosivity, where a matrix spike was not performed, an LCS was performed. Since accuracy could be assessed to some extent, no action was taken by the reviewer.

Matrix spike analysis is not applicable to flashpoint analysis.

Some fractions in some packages contained a matrix QC analysis that was found not to have been from the site in question. Although applied to samples per client specifications, application of matrix QC from other sites may result in qualifiers not completely representative of the sample's matrix since conditions are **not** expected to be consistent from site to site.

### 8.2.2 Recovery

Except as noted below, matrix spike / matrix spike duplicate recoveries were within the specified control limits (75 - 125%). For organics, only the compound in the sample used for spiking has been qualified per validation guidelines.

| Matrix Spike Sample | Compound | MS %R | MSD %R | %R limits | %RPD | %RPD limits | Qualifier |
|---|---|---|---|---|---|---|---|
| R1201 | Pyridine | 24 | 11 | 30-140 | 71 | 20 | UJ-SD |
| | Cresol (total) | -- | -- | -- | 25 | 20 | UJ-D |
| | o-cresol | -- | -- | -- | 24 | 20 | UJ-D |
| | m, p-cresol | -- | -- | -- | 25 | 20 | UJ-D |

Some compounds were identified as not meeting laboratory criteria; they did, however, meet QAPP criteria and were not summarized above.

## 9.0 Precision

### 9.1 Matrix Duplicates

#### 9.1.1 Frequency

The matrix (pre-digest) duplicate frequency requirement was not met since metals analyses did not have a duplicate performed. Since, however, matrix spike/matrix spike duplicate analyses were performed for metals and precision could be assessed to some extent, no action was taken by the reviewer. The following table summarizes samples used for matrix duplicate analysis, their matrices, parameters and samples associated with those matrix spike samples.

| Matrix Duplicate Sample | Matrix | Analyte | Associated Samples |
|---|---|---|---|
| H8I210120-001 | soil | Reactive cyanide, reactive sulfide | R1201 |
| R1201 | soil | Corrosivity | R1201 |
| A8I260167-002 | soil | Flash Point | R1201 |

Some fractions in some packages contained a matrix QC analysis that was found not to have been from the site in question. Although applied to samples per client specifications, application of matrix QC from other sites may result in qualifiers not completely representative of the sample's matrix since conditions are **not** expected to be consistent from site to site.

#### 9.1.2 Performance

Matrix (pre-digest) duplicate differences were within specified control limits (20% RPD or the duplicate difference less than the MDA for results less than five times the MDA).

## 9.2 Matrix Spike Duplicates

### 9.2.1 Frequency

The matrix spike /matrix spike duplicate frequency requirement was met. Please see section 8.2.1 for a table summarizing matrix spike/matrix spiked duplicate analyses.

### 9.2.2 Performance

Matrix spike/matrix spike duplicate differences met contract-specified control limits (20% RPD for waters, 35% for soils).

## 10.0 SMCs/Surrogates

### 10.1 Frequency

System Monitoring Compounds (SMCs)/surrogates were analyzed at the specified frequency.

### 10.2 Recovery

With the exception of the following, system Monitoring Compounds (SMCs)/surrogates met all criteria.

| Sample ID | Surrogate | %R | %R limits | Qualifier | Affected Compouds |
|---|---|---|---|---|---|
| R1201 | DCB | 0 D | | None* | |

* Results diluted out, no qualifiers applied.

### 10.3 Reanalysis

Reanalyses were not required.

## 11.0 Internal Standard

### 11.1 Frequency

Internal standards were analyzed at the specified frequency.

### 11.2 Recovery

Internal standard recoveries and retention times met all criteria.

### 11.3 Reanalysis

Reanalyses were performed as required.

## 12.0 Reanalyses

Reanalyses were performed when required. Please see sections 8.1.4, 10.3, and 11.3.

## 13.0 Dilution Analyses

### 13.1 Dilution Analyses

Secondary dilutions were performed when required. Please see sections 10.2.

Undiluted analyses were not provided by the laboratory.

### 13.2 Serial Dilution

Because the ICP serial dilution analysis was performed on a different client's sample, the laboratory did not include an Inorganics Form 9. Since all metals results were reported as "not detected," a lack of serial dilution analysis is considered inconsequential. Had a serial dilution analysis been performed, no outliers would have been obtained since all sample results were less than 50x IDL.

## 14.0 Case Narratives

Case narratives were for the most part generic and generally did a poor job of describing specific issues found in the data package. For some data packages, entire fractions were not addressed. In addition, in most cases where calibration problems existed, these were not addressed.

## 15.0 Field Duplicates

No field duplicates were present in this SDG.

## 16.0 System Performance

Except as noted previously, the instrumental and analytical systems used in the analysis of these samples maintained an acceptable level of performance.

## 17.0 Contract Requirements

Please see sections 4.0, 5.1.6, 5.2.1, 8.1.1 and 18.0 for information concerning non-compliant situations.

## 18.0 Additional Comments

The laboratory did not meet the quarterly requirement for mercury instrument detection limit determination.

## 19.0 Sample Data Qualifier Table

Site Name: Ravenna
SDG A8I230116

| Compound/Analyte | R1201 | R1202 | | | R1201 | |
|---|---|---|---|---|---|---|
| Matrix | Leach | QC | | | leach | |
| | | | | | | |
| **TCLP Volatiles** | | | | **TCLP Pesticides** | | |
| Benzene | UJH | UJH | | Chlordane (technical) | | |
| Carbon tetrachloride | JH | UJH | | Endrin | UJC | |
| Chlorobenzene | UJH | UJH | | Heptachlor | UJC | |
| Chloroform | UJH | UJH | | Heptachlor epoxide | | |
| 1,2-dichloroethane | UJH | UJH | | Lindane | UJC | |
| 1,1-dichloroethylene | UJH | UJH | | Methoxychlor | UJC | |
| Toluene | -- | JH | | Toxaphene | UJC | |
| Methyl ethyl ketone | UJH | UJH | | | | |
| Tetrachloroethylene | UJH | UJH | | **TCLP Herbicides** | | |
| Vinyl chloride | UJH | UJH | | 2,4-D | UJC | |
| | | | | 2,4,5-TP (Silvex) | | |
| **TCLP Semivolatiles** | | | | | | |
| o-cresol | UJD | -- | | **TCLP Metals** | | |
| m-cresol & p-cresol | UJD | -- | | Arsenic | | |
| 1,4-dichlorobenzene | | -- | | Barium | | |
| 2,4-dinitrotoluene | | -- | | Cadmium | | |
| Hexachlorobenzene | | -- | | Chromium | | |
| Hexachlorobutadiene | | -- | | Lead | | |
| Hexachloroethane | | -- | | Selenium | | |
| Nitrobenzene | | -- | | Silver | | |
| Pentachlorophenol | | -- | | Mercury | | |
| Pyridine | UJSD | -- | | | | |
| 2,4,5-trichlorophenol | | -- | | **Other** | | |
| 2,4,6-trichlorophenol | | -- | | matrix | soil | |
| Cresols (total) | UJD | -- | | Corrosivity | | |
| | | | | Flashpoint | | |
| | | | | Reactive Cyanide | UJQ | |
| | | | | Reactive Sulfide | UJQ | |
| | | | | | | |

-- = not analyzed

## APPENDIX A – Data Qualifier Definitions

## Definitions of Data Qualifiers

The following codes are considered the "EPA" qualifiers and specified for use by the various Functional Guidelines for data validation.

**R**: Rejected - Data are unusable (Note: Analyte may or may not be present).

**U**: Undetected; the analyte was not detected above the MDA

**N**: Tentatively Identified

**J**: Estimated

**UJ**: Undetected, but the number that is reported as the quantitation limit (MDA) is an estimated value

**B**: Impacted by an associated blank

The following subqualifiers give further detail of the type and amount of qualification a given data point has received.

