

# **NOTICE**

**CERTAIN DATA  
CONTAINED IN THIS  
DOCUMENT MAY BE  
DIFFICULT TO READ  
IN MICROFICHE  
PRODUCTS.**

PJL--7475

DE91 000081

THE AIR QUALITY MONITORING PROGRAM FOR THE  
1100-EM-1 REMEDIAL INVESTIGATION

C. S. Glantz  
G. L. Laws

September 1990

Prepared for  
the U.S. Department of Energy  
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory  
Richland, Washington 99352

**MASTER**

EB

## SUMMARY

Air quality monitoring for the remedial investigation of the Hanford Site's 1100-EM-1 operable unit was conducted in the spring and fall of 1989 and during January 1990. The monitoring program was divided into two phases. The first phase examined the air quality impact of routine atmospheric emissions at three of the operable unit's waste sites (the 1100-2 and 1100-3 Disposal Pits, Horn Rapids Landfill, and Battery Acid Pit) before the beginning of intrusive remedial investigation activities (i.e., borehole drilling). The second phase of monitoring examined the air quality impact of routine atmospheric emissions from two of the operable unit's waste sites (the 1100-2 and 1100-3 Disposal Pits and the Horn Rapids Landfill) during intrusive remedial investigation activities.

Each phase of the program consisted of a series of monitoring events that measured pollutant concentrations at key locations upwind and downwind of individual waste sites. During each monitoring event, sampling was conducted to determine the air concentrations of a wide variety of volatile organic compounds and semivolatile organic compounds. Monitoring for heavy metals and asbestos was also conducted during some monitoring events.

The results of the air quality monitoring program indicate that the 1100-EM-1 waste sites are not significant emitters of volatile organic compounds, semivolatile organic compounds, heavy metals, or asbestos. Although volatile organic compounds were detected in low concentrations near each of waste sites, differences in pollutant concentrations between upwind and downwind monitoring locations were not statistically significant. The threshold limit values for the volatile organic compounds that were detected near the waste sites are hundreds to thousands of times greater than their measured concentrations. Elevated levels of semivolatile organic compounds were not detected in the atmosphere downwind of any waste site. The concentrations of heavy metals in particles collected downwind of selected waste sites were not significantly different from background levels. Asbestos fibers were not detected downwind of an asbestos disposal area within the Horn Rapids Landfill.

The results of this monitoring program indicate that, at this time, the waste sites in the 1100-EM-1 pose little or no threat to the local population via the airborne transport of pollutant material.

## ACKNOWLEDGMENTS

The authors would like to thank Greg Patton, Kim Lessor, Owen Abbey, and Don Glover for their assistance in planning and conducting field operations. John Evans and Chuck Ververka provided guidance and assistance in the development of techniques for sampling and analyzing volatile organic compound samples.

CONTENTS

SUMMARY . . . . .	iii
ACKNOWLEDGMENTS . . . . .	v
INTRODUCTION . . . . .	1
THE 1100-EM-1 OPERABLE UNIT WASTE SITES . . . . .	3
DESCRIPTION OF THE AIR MONITORING PROGRAM . . . . .	7
SAMPLING EQUIPMENT . . . . .	8
SAMPLING PROCEDURE AND ANALYSIS . . . . .	10
FIELD OPERATIONS DURING PHASE I AIR QUALITY MONITORING . . . . .	13
PHASE I AIR QUALITY MONITORING AT THE 1100-2 AND 1100-3 DISPOSAL PITS . . . . .	13
PHASE I AIR QUALITY MONITORING AT THE HORN RAPIDS LANDFILL . . . . .	15
PHASE I AIR QUALITY MONITORING AT THE BATTERY ACID PIT . . . . .	18
FIELD OPERATIONS DURING PHASE II AIR QUALITY MONITORING . . . . .	21
PHASE II AIR QUALITY MONITORING AT THE 1100-2 DISPOSAL PIT . . . . .	21
PHASE II AIR QUALITY MONITORING AT THE HORN RAPIDS LANDFILL . . . . .	23
Procedure Changes for Phase II Sampling at the Horn Rapids Landfill . . . . .	23
Phase II Monitoring at the HRL-2 Drilling Site . . . . .	26
Phase II Monitoring at the HRL-10 Drilling Site . . . . .	31
RESULTS OF AIR QUALITY MONITORING . . . . .	37
RESULTS OF PHASE I MONITORING AT THE 1100-2 AND 1100-3 DISPOSAL PITS . . . . .	39
RESULTS OF PHASE I MONITORING AT THE HORN RAPIDS LANDFILL . . . . .	41
RESULTS OF PHASE I MONITORING AT THE BATTERY ACID PIT . . . . .	43

RESULTS OF PHASE II MONITORING AT THE 1100-2 DISPOSAL PIT . . . .	44
RESULTS OF PHASE II MONITORING AT THE HRL-2 DRILLING SITE IN THE HORN RAPIDS LANDFILL . . . . .	45
RESULTS OF PHASE II MONITORING AT THE HRL-10 DRILLING SITE IN THE HORN RAPIDS LANDFILL . . . . .	48
PROCEDURAL CHANGES TO IMPROVE PERFORMANCE IN FUTURE MONITORING PROGRAMS . . . . .	53
CONCLUSIONS . . . . .	55
REFERENCES . . . . .	57
APPENDIX A - METEOROLOGICAL DATA FOR EACH MONITORING EVENT . . . . .	A.1
APPENDIX B - SAMPLING PARAMETERS . . . . .	B.1
APPENDIX C - LABORATORY ANALYSES OF CARBON MOLECULAR SIEVE SAMPLES . .	C.1
APPENDIX D - LABORATORY ANALYSIS OF POLYURETHANE FOAM SAMPLES - PHASE I SAMPLING . . . . .	D.1
APPENDIX E - LABORATORY ANALYSIS OF POLYURETHANE FOAM AND GLASS- FIBER FILTER SAMPLES - PHASE II SAMPLING . . . . .	E.1
APPENDIX F - LABORATORY ANALYSES OF FILTER SAMPLES FOR PARTICULATES (HEAVY METALS) . . . . .	F.1
APPENDIX G - LABORATORY ANALYSES OF FILTER SAMPLES FOR ASBESTOS . . . . .	G.1

## FIGURES

1.	The 1100-2 and 1100-3 Disposal Pits . . . . .	3
2.	The Horn Rapids Landfill . . . . .	4
3.	The Battery Acid Pit . . . . .	5
4.	The Grid Map for the 1100-2 Disposal Pit--Phase I Sampling . . . . .	14
5.	The Grid Map for the 1100-3 Disposal Pit--Phase I Sampling . . . . .	15
6.	The Grid Map for the Horn Rapids Landfill--Phase I Sampling . . . . .	17
7.	Monitoring Locations at the Battery Acid Pit . . . . .	19
8.	The Grid Map for the 1100-2 Disposal Pit--Phase II Sampling . . . . .	22
9.	The Grid Map for the Horn Rapids Landfill--Phase II Sampling . . . . .	24
10.	The Position of Monitoring Equipment During Monitoring Event "H" at the HRL-2 Drilling Site . . . . .	28
11.	The Position of Monitoring Equipment During Monitoring Event "G" at the HRL-2 Drilling Site . . . . .	29
12.	The Position of Monitoring Equipment During Monitoring Event "I" at the HRL-2 Drilling Site . . . . .	30
13.	The Position of Monitoring Equipment During Monitoring Event "K" at the HRL-10 Drilling Site . . . . .	32
14.	The Position of Monitoring Equipment During Monitoring Event "J" at the HRL-10 Drilling Site . . . . .	33
15.	The Position of Monitoring Equipment During Monitoring Event "L" at the HRL-10 Drilling Site . . . . .	35

TABLES

1. Threshold Limit Values for Volatile Organic Compounds Detected in the 1100-EM-1 Operable Unit . . . . .	40
2. Volatile Organic Compound Measurements at the 1100-2 and 1100-3 Disposal Pits . . . . .	41
3. Volatile Organic Compound Measurements at the Horn Rapids Landfill . . . . .	42
4. Volatile Organic Compound Measurements at the Battery Acid Pit . . . . .	43
5. Volatile Organic Compound Measurements at the 1100-2 Disposal Pit . . . . .	44
6. Volatile Organic Compound Measurements for Monitoring Event "H" at the HRL-2 Drilling Site . . . . .	46
7. Volatile Organic Compound Measurements for Monitoring Event "I" at the HRL-2 Drilling Site . . . . .	47
8. Volatile Organic Compound Measurements for Monitoring Event "K" at the HRL-10 Drilling Site . . . . .	49
9. Volatile Organic Compound Measurements for Monitoring Event "L" at the HRL-10 Drilling Site . . . . .	50

## INTRODUCTION

Remedial investigation (RI) activities are conducted at hazardous waste sites to determine the nature and extent of environmental contamination. Atmospheric transport is one of the pathways by which hazardous materials can leave the waste site. Buried liquids can evaporate and release hazardous vapors to the atmosphere, and particles and fibers can be lifted off the surface and become suspended in the atmosphere. Because of concerns regarding the potential significance of the atmospheric pathway for pollutant exposure, an air quality monitoring program was conducted as part of the RI of the 1100-EM-1 Operable Unit at the U.S. Department of Energy's Hanford Site in southcentral Washington State. The objective of this air quality monitoring program was to estimate the air quality impact of waste site emissions and the effect RI activities (e.g., borehole drilling) may have on pollutant emissions. The program was designed in accordance with U.S. Environmental Protection Agency (U.S. EPA) guidelines (U.S. EPA 1983, 1984, 1986, 1988) and based on the monitoring conducted at other RI waste sites (Marquardt 1987).

Two phases of air quality monitoring were conducted during the RI of 1100-EM-1 Operable Unit waste sites. The first phase of monitoring was conducted before intrusive RI activities were conducted at the waste sites; the second phase of monitoring was conducted while intrusive RI activities (i.e., borehole drilling) were under way at the waste sites. A third phase of air quality monitoring, originally scheduled to be conducted after the completion of all intrusive RI activities, was determined to be unnecessary based on the results of the air quality monitoring data presented in this report.

The first phase of the air quality monitoring program was conducted in April and May 1989. Measurements were made at three of the 1100-EM-1 Operable Unit's waste sites: the 1100-2 and 1100-3 Disposal Pits, Horn Rapids Landfill, and Battery Acid Pit. Sampling was conducted at each waste site to determine the concentrations of airborne volatile organic compounds and semi-volatile organic compounds. Sampling to determine the airborne concentration of heavy metals was conducted at the 1100-2 and 1100-3 Disposal Pits and the Horn Rapids Landfill. Sampling to determine airborne asbestos concentrations was conducted at the Horn Rapids Landfill.

The second phase of the air quality monitoring program was conducted in September 1989 and January 1990. Measurements were made at the 1100-2 Disposal Pit and the Horn Rapids Landfill. Sampling to determine the concentrations of airborne volatile organic compounds and semivolatile organic compounds was conducted at both waste sites.

This report briefly reviews the location and configuration of the 1100-EM-1 waste sites, the schedule for air quality monitoring activities, and the procedures and equipment used in air quality monitoring. The report also describes each monitoring event and presents a summary of the results obtained. Meteorological conditions within the 1100-EM-1 operable unit during each monitoring event are presented in Appendix A, the sampling parameters associated with each monitoring event are presented in Appendix B, and selected laboratory analyses are presented in Appendices C, D, E, F, and G.

## THE 1100-EM-1 OPERABLE UNIT WASTE SITES

For purposes of air quality monitoring, the waste sites in the 1100-EM-1 Operable Unit are grouped into three study areas. The three areas are the 1100-2 and 1100-3 Disposal Pits (Figure 1), Horn Rapids Landfill (Figure 2), and Battery Acid Pit (Figure 3). The 1100-2 and 1100-3 Disposal Pits were primarily employed for the disposal of construction debris (U.S. DOE 1989). The 1100-2 Disposal Pit was used intermittently from 1954 through 1985, and the 1100-3 Disposal Pit was used from 1979 through 1985. A review of the waste disposal practices at this waste site (U.S. DOE 1989) indicates that small quantities of waste chemicals (<100 gal/yr) were disposed of at both sites. Records and personnel involved in operations at the waste site indicated that solvents, paints, and paint thinners were disposed of at the 1100-2 Disposal Pit and that antifreeze and degreasing solvents were disposed

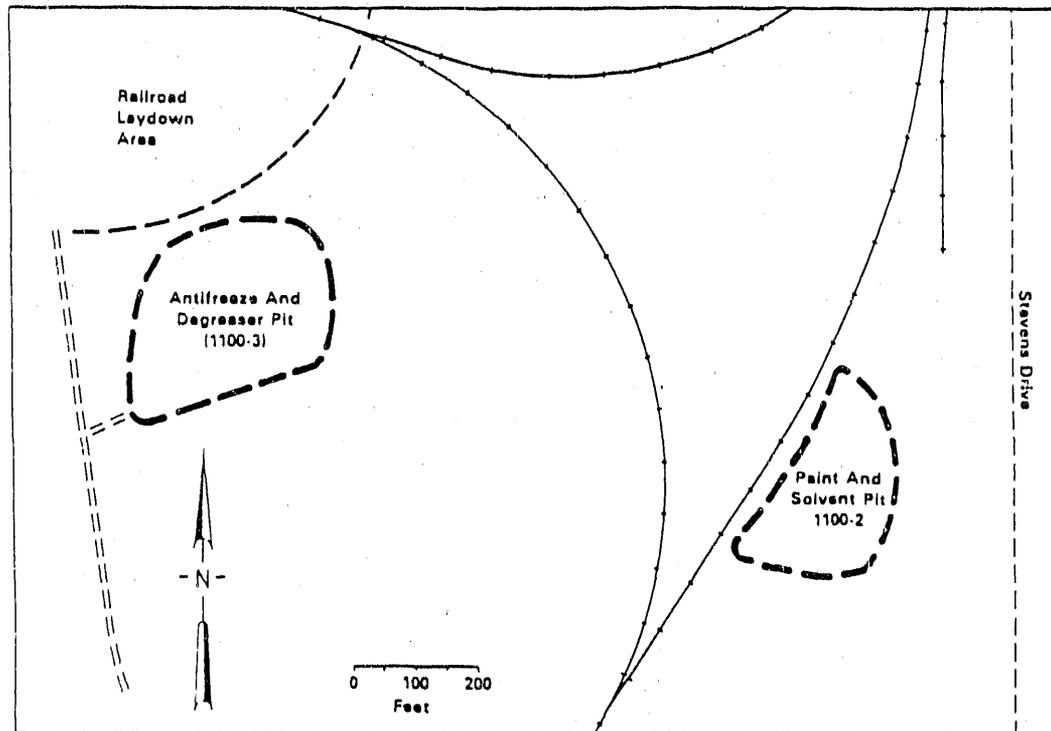
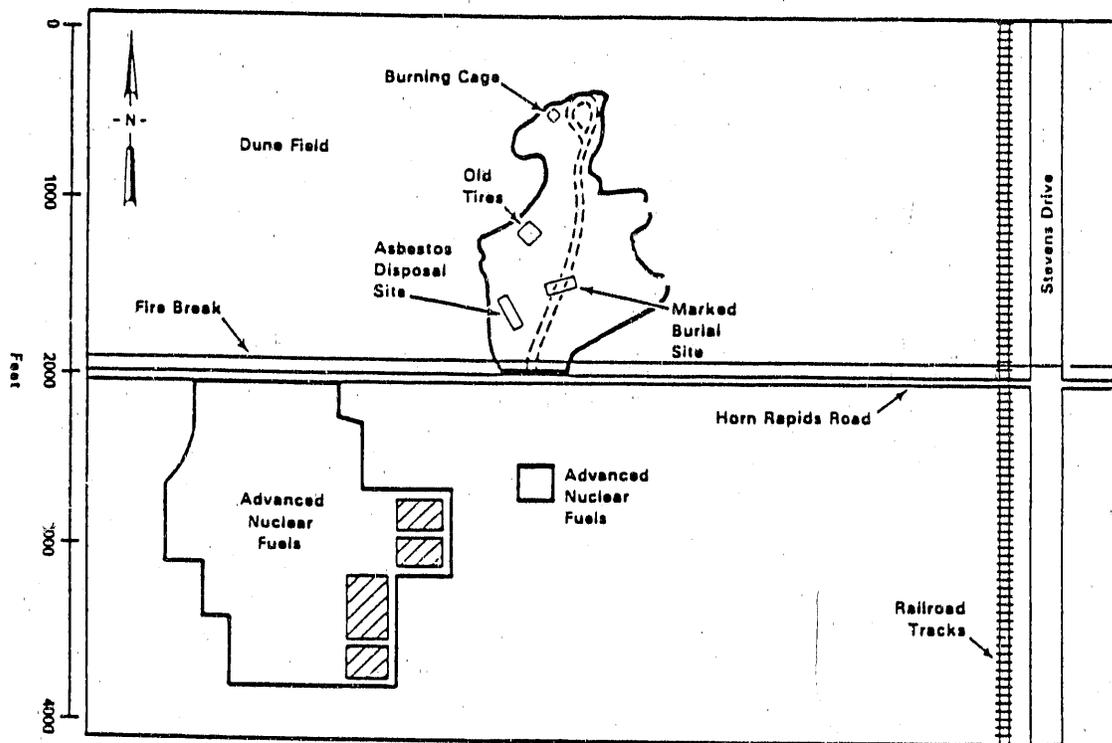


FIGURE 1. The 1100-2 and 1100-3 Disposal Pits. The disposal pits are located west of Stevens Drive, near the center of the 1100 Area.



**FIGURE 2.** The Horn Rapids Landfill. The landfill is located north of the 1100 Area and southwest of the 300 Area, near the junction of Horn Rapids Road and Stevens Drive.

of at the 1100-3 Disposal Pit. The 1100-2 and 1100-3 Disposal Pits have a combined area of approximately 75,000 ft<sup>2</sup> (7,000 m<sup>2</sup>).

The Horn Rapids Landfill contains indeterminate quantities of hazardous chemicals and office and construction wastes (U.S. DOE 1989). The landfill was used from 1950 to 1970 and covers approximately 15 acres (60,000 m<sup>2</sup>). Some wastes are buried in trenches to depths of 40 ft (13 m) below the surface. The characterization of wastes disposed of at this site is complicated by evidence indicating that dumping was conducted at the landfill by both Hanford and non-Hanford personnel.

The Battery Acid Pit is a small [about 12 ft (4 m) in diameter], unlined disposal pit located near the southwest corner of the 1171 Building (U.S. DOE 1989). The Battery Acid Pit was used for the disposal of an estimated 15,000 gal (400,000 l) of battery acid and other liquid materials during the period from 1957 through 1976.

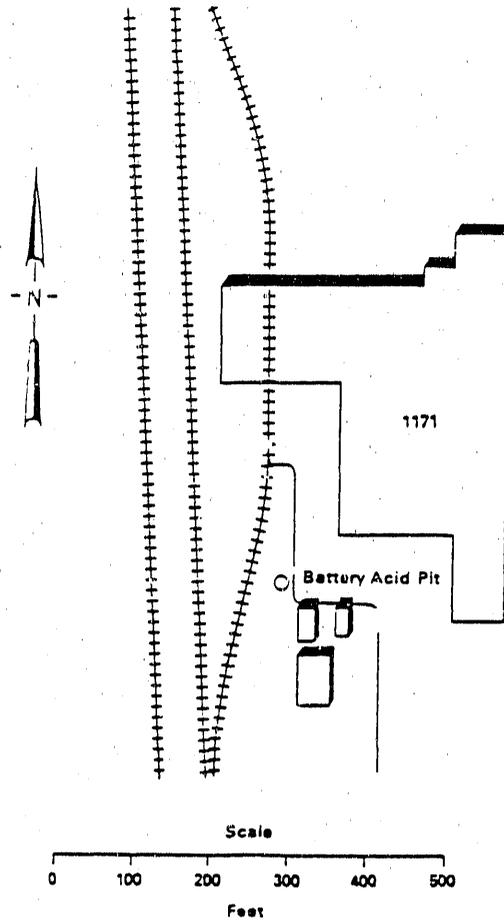


FIGURE 3. The Battery Acid Pit. The pit is located near the southwest corner of the 1171 Building.

## DESCRIPTION OF THE AIR MONITORING PROGRAM

The air quality monitoring program was designed to have up to three phases. Phase I of the program involved air sampling before intrusive RI activities were conducted. This phase of the program was conducted during the spring of 1989. Phase II of the program involved air sampling while intrusive operations were being conducted at the waste sites. The initial monitoring event for this phase was conducted in mid-September 1989 at the 1100-2 Disposal Pit. The remaining Phase II monitoring events were conducted at the Horn Rapids Landfill in January 1990. Phase III of the program was to involve monitoring after intrusive operations had been completed at the waste sites. This phase was not conducted because the results obtained during Phases I and II indicated that additional air quality monitoring was not warranted. The results that led to this decision are presented in this report.

The air quality monitoring program for the 1100-EM-1 operable unit examined a broad spectrum of potential air pollutants. This wide range of monitoring was initially required because of the variety of potentially hazardous substances that are known to have been buried at 1100-EM-1 waste sites and uncertainties about the presence of other waste materials. The equipment selected for use in this program allowed the sampling of a wide range of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) including pesticides and polychlorinated biphenyls (PCBs), particulates (heavy metals), and asbestos.

To estimate the impact of a waste site on air quality, air sampling was conducted both upwind and downwind of each site. Upwind sampling was used to characterize background concentrations of pollutants. Downwind sampling provided information on potential increases in pollutant concentrations resulting from site emissions.

In addition to the sampling conducted at upwind and downwind monitoring locations, additional sampling modules were also brought into the field but were not exposed to outside air. These samples (control blanks) were used to identify potential contamination that might have occurred during the preparation, transportation, handling, and analysis of the sampling modules.

During some monitoring events, sampling was conducted for only one class of pollutant; during other monitoring events, sampling was conducted simultaneously for a several classes of pollutants. The determination as to which types of pollutants would be sampled during a single monitoring event was based on a consideration of the waste materials that may have been present at the site, how the waste materials were disposed, and the availability of monitoring equipment.

#### SAMPLING EQUIPMENT

In the air quality monitoring program, several types of sampling modules were used to collect pollutants, and two types of sampling devices were used to draw air through the sampling modules. The General Metal Works (GMW) Model PS-1 High Volume Sampler<sup>(a)</sup> was the sampling device used in the collection of airborne particulates and SVOCs. The sampler was operated in both battery-powered and AC-powered modes. To collect samples, air was drawn through a 4-in. Teflon<sup>®</sup> or glass-fiber filter (the Teflon filter was used to collect particulates to be analyzed for heavy metal concentrations; the glass-fiber filter was used to collect particulates to be analyzed for SVOCs that may adhere to the surface of the particulates) and then through a 3-in.-long, cylindrical glass cartridge containing a polyurethane foam (PUF) plug (which adsorbs SVOCs). The pump could draw air through a sampling module at a flow rate up to 250 l/min in the battery-powered mode or to 350 l/min in the AC-powered mode. In the battery-powered mode, power was provided using two 12-V rechargeable batteries connected in series to provide a 24-V power source. In this configuration, the instrument could operate at full power for over 4 h. In the AC-powered mode, power was obtained from a gasoline-fueled generator that provided a 110-V power source. The sampler could be operated for an indefinite period of time if the generator were regularly refueled and properly maintained. Because of the potential contamination

---

(a) General Metal Works Inc., Village of Cleves, Ohio.

\* Teflon is a registered trademark of I. E. DuPont de Nemours and Co., Wilmington, Delaware.

from the exhaust of the generator, the gasoline-fueled generator was not operated when sampling was being conducted for VOCs.

A low-volume air pump (as used in the Spectrex Model PAS-3000 Personal Air Sampler<sup>(a)</sup>) was employed for the collection of VOCs and airborne asbestos fibers. Asbestos fibers were collected by drawing air through a 25-mm-diameter filter made from mixed cellulose esters. The type of cellulose filter used in the program has an effective pore size of 0.8  $\mu\text{m}$ . VOCs were collected when air was drawn through a carbon molecular sieve (CMS) cartridge. The stainless-steel Supelco Carbotrap Model 300<sup>(b)</sup> cartridges used in this study are each filled with three specialized adsorbents: Carbotrap C, Carbotrap, and Carbosieve S-III.<sup>(b)</sup> Glass wool plugs separate the adsorbent materials and are packed into the ends of the cartridge. The CMS cartridge is specifically designed to efficiently adsorb and desorb all hydrocarbons listed in EPA methods T0-1, T0-2, and T0-3 (U.S. EPA 1983), whether present individually or in complex mixtures. The maximum flow rate through the CMS cartridges is over 500 ml/min, but flow rates were adjusted to lower values for most field operations. The low-volume air pump could run for over 10 h using a single 12-V rechargeable battery.

Several alternative methods were available for sampling VOCs. Two common alternatives involve the use of SUMMA<sup>®</sup> polished canisters (U.S. EPA 1988) and Tenax<sup>(c)</sup> adsorbent cartridges (U.S. EPA 1984). The SUMMA process is used to passivate the interior of a stainless-steel canister to create an interior surface that is free of active adsorption sites. Samples are collected by drawing air into a treated, evacuated canister. Tenax is an adsorbent that traps VOCs. A stainless-steel tube (similar to the cartridge used in the CMS) is filled with the Tenax material and air is drawn through the tube. There are advantages and disadvantages to each of these methods for

---

(a) Spectrex, Redwood City, California.

(b) Supelco, Inc., Bellefonte, Pennsylvania.

\* SUMMA is a registered trademark of DBA Molectrics Inc., Inglewood, California.

(c) Enka N.V., The Netherlands.

collecting airborne VOCs; although CMS cartridges were selected for this study, one of the alternative methods could have been used to achieve project objectives.

#### SAMPLING PROCEDURE AND ANALYSIS

The procedures for air quality monitoring in the 1100-EM-1 operable unit are outlined in WHC-MR-0030 (WHC 1989). In preparing sampling material for an experiment, the clean handling procedures outlined in U.S. EPA methods TO-2 (U.S. EPA 1983) and TO-4 (U.S. EPA 1984, 1986) were followed for all sampling equipment. Sampling modules were brought to the field and installed in their housings just before a sampling event. Additional sampling modules were also taken into the field but were not attached to sampling pumps. The sampling media in these modules served as quality control blanks.

To determine the airborne concentration of a pollutant being collected by a sampling medium, the volume of air passing through the sampler must be known. For each sampling device, flow rates were calibrated in the laboratory (according to manufacturer's specifications) before each phase of the study. In the field, instrument flow rates were checked at the beginning and the end of each monitoring event.

Each sample collected during a monitoring event was identified using a three-character code. The first character in the code identifies the monitoring event. For example, sampling at the HRL-2 drilling site (in the Horn Rapids Landfill) on January 18, 1990, is identified as monitoring event "H"; all samples collected during this monitoring event have "H" as the first character in their identification code. The second character in the code is the identification number of the pump used to collect the sample. The location of each pump during a monitoring event was recorded in the project's field logbook. The third character in the three-digit code identifies the sampling medium. For example, a "C" represents a CMS cartridge and a "P" represents a PUF foam sample. A code of "H2C" represents a CMS cartridge that was exposed on January 18, 1990 (monitoring event "H") using pump number

"2". Logbook entries indicate that this pump was deployed downwind of the HRL-2, on the boundary between the contamination reduction zone and the site survey zone, directly south-southeast of the drilling rig.

Meteorological conditions were monitored throughout a monitoring event using either a portable meteorology tower (equipped with a wind vane, anemometer, and temperature sensor) or nearby Hanford meteorology monitoring stations. If a portable meteorology tower was used, information from the tower's instruments was processed by a battery-powered datalogger. The datalogger processed data into 5-min averages and stored these values on cassette tape for later analysis. If a portable tower was not used, meteorological data were obtained from an automated Hanford monitoring station. Data from a meteorological station's wind and temperature sensors were processed into 15-min averaged values and transmitted via UHF radio to the Hanford Meteorology Station. At the Hanford Meteorology Station, data were processed into hourly averages and reformatted for long-term storage. The two closest Hanford meteorology monitoring stations to the 1100-EM-1 operable unit are the 300 Area and Richland Airport stations. The 300 Area station is located less than 1 mi (1.6 km) north-northeast of the Horn Rapids Landfill. The Richland station is located about 2 mi (3 km) south-southwest of the 1100-2 and 1100-3 Disposal Pits.

During Phase I monitoring, stringent requirements existed for the wind direction and speeds to be used for sampling. Winds were required to be from a designated sampling direction. Winds from the southwest were selected because of their frequency of occurrence and tendency to persist for extended periods of time (i.e, hours to days) after the passage of frontal systems. Moderate wind speeds, such as between 4 and 15 mph (2 and 7 m/s), were preferred during most types of monitoring events.(a) Higher wind speeds [ $>15$  mph (7 m/s)] were required for asbestos monitoring (high-speed winds are needed to lift fibers off the surface and produce detectable concentrations

---

(a) Winds below this speed range tend to be associated with rapidly varying wind directions; winds above this speed range may require overly long monitoring periods to obtain minimum detectable pollutant concentrations (pollutant concentrations tend to decrease with increasing wind speed).

of airborne asbestos). During Phase II monitoring, however, wind requirements were eliminated because of the limited time period available for sampling (sampling had to be conducted after the borehole reached a critical depth but before the borehole was capped). With only a few days available to conduct sampling at each borehole, air quality monitoring was scheduled with only minimal consideration of meteorological conditions. As a result of this lack of scheduling flexibility, the potential existed for significant variation in wind directions during sampling. Under some conditions, all sampling locations (including predominantly upwind locations) could be impacted by any pollutant emissions from the drilling site. Extra attention was required during the analysis of samples to identify incidents in which this type of contamination was possible.

After a monitoring event was completed, samples were collected, placed in clean containers, and sealed from contact with outside air. Samples were returned to the sample preparation laboratory for temporary storage before being transported to other laboratories for analysis.

In laboratory analyses, SVOCs (including PCBs and pesticides) were removed from the PUF material via Soxhlet extraction. The SVOCs collected on the PUF material and glass-fiber filters were analyzed using gas chromatography and mass spectroscopy (GC/MS) following the procedures outlined in U.S. EPA method TO-4 (U.S. EPA 1984, 1986). The CMS samples were also analyzed for VOCs using GC/MS following the procedures outlined in U.S. EPA Method TO-2 (U.S. EPA 1983). The Teflon filters were analyzed for particulates and metals via nondestructive x-ray fluorescence. The asbestos filters were analyzed using phase contrast microscopy.

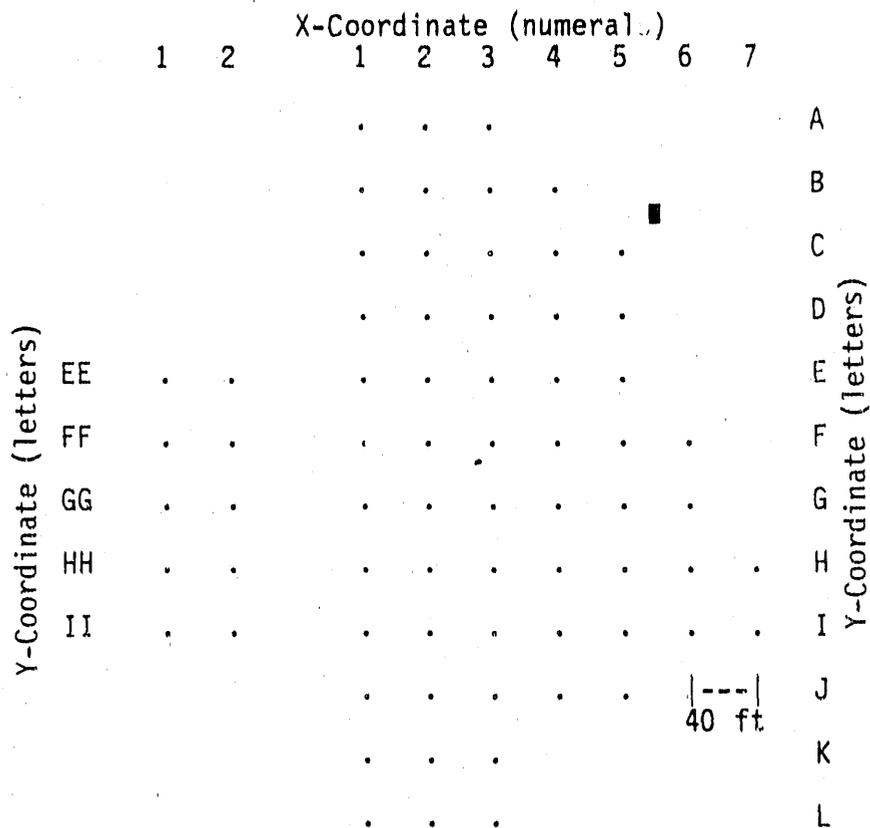
## FIELD OPERATIONS DURING PHASE I AIR QUALITY MONITORING

In this section we describe the field operations conducted at each waste site during Phase I of the air monitoring program. Included in the discussion is a brief description of a monitoring event that was aborted because of contamination from outside sources of pollution. Meteorological data obtained for each monitoring event are presented in Appendix A. Sampling durations, pump flow rates, and other sampling parameter data are presented in Appendix B. Laboratory assays of collected samples are presented in detail in Appendices C, D, F, and G. Although not reproduced in this report, photographs were taken during field operations to document the location of equipment, weather conditions, vegetation, and potential sources of contamination. These photographs are stored in controlled project files and logbooks.

### PHASE I AIR QUALITY MONITORING AT THE 1100-2 AND 1100-3 DISPOSAL PITS

On March 26, air quality monitoring event "A" was conducted at the 1100-2 and 1100-3 Disposal Pits. Sampling began at 1500 Pacific Standard Time (PST) with winds from the southwest at 8 to 13 mph (4 to 6 m/s). Sampling proceeded normally until 1540 PST when a cloud of smoke was observed several miles to the south-southwest. The smoke cloud increased in size over the next hour. Periodically, between 1630 and 1730 PST, smoke was present at all monitoring locations. The smoke came from a brush fire near the Horn Rapids Industrial Park [located approximately 1.4 mi (2 km) south-southwest of the 1100-2 Disposal Pit] that local firefighters were battling with water and chemical foam. The air samples collected during this monitoring event were not analyzed because of concerns about extensive smoke contamination.

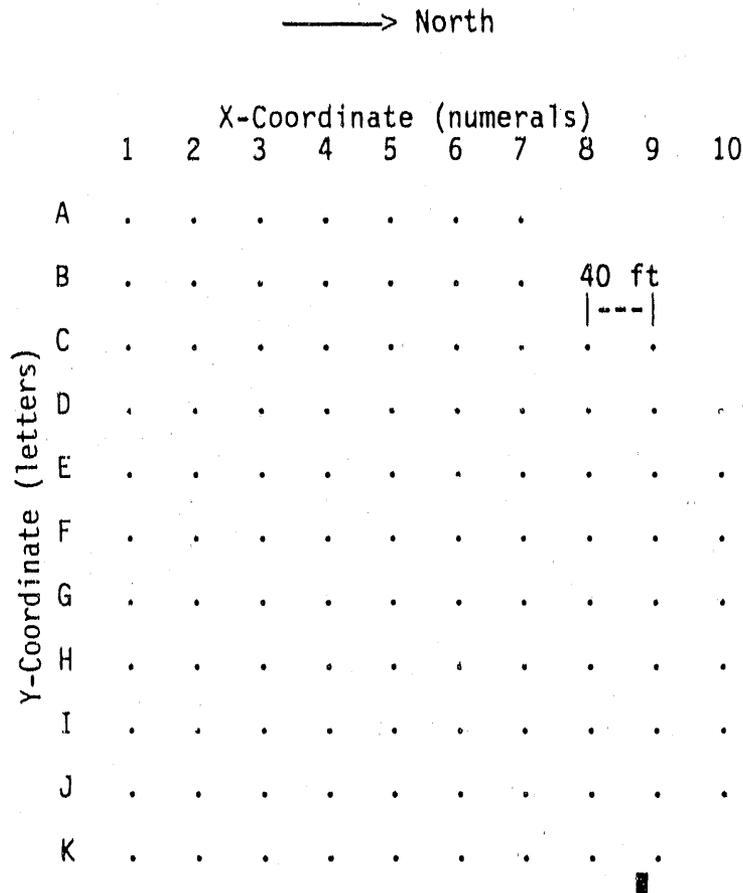
On April 3, air quality monitoring event "B" was conducted at the 1100-2 and 1100-3 Disposal Pits. At 1030 Pacific Daylight Time (PDT) on April 3, the field team began deploying battery packs and sampling equipment (Figure 4 and 5). Winds were southwesterly at 10 to 15 mph (4 to 7 m/s) at this time. Air monitoring equipment at the upwind monitoring site was



**FIGURE 4.** The Grid Map for the 1100-2 Disposal Pit--Phase I Sampling. The rectangle (■) denotes the location for downwind monitoring on April 3, 1989. Upwind monitoring on this date was conducted about 500 ft (150 m) west-southwest of the 1100-3 Disposal Pit.

positioned approximately 500 ft (150 m) southwest of the southwest-most grid point (A-1) at the 1100-3 Disposal Pit (Figure 5). Meteorological monitoring equipment was set up between the upwind monitoring site and the southwest corner of the disposal pit. Downwind of the 1100-2 and 1100-3 Disposal Pits, monitoring equipment was located near the markers that denote the northeast corners of each of the disposal pits.

At 1230 PDT all equipment was deployed, and wind speeds had decreased to between 6 and 12 mph (3 to 5 m/s). The duty meteorologist at the Hanford Meteorology Station continued to call for moderate southwesterly to west-southwesterly winds.



**FIGURE 5.** The Grid Map for the 1100-3 Disposal Pit--Phase I Sampling. The rectangle (■) denotes the location for downwind monitoring on April 3, 1989. Upwind monitoring on this date was conducted about 500 ft (150 m) west-southwest of grid point A-1.

Sampling instruments were turned on at 1250 PDT and sampling was completed at 1540 PDT. Each PS-1 operated for close to the full 170 min of the monitoring event. The low-volume air pump located downwind of the 1100-2 Disposal Pit failed shortly after being turned on; a valid sample for VOCs was not collected at this site. The low-volume air pump at the upwind monitoring location was operated for 140 min and the pump downwind of 1100-3 Disposal Pit was operated for 159 min.