-H: Qualified due to holding time violation

-P: Qualified due to sample preservation problems

-I: Qualified due to interference problems

-D: Qualified due to precision problems (duplicate control limits not met)

-S: Qualified due to accuracy problems (matrix spike recovery criteria not met)

-C: Qualified due to instrument calibration problems

-L: Qualified due to accuracy problems (LCS recovery criteria not met)

-G: Qualified due to background problems

-K: Qualified due to negative blank value problems

-T: Qualified due to chemical tracer/internal standard problems

-Q: Qualified for other reasons - refer to the text of the report

# DATA VALIDATION REPORT

| | |
|---|---|
| Program: | U.S. Army Corps of Engineers, U.S. EPA |
| Site: | Ravenna Army Ammunition Plant |
| Sampling Date (Month/Year): | 9/98 |
| Client: | IT Corporation, Knoxville, TN |
| Analytical Laboratory: | Quanterra, North Canton, OH |
| Case No.: | N/A |
| Sample Delivery Group (SDG): | A8I110156, A8I110171-A, A8I110171-B, A8I190158, A8I190159, A8I230103 and A8I240174 |
| Analyses: | Volatiles, Semivolatiles, Pesticides, Herbicides |

Signatures:

Data Reviewer: Roger Simon Date: 12/10/98

QA/QC Review: Doug Kolb Date: 12/10/98

Senior Approval: Roger Simon Date: 12/10/98

## Validation Summary Narrative

Due to the large number of minor qualifiers present, the data did not maintain as high a degree of quality as it could have. Nearly every sample was impacted by temperatures greater than 6°C, which resulted in a large number of qualifiers. Since it is expected that appreciable cooling over ambient conditions was likely, these are considered to be minor estimations. All blank values were well less than 2x the quantitation limit (accounting for dilution), although methylene chloride results were generally flagged with a "B". Detection limits for vinyl chloride, toluene, and a number of semivolatile compounds failed to meet the QAPP specified criteria. Minor calibration problems were noted for a variety of compounds which resulted in qualification. Finally, in sample R7004, two semivolatile internal standards did not meet response criteria. In this case, as well as some where surrogate recoveries were out of specifications, the laboratory did not reanalyze the samples.

## Table of Contents

## 1.0 Sample IDs

The following table summarizes sample IDs, matrix of each sample and analyses present in the data package for each sample.

| Sample Number | Matrix | V | B | P | H |
|---|---|---|---|---|---|
| **SDG A8I110156** | | | | | |
| R7004 | W | X | X | -- | -- |
| R7005 | W | X | X | -- | -- |
| R7006 | W | X | X | -- | -- |
| R7007TB | QC | X | -- | -- | -- |
| *SDG subtotal:* | | 4 | 3 | 0 | 0 |
| **SDG A8I110171-A** | | | | | |
| R5109FB | QC | X | X | -- | -- |
| R5113TB | QC | X | -- | -- | -- |
| *SDG subtotal:* | | 2 | 1 | 0 | 0 |
| **SDG A8I110171-B** | | | | | |
| R7009 | Sawdust | X | X | -- | -- |
| *SDG subtotal:* | | 1 | 1 | 0 | 0 |
| **SDG A8I190158** | | | | | |
| R9104FB | QC | -- | -- | X | X |
| R9100 | W | -- | -- | X | X |
| R9101 | W | -- | -- | X | X |
| R9102 | W | -- | -- | X | X |
| *SDG subtotal:* | | 0 | 0 | 4 | 4 |
| **SDG A8I190159** | | | | | |
| R9103 | W | -- | -- | X | X |
| *SDG subtotal:* | | 0 | 0 | 1 | 1 |
| **SDG A8I230103** | | | | | |
| R7010TB | QC | X | -- | -- | -- |
| R7011 | W | X | X | -- | -- |
| *SDG subtotal:* | | 2 | 1 | 0 | 0 |

| Sample Number | Matrix | V | B | P | H |
|---|---|---|---|---|---|
| **SDG A8I240174** | | | | | |
| R9105 | W | -- | -- | X | X |
| *SDG subtotal:* | | 0 | 0 | 1 | 1 |

Laboratory QC Samples

Please see section 8.2.1

| | | | | | |
|---|---|---|---|---|---|
| Number of Samples Analyzed: | 9 | 6 | 6 | 6 |
| Total Number of Analyses: | 17 | 14 | 6 | 12 |

V = Volatiles by SW-846 Method 8260B  B = Semivolatiles by SW-846 Method 8270C
P = Pesticdes by SW-846 Method 8081A  H = Herbicides by SW-846 Method 8151A

X: analysis was provided for validation
O: analysis was requested on Chain of Custody Record, but not provided for validation
NR: analysis was not requested on Chain of Custody Record

MS: matrix spike  MSD: matrix spike duplicate  Dup: matrix duplicate
RE: re-analysis  DL: dilution analysis

W: water  S: soil  Sed: sediment  QC: field blank (trip, equipment, rinseate, etc.)

## 2.0 Deliverables

With the exception of the following, all data deliverables as specified for Level III quality control were found in the package.

- GC/MS Volatile Standard Data (ICAL/CCAL) for SDG A8I230103
- GC/MS Volatile Tune Data for SDG A8I230103
- GC/MS Semivolatile Tune Raw Data for SDG A8I230103

Missing data was provided by the laboratory. In response to a question concerning herbicide column identification, the laboratory provided a copy of data originally provided in the data package and did not identify which column was primary and which was secondary. The reviewer has therefore followed standard GC assessment procedures and based herbicide qualification decisions on a 'worst case' scenario.

## 2.1 Completeness Checklist

The following table summarizes the summary form information and raw data found in the package. Form numbers shown in parentheses refer to the current U.S. EPA CLP Organics and/or Inorganics SOWs; equivalent reporting

of results in an alternate summary format has been determined to be acceptable.

| Deliverable | | | | |
|---|---|---|---|---|
| V | B | P | H | |
| X | X | X | X | Case Narrative |
| X | X | X | X | Chain of Custody Records/Traffic Reports/Tracking Records |
| X | X | X | X | Preservation Information |
| X | X | X | X | Sample Cross Reference with Unique Identifiers |
| X | X | X | X | Sample Results Summary Form (Form 1) |
| X | X | X | X | CLP Flagging used on Results Summary |
| X/RS | X | X | X | Initial Calibration: Correlation Coeff. / RRF / %RSD |
| X/RS | X | NR | NR | Initial Calibration: GC/MS Tune |
| X/RS | X | X | X | Continuing Calibration Verification |
| X | X | X | X | Method/Preparation Blank Results Summary (Form 3) |
| X | X | O | X | Matrix Spike/Matrix Spike Duplicate Results Summary (Form 5A) |
| NR | NR | NR | NR | Matrix Duplicate Results (Form 6) |
| X | X | X | X | Laboratory Control Sample (LCS)/ Blank Spike Results Summary (Form 7) |
| O | O | O | O | Control Charts |
| X | X | NR | NR | Internal Standard |
| X | X | X | X | Surrogate/SMC |
| X | X | X | X | Legible Pages |
| X | X | X | X | Pages in Package Numbered and in Sequence |
| NR | NR | NR | NR | Electronic Data Deliverable (EDD) |

X = Included in original Data Package
O = Not Included and/or Not Available
NR = Not Required
RS = Provided as a Resubmission

## 3.0 Detection Limits

The following is a table of samples and analytes having quantitation limits that do not meet the contract required or project-specific CRQLs:

| Sample ID | Compound | Reported Quantitation Limit | CRQL per Ravenna QAPP |
|---|---|---|---|
| All waters | Vinyl chloride | 10 µg/L | 2 µg/L |
| | toluene | 5 µg/L | 2 µg/L |
| | Pentachlorophenol | 10 µg/L | 5 µg/L |
| | Dimethyl phthalate | 10 µg/L | 5 µg/L |
| | Diethyl phthalate | 10 µg/L | 5 µg/L |
| | di-n-butyl phthalate | 10 µg/L | 5 µg/L |
| | di-n-octyl phthalate | 10 µg/L | 5 µg/L |
| | Bis(2-ethylhexyl) phthalate | 10 µg/L | 5 µg/L |
| | Butylbenzyl phthalate | 10 µg/L | 5 µg/L |
| | Benzo[a]pyrene | 10 µg/L | 0.2 µg/L |
| All soils | Vinyl chloride | 3.5 mg/kg | 2 mg/kg |

## 4.0 Holding Times

Samples were prepared and analyzed within holding times specified by the data validation guidelines. The holding time is from the date of sample collection to the date of extraction and from the date of extraction to the date of analysis.

## 4.1 Sample Preservation

Sample temperature in a number of coolers were greater than 6°C (4°C ± 2). The following table summarizes samples, SDGs, temperatures and qualifiers due to temperature preservation problems. pH requirements were met. All other samples were preserved properly.

| SDG | Samples Affected | Fractions Affected* | Temperature (°C) | Qualifier |
|---|---|---|---|---|
| A8I110171-A | R5109FB | V, B | 8.2 | J-T/UJ-T |
| A8I110171-A | R5113TB | V | 8.2 | J-T/UJ-T |
| A8I110156 | R7004, R7005, R7006 | V, B | 7.4 | J-T/UJ-T |
| A8I110156 | R7007TB | V | 7.4 | J-T/UJ-T |
| A8I110171-B | R7009 | V, B | 8.2 | J-T/UJ-T |
| A8I190158 | R9104FB, R9100, R9101, R9102 | P, H | 7.3, 10.4 | J-T/UJ-T |

* all compounds in a fraction are qualified

## 4.2 Chain of Custody Records

All Chain of Custody Records were present and completed properly.