PHASE I AIR QUALITY MONITORING AT THE HORN RAPIDS LANDFILL

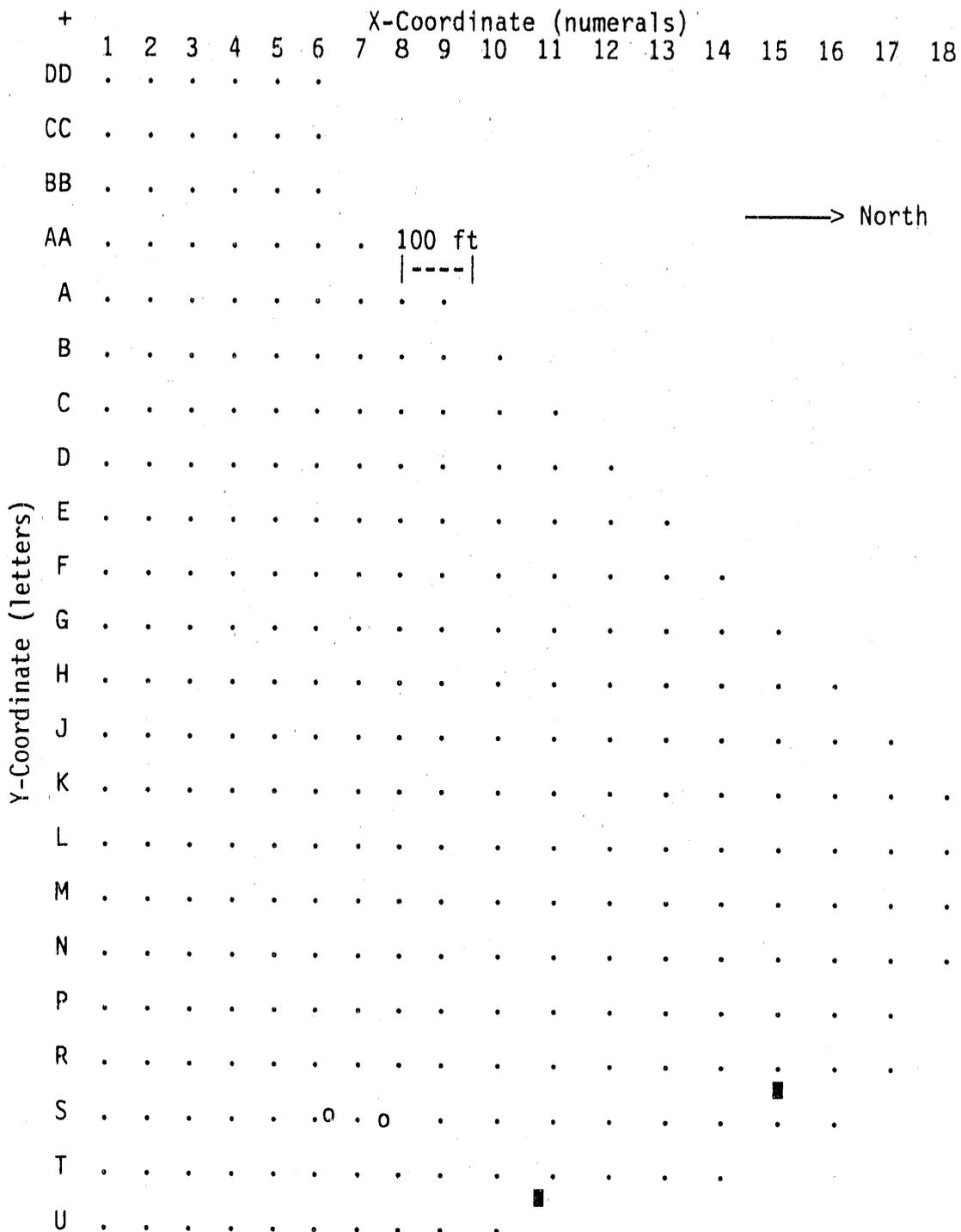
After sampling at the 1100-2 and 1100-3 Disposal Pits was completed, the sampling equipment housings were moved to the Horn Rapids Landfill. Two

sets of instrument housings were deployed at downwind monitoring locations, and the third set of housings was deployed at an upwind monitoring location (Figure 6). The upwind monitoring equipment was positioned about 200 ft (60 m) west of the southwest most grid point (DD-1) at the landfill, on the strip of land located between Horn Rapids Road and the landfill fence line. The first downwind monitoring site was located approximately 25 ft (8 m) east of marker stake T-11. Meteorological monitoring equipment was positioned approximately 50 ft (15 m) northeast of the first downwind monitoring site. The second downwind monitoring site was located approximately 460 ft (140 m) northwest of the first downwind site, about 80 ft (25 m) northeast of marker stake R-15, 50 ft (15 m) southeast of marker stake R-16, and 80 ft (25 m) northwest of marker stake S-15.

During the remainder of April, unseasonable weather did not allow monitoring to be conducted at the Horn Rapids Landfill. On only a few occasions during the month were there extended periods of the southwesterly winds that were required for air quality monitoring. On each of these occasions, precipitation or convective activity (with the risk of thunderstorms) prevented a monitoring event from being conducted. Monitoring event "C" was finally conducted at the Horn Rapids Landfill on the morning of May 2. At 0940 PDT, winds were from the southwest at approximately 6 mph (3 m/s). In the wake of a frontal passage on the previous day, a high pressure system was developing over eastern Washington. Skies were mostly cloudy, with broken low-level clouds and scattered high-level clouds. Winds aloft were weak and from the southwest. The forecast was for decreasing wind speeds and clearing skies.

Sampling instruments were turned on at 0955 PDT. At 1059 PDT monitoring was discontinued as winds decreased in speed and began shifting away from the southwest (winds were becoming light and variable). All instruments sampled for 64 min during this monitoring event.

On May 24, monitoring event "D", supplementary monitoring for airborne asbestos, was conducted at the Horn Rapids Landfill. Monitoring equipment were positioned near the eastern border of the Horn Rapids Landfill, to the northeast of an area within the waste site in which asbestos shingles had been found near the surface (Figure 2). The first downwind monitoring site



**FIGURE 6.** The Grid Map for the Horn Rapids Landfill--Phase I Sampling. The cross (+) denotes the location for upwind monitoring and the rectangles (■) the locations for downwind monitoring on May 2, 1989. The circles (o) denote the locations for downwind asbestos sampling on May 24.

was located 13 ft (4 m) north of marker stake S-6. The second monitoring site was located approximately 150 ft (46 m) north-northwest of the first monitoring site, at a point about 50 ft (15 m) northeast of marker stake S-7 and 65 ft (20 m) southeast of marker stake S-8. An upwind sampling location was not operated during this monitoring event; it was conservatively assumed that there were no airborne asbestos fibers in the ambient atmosphere upwind of the Horn Rapids Landfill and that all fibers detected at the downwind monitoring locations would have the landfill as their source.

Conditions on May 24 were quite good for airborne asbestos sampling. Winds averaging over 18 mph (8 m/s) were present throughout the monitoring period, with gusts reaching the 30 mph (13 m/s) range. These wind conditions were slightly offset by some remaining moisture in the surface soil at the landfill (from rain showers the previous evening). The monitoring event began at 1255 PDT and was completed by 1556 PDT.

#### PHASE I AIR QUALITY MONITORING AT THE BATTERY ACID PIT

After sampling at the Horn Rapids Landfill was completed, air monitoring equipment was moved to the Battery Acid Pit (Figure 7). The upwind monitoring site was located about 65 ft (20 m) southwest of the Battery Acid Pit between two sets of north-south running railroad tracks. Onsite meteorological monitoring equipment was deployed several meters south of the upwind monitoring site. Because of the proximity of the waste site to the 1171 Building and the adjacent road, only one downwind monitoring site was deployed; this site was located only several feet from the northeast corner of the Battery Acid Pit.

Monitoring event "E" was conducted at the Battery Acid Pit on May 25. Sampling began at 1240 PDT and was discontinued at 1530 PDT. Winds were observed to be light and generally southwesterly during the monitoring event.

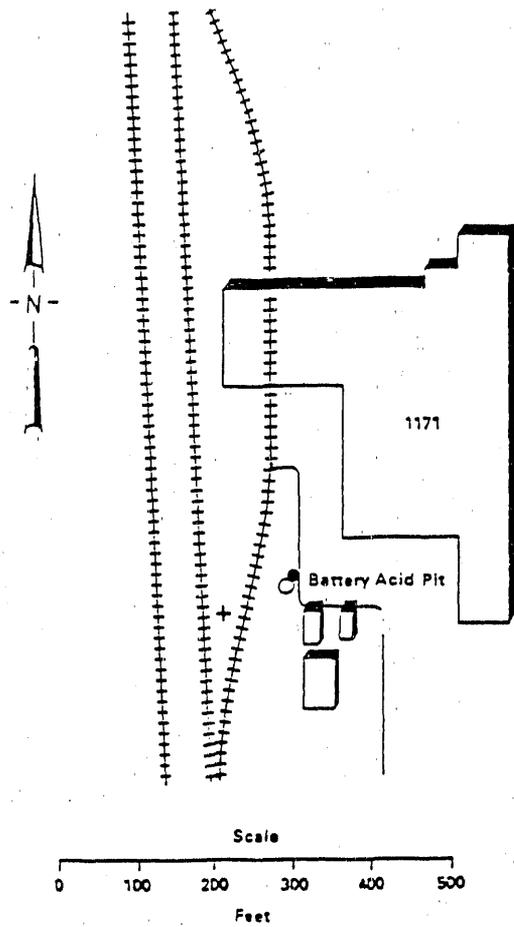


FIGURE 7. Monitoring Locations at the Battery Acid Pit. The cross (+) denotes the location for upwind monitoring, and the darkened circle (•) the location for downwind monitoring on May 2, 1989.

## FIELD OPERATIONS DURING PHASE II AIR QUALITY MONITORING

In this section we describe the field operations conducted at each waste site during Phase II of the air monitoring program. Meteorological data obtained for each monitoring event are presented in Appendix A. Sampling durations, pump flow rates, and other sampling parameter data are presented in Appendix B. Laboratory assays of collected samples are presented in detail in Appendix E. Although not reproduced in this report, photographs were taken during field operations to document the location of equipment, weather conditions, vegetation, and potential sources of contamination. These photographs are stored in controlled project files and logbooks.

Based on the results of Phase I monitoring, several procedural changes were implemented after the completion of Phase II monitoring at the 1100-2 disposal pit and prior to Phase II monitoring at the Horn Rapids Landfill. These modifications are discussed later in this section.

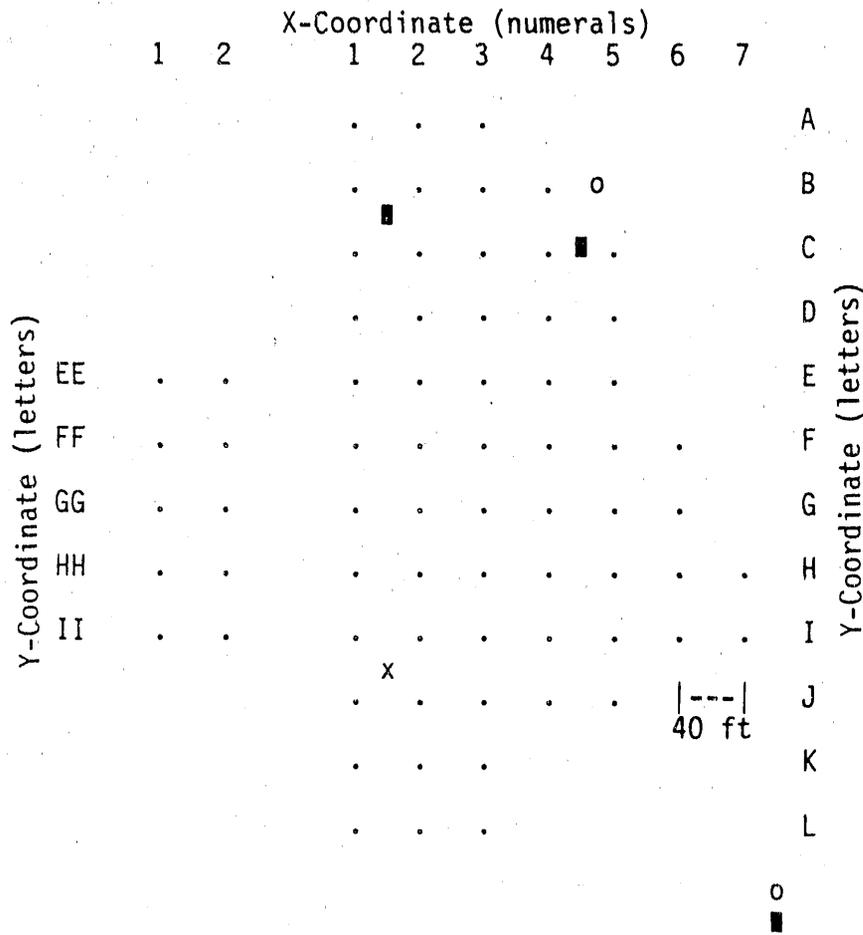
### PHASE II AIR QUALITY MONITORING AT THE 1100-2 DISPOSAL PIT

On September 12, 1989, drilling operations began at the 1100-2 Disposal Pit. Drilling operations were scheduled to be completed by September 20, leaving approximately 8 days to conduct an air quality monitoring event. On September 15, meteorological conditions were favorable for monitoring; winds were from the southwest and moderate in speed (5 to 15 mph). The forecast called for the winds to remain relatively steady through the evening hours, although a slight turning of the winds to a more southerly direction was possible.

Monitoring event "F" was scheduled for the late afternoon/early evening after drilling operations were halted for the day and rush-hour traffic ended. This was done to avoid potential contamination from local emissions by drilling equipment and automobile traffic--these emissions could mask potential emissions from the waste site.

In the early afternoon of September 15, the field team began deploying battery packs and sampling equipment. Air monitoring equipment at the background (i.e., "upwind") monitoring site was positioned approximately 500 ft

(150 m) southeast of the drilling rig at the 1100-2 Disposal Pit (Figure 8). Downwind of the 1100-2 Disposal Pit, monitoring equipment was positioned at three locations. To the north-northeast of the drilling site, equipment to sample VOCs was positioned between site stakes C1 and C2. To the northeast of the drilling site, equipment to sample VOCs was also positioned between site stakes C4 and C5. Equipment to sample SVOCs and heavy metals was positioned between site stakes B4 and B5. Meteorological monitoring equipment was set up about 30 m (100 ft) north of this location.



**FIGURE 8.** The Grid Map for the 1100-2 Disposal Pit--Phase II Sampling. The "x" denotes the borehole drilling site on September 15, 1989. The rectangles (■) denote the volatile organic compound sampling locations and the circles (o) denote the semivolatile organic compound sampling locations during monitoring event "F". Note that "upwind" or background sampling was conducted 150 m (490 ft) southeast of the drilling rig.

At 1749 PDT, the battery-powered GMW sampling pumps were turned on to begin sampling for SVOCs; monitoring event "F" was initiated. At 2031 PDT, the PS-1 sampling pumps were turned on to begin sampling for VOCs. The PS-1 pumps were operated for 1 h. The GMW sampling pumps were turned off at 2149 PDT after 4 h of operation. There were no problems detected with the sampling equipment during the monitoring event. Instrument calibration checks confirmed that all the pumps were operating properly. Average wind directions during the monitoring event were predominantly from the southwest; however, for short periods of time, westerly and southerly winds were observed.

All samples collected at the 1100-2 Disposal Pit were processed for shipment and delivered to their respective laboratories for analysis. With the completion of monitoring at the 1100-2 Disposal Pit, additional Phase II monitoring was not scheduled for several months.

#### PHASE II AIR QUALITY MONITORING AT THE HORN RAPIDS LANDFILL

Air quality monitoring at the Horn Rapids Landfill was conducted in January 1990 in association with borehole drilling (i.e., intrusive RI activities) at the landfill. Two drilling sites were selected for air quality monitoring (Figure 9). These two sites, HRL-2 and HRL-10, are at locations at which slightly elevated levels of VOCs were detected in earlier Phase I soil gas sampling.

#### Procedure Changes for Phase II Sampling at the Horn Rapids Landfill

Several changes were made in the air quality monitoring program between sampling at the 1100-2 Disposal Pit and the Horn Rapids Landfill. First, the objectives of the air quality monitoring program were changed slightly for Phase II operations in the Horn Rapids Landfill. Instead of concentrating on measuring pollutant concentrations near the landfill boundaries (as at the 1100-2 Disposal Pit), the primary objective of the monitoring program was to measure VOCs within the site exclusion zone, contamination reduction zone, and site support zone and SVOC concentrations at the boundary between the

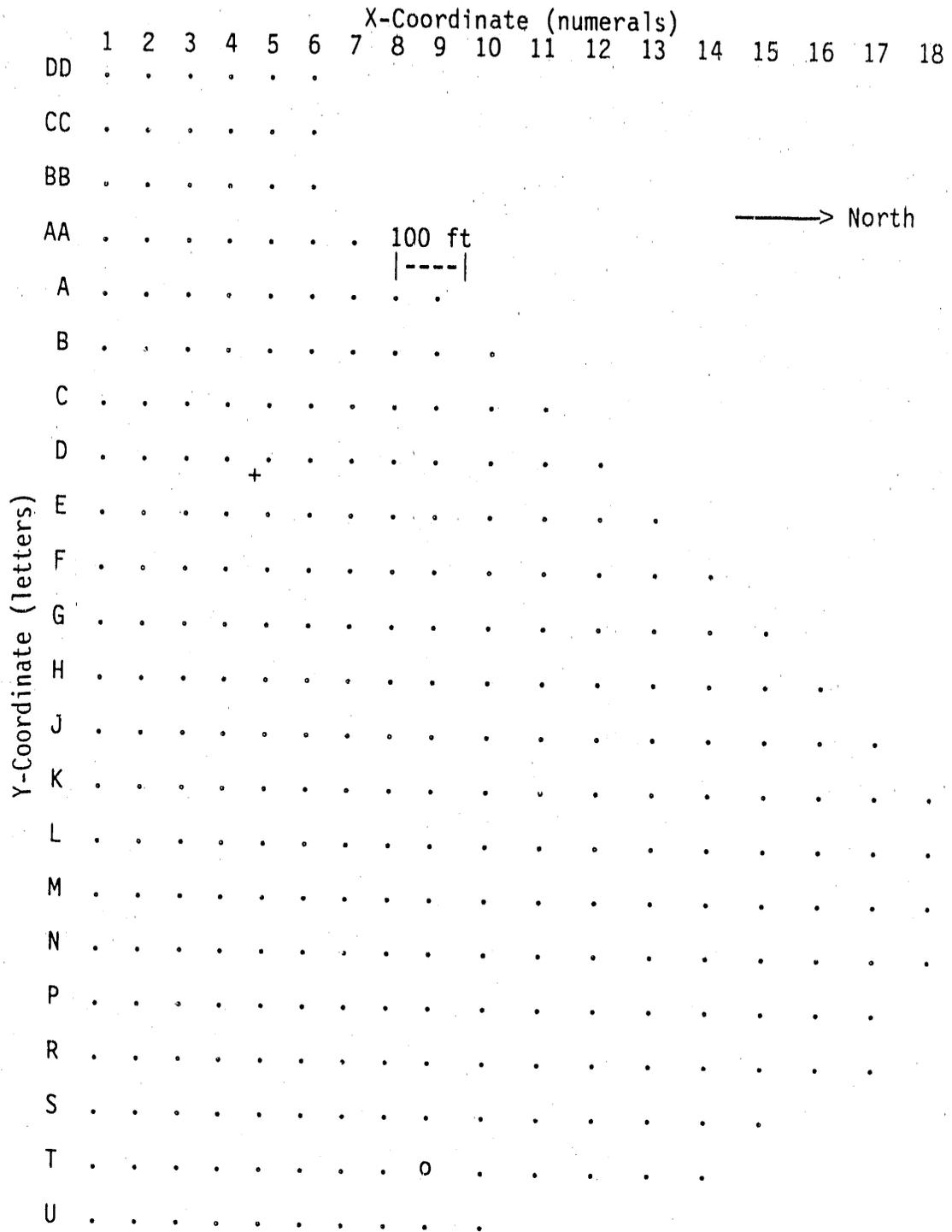


FIGURE 9. The Grid Map for the Horn Rapids Landfill--Phase II Sampling. The cross (+) denotes the HRL-2 drilling site, the circle (o) the HRL-10 drilling site.

contamination reduction zone and site support zone. This sampling configuration was chosen to allow a more thorough assessment of the pollutant concentrations to which site workers were being exposed (U.S. EPA 1986). Sampling closer to the drilling location would also increase the possibility that monitoring equipment would be able to detect pollutants with relatively low emission rates.

Drilling activities in the Horn Rapids Landfill were anticipated to go faster than at the 1100-2 and 1100-3 Disposal Pits. The rock cobbles and other debris that slowed drilling at the disposal pits were not present in the Horn Rapids Landfill; as a result, drilling activities at a Horn Rapids Landfill borehole might be completed in as little as three or four days. With such a short time period during which air quality monitoring could be conducted in association with drilling activities, the air quality monitoring field team had little flexibility in selecting the meteorological conditions under which air quality monitoring would be conducted.

Three modifications were made in the sample handling and analysis procedures for VOCs before the beginning of Phase II sampling. First, impurities were found in the initial CMS samples owing to the incomplete cleaning of the CMS cartridges or too long a delay between cartridge cleaning and use. This problem was corrected through the development of more stringent cleaning procedures. Second, calibration standards were not prepared for several VOCs that were detected in the analysis of the CMS samples. Additional calibration work was conducted to correct this problem for future analyses and allow the identification of a broader base of VOCs. Third, to prevent the CMS cartridges from becoming overloaded for certain compounds, shorter exposure times (about 1 h) were used for Phase II monitoring.

Several modifications were also made in the procedures for collecting and analyzing SVOCs. These changes in the monitoring program involved the equipment used to pump air for SVOC sampling, the duration of sampling, the types of samples analyzed for SVOCs, and the focus of the laboratory analysis.

To detect SVOCs at lower atmospheric concentrations than achieved during Phase I, we switched from a battery-powered sampling system to an AC-powered

system with a comparable flow rate. The change in power source allowed us to schedule substantially longer sampling durations. It was determined that a total sampling duration of approximately 24 h would provide an appropriate balance between the need for a longer sampling period and a persistent wind direction. The longer sampling period meant a larger volume of air would be drawn through the samplers, thereby allowing higher concentrations of SVOCs to build up on the sampling media. It was expected that if SVOCs were present in the air near the waste site, this new procedure would increase the likelihood of detecting the pollutants.

The switch to an AC-powered system required the use of a gasoline-powered generator at the waste site and the installation of AC-compatible pump motors. Because of the potential contamination from the exhaust of the generator, simultaneous sampling for VOCs could not be conducted. Therefore, sampling for VOCs and SVOCs was done in separate monitoring events.

Because elevated levels of heavy metals were not detected during Phase I, it was determined that the objective of particulate sampling should be changed to involve the use of glass-fiber filters to determine if SVOCs were adhering to the surface of airborne particulates. This change in objective involved changing from a Teflon filter to a glass-fiber filter on the GMW housings.

#### Phase II Monitoring at the HRL-2 Drilling Site

The HRL-2 drilling site was the first location in the Horn Rapids Landfill at which air quality monitoring was conducted. Drilling at this site began late in the day on January 17. The deployment of air quality monitoring equipment at the site continued as drilling activities began. Three monitoring events were scheduled; monitoring event "G" would involve sampling for SVOCs, and monitoring events "H" and "I" would involve sampling for VOCs.

The first monitoring event conducted was monitoring event "H". This event began on January 18 at 1236 PST and lasted for 1 h. Ten CMS tubes and nine battery-powered sampling pumps were deployed for this event. Two CMS tubes (#1 and #2) were deployed at one location to study the variation in results for CMS tubes operating side-by-side. Winds during this monitoring event were from the north-northwest and the north at speeds estimated at

between 8 and 15 mph (4 and 7 m/s) [winds measured at the 300 Area monitoring station were between 9 and 13 mph (4 and 6 m/s) during this period]. Monitoring was conducted during an extended lunch break for the drilling team (allowing for the shutdown of all local pollutant sources) and was terminated at 1336 PST. The drilling rig had reached a depth of approximately 8 ft (2.4 m) at the time this monitoring event was conducted.

The position of the sampling equipment during monitoring event "H" is shown in Figure 10. One CMS tube (#1) failed during monitoring; its plug vibrated loose and the tube's carbon material was drawn into the sampling pump. The plug on a second tube (#6) also loosened; however, nearly all of the carbon material was retrieved. A third tube (#2) exhibited a significant decrease in flow rate between the initial and final flow rate check, but the tube appeared intact and the decrease in flow rate was attributed to a drained battery. Sampling pump #5 was not used during this monitoring event.

After monitoring event "H" was completed and all samples were collected, monitoring event "G" was begun. After warming up the generator and checking the sampling modules, we began sampling on January 18 at 1357 PST. Winds continued to blow from the north-northwest and the north during the initial period of this monitoring event. The position of the sampling equipment during monitoring event "G" is shown in Figure 11.

Monitoring event "G" was temporarily halted between 1608 PST and 1735 PST to allow monitoring event "I" to be conducted. After the generator was restarted and monitoring event "G" resumed, sampling continued uninterrupted until the event was terminated on January 19 at 1546 PST. The total duration of sampling was approximately 24.5 h. Winds during the monitoring event were predominantly north-northwesterly through north-northeasterly; however, winds were southerly during the last few hours of the monitoring event. There were no problems with the sampling equipment.

Monitoring event "I" began on January 18 at 1624 PST and continued for 58 min. Ten CMS tubes and eight battery-powered sampling pumps were deployed for this event. Two CMS tubes (#4 and #5) were deployed at one location. Winds during this monitoring event were north-northwesterly at speeds estimated at between 5 and 9 mph (2 and 4 m/s) [winds measured at the 300 Area

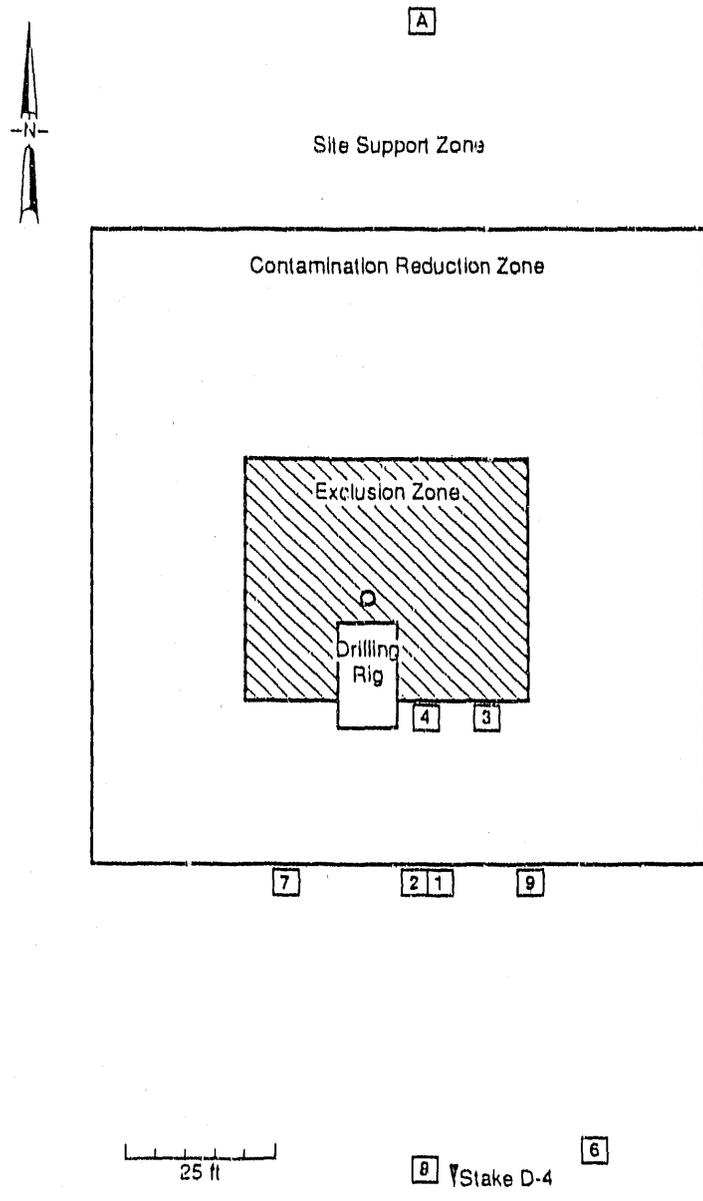
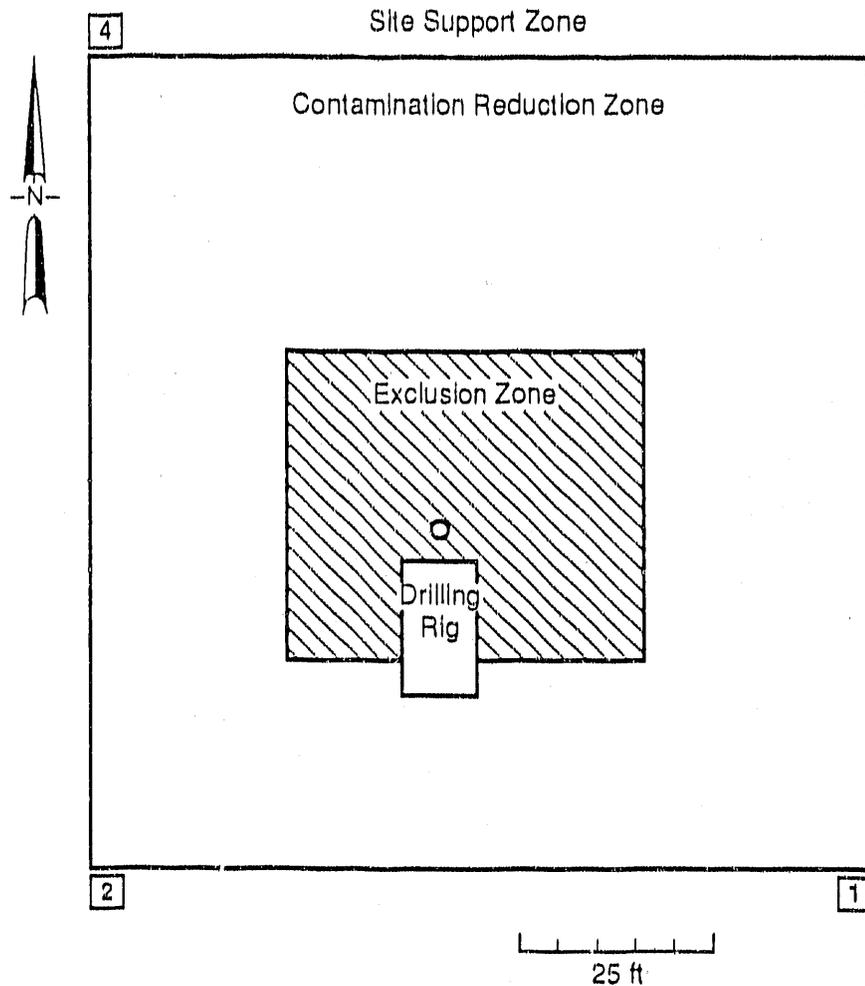


FIGURE 10. The Position of Monitoring Equipment During Monitoring Event "H" at the HRL-2 Drilling Site. Each sampler's pump identification number (or letter) is indicated in the middle of the box that denotes its location. The location of the borehole is indicated by a circle (o) near the center of the exclusion zone. The location of Horn Rapids Landfill marker stake D-4 is also indicated. Winds during this monitoring event were from the north-northwest and north.



**FIGURE 11.** The Position of Monitoring Equipment During Monitoring Event "G" at the HRL-2 Drilling Site. Each sampler's pump identification number is indicated in the middle of the box that denotes its location. The location of the borehole is indicated by a circle (o) near the center of the exclusion zone. Winds during this monitoring event were mostly from the north-northwest.

monitoring station were between 7 and 8 mph (3 and 4 m/s) during this period]. Monitoring was conducted after the day's work by the drilling team ended (allowing for the shutdown of all local pollutant sources). The monitoring event was terminated at 1722 PST. The drilling rig had reached a depth of approximately 14 ft (4 m) by the time this monitoring event was conducted.

The position of the sampling equipment during monitoring event "I" is shown in Figure 12. Two CMS tubes (#1 and #5) failed during the monitoring

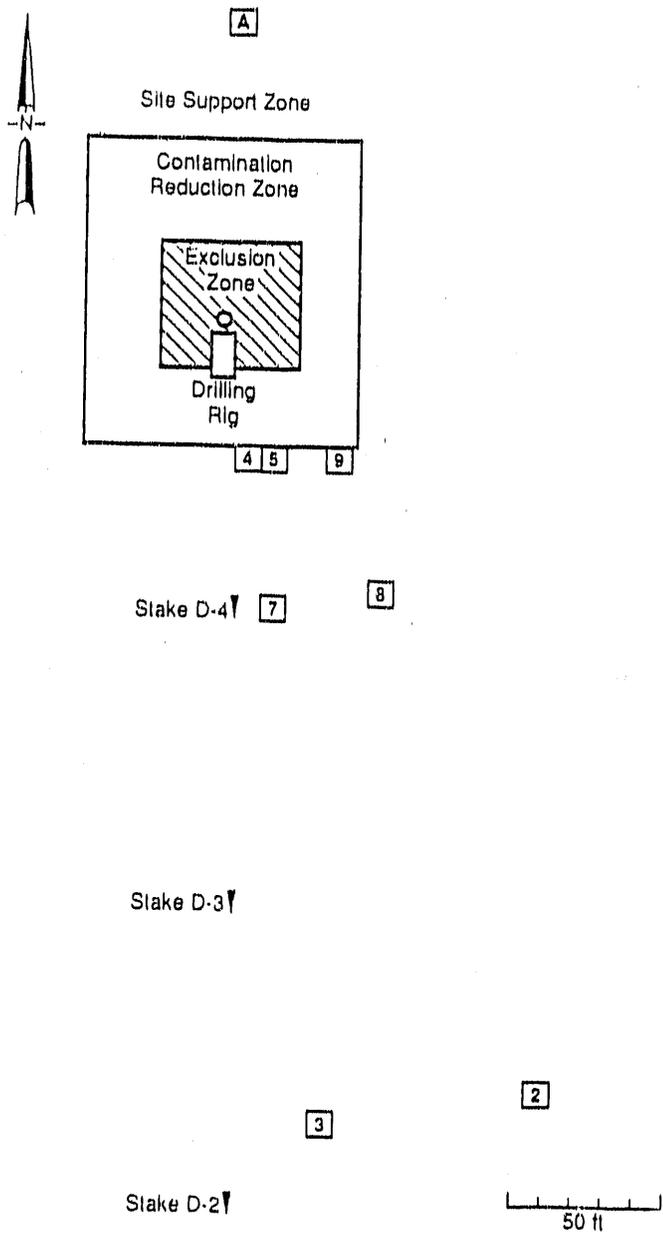


FIGURE 12. The Position of Monitoring Equipment During Monitoring Event "I" at the HRL-2 Drilling Site. Each sampler's pump identification number (or letter) is indicated in the middle of the box that denotes its location. The location of the borehole is indicated by a circle (o) near the center of the exclusion zone. The locations of several Horn Rapids Landfill marker stakes are also indicated. Winds during this monitoring event were from the north-northwest.

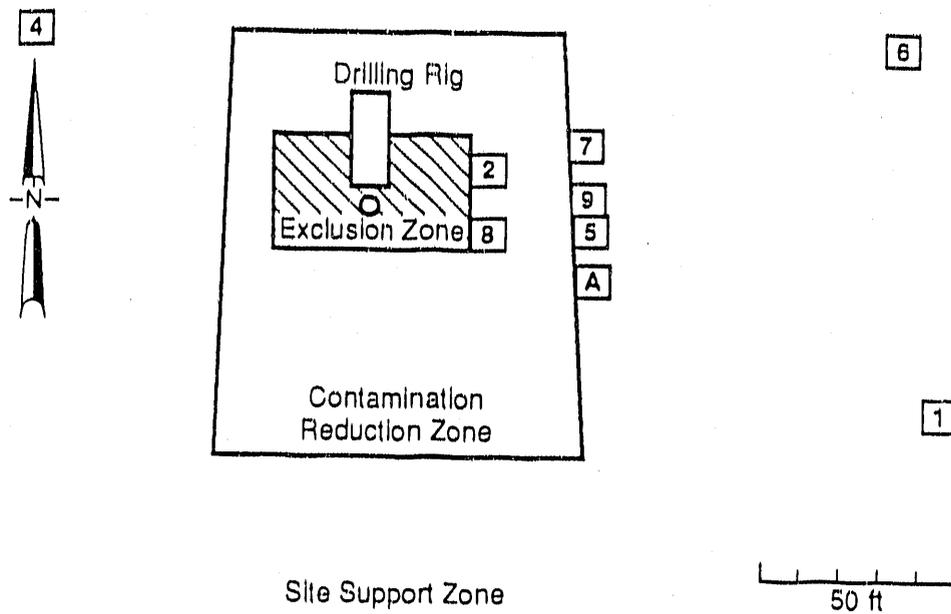
event; their plugs vibrated loose and the tubes' carbon material was drawn into the sampling pumps. Sampling pump #3 and pump #6 were not used during the monitoring event.

#### Phase II Monitoring at the HRL-10 Drilling Site

After work was completed at the HRL-2 drilling site, monitoring equipment was redeployed to the HRL-10 drilling site. Drilling at this site began on January 22. Three monitoring events were scheduled; monitoring event "J" would involve sampling for SVOCs and monitoring events "K" and "L" would involve sampling for VOCs.

The first monitoring event conducted was monitoring event "K". This event began on January 23 at 1300 PST and continued for just over 1 h. Ten CMS tubes and nine battery-powered sampling pumps were deployed for this event. Two CMS tubes (#5 and #9) were deployed at one location. Winds just before the monitoring event began were from the west-southwest through the west-northwest. During the monitoring event, winds were consistently from the west-southwest at speeds of over 20 mph (9 m/s) [winds measured at the 300 Area monitoring station were between 21 and 24 mph (9 and 11 m/s) during this period]. Monitoring was conducted during an extended lunch break for the drilling team (allowing for the shutdown of all local pollutant sources). The monitoring event was terminated at 1401 PST. The drilling rig had reached a depth of approximately 14 ft (4 m) by the time this monitoring event was conducted.

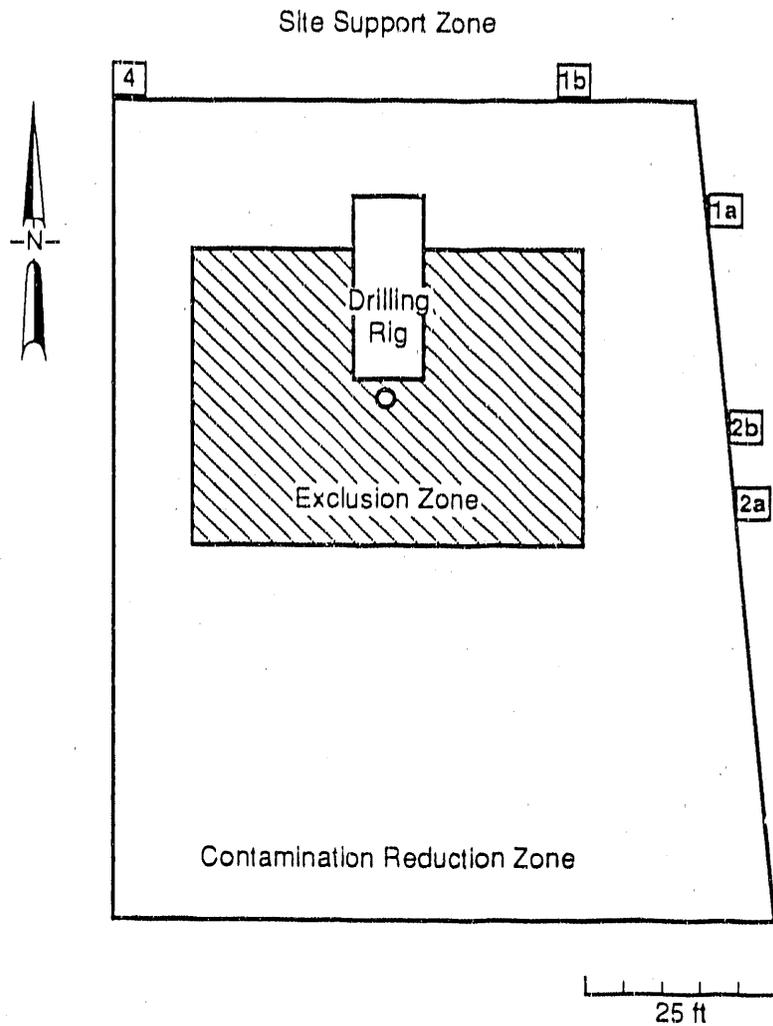
The position of the sampling equipment during monitoring event "K" is shown in Figure 13. One CMS tube (#1) failed during the monitoring event; its plug vibrated loose and carbon material was drawn into the sampling pump. The plug on a second tube (#5) was drawn into the plastic tube leading into the sampling pump; however, the plug and nearly all of the carbon material were retrieved and packed back into the tube. A third tube (#4) is of uncertain quality. The flow rate through this tube was about twice that experienced by the other CMS tubes; the field team could not determine whether this sample was adversely affected by the overly large flow rate. Sampling pump #2 was not used during this monitoring event.