## 5.0 Calibration Quality Control

## 5.1 Initial Calibration

### 5.1.1 Correlation Coefficient

The required summary forms/information were provided and information was present to determine that correlation coefficients ($r^2$) were greater than 0.995.

### 5.1.2 GC/MS Tune

GC/MS tuning requirements were met.

### 5.1.3 Calibration Factors/%RSDs

Calibration factors/%RSDs met specified criteria.

The following tables summarizes samples, calibration factors / %RSDs that did not meet criteria and associated qualifiers.

| SDG | Samples Affected | Compound | Date/Time | Instrument | %RSD or $r^2$ | Qualifier |
|---|---|---|---|---|---|---|
| A8I230103 | R7011 | 4-nitroaniline | 10/8 0947 | A4HP7 | 30.6 | UJ-C |
| A8I110171-A | R5109FB | 4-chloroaniline<br>3-nitroaniline | 9/20 0617 | A4HP6 | 46.2<br>64.2 | UJ-C<br>UJ-C |
| A8I110171-B | R7009 | 4-chloroaniline<br>3-nitroaniline | 9/23 0956 | A4HP7 | 36.5<br>37.8 | UJ-C<br>UJ-C |
| A8I110156 | R7004, R7005, R7006 | 4-chloroaniline<br>3-nitroaniline | 9/20 0617 | A4HP6 | 46.2<br>64.2 | UJ-C<br>UJ-C |
| A8I110171-A | R9105FB | MCPA | 10/7 | 2° | 0.992 | UJ-C |
| A8I190158 | R9100, R9101, R9102, R9103 | Toxaphene | 9/19 1402 | 1°, 2° | 43.5, 31.9 | UJ-C |
| A8I190159 | R9104FB | Toxaphene | 9/19 1402 | 1°, 2° | 43.5, 31.9 | UJ-C |
| A8I240174 | R9105 | Toxaphene | 9/19 1402 | 1°, 2° | 43.5, 31.9 | UJ-C |

### 5.1.4 Minimum RRFs

Minimum RRFs were obtained for target compounds.

## 5.2 Continuing Calibration

### 5.2.1 %D / %R

The continuing calibration standard (CCV) analyses were reported as required and had recoveries reported to be within the Level III specified control limits.

| SDG | Samples Affected | Compound | Date/Time | Instrument | %D | Qualifier |
|---|---|---|---|---|---|---|
| A8I110171-A | R5109FB, R5113TB | Acetone | 9/20 1709 | A3UX7 | 43.8 | UJ-C |
| | | 2-butanone | | | 38.0 | UJ-C |
| | | 2-hexanone | | | 27.0 | UJ-C |
| A8I110156 | R7007TB | Acetone | 9/20 1709 | A3UX7 | 43.8 | UJ-C |
| | | 2-butanone | | | 38.0 | UJ-C |
| | | 2-hexanone | | | 27.0 | UJ-C |
| A8I110156 | R7004, R7005, R7006 | Acetone | 9/21 0947 | A3UX7 | 53.4 | UJ-C |
| | | 2-butanone | | | 50.3 | UJ-C |
| | | 2-hexanone | | | 42.4 | UJ-C |
| | | 4-methyl-2-pentanone | | | 28.7 | UJ-C |
| A8I230103 | R7010TB, R7011 | Acetone | 9/25 1112 | A3UX7 | 50.9 | J-C/UJ-C |
| | | 2-butanone | | | 49.8 | UJ-C |
| | | 2-hexanone | | | 30.9 | UJ-C |
| | | 4-methyl-2-pentanone | | | 44.5 | UJ-C |
| A8I110156 | R7005 RE, R7006 RE | Acetone | 9/22 0946 | A3UX7 | 32.2 | UJ-C |
| | | 2-butanone | | | 32.8 | UJ-C |
| A8I230103 | R7011 | 3-nitroaniline | 10/9 0815 | A4HP7 | -52.5 | UJ-C |
| | | 4-nitroaniline | | | -38.2 | UJ-C |
| | | 4-nitrophenol | | | -23.5 | UJ-C |
| | | carbazole | | | -56.6 | UJ-C |
| A8I110171-A | R5109FB | 4-chloroaniline | 9/21 0652 | A4HP7 | -50.7 | UJ-C |
| | | 3-nitroaniline | | | -106 | UJ-C |
| | | 3,3'-dichlorobenzidine | | | -27.4 | UJ-C |
| A8I110171-B | R7009 | 3,3'-dichlorobenzidine | 9/25 0831 | A4HP7 | -26.3 | UJ-C |
| A8I110156 | R7004, R7005 R7006 | 4-chloroaniline | 9/21 0652 | A4HP7 | -50.7 | UJ-C |
| | | 3-nitroaniline | | | -106 | UJ-C |
| | | 3,3'-dichlorobenzidine | | | -27.4 | UJ-C |
| A8I240174 | R9105 | All Herbicides except 2,4-DB | 10/9 1503 | 2° | >15 % | J-C/UJ-C |

### 5.2.2 Minimum RRFs

Minimum RRFs were obtained for target compounds.

## 6.0 Blank Quality Control

### 6.1 Instrument Blanks

Instrument blanks were not analyzed.

### 6.2 Method/Preparation Blanks

A preparation/method blank was prepared and analyzed at the specified frequency. The following is a table of samples and analytes requiring data

qualifiers due to reported contaminants in the preparation blanks. The samples and analytes listed below were reported to be less than five times the amount reported in the associated blank and were not re-analyzed.

| SDG | Sample ID | Analyte | Sample Amount (ug/L) | Blank Amount (ug/L) | Qualifier |
|---|---|---|---|---|---|
| A8I110156 | R7004 | Methylene chloride | 2.2 J | 0.67 J | B |
| | R7005 | Methylene Chloride | 62 | 0.67 J | B |
| | R7006 | Methylene Chloride | 1.8 J | 0.67 J | B |
| A8I110171-B | R7009 | Methylene Chloride | 2900 JB | 44 J | B |

Methylene chloride values in associated method blanks have been adjusted for dilution factors as a basis for applying blank flags.

## 7.0 Field QC Blanks

### 7.1 Field Blanks

The following table summarizes field blanks, results present within them and their associated samples.

| SDG | Blank ID | Analyte | Amount | Associated Samples |
|---|---|---|---|---|
| A8I190158 | 9104FB | None reported | | R7011, R9100, R9101, R9102, R9103, R9105 |
| A8I110171-A | 5109FB | Methylene chloride | 0.93 J | R7004, R7005, R7006, R7009 |

The following table summarizes samples and qualifiers associated with field blanks containing target analytes.

| SDG | Sample ID | Analyte | Sample Amount (ug/L) | Blank Amount (ug/L) | Qualifier |
|---|---|---|---|---|---|
| A8I110156 | R7004 | Methylene | 2.2 J | 0.93 J | B |
| | R7005 | Chloride | 62 | | B |
| | R7006 | | 1.8 J | | B |
| | | | (mg/kg) | | |
| A8I110171-B | R7009 | Methylene Chloride | 2900 J | 0.93 J | B |

### 7.2 Equipment Rinseate Blanks

Not applicable.

### 7.3 Trip Blanks

The following table summarizes trip blanks, results present within them and their associated samples.

| SDG | Blank ID | Analyte | Amount | Associated Samples |
|---|---|---|---|---|
| A8I110156 | R7007TB | Methylene chloride | 0.64 J | R7005, R7006 |
| A8I110171-A | R5113TB | None reported | | R7009 |
| A8I230103 | R7010TB | None reported | | R7011 |

The following table summarizes samples and qualifiers associated with field blanks containing target analytes.

| SDG | Sample ID | Analyte | Sample Amount (ug/L) | Blank Amount (ug/L) | Qualifier |
|---|---|---|---|---|---|
| A8I110156 | R7006 | Methylene | 1.8 J | 0.64 J | B |
| | R7005 | Chloride | 62 | | B |

### 7.4 Ambient Conditions Blanks

Ambient conditions blanks were not sampled.

## 8.0 Accuracy

### 8.1 Laboratory Control Samples/Blank Spikes

#### 8.1.1 Frequency

Blank spikes/laboratory control samples (LCS) were prepared and analyzed with each sample batch and for each matrix in the data package.

#### 8.1.2 Control Charts

Although laboratory control charts were not present in any data package, the laboratory did include their internal QC limits. Control limits specified by the QAPP were used for evaluation of data.

### 8.1.3 Recovery

Blank spike/LCS (and blank spike duplicate, when analyzed) recoveries met control limits specified by the Ravenna QAPP.

### 8.1.4 Reanalyses

Not applicable.

## 8.2 Matrix Spikes / Matrix Spike Duplicates

### 8.2.1 Frequency

The matrix (pre-digest) spike frequency requirement was not met. The following table summarizes samples used for matrix spiking, their matrices, parameters and samples associated with that matrix spike sample.

| Matrix Spike Sample | Matrix | Fraction | Associated Samples |
|---|---|---|---|
| "LAB MS/MSD" | W | Volatiles, semivolatiles | SDG A8I230103 |
| "LAB MS/MSD"<br>R5109FB | W | Volatiles<br>Semivolatiles | SDG A8I110171-A |
| "LAB MS/MSD"<br>"LAB MS/MSD" | W<br>W | Volatiles<br>Semivolatiles | SDG A8I110156 |
| R7009 | Sawdust | Volatiles, semivolatiles | SDG A8I110171-B |
| None | W | Pesticides | SDG A8I190158, A8I190159, A8I240174 |
| R9105<br>"LAB MS/MSD" | W<br>W | Herbicides<br>Herbicides | SDG A8I240174<br>SDG A8I190159 |
| R9104FB | W | Herbicides | SDG A8I190158 |

The reviewer noted that samples R9104FB and R5109FB, used by the laboratory as matrix spike samples, are field blanks. These samples may not be completely representative of sample matrix for other non-blank water samples in the data package.

For analyses where a matrix spike was not performed, LCS / LCS Duplicate analyses were performed. Since accuracy and precision could be assessed to some extent, no action was taken by the reviewer.

Some fractions in some packages contained a matrix QC analysisthat was found not to have been from the site in question. Although applied to samples per client specifications, application of matrix QC from other sites may result in qualifiers not completely representative of the sample's matrix since conditions are **not** expected to be consistent from site to site.

### 8.3.2 Recovery

Matrix spike / matrix spike duplicate recoveries were within QAPP specified control limits with the exception of the following. Only the compound in the sample used for spiking has been qualified per validation guidelines.

| Matrix Spike Sample | Compound | MS %R | MSD %R | %R limits | %RPD | %RPD limits | Qualifier |
|---|---|---|---|---|---|---|---|
| "LAB MS/MSD" | Benzene[a] | 36 | 35 | 50-150 | -- | -- | None |
| R7009 | 4-chloro-3-methylphenol[b] | 176 | 154 | 30-140 | -- | -- | None |
| R9105 | 2,4-D | 790 | 0[c] | | 200[c] | -- | None |
| | 2,4,5-TP | 0* | 0[c] | -- | [c] | -- | None |
| | 2,4,5-T | 0* | 0[c] | -- | [c] | -- | None |

[a] no qualifiers have been applied since the MS/MSD sample was not identified
[b] no qualifiers have been applied since 4-chloro-3-methylphenol results in sample R7009 were not detected; undetected results are not impacted by the high bias indicated by a high spike recovery.
[c] results diluted out, no qualifiers applied

## 9.0 Precision

## 9.1 Matrix Duplicates

### 9.1.1 Frequency

Matrix (pre-digest) duplicate analyses were not performed and are typically not a part of organics analyses.

### 9.1.2 Performance

Please see section 9.1.1.

## 9.2 Matrix Spike Duplicates

### 9.2.1 Frequency

Please see section 8.2.1 for a table summarizing matrix spike/matrix spiked duplicate analyses.

### 9.2.2 Performance

With the exception of compounds affected by sample dilution problems, matrix spike/matrix spike duplicate differences met contract-specified control limits (20% RPD for waters, 35% for soils).

## 10.0 SMCs/Surrogates

### 10.1 Frequency

System Monitoring Compounds (SMCs)/surrogates were analyzed at the specified frequency.

### 10.2 Recovery

With the exception of the following, system Monitoring Compounds (SMCs)/surrogates met all criteria.

| Sample ID | Surrogate | %R | %R limits | Qualifier | Affected Compouds |
|---|---|---|---|---|---|
| R7005 | Bromofluorobenzene | 118 | 86-115 | J-S / none[a] | All detected volatiles |
| R7011 | Terphenyl-$d_{14}$ | 15 | 33-141 | None[b] | |
| R7009 | 2-fluorobiphenyl | 0 D | | None[c] | |
| R9101 | TCM | 0 D | | None[c] | |
| R9105 | DCB | 0 D | | None[c] | |
| LCS (8273107) | DCB | 308 | | None[d] | |
| R9105 | DCAA | 177 D | 30-130 | J-S / none | All detected herbicides |
| R9105 MS | DCAA | 0 D | | None[c] | |
| R9105 MSD | DCAA | 134 D | | None[d] | |

[a] Undetected results are not impacted by the high bias indicated by a high surrogate recovery and have not been qualified.

[b] No qualifiers are required when only one base neutral or one acid compound is out and recoveries are greater than 10%.

[c] Results diluted out, no qualifiers applied.

[d] Qualifiers are not applied to QC samples.

### 10.3 Reanalysis

Reanalyses were performed as required.

## 11.0 Internal Standard

### 11.1 Frequency

Internal standards were analyzed at the specified frequency.

### 11.2 Recovery

With the exception of the following, internal standard recoveries and retention times met all criteria.

| Sample ID | IS | Response or rt | Limits | Qualifier | Affected Compouds |
|---|---|---|---|---|---|
| R7004 | IS5 (CRY) | 743149 | 808992 – 3235968 | J-I/UJ-I | benzo[a]anthracene, bis(2-ethylhexyl) phthalate, butylbenzyl phthalate, chrysene, 3,3'-dichlorobenzidine, pyrene |
| R7004 | IS6 (PRY) | 632916 | 697438 – 2789752 | J-I/UJ-I | Benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[g,h,i]perylene, benzo[a]pyrene, dibenz[a,h]anthracene, di-n-octylphthalate, indeno[1,2,3-cd]pyrene |

### 11.3 Reanalysis

Reanalyses were not performed.

## 12.0 Reanalyses

Please see sections 8.1.4, 10.3 and 11.3 for details concerning reanalyses.

## 13.0 Dilution Analyses

Secondary dilutions were performed when required. Please see sections 10.2.

Undiluted analyses were not provided by the laboratory.

Dilution analyses resulted in over-range methylene chloride results for samples R7005 RE-1 and R7006 RE-2. These results have therefore been qualified as estimated (J-C).

## 14.0 Case Narratives

Case narratives were for the most part generic and generally did a poor job of describing specific issues found in the data package. For some data packages, entire fractions were not addressed. In addition, in most cases where calibration problems existed, these were not addressed.

## 15.0 Field Duplicates

Field duplicate pairs were not present for analyses in this report.

## 16.0 System Performance

Except as noted previously, systems maintained an adequate level of performance.

## 17.0 Contract Requirements

Please see sections 3.0, 4.1, 5.1.3, 5.2.1, 8.2.1, 10.2 and 11.2 for information concerning non-compliant situations.

## 18.0 Additional Comments

Please see the addendum report for Ravenna for Project Correspondence, Case Narratives, Chain of Custody Records and Matrix Spike/Matrix Spike Duplicate Summary Forms. LCS/LSC Dup summary forms have been included when matrix spike analyses were not performed.