**FIGURE 13.** The Position of Monitoring Equipment During Monitoring Event "K" at the HRL-10 Drilling Site. Each sampler's pump identification number (or letter) is indicated in the middle of the box that denotes its location. The location of the borehole is indicated by a circle (o) near the center of the exclusion zone. Winds during this monitoring event were from the west-southwest.

After monitoring event "K" was completed and all samples were collected, monitoring event "J" began. After field team members warmed up the generator and checked the sampling modules, monitoring event "J" began on January 23 at 1443 PST. Winds continued to blow from the west during the initial portion of this monitoring event. The position of the sampling equipment during the initial portion of monitoring even "J" is shown in Figure 14. At 1744 PST, just over 3 h after the beginning of this monitoring event, the generator powering the AC pumps failed. The site was unattended at this time and the shutdown was not identified until early the next morning.

In the morning of January 24, an emergency service visit was made to diagnose and repair the generator. The automatic shutdown of the generator was traced to a low level of motor oil; oil was added and the automatic shut-off circuit was reset. The winds had shifted significantly from the previous



**FIGURE 14.** The Position of Monitoring Equipment During Monitoring Event "J" at the HRL-10 Drilling Site. Each sampler's pump identification number is indicated in the middle of the box that denotes its location. An "a" after the identification number indicates the initial position of samplers 1 and 2; a "b" indicates their final position. The location of the borehole is indicated by a circle (o) near the center of the exclusion zone. Winds during this monitoring event were initially from the west-southwest, but later ranged from southwesterly through southeasterly.

day, from westerly to more southerly. To maintain the "downwind" sampling equipment in a downwind direction, two of the sampling housings were redeployed. The new position of the sampling equipment is shown in Figure 14. After the generator was restarted, monitoring event "J" resumed on

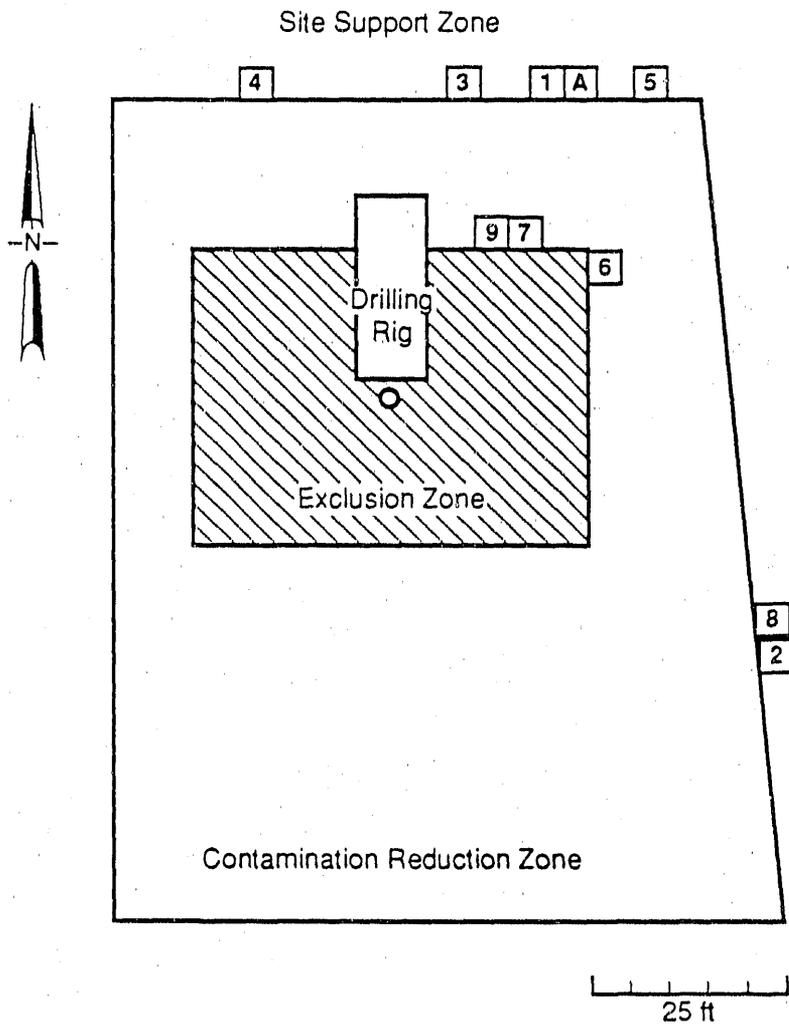
January 24 at 1046 PST. Winds continued southwesterly through southeasterly during the remainder of the monitoring event.

Sampling was discontinued from 1125 to 1257 PST to allow monitoring event "L" to be conducted. After monitoring event "L" was completed, monitoring event "J" resumed and sampling continued until January 24 at 2357 PST when once again the generator powering the AC pumps failed. This second automatic shutdown was detected early the next morning. A second emergency service visit was made that morning to diagnose and repair the generator. The automatic shutdown of the generator was again traced to a low motor oil level. The failure of the generator to maintain a proper oil level was traced to a malfunctioning valve that is part of the system that automatically replenishes the generator's motor oil from a secondary oil reservoir. The generator was restarted after the valve was repaired, motor oil was added to the system, and the automatic shutoff circuit was reset.

With the generator problem finally corrected, monitoring event "J" resumed on January 25 at 0958 PST. The monitoring event was completed later that day at 1540 PST. Sampling instruments operated for approximately 21 h during the 3-day-long monitoring event. Aside from the generator problem, there were no problems with the sampling equipment during this monitoring event.

Monitoring event "L" began on January 24 at 1139 PST and continued for 1 h. Twelve CMS tubes and ten battery-powered sampling pumps were deployed for this event. Side-by-side sets of CMS tubes were deployed at three sampling locations (#2 and #8, #7 and #9, #1 and A). Winds during this monitoring event were from the south-southwest and southwest at speeds between 13 and 18 mph (6 and 8 m/s) (as measured at the 300 Area monitoring station). Monitoring was conducted during the drilling team's lunch break (allowing for the shutdown of all local pollutant sources) and was completed at 1239 PST. The drilling rig had reached a depth of approximately 18 ft (5 m) by the time this monitoring event was conducted.

The position of the sampling equipment during monitoring event "L" is shown in Figure 15. None of the CMS tubes failed during the monitoring event. Sampling pumps were placed on bubble wrap to reduce the vibration



**FIGURE 15.** The Position of Monitoring Equipment During Monitoring Event "L" at the HRL-10 Drilling Site. Each sampler's pump identification number (or letter) is indicated in the middle of the box that denotes its location. The location of the borehole is indicated by a circle (o) near the center of the exclusion zone. Winds during this monitoring event were from the south-southwest and south.

experienced by the CMS tubes during previous monitoring events. This "quick fix" seemed to prevent the loosening of tube plugs that was experienced during earlier monitoring events.

With the completion of monitoring at HRL-10, no additional Phase II monitoring was scheduled. All samples were processed for shipment and delivered to their respective laboratories for analysis.

## RESULTS OF AIR QUALITY MONITORING

In the following section we present the results of the laboratory analysis of the samples collected at each of the waste sites during the second phase of air quality monitoring.

The PUF samples from Phase I sampling and from Phase II sampling at the 1100-2 Disposal Pit were analyzed by U.S. Testing Company's Richland Laboratory for a large number of SVOCs, including

- cresol
- hexachlorobenzene
- pentachlorophenol
- phenol
- hexachlorophene
- naphthalene
- nicotinic acid
- chlorobenzene
- 1,2-, 1,3-, and p-dichlorobenzene
- pentachlorobenzene
- kerosene
- 1,2,4- and 1,3,5-trichlorobenzene
- strychnine
- maleic hydrazide
- tributylphosphate
- 1,2,4,5-, 1,2,3,4-, and 1,2,3,5-tetrachlorobenzene.

These PUF samples were also screened for a limited number of pesticides and PCBs.

The PUF and glass-fiber filter samples from Phase II sampling at the Horn Rapids Landfill were analyzed by U.S. Testing Company's Richland Laboratory for the following pesticide compounds:

- endrin
- alpha BHC
- delta BHC
- 4,4'-DDT
- kepone
- chlordane
- endo sulfate
- methoxychlor
- beta BHC
- 4,4'-DDD
- heptachlor
- dieldrin
- endosulfan I
- chlorobenzilate.
- toxaphene
- lindane
- 4,4'-DDE
- heptepoxide
- aldrin
- endosulfan II

PUF and glass-fiber filter samples from Phase II sampling at the Horn Rapids Landfill were also analyzed by U.S. Testing Company's Richland Laboratory for the following PCBs:

- ARO 1016
- ARO 1221
- ARO 1232
- ARO 1242
- ARO 1248
- ARO 1254
- ARO 1260.

The CMS samples from all Phase I sampling and from Phase II sampling at the 1100-2 Disposal Pit were analyzed for a number of VOCs by Pacific Northwest Laboratory's Soil Gas Laboratory. These compounds include

- tetrachloroethylene (PCE)
- 1,1,1-trichloroethane (1,1,1-TCA)
- trichloroethylene (TCE)
- carbon tetrachloride (CCl<sub>4</sub>)
- benzene
- toluene
- octane.

The CMS samples from Phase II at the Horn Rapids Landfill were analyzed for 41 VOCs by the Air Pollution Sciences Laboratory at Battelle Memorial Institute in Columbus, Ohio. The analyzed compounds are

- dichlorodifluoromethane
- methyl chloride
- 1,2,-dichloro-1,1,2,2,-tetrafluoroethane
- vinyl chloride
- methyl bromide
- ethyl chloride
- trichlorofluoromethane
- 1,1-dichloroethene
- dichloromethane
- 1-1-dichloroethane
- 1,1,2-trichloro-1,2,2-trifluoroethane
- cis-1,2-dichloroethene
- trichloromethane
- 1,2-dichloroethane
- 1,1,1-trichloroethane (1,1,1-TCA)
- benzene
- carbon tetrachloride (CCl<sub>4</sub>)
- 1,2-dichloropropane
- trichloroethene (TCE)
- cis-1,3,-dichloropropene
- trans-1,3-dichloropropene
- 1,1,2-trichloroethane
- toluene
- tetrachloroethene (PCE)

- chlorobenzene
- m+p-xylene
- 1,1,2,2-tetrachloroethane
- 1,3,5-trimethylbenzene
- benzyl chloride
- p-dichlorobenzene
- 1,2,4-trichlorobenzene
- hexachlorobutadiene
- 3-chloropropene.
- ethylbenzene
- styrene
- o-xylene
- 1,2,4-trimethylbenzene
- o-dichlorobenzene
- o-dichlorobenzene
- 4-ethyl toluene
- 1,2-dibromoethane

The Threshold Limit Values<sup>(a)</sup> (TLV) for those of the above VOCs that have values listed by the American Conference of Governmental Industrial Hygienists (1989) are presented in Table 1.

#### RESULTS OF PHASE I MONITORING AT THE 1100-2 AND 1100-3 DISPOSAL PITS

Slightly elevated levels of tetrachloroethylene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), and trichloroethylene (TCE) were detected downwind of the 1100-3 Disposal Pit (Table 2). Concentrations of carbon tetrachloride (CCl<sub>4</sub>) were also above background levels. Impurities in the CMS tubes prevented a more quantitative estimate of airborne CCl<sub>4</sub> concentrations. Although slightly elevated above background values, all the VOCs measured near the disposal pits were present in concentrations that are many orders of magnitude below their respective TLVs (Table 1).

Several SVOCs were detected in significant, but equal, amounts on every sample (including the control blank). The laboratory staff theorized that the uniformly elevated concentrations of several SVOCs were the result of overheating the PUF material during sample cleaning. Pesticides and PCBs were not detected in significant quantities on any PUF sample.

---

(a) Threshold Limit Values refer to the airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect.

**TABLE 1.** Threshold Limit Values for Volatile Organic Compounds Detected in the 1100-EM-1 Operable Unit. Values are from the American Conference of Governmental Industrial Hygienists (1989). Values are presented in units of ng/l to be consistent with the units used in reporting measurements from 1100-EM-1 air monitoring. Threshold limit values are typically reported in mg/m<sup>3</sup>.

Pollutant	Threshold Limit Value (air-borne concentration) (ng/l)
dichlorodifluoromethane	4,950,000
methyl chloride	103,000
1,2,-dichloro-1,1,2,2,-tetrafluoroethane	4,170,000
vinyl chloride	13,000
methyl bromide	19,000
ethyl chloride	2,640,000
trichlorofluoromethane	5,620,000
1,1-dichloroethene	20,000
dichloromethane	174,000
1,1,2-trichloro-1,2,2-tetrafluoroethane	7,670,000
1,1-dichloroethane	810,000
cis-1,2-dichloroethene	793,000
trichloromethane	49,000
1,2-dichloroethane	40,000
1,1,1-trichloroethane (1,1,1-TCA)	1,910,000
benzene	32,000
carbon tetrachloride (CCl <sub>4</sub> )	31,000
1,2-dichloropropane	347,000
trichloroethene (TCE)	269,000
cis-1,3,-dichloropropene	4,500
trans-1,3-dichloropropene	4,500
1,1,2-trichloroethane	55,000
toluene	377,000
tetrachloroethene (PCE)	339,000
chlorobenzene	345,000
ethylbenzene	434,000
m+p-xylene	434,000
styrene	213,000
1,1,2,2-tetrachloroethane	6,900
o-xylene	434,000
1,3,5-trimethylbenzene	123,000
1,2,4-trimethylbenzene	123,000
benzyl chloride	5,200
p-dichlorobenzene	451,000
o-dichlorobenzene	301,000
1,2,4-trichlorobenzene	37,000
hexachlorobutadiene	210
octane	1,400,000

Note: Compound names ending in "ethene" may be named elsewhere with the ending "ethylene."

TABLE 2. Volatile Organic Compound Measurements at the 1100-2 and 1100-3 Disposal Pits(a)

	Pollutant Concentrations at	
	Upwind Monitoring Location (ng/l)	Downwind Monitoring Location (ng/l)
PCE	0.04	0.18
1,1,1-TCA	<0.005(b)	0.15
CCl <sub>4</sub>	<0.005(b)	1.1
TCE	0.04	0.2
Benzene	0.4	0.25
Toluene	<0.005(b)	<0.005(b)
Octane	0.125	0.55

- (a) Sampling volume at the upwind monitoring location: 38.4 l.  
 Sampling volume at the downwind monitoring location: 46.3 l.
- (b) below minimum detectable.

The analyses of Teflon filters showed significant quantities of aluminum, silicon, sulfur, potassium, calcium, and iron in airborne particulates. These are the normal constituents of the local soil; concentrations of these elements were similar on both the upwind and downwind filters. In addition to these elements, copper and zinc were also detected on upwind and downwind filters. It is believed that these two elements, and some of the aluminum and silicon, may have been the result of contamination from the sampling instrument. Elevated levels of heavy metals (e.g., lead, arsenic, uranium) were not detected on any of the filters.

#### RESULTS OF PHASE I MONITORING AT THE HORN RAPIDS LANDFILL

Slightly elevated levels of PCE (on the order of 4 or 5 times background levels) were detected downwind of the Horn Rapids Landfill (Table 3). Concentrations of 1,1,1-TCA, CCl<sub>4</sub>, and TCE were slightly higher upwind of the landfill. The background concentrations of VOCs were significantly higher during this monitoring event than during the monitoring event at the 1100-2 and 1100-3 Disposal Pits. Less favorable dispersion conditions account for much of this difference, although the elevated background concentrations of some VOCs might in part be due to other pollution sources in the area (e.g.,

TABLE 3. Volatile Organic Compound Measurements at the Horn Rapids Landfill(a)

	Pollutant Concentrations at		
	Upwind Monitoring Location (ng/l)	Downwind 1 Monitoring Location (ng/l)	Downwind 2 Monitoring Location (ng/l)
PCE	0.45	2.4	2.9
1,1,1-TCA	0.85	7.0	6.5
CCl <sub>4</sub>	2.2	1.9	1.8
TCE	3.4	2.2	2.2

- (a) Sampling volume at the upwind monitoring location: 18.9 l.  
 Sampling volume at the 1st downwind monitoring location: 14.7 l.  
 Sampling volume at the 2nd downwind monitoring location: 14.7 l.

emissions from a nearby fuel fabrication facility or automobile emissions along Horn Rapids Road). It is important to emphasize that all the VOCs measured near the Horn Rapids Landfill were present in concentrations that are many orders of magnitude below their respective TLVs (Table 1).

Several SVOCs were detected in roughly equivalent concentrations at the upwind and downwind monitoring locations. Benzoic acid was tentatively identified at one downwind monitoring location but not at either the other downwind monitoring location or the upwind monitoring location. Pesticides and PCBs were not detected on any PUF samples.

The analyses of Teflon filters showed significant quantities of aluminum, silicon, sulfur, potassium, calcium, and iron in airborne particulates. These are the normal constituents of the local soil; concentrations of these elements were similar in both the upwind and downwind filters. Elevated levels of heavy metals (e.g., lead, arsenic, uranium) were not detected on any of the filters. During separate sampling for asbestos, under conditions that would maximize the suspension of asbestos fibers from the Horn Rapids Landfill, asbestos fibers were not detected on either of the filters deployed downwind of the landfill's asbestos disposal area. Asbestos concentrations were reported as being below the minimum detectable level of 0.02 fibers/cc

(<0.03 fibers per field). The lowest TLV for asbestos is 0.2 fibers/cc (American Conference of Governmental Industrial Hygienists 1989).

RESULTS OF PHASE I MONITORING AT THE BATTERY ACID PIT

Slightly elevated levels of PCE, 1,1,1-TCA, and TCE were detected upwind of the Battery Acid Pit (Table 4). This may be the result of the proximity of the waste site to local sources of pollution or the effects of the 1170 Building on air flow at the downwind monitoring location. All other VOCs were measured at concentrations comparable to those measured on the control blank.

Several SVOCs were detected in roughly equivalent concentrations at the upwind, downwind, and blank samples. Pesticides and PCBs were not detected on any PUF sample. Particulate sampling was not conducted at this site during this phase of monitoring, because the heavy metals contained in the liquids that were dumped into the pit are currently buried beneath fill material. A mechanism for entraining waste site particulates into the atmosphere will not exist until intrusive activities disturb the site and bring contaminated soils to the surface.

TABLE 4. Volatile Organic Compound Measurements at the Battery Acid Pit(a)

	<u>Pollutant Concentrations at</u>	
	<u>Upwind Monitoring Location (ng/l)</u>	<u>Downwind Monitoring Location (ng/l)</u>
PCE	0.17	0.04
1,1,1-TCA	1.0	0.80
CCl4	0.47	0.45
TCE	0.49	0.37

(a) Sampling volume at the upwind monitoring location: 5.7 l.  
Sampling volume at the downwind monitoring location: 4.5 l.

## RESULTS OF PHASE II MONITORING AT THE 1100-2 DISPOSAL PIT

The concentrations of the standard SVOCs sampled during monitoring event "F" were all below minimum detectable levels. Any supplementary SVOCs detected during the analysis of samples were present in similar quantities on both field samples and the control blank, indicating that these compounds were sample-handling or laboratory contaminants and were not present in the atmosphere near the waste site. Laboratory data sheets for the PUF samples and glass-fiber filters are presented in Appendix E.

The laboratory analysis of the CMS tubes collected during monitoring event "F" indicated extremely low concentrations of VOCs in the vicinity of the 1100-2 Disposal Pit (Table 5). The TLVs for PCE, 1,1,1-TCA, CCl<sub>4</sub>, and TCE are hundreds to thousands of times greater than the concentrations that were detected at the monitoring locations. VOC concentrations were slightly higher in the samples collected downwind of the drilling site than in the sample collected upwind of the site; however, these differences are well within the bounds of uncertainty associated with sample collection efficiencies, flow rate measurements, and laboratory analysis techniques.

This analysis indicates that significant levels of SVOCs and VOCs were not present in the atmosphere near the disposal pit during monitoring event "F". If these compounds were being emitted to the atmosphere from the 1100-2 Disposal Pit, their emission rates were extremely low.

TABLE 5. Volatile Organic Compound Measurements at the 1100-2 Disposal Pit (a)

	Pollutant Concentrations at		
	Upwind Monitoring Location (ng/l)	Downwind 1 Monitoring Location (ng/l)	Downwind 2 Monitoring Location (ng/l)
PCE	0.02	0.05	0.22
1,1,1-TCA	0.30	2.1	4.9
CCl <sub>4</sub>	0.43	0.65	1.2
TCE	0.08	0.16	0.39

- (a) Sampling volume at the upwind monitoring location: 6.4 l.  
Sampling volume at the NE downwind monitoring location: 3.1 l.  
Sampling volume at the NNE downwind monitoring location: 5.1 l.

RESULTS OF PHASE II MONITORING AT THE HRL-2 DRILLING SITE IN THE HORN  
RAPIDS LANDFILL

The concentrations of pesticides and PCBs sampled during this monitoring event (a combination of both PUF and filter samples) were all below minimum detectable levels. Laboratory data sheets for the PUF and glass-fiber filter samples collected during monitoring event "G" are presented in Appendix E.

The laboratory analysis of the CMS tubes collected during monitoring event "H" indicates that a variety of VOCs was present at low concentrations near the drilling site (Table 6). The VOCs detected at concentrations exceeding 1 ng/l are trichlorofluoromethane, dichlorodifluoromethane, benzene, toluene, 1,1,1-TCA, and m+p-xylene. The TLVs for these VOCs are thousands of times greater than the measured pollutant concentrations. The highest concentration for a VOC at a single monitoring location is just over 20 ng/l of trichlorofluoromethane. Results of sampling did not indicate any significant increase in the concentrations of VOCs downwind of the drilling site. Any VOCs emitted from the borehole during monitoring event "H" are indistinguishable from the low background concentrations of VOCs that were present during the monitoring event.

The laboratory analysis of the CMS tubes collected during monitoring event "I" indicate that a variety of VOCs were present at low concentrations near the drilling site (Table 7). The VOCs detected at concentrations exceeding 1 ng/l are trichlorofluoromethane, dichlorodifluoromethane, methyl chloride, benzene, 1,1,1-TCA, CCl<sub>4</sub>, and toluene. The TLVs for each of these VOCs are thousands of times greater than the measured pollutant concentrations. The highest concentration for a VOC at a single monitoring location is just under 14 ng/l of trichlorofluoromethane. Results of sampling did not indicate any significant increase in the concentrations of VOCs downwind of the drilling site. Any VOCs emitted from the borehole during monitoring event "I" were indistinguishable from the background concentrations of VOCs that were present during the monitoring event.

TABLE 6. Volatile Organic Compound Measurements for Monitoring Event "H" at the HRL-2 Drilling Site. "ND" indicates that less than 1 ng of the indicated compound was present in the GC/MS trap during the sample's analysis. For the sampling volumes associated with this monitoring event (i.e., 16 - 39 l), an "ND" value corresponds to a minimum detectable atmospheric concentration of less than 0.1 ng/l. On the field blank, none of the tested compounds was present above the "ND" level. "\*\*\*\*\*" indicates that interference from another compound prevented the detection of the indicated compound.

Compound	CMS Tubes						
	H2C	H3C	H4C	H7C	H8C	H9C	HAC
	(ng/l)						
dichlorodifluoroethane	1.62	1.98	2.81	2.21	2.11	*****	1.71
methyl chloride	0.66	0.99	0.64	0.94	0.55	*****	0.34
1,2-dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	ND	ND	ND	ND	ND	ND
methyl bromide	ND	ND	ND	ND	ND	ND	ND
ethyl chloride	ND	ND	ND	ND	ND	ND	ND
trichlorofluoroethane	13.38	9.89	18.46	18.05	36.94	17.82	28.52
1,1-dichloroethane	ND	ND	ND	ND	ND	0.14	ND
dichloroethane	ND	ND	ND	ND	ND	ND	ND
3-chloropropene	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloro-1,2,2-trifluoroethane	0.71	0.77	0.82	0.77	0.78	0.63	0.71
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND
trichloroethane	0.62	0.13	0.48	0.16	ND	0.12	0.21
1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	0.89	0.95	1.19	1.38	1.07	0.88	0.99
benzene	1.89	1.86	1.21	0.84	0.72	0.52	0.88
carbon tetrachloride	0.64	0.72	0.75	0.71	0.68	0.53	0.67
1,2-dichloropropane	ND	ND	ND	ND	ND	ND	ND
trichloroethene	ND	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND	ND	ND
toluene	1.29	0.85	4.44	1.22	0.81	0.98	0.58
1,2-dibromoethane	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene	ND	0.15	0.41	0.46	ND	0.11	ND
chlorobenzene	ND	ND	ND	ND	ND	ND	ND
ethylbenzene	0.28	0.15	0.37	0.28	0.13	0.12	0.18
m-p-xylene	0.81	0.32	1.27	0.64	0.43	0.31	0.19
styrene	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	ND	ND	ND
o-xylene	0.24	0.14	0.48	0.25	0.18	0.12	0.18
4-ethyl toluene	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	0.19	0.34	0.19	ND	ND	ND	ND
1,2,4-trimethylbenzene	0.31	0.39	0.34	0.21	0.28	ND	ND
benzyl chloride	ND	ND	ND	ND	ND	ND	ND
m-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND
p-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND
o-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	ND	ND	ND	ND	ND	ND	ND
hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND

TABLE 7. Volatile Organic Compound Measurements for Monitoring Event "I" at the HRL-2 Drilling Site. "ND" indicates that less than 1 ng of the indicated compound was present in the GC/MS trap during the sample's analysis. For the sampling volumes associated with this monitoring event (i.e., 17 - 64 l), an "ND" value corresponds to a minimum detectable atmospheric concentration of less than 0.1 ng/l. On the field blank, none of the tested compounds was present above the "ND" level. "\*\*\*\*\*" indicates that interference from another compound prevented the detection of the indicated compound.

Compound	CMS Tubes					
	IAC	I2C	I4C	I7C	I8C	I9C
	(ng/l)					
dichlorodifluoromethane	2.35	*****	*****	2.17	1.98	2.18
methyl chloride	0.72	*****	*****	1.18	0.55	0.87
1,2-dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	ND	ND	ND	ND	ND
methyl bromide	ND	ND	ND	ND	ND	ND
ethyl chloride	ND	ND	ND	ND	ND	ND
trichlorofluoromethane	0.47	13.03	2.04	11.47	13.41	9.17
1,1-dichloroethene	ND	0.28	ND	ND	ND	ND
dichloromethane	ND	ND	ND	ND	ND	ND
3-chloropropene	ND	ND	ND	ND	ND	ND
1,1,2-trichloro-1,2,2-trifluoroethane	0.84	0.60	0.75	0.92	0.87	0.70
1,1-dichloroethane	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethene	ND	ND	ND	ND	ND	ND
trichloroethane	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	1.01	0.44	0.79	2.00	1.43	1.09
benzene	0.88	0.90	0.93	1.05	0.92	0.78
carbon tetrachloride	0.83	0.40	0.70	0.75	0.74	0.71
1,2-dichloropropane	ND	ND	ND	ND	ND	ND
trichloroethene	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND	ND
toluene	0.48	1.18	0.83	0.80	0.88	1.29
1,2-dibromoethane	ND	ND	ND	ND	ND	ND
tetrachloroethene	ND	ND	0.11	ND	1.28	0.81
chlorobenzene	ND	ND	ND	ND	ND	ND
ethylbenzene	ND	0.11	0.16	0.12	0.19	0.16
m-p-xylene	0.23	0.23	0.47	0.32	0.37	0.41
styrene	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	ND	ND
o-xylene	0.10	ND	0.19	0.13	0.14	0.15
4-ethyl toluene	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	ND	ND	ND	ND	ND	ND
1,2,4-trimethylbenzene	ND	ND	0.14	ND	0.65	0.51
benzyl chloride	ND	ND	ND	ND	ND	ND
m-dichlorobenzene	ND	ND	ND	ND	ND	0.15
p-dichlorobenzene	ND	ND	ND	ND	ND	ND
o-dichlorobenzene	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	ND	ND	ND	ND	ND	ND
hexachlorobutadiene	ND	ND	ND	ND	ND	ND

## RESULTS OF PHASE II MONITORING AT THE HRL-10 DRILLING SITE IN THE HORN RAPIDS LANDFILL

The concentrations of pesticides and PCBs sampled during this monitoring event (a combination of both PUF and filter samples) were all below minimum detectable levels. Laboratory data sheets for the PUF and glass-fiber filter samples collected during monitoring event "J" are presented in Appendix E.

The laboratory analysis of the CMS tubes collected during monitoring event "K" indicates that a variety of VOCs was present at low concentrations near the drilling site (Table 8). The VOCs detected at concentrations exceeding 1 ng/l are trichlorofluoromethane, dichlorodifluoromethane, methyl chloride, benzene, toluene, 1,1,1-TCA, PCE, and 1,3,5-trimethylbenzene. The TLVs for these VOCs are thousands of times greater than the measured pollutant concentrations. The highest concentration for a VOC at a single monitoring location is just over 18 ng/l of trichlorofluoromethane. Results of sampling did not indicate any significant increase in the concentrations of VOCs downwind of the drilling site. Any VOCs emitted from the borehole during monitoring event "K" are indistinguishable from the background concentrations of VOCs that were present during the monitoring event.

The laboratory analysis of samples collected during monitoring event "L" indicated that a variety of VOCs were present in detectable concentrations near the drilling site (Table 9). The VOCs detected at concentrations exceeding 1 ng/l are trichlorofluoromethane, dichlorodifluoromethane, methyl chloride, 1,1,2-trichloro-1,2,2-trifluoroethane, benzene, 1,1,1-TCA, toluene, PCE, and 1,2,4-trimethylbenzene. The TLV values for each of these VOCs are thousands of times greater than the measured pollutant concentrations. The highest concentration for a VOC at a single monitoring location is just under 22 ng/l of trichlorofluoromethane. Results of sampling did not indicate any significant increase in the concentrations of VOCs downwind of the drilling site. Any VOCs emitted for the borehole during monitoring event "L" were indistinguishable from the background concentrations of VOCs that were present during the monitoring event.

TABLE 8. Volatile Organic Compound Measurements for Monitoring Event "K" at the HRL-10 Drilling Site. "ND" indicates that less than 1 ng of the indicated compound was present in the GC/MS trap during the sample's analysis. For the sampling volumes associated with this monitoring event (i.e., 12 - 31 l), an "ND" value corresponds to a minimum detectable atmospheric concentration of less than 0.1 ng/l. On the field blank, none of the tested compounds was present above the "ND" level. "\*\*\*\*\*" indicates that interference from another compound prevented the detection of the indicated compound.

Compound	CMS Tube						
	K2C	K4C	K5C	K6C	K7C	K8C	K9C
	(ng/l)						
dichlorodifluoromethane	2.19	*****	*****	8.43	7.19	2.81	2.84
methyl chloride	*****	*****	*****	1.18	3.57	1.28	8.79
1,2-dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	ND	ND	ND	ND	ND	ND
methyl bromide	ND	ND	ND	ND	ND	ND	ND
ethyl chloride	ND	ND	ND	ND	ND	ND	ND
trichlorofluoromethane	7.77	2.83	8.45	14.39	7.19	17.88	18.19
1,1-dichloroethene	ND	0.16	ND	ND	ND	ND	ND
dichloromethane	ND	ND	ND	ND	ND	0.85	0.39
3-chloropropene	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloro-1,2,2-trifluoroethane	0.75	0.85	0.81	0.67	ND	0.71	0.71
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethene	ND	ND	ND	ND	ND	ND	ND
trichloroethane	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	1.09	0.58	0.95	1.03	1.18	1.02	1.13
benzene	0.99	0.81	0.65	0.91	1.01	0.83	0.97
carbon tetrachloride	0.55	0.35	0.57	0.55	0.37	0.64	0.64
1,2-dichloropropane	ND	ND	ND	ND	ND	ND	ND
trichloroethene	ND	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND	ND	ND
toluene	0.45	0.45	0.49	4.91	9.54	2.72	2.25
1,2-dibromoethane	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene	ND	0.44	ND	ND	1.73	0.89	1.42
chlorobenzene	ND	ND	ND	ND	ND	ND	ND
ethylbenzene	0.13	ND	ND	ND	0.14	ND	0.11
m-p-xylene	ND	ND	ND	ND	0.23	0.18	0.17
styrene	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	ND	ND	ND
o-xylene	ND	ND	ND	ND	ND	ND	ND
4-ethyl toluene	ND	ND	ND	ND	ND	ND	ND
1,3,5-trimethylbenzene	ND	ND	ND	ND	1.12	0.78	0.75
1,2,4-trimethylbenzene	ND	0.51	ND	ND	0.98	0.78	0.68
benzyl chloride	ND	ND	ND	ND	ND	ND	ND
m-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND
p-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND
o-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	ND	ND	ND	ND	ND	ND	ND
hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND

TABLE 9. Volatile Organic Compound Measurements for Monitoring Event "L" at the HRL-10 Drilling Site. "ND" indicates that less than 1 ng of the indicated compound was present in the GC/MS trap during the sample's analysis. For the sampling volumes associated with this monitoring event (i.e., 6 - 18 l), an "ND" value corresponds to a minimum detectable atmospheric concentration of less than 0.2 ng/l. On the field blank, none of the tested compounds was present above the "ND" level. "\*\*\*\*\*" indicates that interference from another compound prevented the detection of the indicated compound.

Compound	CMS Tube								
	L1C	L2C	L3C	L4C	L5C	L6C	L8C	L9C	LAC
	(ng/l)								
dichlorodifluoroethane	1.77	3.17	1.21	11.99	2.40	1.84	10.51	6.84	2.50
ethyl chloride	*****	1.88	0.81	6.11	0.82	1.18	5.75	3.28	1.13
1,2-dichloro-1,1,2,2-tetrafluoroethane	ND	ND	2.34	ND	ND	ND	ND	ND	ND
vinyl chloride	ND	0.55	ND	ND	ND	ND	ND	ND	ND
ethyl bromide	ND	ND	ND	ND	ND	ND	ND	ND	ND
ethyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichlorofluoroethane	9.20	20.61	8.56	12.70	15.18	12.80	12.21	21.27	18.89
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-chloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloro-1,2,2-trifluoroethane	0.60	0.82	0.61	0.80	0.80	0.82	ND	1.11	0.84
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-trichloroethane	0.80	0.95	0.75	0.90	0.95	0.70	1.30	3.03	1.56
benzene	0.83	0.89	0.83	1.06	1.08	0.82	0.77	1.55	0.85
carbon tetrachloride	0.39	0.77	0.60	0.80	0.54	0.47	0.60	0.60	0.50
1,2-dichloropropane	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-dichloropropene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
toluene	1.79	0.72	0.82	2.21	2.61	0.65	2.51	20.88	19.06
1,2-dibromoethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
tetrachloroethene	ND	ND	1.29	0.97	ND	0.74	1.69	2.12	1.38
chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-p-xylene	ND	ND	0.51	0.46	0.29	0.23	ND	ND	0.32
styrene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-tetrachloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-ethyl toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-triethylbenzene	ND	ND	0.19	0.39	0.45	ND	ND	ND	0.38
1,2,4-triethylbenzene	ND	ND	0.65	1.05	0.47	ND	2.09	2.82	0.77
benzyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
hexachlorobutadiene	ND	ND	ND	ND	ND	ND	ND	ND	ND

It is interesting to note the different concentrations of VOCs detected by CMS tubes operated in a side-by-side mode (e.g., L1C and L9C). Although these tubes were exposed at the same monitoring location and for the same period of time, they show differences in pollutant concentrations that are comparable to those observed when comparing concentrations from the upwind monitoring site to those recorded for any of the downwind monitoring locations. This suggests that the concentration differences between samples are insignificant when concentrations as low as observed during this study are compared.

## PROCEDURAL CHANGES TO IMPROVE PERFORMANCE IN FUTURE MONITORING PROGRAMS

Based on lessons learned during Phase II of the air quality monitoring program, four modifications are being considered for incorporation in future air quality monitoring procedures. First, a new "even-flow" manifold is needed to clean CMS tubes in the gas chromatograph oven. Concerns have been raised about the unequal flow rates through the CMS tubes when they are cleaned using the old linear manifold. Although contamination problems have not occurred, an even-flow manifold would ensure the same flow rate through the sampling tubes and guarantee a more uniform cleaning of the tubes. This would be especially important if a contaminated batch of CMS tubes were being cleaned for reuse.

Second, additional testing is required to quantify CMS tube performance; this is particularly important in cases for which low VOC concentrations are anticipated. Experiments involving the sampling of known pollutant concentrations are required to gage CMS tube performance at various exposure levels. Experiments involving side-by-side sampling are required to determine if concentration variations between samples are due to unquantified uncertainties or variations in a pollutant's atmospheric concentrations.

Third, the use of mass flow meters to measure flows through sampling media will be assessed. The use of flow meters would allow us to directly measure total flow through a sampler instead of computing this value from one or more quick flow check measurements during the course of monitoring. Several flow meters have been purchased by the Pacific Northwest Laboratory for use in environmental monitoring programs. We will carefully assess the performance of the flow meters during their routine use for other projects and determine if we can apply them for use during future monitoring events at hazardous waste sites.

Fourth, methods must be routinely applied to reduce vibration within sampler housings when PS-1 sampler pumps are being used. Pump vibration has shown a tendency to loosen the glass wool plugs on the CMS tubes and cause the tube to malfunction. The use of bubble wrap and other vibration reduction methods will be explored.

## CONCLUSIONS

The first phase of air quality monitoring at the 1100-EM-1 Operable Unit was conducted in April and May 1989. The air pollutants monitored during this study included volatile organic compounds, semivolatile organic compounds (pesticides and PCBs are included in this category), heavy metals, and asbestos. Monitoring was conducted at several locations near each waste site (the 1100-2 and 1100-3 Disposal Pits, Horn Rapids Landfill, and Battery Acid Pit) to determine upwind and downwind pollutant concentrations.

The second phase of air quality monitoring at the 1100-EM-1 Operable Unit was conducted in September 1989 and January 1990. The air pollutants monitored during this study included a wide range of volatile organic compounds and semivolatile organic compounds (pesticides and PCBs are included in this category). Monitoring was conducted at several locations near the 1100-2 Disposal Pit and in the Horn Rapids Landfill at the HRL-2 and HRL-10 borehole sites. Monitoring equipment was positioned to allow the assessment of both upwind and downwind pollutant concentrations.

At each of the waste sites, detectable levels of volatile organic compounds were measured in the air upwind and downwind of the borehole. Differences in pollutant concentrations between upwind and downwind monitoring locations were not statistically significant. The threshold limit values for each of the detected volatile organic compounds were hundreds to thousands of times greater than measured concentrations. Even under less favorable dispersion conditions, threshold limit values would still be hundreds of times greater than projected volatile organic compounds concentrations. Although this study indicates that emission rates from the waste sites were extremely low during our monitoring events, we have not estimated the degree to which these emission rates might change if additional Horn Rapids Landfill boreholes are drilled during summer months (when higher air and sub-surface temperatures might increase volatilization rates).

Semivolatile organic compounds were not detected in the atmosphere near the waste sites; laboratory data indicated that each of the analyzed

semivolatile organic compounds had concentrations below minimum detectable limits.

Elevated concentrations of heavy metals were not measured on any of the filters collected downwind of the waste sites during Phase I sampling. Also during Phase I, asbestos fibers were not detected downwind of the Horn Rapids Landfill.

The results of the air quality monitoring program indicate that significant concentrations of volatile organic compounds, semivolatile organic compounds, SVOCs, heavy metals, and asbestos fibers were not being emitted to the atmosphere from 1100-EM-1 waste sites before or during intrusive RI activities.

Because the atmospheric pathway for pollutant exposure at the 1100-EM-1 was found to be insignificant during Phases I and II, it was determined that a third phase of air quality monitoring to investigate air quality after the completion of intrusive RI activities would not be required.