## 19.0 Sample Data Qualifier Table

Site Name: Ravenna

| Sample ID | R7004 | R7005 | R7005 RE-1 | R7006 | R7006 RE-1 | R7007TB | R5109FB | R5113TB |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Matrix | water | water | water | water | water | QC | QC | QC |
| | | | | | | | | |
| **Volatiles** | | | | | | | | |
| 1,2-dichloroethene (total) | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,2-dichloropropane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Cis-1,3-dichloropropene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Trans-1,3-dichloropropene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Ethylbenzene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 2-hexanone | UJTC | UJTC | UJT | UJTC | UJT | UJTC | UJTC | UJTC |
| Methylene chloride | BJT | BJTS | JTC | BJT | JTC | JT | JT | UJT |
| 4-methyl-2-pentanone | UJTC | UJTC | UJT | UJTC | UJT | UJT | UJT | UJT |
| Styrene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,1,2,2-tetrachloroethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Tetrachloroethene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Toluene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,1,1-trichloroethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,1,2-trichloroethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Trichloroethene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Vinyl chloride | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Xylenes (total) | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Acetone | UJTC | UJTC | UJTC | UJTC | UJTC | UJTC | UJTC | UJTC |
| Benzene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Bromodichloromethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Bromoform | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Bromomethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 2-butanone | UJTC | UJTC | UJTC | UJTC | UJTC | UJTC | UJTC | UJTC |
| Carbon disulfide | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Carbon tetrachloride | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Chlorobenzene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Dibromochloromethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Chloroethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Chloroform | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| Chloromethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,1-dichloroethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,2-dichloroethane | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| 1,1-dichloroethene | UJT | UJT | UJT | UJT | UJT | UJT | UJT | UJT |
| | | | | | | | | |
| **Semivolatiles** | | | | | | | | |
| Acenaphthene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Acenaphthylene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Anthracene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Benzo[a]anthracene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Benzo[b]fluroanthene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Benzo[k]fluoranthene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Benzo[g,h,i]perylene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Benzo[a]pyrene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Bis(2-chloroethoxy)methane | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Bis(2-chloroethyl) ether | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |

Site Name: Ravenna

| Sample ID | R7004 | R7005 | R7005 RE-1 | R7006 | R7006 RE-1 | R7007TB | R5109FB | R5113TB |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Matrix | water | water | water | water | water | QC | QC | QC |
| | | | | | | | | |
| 2,2'-Oxybis(1-Chloropropane) | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Bis(2-ethylhexyl) phthalate | UJTI | UJT | N/A | JT | N/A | N/A | UJT | N/A |
| 4-bromophenyl phenyl ether | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Butyl benzyl phthalate | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 4-chloroaniline | UJTC | UJTC | N/A | UJTC | N/A | N/A | UJTC | N/A |
| 4-chloro-3-methylphenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2-chloronaphthalene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2-chlorophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 4-chlorophenyl phenyl ether | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Chrysene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Dibenz[a,h]anthracene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Dibenzofuran | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| di-n-butyl phthalate | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 1,2-dichlorobenzene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 1,3-dichlorobenzene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 1,4-dichlorobenzene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 3,3'-dichlorobenzidine | UJTCI | UJTC | N/A | UJTC | N/A | N/A | UJTC | N/A |
| 2,4-dichlorophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Diethyl phthalate | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2,4,-dimethylphenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Dimethyl phthalate | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| di-n-octyl phthalate | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 4,6-dinitro-2-methylphenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2,4-dinitrophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2,4-dinitrotoluene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2,6-dinitrotoluene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Fluoranthene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Fluorene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Hexachlorobenzene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Hexachlorobutadiene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Hexachloroethane | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Indeno[1,2,3-cd]pyrene | UJTI | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Isophorone | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2-methylnapthalene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2-methylphenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Naphthalene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2-nitroaniline | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 3-nitroaniline | UJTC | UJTC | N/A | UJTC | N/A | N/A | UJTC | N/A |
| 4-nitroaniline | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Nitrobenzene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2-nitrophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 4-nitrophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| N-nitroso-di-n-propyl amine | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| N-nitroso diphenyl amine | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Pentachlorophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Phenanthrene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Phenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Pyrene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 1,2,4-trichlorobenzene | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 2,4,5-trichlorophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |

Site Name: Ravenna

| Sample ID | R7004 | R7005 | R7005 RE-1 | R7006 | R7006 RE-1 | R7007TB | R5109FB | R5113TB |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Matrix | water | water | water | water | water | QC | QC | QC |
| | | | | | | | | |
| 2,4,6-trichlorophenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| Carbazole | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| 4-methylphenol | UJT | UJT | N/A | UJT | N/A | N/A | UJT | N/A |
| | | | | | | | | |

Site Name: Ravenna

| Sample ID | R7009 | R7010TB | R7011 | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | QC | water | | | |
| | | | | | | |
| **Volatiles** | | | | | | |
| 1,2-dichloroethene (total) | UJT | | | | | |
| 1,2-dichloropropane | UJT | | | | | |
| Cis-1,3-dichloropropene | UJT | | | | | |
| Trans-1,3-dichloropropene | UJT | | | | | |
| Ethylbenzene | UJT | | | | | |
| 2-hexanone | UJT | UJC | UJC | | | |
| Methylene chloride | BJT | | | | | |
| 4-methyl-2-pentanone | UJT | UJC | UJC | | | |
| Styrene | UJT | | | | | |
| 1,1,2,2-tetrachloroethane | UJT | | | | | |
| Tetrachloroethene | UJT | | | | | |
| Toluene | JT | | | | | |
| 1,1,1-trichloroethane | UJT | | | | | |
| 1,1,2-trichloroethane | UJT | | | | | |
| Trichloroethene | UJT | | | | | |
| Vinyl chloride | UJT | | | | | |
| Xylenes (total) | UJT | | | | | |
| Acetone | UJT | UJC | JC | | | |
| Benzene | UJT | | | | | |
| Bromodichloromethane | UJT | | | | | |
| Bromoform | UJT | | | | | |
| Bromomethane | UJT | | | | | |
| 2-butanone | UJT | UJC | UJC | | | |
| Carbon disulfide | UJT | | | | | |
| Carbon tetrachloride | UJT | | | | | |
| Chlorobenzene | UJT | | | | | |
| Dibromochloromethane | UJT | | | | | |
| Chloroethane | UJT | | | | | |
| Chloroform | UJT | | | | | |
| Chloromethane | UJT | | | | | |
| 1,1-dichloroethane | UJT | | | | | |
| 1,2-dichloroethane | UJT | | | | | |
| 1,1-dichloroethene | UJT | | | | | |
| | | | | | | |
| **Semivolatiles** | | | | | | |
| Acenaphthene | UJT | | | | | |
| Acenaphthylene | UJT | | | | | |

Site Name: Ravenna

| Sample ID | R7009 | R7010TB | R7011 | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | QC | water | | | |
| | | | | | | |
| Anthracene | UJT | | | | | |
| Benzo[a]anthracene | UJT | | | | | |
| Benzo[b]fluroanthene | UJT | | | | | |
| Benzo[k]fluoranthene | UJT | | | | | |
| Benzo[g,h,i]perylene | UJT | | | | | |
| Benzo[a]pyrene | UJT | | | | | |
| Bis(2-chloroethoxy)methane | UJT | | | | | |
| Bis(2-chloroethyl) ether | UJT | | | | | |
| 2,2'-Oxybis(1-Chloropropane) | UJT | | | | | |
| Bis(2-ethylhexyl) phthalate | JT | | | | | |
| 4-bromophenyl phenyl ether | UJT | | | | | |
| Butyl benzyl phthalate | UJT | | | | | |
| 4-chloroaniline | UJTC | | | | | |
| 4-chloro-3-methylphenol | UJT | | | | | |
| 2-chloronaphthalene | UJT | | | | | |
| 2-chlorophenol | UJT | | | | | |
| 4-chlorophenyl phenyl ether | UJT | | | | | |
| Chrysene | UJT | | | | | |
| Dibenz[a,h]anthracene | UJT | | | | | |
| Dibenzofuran | UJT | | | | | |
| di-n-butyl phthalate | UJT | | | | | |
| 1,2-dichlorobenzene | UJT | | | | | |
| 1,3-dichlorobenzene | UJT | | | | | |
| 1,4-dichlorobenzene | UJT | | | | | |
| 3,3'-dichlorobenzidine | UJTC | | | | | |
| 2,4-dichlorophenol | UJT | | | | | |
| Diethyl phthalate | UJT | | | | | |
| 2,4,-dimethylphenol | UJT | | | | | |
| Dimethyl phthalate | UJT | | | | | |
| di-n-octyl phthalate | UJT | | | | | |
| 4,6-dinitro-2-methylphenol | UJT | | | | | |
| 2,4-dinitrophenol | UJT | | | | | |
| 2,4-dinitrotoluene | UJT | | | | | |
| 2,6-dinitrotoluene | UJT | | | | | |
| Fluoranthene | UJT | | | | | |
| Fluorene | UJT | | | | | |
| Hexachlorobenzene | UJT | | | | | |
| Hexachlorobutadiene | UJT | | | | | |
| Hexachloroethane | UJT | | | | | |
| Indeno[1,2,3-cd]pyrene | UJT | | | | | |
| Isophorone | UJT | | | | | |
| 2-methylnapthalene | UJT | | | | | |
| 2-methylphenol | UJT | | | | | |
| Naphthalene | UJT | | | | | |
| 2-nitroaniline | UJT | | | | | |
| 3-nitroaniline | UJTC | | UJC | | | |
| 4-nitroaniline | UJT | | UJC | | | |
| Nitrobenzene | UJT | | | | | |
| 2-nitrophenol | UJT | | | | | |
| 4-nitrophenol | UJT | | UJC | | | |
| N-nitroso-di-n-propyl amine | UJT | | | | | |
| N-nitroso diphenyl amine | UJT | | | | | |