## REFERENCES

American Conference of Governmental Industrial Hygienists 1989. Threshold Limit Values and Biological Exposure Indices for 1989-1990. ISBN: 0-936712-81-3. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.

Marquardt, G. D. 1987. "Toxic Air Quality Investigation at a Hazardous Waste Site." In Proceedings of Superfund '87, 8th National Conference. pp. 284-295, Washington, D.C.

U.S. DOE. 1989. Remedial Investigation/Feasibility Study Work Plan for the 1100-EM-1 Operable Unit Hanford Site. DOE/RL 88-23, U.S. Department of Energy, Richland, Washington.

U.S. EPA. 1983. Quality Assurance Handbook for Air Pollution Measurement Systems. Volume II of Ambient Specific Methods. EPA/600/4-77-027a, Section 2, U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA. 1984. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. EPA/600/4-84-041, U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA. 1986. Supplement to EPA/600/4-84-041: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. EPA/600/4-87-006, U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA. 1988. Compendium Method TO-14, The Determination of Volatile Organic Compounds (VOCs) in Ambient Air Using SUMMA Passivated Canister Sampling and Gas Chromatographic Analysis. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

WHC. 1989. 1100 Area Air Quality Monitoring Protocols and Procedures. WHC-MR-0030, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

METEOROLOGICAL DATA FOR EACH MONITORING EVENT

## METEOROLOGICAL DATA FOR EACH MONITORING EVENT

Meteorological data for the 1100-EM-1 air quality monitoring events are presented in this appendix. The data were collected from Hanford meteorological monitoring stations located near the waste sites (the 300 Area and Richland stations) or from a portable meteorological tower that was deployed near the waste site just before a monitoring event. The 300 Area meteorological monitoring station is located near Highway 4S (Stevens Drive), under 1 mi (1.6 km) north-northeast of the Horn Rapids Landfill. The Richland meteorological monitoring station is located on the roof of the Richland Airport control tower. This station is about 2 mi (3 km) south-southwest of the 1100-2 and 1100-3 Disposal Pits. If used during a monitoring event, a portable meteorological monitoring tower was positioned as indicated.

Meteorological Data Collected During Monitoring Event "B"  
Monitoring at the 1100-2 and 1100-3 Disposal Pits

Date: April 3, 1989

Data were collected using the supplementary monitoring tower. The portable tower was located 200 ft (60 m) southwest of the 1100-3 Disposal Pit 3.

Temperature at start of monitoring event: 62°F (17°C)

Temperature at end of monitoring event: 63°F (17°C)

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 5° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
13:00	12:00	220°	8.3
13:15	12:15	250°	9.1
13:30	12:30	240°	9.4
13:45	12:45	280°	7.3
14:00	13:00	295°	6.3
14:15	13:15	250°	7.9
14:30	13:30	295°	6.0
14:45	13:45	255°	8.4
15:00	14:00	240°	7.9
15:15	14:15	260°	7.3
15:30	14:30	265°	7.5
15:45	14:45	260°	11.0

Meteorological Data Collected During Monitoring Event "C"  
Standard Monitoring at the Horn Rapids Landfill

Date: May 2, 1989

The datalogger for the supplementary monitoring tower failed during this monitoring event. Representative data are available from the 300 Area and Richland Airport meteorology monitoring stations.

Temperature during the monitoring event:  $\approx$  69°F (21°C)

The wind direction presented below is the mean direction the wind was blowing from during each one-hour averaging period. Winds are rounded to the nearest 5° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

300 Area Meteorology Monitoring Station

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
11:00	10:00	230°	7
12:00	11:00	240°	4
13:00	12:00	160°	4

Richland Meteorology Monitoring Station

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
11:00	10:00	260°	6
12:00	11:00	250°	8
13:00	12:00	210°	4

Meteorological Data Collected During Monitoring Event "D"  
Asbestos Monitoring at the Horn Rapids Landfill

Date: May 24, 1989

Supplementary meteorological monitoring was not required during this monitoring event. Meteorological observations at the 300 Area and Richland Airport meteorology monitoring stations were representative of the conditions present at the landfill on this day<sup>(a)</sup>.

Temperature during the monitoring event:  $\approx 67^{\circ}\text{F}$  ( $19^{\circ}\text{C}$ )

The wind direction presented below is the mean direction the wind was blowing from during each one-hour averaging period. Winds are rounded to the nearest  $5^{\circ}$  and are measured clockwise from true North. Add or subtract  $180^{\circ}$  to obtain the mean transport direction (the direction the wind was blowing toward).

300 Area Meteorology Monitoring Station

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
12:00	11:00	240°	19
13:00	12:00	240°	18
14:00	13:00	250°	17
15:00	14:00	250°	18
16:00	15:00	240°	18

Richland Meteorology Monitoring Station

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
12:00	11:00	230°	19
13:00	12:00	230°	16
14:00	13:00	240°	16
15:00	14:00	260°	15
16:00	15:00	270°	15

- (a) The strong atmospheric pressure gradient that was present on this day produced uniform meteorological conditions over a wide area that included the southern portion of the Hanford Site and north Richland.

Meteorological Data Collected During Monitoring Event "E"  
Standard Monitoring at the Battery Acid Pit

Date: May 25, 1989

The datalogger for the supplementary monitoring tower was still inoperable for this monitoring event. Representative data are available from the 300 Area and Richland Airport meteorology monitoring stations.

Temperature during the monitoring event:  $\approx$  70°F (21°C)

The wind direction presented below is the mean direction the wind was blowing from during each one-hour averaging period. Winds are rounded to the nearest 5° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

300 Area Meteorology Monitoring Station

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
12:00	11:00	240°	12
13:00	12:00	210°	11
14:00	13:00	210°	10
15:00	14:00	240°	8
16:00	15:00	270°	6

Richland Meteorology Monitoring Station

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
12:00	11:00	210°	11
13:00	12:00	200°	9
14:00	13:00	210°	7
15:00	14:00	260°	5
16:00	15:00	240°	7

Meteorological Data Collected During Monitoring Event "F"  
Monitoring at the 1100-2 Disposal Pit

Date: September 15, 1989

Data were collected using the portable monitoring tower. The portable tower was located about 100 ft (30 m) north of the northeast corner of the 1100-2 Disposal Pit.

Temperature at start of monitoring event: 92°F (34°C)

Temperature at end of monitoring event: 72°F (22°C)

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 5° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

<u>Time</u> <u>(PDT)</u>	<u>Time</u> <u>(PST)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
18:00	17:00	250°	10
18:15	17:15	245°	11
18:30	17:30	245°	10
18:45	17:45	255°	8
19:00	18:00	270°	5
19:15	18:15	265°	5
19:30	18:30	245°	4
19:45	18:45	220°	4
20:00	19:00	215°	5
20:15	19:15	215°	8
20:30	19:30	240°	9
20:45	19:45	230°	8
21:00	20:00	220°	7
21:15	20:15	220°	7
21:30	20:30	215°	7
21:45	20:45	215°	6
22:00	21:00	210°	6

Meteorological Data Collected During Monitoring Event "G"  
Monitoring at the Horn Rapids Landfill

Date: January 18-19, 1990

Meteorological data are collected at the 300 Area and Richland Airport meteorological monitoring stations.

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 10° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

Time (PST)	300 Area Station		Richland Airport Station	
	Wind Direction (from N)	Wind Speed (mph)	Wind Direction (from N)	Wind Speed (mph)
13:00 - 1/18	10°	10	20°	6
14:00	350°	12	0°	9
15:00	350°	9	350°	10
16:00	340°	9	330°	8
17:00	340°	8	330°	7
18:00	10°	8	10°	5
19:00	10°	8	10°	5
20:00	0°	6	0°	4
21:00	340°	4	10°	3
22:00	10°	8	350°	5
23:00	350°	5	350°	3
24:00	350°	6	20°	3
01:00 - 1/19	0°	4	10°	4
02:00	20°	5	10°	4
03:00	150°	2	110°	3
04:00	210°	2	140°	3
05:00	180°	2	160°	3
06:00	220°	2	150°	2
07:00	310°	4	200°	1
08:00	20°	3	300°	3
09:00	250°	3	330°	1
10:00	340°	1	40°	2
11:00	40°	3	30°	2
12:00	40°	3	90°	2
13:00	160°	2	300°	1
14:00	150°	3	230°	1
15:00	190°	2	180°	2
16:00	190°	2	190°	3

Meteorological Data Collected During Monitoring Event "H"  
Monitoring at the Horn Rapids Landfill

Date: January 18, 1990

Meteorological data are collected at the 300 Area and Richland Airport meteorological monitoring stations.

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 10° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

Time (PST)	300 Area Station		Richland Airport Station	
	Wind Direction (from N)	Wind Speed (mph)	Wind Direction (from N)	Wind Speed (mph)
12:30	360°	9	0°	7
12:45	n/a	n/a	30°	7
13:00	10°	11	40°	6
13:15	350°	10	20°	7
13:30	n/a	n/a	0°	8
13:45	340°	13	0°	9

Meteorological Data Collected During Monitoring Event "I"  
Monitoring at the Horn Rapids Landfill

Date: January 18, 1990

Meteorological data are collected at the 300 Area and Richland Airport meteorological monitoring stations.

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 10° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

Time (PST)	300 Area Station		Richland Airport Station	
	Wind Direction (from N)	Wind Speed (mph)	Wind Direction (from N)	Wind Speed (mph)
18:15	340°	7	330°	7
18:30	340°	7	330°	8
18:45	n/a	n/a	340°	7
19:00	350°	8	340°	6
19:15	n/a	n/a	0°	5
19:30	10°	8	10°	5

Meteorological Data Collected During Monitoring Event "J"  
Monitoring at the Horn Rapids Landfill

Date: January 23-25, 1990

Meteorological data are collected at the 300 Area and Richland Airport meteorological monitoring stations.

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 10° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

Time (PST)	300 Area Station		Richland Airport Station	
	Wind Direction (from N)	Wind Speed (mph)	Wind Direction (from N)	Wind Speed (mph)
14:00 - 1/23	290°	22	290°	24
15:00	290°	19	280°	21
16:00	290°	17	300°	18
17:00	250°	8	270°	11
18:00	260°	7	240°	8
10:00 - 1/24	200°	12	210°	8
11:00	210°	13	210°	10
12:00	210°	16	210°	11
13:00	210°	17	220°	12
14:00	220°	15	230°	11
15:00	220°	13	220°	10
16:00	220°	9	230°	6
17:00	190°	3	230°	6
18:00	140°	2	40°	1
19:00	120°	5	240°	1
20:00	150°	8	210°	2
21:00	150°	7	90°	1
22:00	140°	8	140°	3
23:00	150°	7	70°	1
24:00	130°	7	190°	4
9:00 - 1/25	220°	9	220°	11
10:00	200°	8	210°	10
11:00	210°	20	210°	14
12:00	220°	27	220°	11
13:00	210°	24	220°	7
14:00	240°	18	260°	14
15:00	250°	23	250°	15
16:00	250°	20	250°	18

Meteorological Data Collected During Monitoring Event "K"  
Monitoring at the Horn Rapids Landfill

Date: January 23, 1990

Meteorological data are collected at the 300 Area and Richland Airport meteorological monitoring stations.

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 10° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

Time (PST)	300 Area Station		Richland Airport Station	
	Wind Direction (from N)	Wind Speed (mph)	Wind Direction (from N)	Wind Speed (mph)
13:00	290°	21	290°	23
13:15	290°	23	290°	24
13:30	290°	24	290°	26
13:45	290°	22	290°	24
14:00	290°	20	290°	22
14:15	290°	21	280°	22

Meteorological Data Collected During Monitoring Event "L"  
Monitoring at the Horn Rapids Landfill

Date: January 24, 1990

Meteorological data are collected at the 300 Area and Richland Airport meteorological monitoring stations.

The wind direction presented below is the mean direction the wind was blowing from during each 15-min averaging period. Winds are rounded to the nearest 10° and are measured clockwise from true North. Add or subtract 180° to obtain the mean transport direction (the direction the wind was blowing toward).

<u>Time</u> <u>(PST)</u>	<u>300 Area Station</u>		<u>Richland Airport Station</u>	
	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>	<u>Wind</u> <u>Direction</u> <u>(from N)</u>	<u>Wind</u> <u>Speed</u> <u>(mph)</u>
11:30	210°	16	220°	11
11:45	210°	18	210°	12
12:00	200°	17	220°	12
12:15	210°	13	220°	12
12:30	n/a	n/a	220°	11
12:45	210°	18	220°	11

APPENDIX B  
SAMPLING PARAMETERS

## SAMPLING PARAMETERS

Information on sampling parameters for each monitoring event is presented in this appendix. The information presented includes sample id, the date of sampling, instrument on- and off-times, the duration of sampling, the average flow rate through the sampling instrument, and the total volume sampled.

Sampling Parameters

<u>Sample ID(a)</u>	<u>Date(s) Sampled</u>	<u>Sampling Started (PDT)</u>	<u>Sampling Ended (PDT)</u>	<u>Sampling Duration (min)</u>	<u>Flow Rate (l/min)</u>	<u>Volume Sampled (l)</u>
B2F-U	4/03/89	12:50	15:40	170	147	25,000
B2P-U	4/03/89	12:50	15:40	170	147	25,000
B2C-U	4/03/89	12:50	15:29	159	0.29	46
B1F-DW	4/03/89	12:50	15:40	170	155	26,000
B1P-DW	4/03/89	12:50	15:40	170	155	26,000
B4C-DW	4/03/89	12:50	15:12	142	0.27	38
B3F-DE	4/03/89	12:52	15:41	169	159	27,000
B3P-DE	4/03/89	12:52	15:41	169	159	27,000
B3C-DE	4/03/89	12:52	pump fail.	-	-	-
BOF	4/03/89	-	-	-	-	-
BOP	4/03/89	-	-	-	-	-
BOC	4/03/89	-	-	-	-	-
C1F-U	5/02/89	9:55	10:59	64	156	10,000
C1P-U	5/02/89	9:55	10:59	64	156	10,000
C2C-U	5/02/89	9:55	10:59	64	0.30	19
C2F-DW	5/02/89	9:56	11:00	64	147	9,400
C2P-DW	5/02/89	9:56	11:00	64	147	9,400
C1C-DW	5/02/89	9:56	11:00	64	0.23	15
C3F-DE	5/02/89	9:54	10:58	64	135	8,700
C3P-DE	5/02/89	9:54	10:58	64	135	8,700
C3C-DE	5/02/89	9:54	10:58	64	0.23	15
COF	5/02/89	-	-	-	-	-
COP	5/02/89	-	-	-	-	-
COC	5/02/89	-	-	-	-	-
D1A	5/24/89	12:55	15:56	181	0.50	91
D2A	5/24/89	12:55	15:56	181	0.54	97
DOA	5/24/89	-	-	-	-	-
E3F-U	5/25/89	12:40	13:40	60	144	8,600
E3P-U	5/25/89	12:40	13:40	60	144	8,600
E3C-U	5/25/89	12:40	13:40	60	0.075	4.5
E1F-D	5/25/89	12:41	13:41	60	147	8,800
E1P-D	5/25/89	12:41	13:41	60	147	8,800
E1C-D	5/25/89	12:41	13:41	60	0.095	5.7
EOF	5/25/89	-	-	-	-	-
EOP	5/25/89	-	-	-	-	-
EOC	5/25/89	-	-	-	-	-

(a) The sampler ID and site code consists of the three-character sample ID, followed by a location code. In this code U = upwind, D = downwind, DW = the more westerly downwind monitoring location (when there are two downwind monitoring sites), and DE = the more easterly downwind monitoring location (when there are two downwind monitoring sites).

Sampling Parameters

<u>Sample ID(a)</u>	<u>Date(s) Sampled</u>	<u>Sampling Started (PDT)</u>	<u>Sampling Ended (PDT)</u>	<u>Sampling Duration (min)</u>	<u>Flow Rate (l/min)</u>	<u>Volume Sampled (l)</u>
F1F-U	9/15/89	17:49	21:49	240	200	48,000
F1P-U	9/15/89	17:49	21:49	240	200	48,000
F1C-U	9/15/89	20:31	21:31	60	0.11	6.4
F2F-DE	9/15/89	17:49	21:49	240	200	48,000
F2P-DE	9/15/89	17:49	21:49	240	200	48,000
F2C-DW	9/15/89	20:31	21:31	60	0.05	3.1
F3C-DE	9/15/89	20:31	21:31	60	0.09	5.4
FOF	9/15/89	-	-	-	-	-
FOP	9/15/89	-	-	-	-	-
FOC	9/15/89	-	-	-	-	-
G1G-SE	1/19-20/90	13:57 17:35 (1/19)	16:08 15:40 (1/20)	131 <u>1325</u> <del>1456</del>	270	390,000
G1P-SE	1/19-20/90	13:57 17:35 (1/19)	16:08 15:40 (1/20)	131 <u>1325</u> <del>1456</del>	270	390,000
G2G-SW	1/19-20/90	13:57 17:35 (1/19)	16:08 15:46 (1/20)	131 <u>1331</u> <del>1462</del>	270	390,000
G2P-SW	1/19-20/90	13:57 17:35 (1/19)	16:08 15:46 (1/20)	131 <u>1331</u> <del>1462</del>	270	390,000
G4G-NW	1/19-20/90	13:57 17:35 (1/19)	16:08 15:46 (1/20)	131 <u>1331</u> <del>1462</del>	240	350,000
G4P-NW	1/19-20/90	13:57 17:35 (1/19)	16:08 15:46 (1/20)	131 <u>1331</u> <del>1462</del>	240	350,000
GOG	1/19-20/90	-	-	-	-	-
GOP	1/19-20/90	-	-	-	-	-

(a) The sampler ID and site code consists of the three-character sample ID, followed by a location code. In this code U = upwind, D = downwind, DW = the more westerly downwind monitoring location (when there are two downwind monitoring sites), and DE = the more easterly downwind monitoring location (when there are two downwind monitoring sites).

Sampling Parameters

<u>Sample ID (a)</u>	<u>Date(s) Sampled</u>	<u>Sampling Started (PDT)</u>	<u>Sampling Ended (PDT)</u>	<u>Sampling Duration (min)</u>	<u>Flow Rate (l/min)</u>	<u>Volume Sampled (l)</u>
H1C	1/18/90	12:36	"	-	"	-
H2C	1/18/90	12:36	13:36	60	0.28	17
H3C	1/18/90	12:36	13:36	60	0.47	28
H4C	1/18/90	12:36	13:36	60	0.45	27
H6C	1/18/90	12:36	-	-	-	-
H7C	1/18/90	12:36	13:36	60	0.34	20
H8C	1/18/90	12:36	13:36	60	0.26	16
H9C	1/18/90	12:36	13:36	60	0.65	39
HAC	1/18/90	12:36	13:36	60	0.35	21
HOC	1/18/90	-	-	-	-	-
I2C	1/18/90	16:23	17:22	59	0.44	26
I3C	1/18/90	16:23	-	-	-	-
I4C	1/18/90	16:23	17:21	58	1.1	64
I5C	1/18/90	16:23	-	-	-	-
I7C	1/18/90	16:24	17:21	57	0.35	20
I8C	1/18/90	16:24	17:21	57	0.30	17
I9C	1/18/90	16:23	17:21	58	0.39	23
IAC	1/18/90	16:24	17:22	58	0.37	21
IWC	1/18/90	-	-	-	-	-
IOC	1/18/90	-	-	-	-	-
J1G-NE	1/23/90	14:43	17:44	181		
	1/24/90	10:46	11:25	39		
		12:57	23:57	660		
	1/25/90	9:58	15:37	339		
				<u>1219</u>	230	280,000
J1P-NE	1/23/90	14:43	17:44	181		
	1/24/90	10:46	11:25	39		
		12:57	23:57	660		
	1/25/90	9:58	15:37	339		
				<u>1219</u>	230	280,000
J2G-W	1/23/90	14:43	17:44	181		
	1/24/90	10:46	11:25	39		
		12:57	23:57	660		
	1/25/90	9:58	15:34	336		
				<u>1216</u>	230	280,000

(a) The sampler ID and site code consists of the three-character sample ID, followed by a location code. In this code U = upwind, D = downwind, DW = the more westerly downwind monitoring location (when there are two downwind monitoring sites), and DE = the more easterly downwind monitoring location (when there are two downwind monitoring sites).