Site Name: Ravenna

| Sample ID | R7009 | R7010TB | R7011 | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | water | QC | water | | | |
| | | | | | | |
| Pentachlorophenol | UJT | | | | | |
| Phenanthrene | UJT | | | | | |
| Phenol | UJT | | | | | |
| Pyrene | UJT | | | | | |
| 1,2,4-trichlorobenzene | UJT | | | | | |
| 2,4,5-trichlorophenol | UJT | | | | | |
| 2,4,6-trichlorophenol | UJT | | | | | |
| Carbazole | UJT | | UJC | | | |
| 4-methylphenol | UJT | | | | | |
| | | | | | | |

Site Name: Ravenna

| Sample ID | R9104FB | R9100 | R9101 | R9102 | R9103 | R9105 |
|---|---|---|---|---|---|---|
| | | | | | | |
| Matrix | QC | water | water | water | water | water |
| | | | | | | |
| **Pesticides** | | | | | | |
| Alpha-BHC | UJT | UJT | UJT | UJT | | |
| Beta-BHC | UJT | UJT | UJT | UJT | | |
| Delta-BHC | UJT | UJT | UJT | UJT | | |
| Gamma-BHC (lindane) | UJT | UJT | UJT | UJT | | |
| Heptachlor | UJT | UJT | UJT | UJT | | |
| Aldrin | UJT | UJT | UJT | UJT | | |
| Heptachlor Epoxide | UJT | UJT | UJT | UJT | | |
| Endosulfan I | UJT | UJT | UJT | UJT | | |
| Dieldrin | UJT | UJT | UJT | UJT | | |
| 4,4'-DDE | UJT | JT | UJT | UJT | | |
| Endrin | UJT | UJT | UJT | UJT | | |
| Endosulfan II | UJT | UJT | UJT | UJT | | |
| 4,4'-DDD | UJT | UJT | UJT | UJT | | |
| Endosulfan Sulfate | UJT | UJT | UJT | UJT | | |
| 4,4'-DDT | UJT | UJT | JT | UJT | | |
| Methoxychlor | UJT | UJT | UJT | UJT | | |
| Endrin Ketone | UJT | UJT | UJT | UJT | | |
| Endrin Aldehyde | UJT | UJT | UJT | UJT | | |
| Alpha-Chlordane | UJT | JT | JT | UJT | | |
| Gamma-Chlordane | UJT | UJT | JT | UJT | | |
| Toxaphene | UJTC | UJTC | UJTC | UJTC | UJC | UJC |
| | | | | | | |
| **Herbicides** | | | | | | |
| 2,4-D | UJT | UJT | UJT | UJT | | UJC |
| Dalapon | | | | | | UJC |
| 2,4-DB | | | | | | |
| Dicamba | | | | | | UJC |
| Dichlorprop | | | | | | UJC |
| Dinoseb | | | | | | UJC |
| MCPA | | | | | | UJC |
| MCPP | | | | | | UJC |
| 2,4,5-TP (Silvex) | UJT | UJT | UJT | UJT | | UJC |
| 2,4,5-T | UJT | JT | JT | JT | | JCS |
| | | | | | | |

## APPENDIX A – Data Qualifier Definitions

## Definitions of Data Qualifiers

The following codes are considered the "EPA" qualifiers and specified for use by the various Functional Guidelines for data validation.

**R**: Rejected - Data are unusable (Note: Analyte may or may not be present).

**U**: Undetected; the analyte was not detected above the MDA

**N**: Tentatively Identified

**J**: Estimated

**UJ**: Undetected, but the number that is reported as the quantitation limit (MDA) is an estimated value

**B**: Impacted by an associated blank

The following subqualifiers give further detail of the type and amount of qualification a given data point has received.

-H: Qualified due to holding time violation

-T: Qualified due to sample preservation problems

-I: Qualified due to interference problems

-D: Qualified due to precision problems (duplicate control limits not met)

-S: Qualified due to accuracy problems (matrix spike, surrogate recovery criteria not met)

-C: Qualified due to instrument calibration problems

-L: Qualified due to accuracy problems (LCS recovery criteria not met)

-G: Qualified due to background problems

-K: Qualified due to negative blank value problems

-Q: Qualified for other reasons - refer to the text of the report

# DATA VALIDATION SUMMARY REPORT

**PROJECT:** Ravenna Army Ammunitions Plant-USACE
**PROJECT NO.:** 775477
**LABORATORY:** Quanterra Inc.
**SDG:** A9K240107
**MATRIX:** Waters
**VALIDATION LEVEL:** C
**ANALYSES, METHODS:** Volatile Organic Compounds, SW846 Method 8260B

## 1.0 INTRODUCTION

Three water samples and two field blanks were submitted to Quanterra, Inc. for the analysis listed in the header. The samples are listed in Table 1-1 with the sampling date and analytical date(s).

The organic compounds were validated and reviewed in accordance with the project-specific Quality Assurance Project Plan (QAPP) dated April 1996, Quanterra's Standard Operating Procedures (SOPs), and the "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses" (EPA, 1994).

**Table 1-1. Sample Information**

| Sample ID RVAAP-W221 prefix | Lab ID A9K240607 prefix | Sampling date | Volatiles analysis date |
|---|---|---|---|
| FLOOR | -001 | 11/22/99 | 12/4/99 |
| END | -002 | | |
| WALL | -003 | | |
| FB | -004 | | |
| TB | -005 | | |

## 2.0 VOLATILE ORGANIC COMPOUNDS

### 2.1 Sampling Documentation

Chain-of-custody (COC) records indicate that the samples were received in good condition and at 2.4 degrees Centigrade (°C). No qualifiers were assigned.

### 2.2 Holding Times

The sample was analyzed within the holding period for preserved water samples. No qualifiers were assigned.

## 2.3 Instrument Tune

Two bromofluorobenzene (BFB) tunes were performed. The tunes were performed prior to the initial calibration and the sample analyses. The tunes met the ion abundance criteria specified in the QAPP and the method. The samples were analyzed within a 12-hour period following the tunes. No qualifiers were assigned.

## 2.4 Calibrations

### *2.4.1 Initial Calibration*

The samples were analyzed using an instrument that was initially calibrated using a five-point calibration. All target compounds met the minimum average response factor (RRF) of 0.05. Two compounds exceeded the QAPP-specified maximum Relative Standard Deviation percentage (%RSD) of 30%: acetone and methylene chloride. These were J/UJ qualified for all samples.

### *2.4.2 Continuing Calibration*

One continuing calibration was performed. The target compounds for these calibrations were within the control limits for the RRF (0.05) and the target compounds did not exceed the 25% maximum for the percent deviation between the initial and continuing calibrations. No qualifiers were assigned. The laboratory also analyzed a low-level standard as a reporting limit check. Acetone, methylene chloride, and 2-butanone had %D>25%. The samples had the nondetects UJ-qualified and the detects reported at a 25 ng concentration J-qualified.

## 2.5 Blanks

### *2.5.1 Method/Preparation Blanks*

The method blank associated with the samples had acetone at 4.2 µg/L. The 10X rule was applied. Sample results <10X the blank concentration were U-qualified and either reported at the reporting limit (if less than the reporting limit) or at the reported value (if greater than the reporting limit).

### *2.5.2 Trip Blanks/ Ambient Blank/ Equipment Rinsates*

The trip blank (TB) associated with these samples had methylene chloride (2.3µg/L) and acetone (4.8µg/L) reported as detects. The 10X rule was applied. No action was taken on acetone, because the value was U-qualified as the result of applying the method blank. Samples -END, WALLS, and the field blank had methylene chloride U-qualified for this reason.

The field blank (FB) associated with these samples had methylene chloride and carbon disulfide as reported detects. No action was taken on methylene chloride because it was U-qualified as the result of applying the trip blank. Carbon disulfide was U-qualified for -FLOOR, -END, and -WALLS.

## 2.6 System Monitoring Compounds (surrogates)

Surrogate spike recoveries (%R) for the four volatile compounds met the criteria stated in the QAPP for the samples. No qualifiers were assigned.

### 2.7 Internal Standards (IS)

The areas and retention time for the three internal standards spiked into all the samples, standards, and associated quality control samples were within the performance criteria set forth in the method. No qualifiers were assigned.

### 2.8 Matrix Spike (MS) /Matrix Spike Duplicate (MSD)

Sample RVAAP-W221-FLOOR the MS/MSD for the SDG. The recoveries were within the control limits. No qualifiers were assigned.

### 2.9 Laboratory Control Sample (LCS)

The LCS had the same compounds spiked as used for the MS/MSDs. The recoveries were within the control limits specified in the QAPP; no qualifiers were assigned.

### 2.10 Field Duplicates

There were no field duplicates in this SDG.

### 2.11 Compound Quantitation and Project Reporting Limits

Based on a Level C validation, the sample was identified and quantified appropriately. The reporting limits (RLs) listed on the Form I's met the Quantitation Limit Goals specified in Table 3-3 of the QAPP or were lower except for vinyl chloride (2 vs. 10 µg/L). No tentatively identified compounds (TICs) were reported.

### 2.12 Overall Assessment of the Data

The VOC data for the samples in this SDG are acceptable as qualified.

# APPENDIX D

# WASTE DISPOSAL MANIFEST RECORDS

# NON-HAZARDOUS WASTE MANIFEST

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 Document No. 121698RA

2. Page 1 of 1

3. Generator's Name and Mailing Address
330 358-7311
Ravenna Army Ammunition Plant
845 State Route 5
Ravenna, OH 44266-9297

4. Generator's Phone ( )

5. Transporter 1 Company Name
DFL Oilfield Services, LLC

6. US EPA ID Number

A. State Transporter's ID

B. Transporter 1 Phone 330 792-8416

7. Transporter 2 Company Name

8. US EPA ID Number

C. State Transporter's ID

D. Transporter 2 Phone

9. Designated Facility Name and Site Address
Everclear of Ohio, Ltd.
3700 Oakwood Ave.
Austintown, OH 44515

10. US EPA ID Number
OHR000015792

E. State Facility's ID

F. Facility's Phone 330 792-2120

| 11. WASTE DESCRIPTION | 12. Containers No. | 12. Containers Type | 13. Total Quantity | 14. Unit Wt/Vol. |
|---|---|---|---|---|
| a. Waste Water | 01 | Unk. | 1500 gallons | |
| b. | | | | |
| c. | | | | |
| d. | | | | |

GENERATOR

G. Additional Descriptions for Materials Listed Above

H. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information
Nothing Follows

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| Mark Patterson | | 12 | 16 | 98 |

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| Shane A. Pratt | | 12 | 16 | 98 |

18. Transporter 2 Acknowledgement of Receipt of Materials

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| | | | | |

FACILITY

19. Discrepancy Indication Space

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

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| | | | | |

NON-HAZARDOUS WASTE

CF14 Printed by Labelmaster, An American Labelmark Co., Chicago IL 60646 (800) 621-5808

READ INSTRUCTIONS ON BACK OF MANIFEST

WASTE MANAGEMENT DIVISION
MICHIGAN DEPARTMENT OF
ENVIRONMENTAL QUALITY

DO NOT WRITE IN THIS SPACE
ATT. ☐ DIS. ☐ REJ. ☐ PR. ☐

Required under authority of Part 111 and Part 121 of Act 451, 1994, as amended.

Failure to file may subject you to criminal and/or civil penalties under Sections 324.11151 or 324.12116 MCL.

Please print or type.

Form Approved. OMB No. 2050-0039

**UNIFORM HAZARDOUS WASTE MANIFEST**

1. Generator's US EPA ID No. D H 5 2 1 0 0 2 0 7 3 6 | Manifest Document No.

2. Page 1 of

Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5; Ravenna, OH 44266-9297

4. Generator's Phone ( 330) 358-7311

A. State Manifest Document Number MI 7615757

B. State Generator's ID Same

5. Transporter 1 Company Name: Dart Trucking Company, Inc.

6. US EPA ID Number: O H D 0 0 9 8 6 5 8 2 5

C. State Transporter's ID

D. Transporter's Phone 800-538-2516

7. Transporter 2 Company Name

8. US EPA ID Number

E. State Transporter's ID

F. Transporter's Phone

9. Designated Facility Name and Site Address
Wayne Disposal, Inc.
49350 N. I-94 Service Drive
Belleville, MI 48111

10. US EPA ID Number: M I D 0 4 8 0 9 0 6 3 3

G. State Facility's ID

H. Facility's Phone 800/592-5489

| 11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID NUMBER). HM | 12. Containers No. | Type | 13. Total Quantity | 14. Unit Wt/Vol | I. Waste No. |
|---|---|---|---|---|---|
| a. Non RCRA Non DOT Regulated Material (Ceramic Bricks, Burlap Bags) | | D M | 71 | P | NONE |
| b. Plastic + Tarps. | | DM | 11 | | |
| c. | | | | | |
| d. | | | | | |

J. Additional Descriptions for Materials Listed Above
A. App#121498WM

K. Handling Codes: a / b / c / d

15. Special Handling Instructions and Additional Information
Emergency Contact: Capitol Environmental Services (800) 560-2374

16. GENERATOR'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 national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR; if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR

Printed/Typed Name: Mark C. Patterson | Signature: Mark C. Patterson | Date (Month Day Year): 12/17/98

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name: Brooks E. Burd | Signature | Date (Month Day Year): 12/17/98

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name | Signature | Date (Month Day Year)

FACILITY

19. Discrepancy Indication Space

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

ALL SPILLS MUST BE REPORTED TO THE MICHIGAN POLLUTION EMERGENCY ALERTING SYSTEM, IN MICHIGAN AT 1-800-292-4706 OR OUT OF STATE AT 517-373-7660 AND THE NATIONAL RESPONSE CENTER AT 1-800-424-8802 WITHIN 24 HOURS PER DAY.

INTERNATIONAL TECHNOLOGY CORPORATION

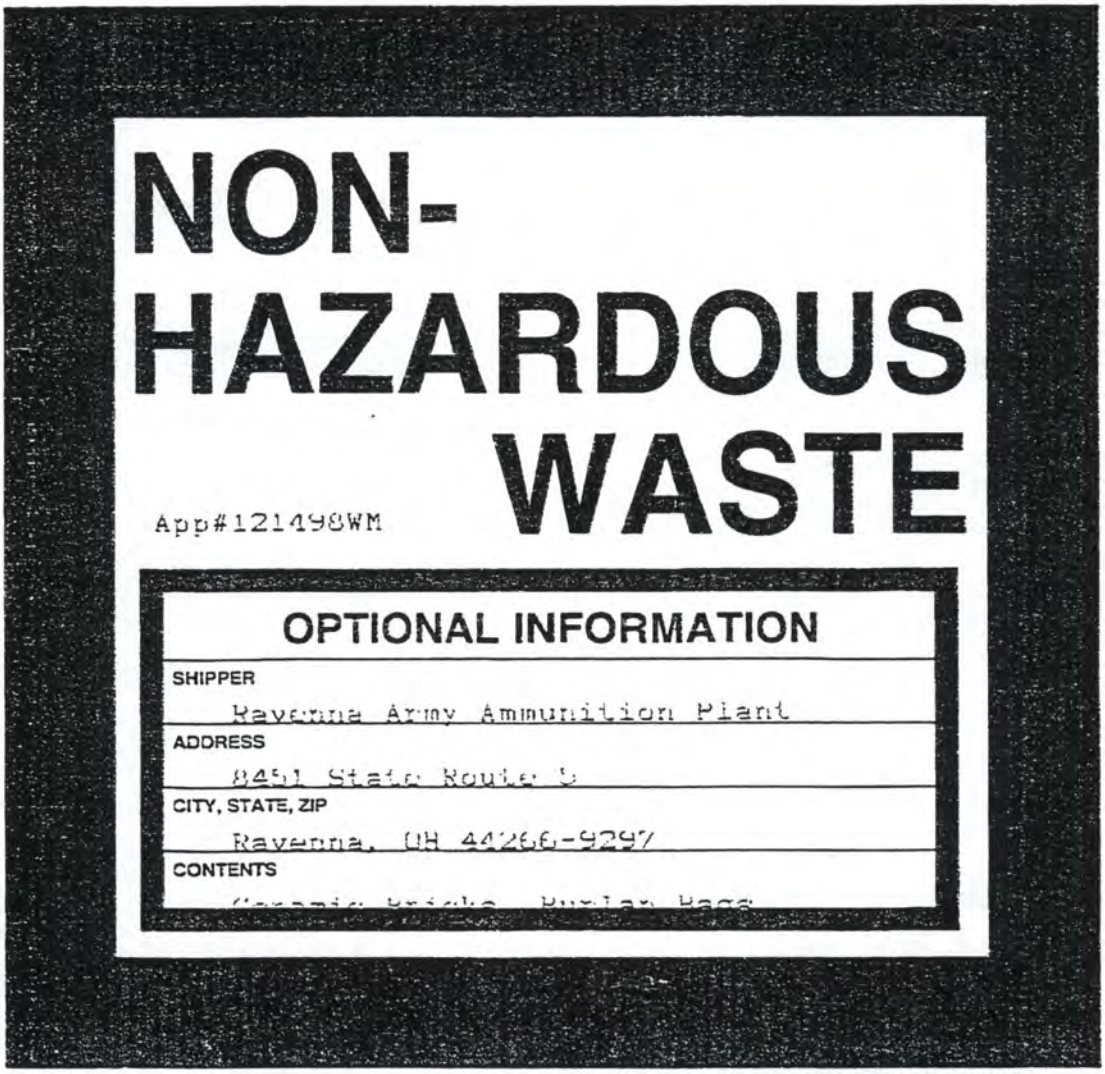
| DAILY LOG | DATE | 12 | 18 | 98 |
|---|---|---|---|---|
| | NO. | | | |
| | SHEET | | OF | |

# FIELD ACTIVITY DAILY LOG

| PROJECT NAME: RVAAP | PROJECT NO. 775574 |
|---|---|

FIELD ACTIVITY SUBJECT: Labels

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:




| VISITORS ON SITE: | CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS. |
|---|---|
| WEATHER CONDITIONS: | IMPORTANT TELEPHONE CALLS: |

IT PERSONNEL ON SITE:

SIGNATURE: DATE:

DEQ

WASTE MANAGEMENT DIVISION
MICHIGAN DEPARTMENT OF
ENVIRONMENTAL QUALITY

DO NOT WRITE IN THIS SPACE
ATT. ☐ DIS: ☐ REJ. ☐ PR. ☐

Required under authority of Part 111 and Part 121 of Act 451, 1994, as amended.

Failure to file may subject you to criminal and/or civil penalties under Sections 324.11151 or 324.12116 MCL.

Please print or type.

Form Approved. OMB No. 2050-0039

# UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: OH5210020736
Manifest Document No.:
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
Ravenna Army Ammunition Plant
8451 State Route 5; Ravenna, OH 44266-9297
4. Generator's Phone ( 330 358-7311

A. State Manifest Document Number: MI 7615768
B. State Generator's ID: Same
C. State Transporter's ID:
D. Transporter's Phone: 800-538-2516
E. State Transporter's ID:
F. Transporter's Phone:
G. State Facility's ID:
H. Facility's Phone: 313/923-0080

5. Transporter 1 Company Name: Dart Trucking Company, Inc.
6. US EPA ID Number: OHD098658825
7. Transporter 2 Company Name:
8. US EPA ID Number:
9. Designated Facility Name and Site Address
City Environmental, Inc.
1923 Frederick Street
Detroit, MI 48211
10. US EPA ID Number: MID980991566

| 11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID NUMBER). | HM | 12. Containers No. | Type | 13. Total Quantity | 14. Unit Wt/Vol | I. Waste No. |
|---|---|---|---|---|---|---|
| a. RQ, Hazardous Waste Solid, N.O.S., 9, NA3077, PGIII (Wood/Cut up Pallets) | X | 25 | DM | 5000 est. 025 | P | D001 D008 |
| b. | | | | | | |
| c. | | | | | | |
| d. | | | | | | |

J. Additional Descriptions for Materials Listed Above
A. App# 26388H
Also D007 ERG-171

K. Handling Codes: a. b. c. d.

15. Special Handling Instructions and Additional Information
Emergency Contact: Capitol Environmental Services (800) 560-2374

16. GENERATOR'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 national government regulations. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR; if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

GENERATOR

Printed/Typed Name: Timothy M. Morgan
Signature: Timothy M. Morgan
Date: Month 12 Day 18 Year 98

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name: Dale Schaef
Signature: Dale Schaef 953
Date: Month 12 Day 18 Year 98

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name:
Signature:
Date: Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name:
Signature:
Date: Month Day Year

ALL SPILLS MUST BE REPORTED TO THE MICHIGAN POLLUTION EMERGENCY ALERTING SYSTEM, IN MICHIGAN CALL 1-800-292-4706 OR OUT OF STATE AT 517-373-7660 AND THE NATIONAL RESPONSE CENTER AT 1-800-424-8802 24 HOURS PER DAY.

INTERNATION TECHNOLOGY CORPORATIO

PROJECT NAME:

FIELD ACTIVITY SUBJECT:

DESCRIPTION OF DAILY ACT

# HAZARDOUS WASTE

## FEDERAL AND/OR STATE LAWS PROHIBIT IMPROPER DISPOSAL

IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, THE U.S. ENVIRONMENTAL PROTECTION AGENCY, OR THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION.

**ACCUMULATION START DATE** _____ **E.P.A. WASTE NO.** D001 D007, D008

**D.O.T. PROPER SHIPPING NAME** RQ, Hazardous Waste Solid, N.O.S.,

**AND** 9, III (Wood/Cut up Pallets)

**U.N. OR N.A. NO.** NA3077

**GENERATOR NAME** Ravenna Army Ammunition Plant

**ADDRESS** 8451 State Route 5

**CITY** Ravenna **STATE** OH

**E.P.A. I.D. NO.** OH5210020736 **MANIFEST DOCUMENT NO.** 015768

App#

## HAZARDOUS WASTE HANDLE WITH CARE

ER & ASSOCIATES, INC., • P.O. Box 368 • Neenah, Wisconsin 54957-0368 • (800) 327-6868 93-HML-C

90-HML-S

Published by: J.J. KELLER & ASSOCIATES, INC. Neenah, Wisconsin 54957-0368 • (800) 327-6868

VI

S AND SPECIFICATIONS, AND
DERS AND IMPORTANT DECISIONS.

WEATHER COND.

TANT TELEPHONE CALLS:

IT PERSONNEL ON SITE:

SIGNATURE:

DATE:



3278-7-97

USL City Environmental, Inc.
1923 Frederick Street
Detroit, MI 48211
(313) 923-0090
(313) 923-3375 (Sales Fax)
(313) 923-0217 (Admin. Fax)

GENERATOR FILE COPY

APPROVAL NO.

MI7615 7708 — MANIFEST NO.

11a — LINE ITEM

## <NOTICE>

### FROM GENERATOR FOR WASTES THAT DO NOT MEET LAND DISPOSAL TREATMENT STANDARDS

The following wastes do not meet the treatment standards specified in Part 268 Subpart D.

(Check all boxes that apply.)

-- This shipment includes F001-F005 spent solvents, as identified on the attached sheet. (2)

This shipment includes F039 multi-source leachate, as identified on the attached sheet(s). (3)

X This shipment includes D001 and/or D002 wastes as identified below. (1)

X This shipment includes one or more TC metals D004-D011 identified below. (1)

This shipment includes one or more TC organics D012-D043 identified below. (1)

| Hazardous Waste No. | Hazardous Subcategory(4) | Treatability group(5) |
|---|---|---|
| D001 | N/A | NWW |
| D007 | N/A | NWW |
| D008 | N/A | NWW |
| | | |
| | | |
| | | |
| | | |
| | | |

(1) Must include Form B (Underlying Hazardous Constituents)
(2) Must include Form D (F001-F005)
(3) Must include Form E (F039)
(4) Subcategory (if any) can be determined from 40 CFR 268.40
(5) Treatability group is either "wastewater" or "nonwastewater"

Signature

Date

Rev. 8/98

# FORM A

**IT Corporation**
*11499 Chester Road*
*Cincinnati, OH 45246-4012*
*Tel. 513.782.4700*
*Fax. 513.782.4807*

*A Member of The IT Group*

June 30, 2000

IT Project No. 775574

U.S. Army Corps of Engineers
600 Dr. Martin Luther King Jr. Place
Room 921
Louisville, Kentucky 40202-2230
Attention of: CELRL-ED-EE (JENT)

RE: USACE Contract No. DACA27-97-D-0005, Delivery Order 0009
Final Closure Report for Buildings W-221 and X-232
Ravenna Army Ammunition Plant
Ravenna, Ohio

Dear Mr. Jent:

Please find enclosed three (3) copies of the Final Closure Report for Buildings W-221 and X-232 at the Ravenna Army Ammunition Plant. If you have any questions, please call me at (513) 782-4745 or e-mail to kvankeuren@theitgroup.com.

Sincerely,

IT CORPORATION

Karl Van Keuren, P.G.
Project Manager

enclosures

c: Robert Woods (1 copy)
Bill Ingold (1 copy)
Mark Patterson (1 copy)
Kerry Kennedy (2 copies)
Eileen Mohr (1 copy)
Diane Kurlich (1 copy)
Jarnal Singh (1 copy)
Gregory Orr (1 copy)