Sampling Parameters

<u>Sample ID(a)</u>	<u>Date(s) Sampled</u>	<u>Sampling Started (PDT)</u>	<u>Sampling Ended (PDT)</u>	<u>Sampling Duration (min)</u>	<u>Flow Rate (l/min)</u>	<u>Volume Sampled (l)</u>
J2P-W	1/23/90	14:43	17:44	181	230	280,000
	1/24/90	10:46	11:25	39		
		12:57	23:57	660		
	1/25/90	9:58	15:34	336		
				<u>1216</u>		
J4G-NW	1/23/90	14:43	17:44	181	230	280,000
	1/24/90	10:46	11:25	39		
		12:57	23:57	660		
	1/25/90	9:58	15:40	342		
				<u>1222</u>		
J4P-NW	1/23/90	14:43	17:44	181	230	280,000
	1/24/90	10:46	11:25	39		
		12:57	23:57	660		
	1/25/90	9:58	15:40	342		
				<u>1222</u>		
J0G	1/23-25/90	-	-	-	-	-
J0P	1/23-25/90	-	-	-	-	-
K1C	1/23/90	13:00	-	-	-	-
K2C	1/23/90	13:00	14:00	60	0.24	14
K4C	1/23/90	13:00	13:57	57	0.54	31
K5C	1/23/90	13:00	14:01	61	0.23	14
K6C	1/23/90	13:00	13:55	55	0.23	13
K7C	1/23/90	13:00	13:54	54	0.22	12
K8C	1/23/90	13:00	13:59	59	0.26	15
K9C	1/23/90	13:00	14:01	61	0.25	15
KAC	1/23/90	13:00	14:01	61	-	-
K0C	1/23/90	-	-	-	-	-

(a) The sampler ID and site code consists of the three-character sample ID, followed by a location code. In this code U = upwind, D = downwind, DW = the more westerly downwind monitoring location (when there are two downwind monitoring sites), and DE = the more easterly downwind monitoring location (when there are two downwind monitoring sites).

Sampling Parameters

<u>Sample ID(a)</u>	<u>Date(s) Sampled</u>	<u>Sampling Started (PDT)</u>	<u>Sampling Ended (PDT)</u>	<u>Sampling Duration (min)</u>	<u>Flow Rate (l/min)</u>	<u>Volume Sampled (l)</u>
L1C	1/24/90	11:39	12:39	60	0.023	14
L2C	1/24/90	11:41	12:39	58	0.029	17
L3C	1/24/90	11:40	12:39	59	0.028	17
L4C	1/24/90	11:40	12:39	59	0.030	18
L5C	1/24/90	11:40	12:39	59	0.027	16
L6C	1/24/90	11:40	12:39	59	0.026	16
L7C	1/24/90	11:40	12:39	59	0.030	18
L8C	1/24/90	11:41	12:39	58	0.019	11
L9C	1/24/90	11:40	12:39	59	0.010	6
LAC	1/24/90	11:39	12:39	60	0.024	14
LOC	1/24/90	-	-	-	-	-
LYC	1/24/90	-	-	-	-	-

---

(a) The sampler ID and site code consists of the three-character sample ID, followed by a location code. In this code U = upwind, D = downwind, DW = the more westerly downwind monitoring location (when there are two downwind monitoring sites), and DE = the more easterly downwind monitoring location (when there are two downwind monitoring sites).

APPENDIX C

LABORATORY ANALYSES OF CARBON MOLECULAR SIEVE SAMPLES

## LABORATORY ANALYSES OF CARBON MOLECULAR SIEVE SAMPLES

Laboratory analyses of carbon molecular sieve (CMS) samples from Phase I are presented in this appendix (Phase II analyses are presented as tables in the text). In Phase I, CMS samples were collected during monitoring events "B", "C", and "E" and analyzed for volatile organic compounds (VOCs). In each table of laboratory results, the CMS samples are identified by their three-character identification code and a brief sample description that indicates where sampling was conducted in relation to the waste site ("blank" represents an unexposed sample analyzed for quality control purposes).

Monitoring Event "B" - Phase I monitoring at the 1100-3 Disposal Pit

Sample Description	Mass (nanograms) of Pollutant Contained in Sample						
	PCE	1,1,1-TCA	CCl <sub>4</sub>	TCE	Benzene	Toluene	Octane
B0C - blank	+	+	+	+	+	+	+
B4C - downwind	<1.5	+	+	<1.5	<15	+	5.0
B2C - upwind	8.0	<7.5	11(a)	>50	8.5	<12	25

(a) Possible detector overload indicating values could be higher.

Monitoring Event "C" - Phase I monitoring at the Horn Rapids Landfill

Sample Description	Mass (nanograms) of Pollutant Contained in Sample						
	PCE	1,1,1-TCA	CCl <sub>4</sub>	TCE	Benzene	Toluene	Octane
C0C - blank	0.05	2.8	<0.05	<0.15	<8.0	<2.5	32
C1C - downwind W	36(a)	104(b)	27(b)	39	<3.5	<1.5	22
C2C - upwind	8.5(a)	160(b)	41(b)	64	<6.0	<1.0	2.5
C3C - downwind E	42	98(b)	26(b)	32	<22	<2.5	300

(a) Possible detector overload indicating values could be higher.

(b) Observed detector overload conditions at this retention time initially caused from impurities in Carbotraps.

Monitoring Event "E" - Phase I monitoring at the Battery Acid Pit

Sample Description	Mass (nanograms) of Pollutant Contained in Sample						
	PCE	1,1,1-TCA	CCl <sub>4</sub>	TCE	Benzene	Toluene	Octane
EOC - blank	0.2	1.4	0.9	0.4	*	*	*
E1C - downwind	0.2	4.6	2.6	2.1	<2.5	<1.0	4.5
E3C - upwind	0.7	4.1	2.1	2.2	<7.5	<7.5	75

\* = experienced overload conditions at these retention times

APPENDIX D

LABORATORY ANALYSES OF POLYURETHANE FOAM SAMPLES - PHASE I SAMPLING

## LABORATORY ANALYSES OF POLYURETHANE FOAM SAMPLES - PHASE I SAMPLING

Laboratory analyses of the polyurethane foam (PUF) samples collected during Phase I are presented in this appendix. PUF samples were collected during monitoring events "B", "C", and "E" and were analyzed for semivolatile organic compounds (including pesticides and PCBs). The data in this appendix are presented using photocopies of the analysis laboratory's reporting sheets. The laboratory report for each sample is two pages long. The identification code of the sample is provided near the top of the first page on each of the sets of reporting sheets.

12147

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (ABN) *All values are reported as total amounts in mg.*

ANALYSIS CODE: 733

UST-RD I. D.: 19035 DATE EXTRACTED: 4-5-89  
 CUST I. D.: BOP DATE ANALYZED: DA 5/10/89 D1 D2  
 ANALYST: EC9/2C EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: - TOTAL DILUTION: DA D1 D2  
 INJECTION VOL(ul): 1 ul MATRIX: FOAM

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	ND	< 10
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb		
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb		
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb		
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb		
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb		
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb		< 50
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb		< 10
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb		
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb		
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb		
PHENOL	C57	< 1.0 ug/g	< 10 ppb	8 ng/ul	8
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb		< 10
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb		
KEROSENE	C79	< 1000 ug/g	< 10 ppm		
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb		< 50
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb		< 500

du  
A.T.R

RECEIVED MAY 16 1989

5/16/89

NICOTINIE ACID	C93	< 10.0 ug/g	< 100 ppb	ND	< 100
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb	}	< 10
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb		}

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.
T1: Diethyl phthalate	B67	2
T2: Di-n-butyl phthalate	B60	10 <del>E</del>
T3: Butyl benzyl phthalate	B42	0.5
T4: Bis(2-ethylhexyl) phthalate	B40	79
T5: Unknown siloxane	L83	14
T6: Unknown polycyclic aromatic hydrocarbon	L68	28
T7: Unknown	I99	19 <del>E</del>
T8: Unknown fatty acid	L05	55
T9: Unknown fatty acid ester	L50	12
T10: Unknown polycyclic aromatic hydrocarbon	L68	9
T11: Unknown phthalate	L16	33 <del>E</del>
T12: Unknown	I99	31 <del>E</del>
T13: Unknown fatty acid ester	L50	44 <del>E</del>
T14: Unknown phenol	L84	50
T15: Unknown aliphatic hydrocarbon	I98	17 <del>E</del>

Y  
v  
sh

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (A8N)

All values are reported as total amounts in ug.

ANALYSIS CODE: 733

UST-RD I. D.: 19036 DATE EXTRACTED: 4-5-89  
 CUST I. D.: B1P DATE ANALYZED: DA 4/24/89 D2  
 ANALYST: ECS/ZC/LKT EXTRACT DILUTION: DA D1 D2  
 SPLE WT (g)/VOL (mL) EXTRD.: — TOTAL DILUTION: DA D1 D2  
 INJECTION VOL (uL): 1 ml MATRIX: FOAM

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	ND	210 ug
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb		
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb		
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb		
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb		
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb		
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb		250 ug
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb		210 ug
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb		
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb		
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb		
PHENOL	C57	< 1.0 ug/g	< 10 ppb		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb		
KEROSENE	C79	< 1000 ug/g	< 10 ppm		
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb		250 ug
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb		2500 ug

KR  
DA  
JW

RECEIVED MAY 05 1989

AKS  
5.15

NICOTINIC ACID	C93	< 10.0 ug/g	< 100 ppb	ND	< 100 ug
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb	↓	< 10 ug
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb	↓	↓

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.
T1: Unknown siloxane	L83	11 ug
T2: Unknown Polynuclear Aromatic Hydrocarbon	L69	27 ug
T3: Unknown	I99	31 ug B
T4: Unknown	I99.1	21 ug
T5: Unknown	I99.2	17 ug
T6: Unknown	I99.13	13 ug
T7: Unknown Polynuclear Aromatic Hydrocarbon	L69-1	15 ug
T8: Unknown	I99.4	16 ug
T9: Unknown Phthalate	L16	33 ug B
T10: Unknown Fatty Acid	L05	106 ug B
T11: Di-butyl Phthalate	B60	26 ug
T12: Unknown Hydrocarbon	I99.1	24 ug
T13: Unknown Fatty Acids & Ester	L80	50 ug B
T14: Bis(2-Ethylhexyl)phthalate	B40	47 ug
T15: Unknown Polynuclear Aromatic Hydrocarbon	L68	211 ug
T16: Unknown	I99.9	54 ug
T17: Unknown Polynuclear Aromatic Hydrocarbon	L68	113 ug
T18: Unknown Hydrocarbon	I99.12	63 ug B
T19: Unknown Hydrocarbon	I99.13	44 ug
T20: Unknown Hydrocarbon	I99.14	14 ug
T21: Unknown Hydrocarbon	I99	11 ug
T22: Unknown Polynuclear Aromatic Hydrocarbon	L68	19 ug

va. 22

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (ABN) All values are reported as total amounts in ug  
ANALYSIS CODE: 733

UST-RD I. D.: 19037 DATE EXTRACTED: 4-5-89  
CUST I. D.: B2P DATE ANALYZED: 2A4247D1 D2  
ANALYST: ECS/LAT/2C EXTRACT DILUTION: DA D1 D2  
SPLE WT(g)/VOL(mL) EXTRD.: - TOTAL DILUTION: DA D1 D2  
INJECTION VOL(uL): 1uL MATRIX: FOAM

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	ND	< 10
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb		
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb		
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb		
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb		
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb		↓
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb		< 50
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb		< 10
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb		
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb		
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb	↓	↓
PHENOL	C57	< 1.0 ug/g	< 10 ppb	2.5 ug/g	3 ug
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb	ND	< 10
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb		
KEROSENE	C79	< 1000 ug/g	< 10 ppm		↓
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb		< 50
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb	↓	< 500

SV76(82) PAGE 1 OF 2

733, 1989 GCMS REPORT

REV 1, 1/9/89

U-R

MA 4/5

RECEIVED MAY 05 1989

2.58

NICOTINIC ACID	C93	< 10.0 ug/g	< 100 ppb	ND	△/00
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb	↓	△/10
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb	↓	↓

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I. D.)

COMPOUND	CODE	EST. CONC.
T1: Unknown Siloxane	L93	20 ug
T2: Unknown Polynuclear Aromatic Hydrocarbon	L64	28 ug
T3: Unknown	I 99-	34 ug B
T4: Unknown	I 99-	25 ug B
T5: Unknown	I 99-	84 ug
T6: Unknown	I 99-	10 ug
T7: Unknown Aliphatic Substituted Benzene	L69	19 ug
T8: Diethyl phthalate	B 67	3 ug
T9: Unknown	I 99-	13 ug
T10: Unknown Phthalate	L16	159 ug B
T11: Unknown	I 99-	35 ug B
T12: Di-n-butyl phthalate	B 60	37 ug B
T13: Unknown Fatty Acid Ester	L80	196 ug B
T14: Bis(2-ethylhexyl)phthalate	B 40	66 ug
T15: Unknown Polynuclear Aromatic Hydrocarbon	L68	73 ug
T16: Unknown	I 99-	17 ug
T17: Unknown Polynuclear Aromatic Hydrocarbon	L69	10 ug

4  
2 NT

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (ABN)

ANALYSIS CODE: 733

All values are reported as total amounts in ug

UST-RD I. D.: 19038 DATE EXTRACTED: 4-5-89  
 CUST I. D.: B3P DATE ANALYZED: DA 4/5/89 D1 D2  
 ANALYST: ECS/2C/LKT EXTRACT DILUTION: DA D1 D2  
 SPLE WT (g)/VOL (mL) EXTRD.: - TOTAL DILUTION: DA D1 D2  
 INJECTION VOL (uL): 1uL MATRIX: FOAM

COMPOUND	CODE	MDL		FOUND	REPORTED		
		SOIL	WATER				
CRESOL	B51	< 1.0 ug/g	< 10 ppb	N D	< 10		
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb				
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb				
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb				
HEXACHLOROBENZENE	B69	< 1.0 ug/g	< 10 ppb				
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb				
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb			< 50	
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb			< 10	
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb				
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb				
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb				
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb	3.0 ug/L	3.0		
PHENOL	C57	< 1.0 ug/g	< 10 ppb	N D	< 10		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb				
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb				
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb				
KEROSENE	C79	< 1000 ug/g	< 10 ppm				
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb			< 50	
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb			< 500	

SY761821 PAGE 1 OF 2

733, 1989 GCMS REPORT

REV 1, 1/9/89

Handwritten initials and marks.

RECEIVED MAY 05 1989

Handwritten initials and marks.

NICOTINIE ACID	C93	< 10.0 ug/g	< 100 ppb	ND	< 100
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb	↓	< 10
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb	↓	↓

TENTATIVELY IDENTIFIED COMPOUNDS (25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.
T1: Unknown	I99-	27 B
T2: Unknown Fatty Acid	L05	49
T3: Unknown	I99-1	10
T4: Unknown Polynuclear Aromatic Hydrocarbon	L68	10
T5: Unknown Polynuclear Aromatic Hydrocarbon	L68-1	15
T6: Diethyl phthalate	B67	3
T7: Unknown	I99-2	17
T8: Unknown Phthalate	L16	55 B
T9: Unknown Fatty Acid Ester	L90	25 B
T10: Di-n-butyl phthalate	B60	17 B
T11: Unknown Hydrocarbon	I99-1	9
T12: Unknown Fatty Acid Ester	L90-	38 B
T13: Bis(2-ethylhexyl)phthalate	B40	66
T14: Unknown Polynuclear Aromatic Hydrocarbon	L68-2	52
T15: Unknown Hydrocarbon	I99-2	39 B
T16: Unknown Hydrocarbon	I99-	17
T17: Unknown Polynuclear Aromatic Hydrocarbon	L68-3	11

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (ABN) *Reported as total amounts in ug.*  
 ANALYSIS CODE: 733

UST-RD I. D.: 18747 DATE EXTRACTED: 5/8/89  
 CUST I. D.: COP DATE ANALYZED: DA 5/13/89 D1 D2  
 ANALYST: ES/2C/LKT EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: — TOTAL DILUTION: DA D1 D2  
 INJECTION VOL(μL): 1 MATRIX: Foam

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	ND	< 10
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb		
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb		
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb		
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb		
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb		
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb		< 50
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb		< 10
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb		
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb		
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb		
PHENOL	C57	< 1.0 ug/g	< 10 ppb		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb		
KEROSENE	C79	< 1000 ug/g	< 10 ppm		
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb		< 50
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb		< 500

SY76[82]PAGE 1 OF 2

733, 1989 GCMS REPORT

REV 1, 1/9/89

RECEIVED MAY 18 1989

ST  
5-17-89

NICOTINIC ACID	C93	< 10.0 ug/g	< 100 ppb	ND	< 100
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb	↓	< 10
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb	↓	↓

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.
T1: Bis (2-Ethylhexyl)phthalate B to	60	70
T2: Unknown Polycyclic Aromatic Hydrocarbon	L68	12
T3: Unknown Phenol	L84	51
T4:		
T5:		

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (SVOA) Reported as  
ANALYSIS CODE: 733 total amounts in g

UST-RD I. D.: 18748 DATE EXTRACTED: 5-8-89  
 CUST I. D.: CIP DATE ANALYZED: DA 5/15/89 D2  
 ANALYST: EC/ES/LKT EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: — TOTAL DILUTION: DA D1 D2  
 INJECTION VOL(μL): 1 MATRIX: Fram

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	ND	<10
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb		
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb		
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb		
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb		
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb		
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb		<50
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb		<10
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb		
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb		
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb		
PHENOL	C57	< 1.0 ug/g	< 10 ppb		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb		
KEROSENE	C79	< 1000 ug/g	< 10 ppm		
STRYCHNINE	C71	< 5.0 ug/g	< 50 ppb		<50
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb		<50

NICOTINIC ACID	C93	< 10.0 ug/g	< 100 ppb	ND	2/100
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb	↓	4/0
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb	↓	↓

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.	
T1: Bis(2-Ethylhexyl)phthalate	B 40	50	
T2: UnKnown Polycyclic Aromatic hydrocarbon	L68	14	
T3: UnKnown Fatty Acid <del>ester</del>	L05	<del>280</del> 57	
T4: UnKnown	I 99	15	
T5: UnKnown Polycyclic Aromatic hydrocarbon	L68	13	
<del>T6: 2,6-Di(1,1-Dimethyl-4-methylphenyl)-4-methylphenol</del>	<del>I 63</del>	<del>16</del>	D5 5-11-89
T7: UnKnown Phenol	L84	35	

T6: 2,6-Di(1,1-Dimethyl-4-methylphenyl)-4-methylphenol (BHT) I63 16

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (SVOC) Reported as

ANALYSIS CODE: 733 total amounts in ug

UST-RD I. D.: 18749 DATE EXTRACTED: 5-8-89  
 CUST I. D.: C2P DATE ANALYZED: 5/10/89 DA D1 D2  
 ANALYST: ES/2C/LKT EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: — TOTAL DILUTION: DA D1 D2  
 INJECTION VOL(ul): 1 MATRIX: Foam

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	ND	ND
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb		
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb		
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb		
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb		
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb		
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb		250
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb		210
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb		
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb		
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb		
PHENOL	C57	< 1.0 ug/g	< 10 ppb		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb		
KEROSENE	C79	< 1000 ug/g	< 10 ppm		
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb		250
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb		250

SY76(82)PAGE 1 OF 2

733, 1989 GCMS REPORT

REV 1, 1/9/89

020

LKT  
5.19.89

NICOTINIC ACID	C93	< 10.0 ug/g	< 100 ppb	ND	< 100
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb		< 10
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb		1

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.
T1: Benzoic acid		78 107
T2: Bis(2-Ethylhexyl)phthalate		B 40 75
T3: Unknown Polyaromatic Hydrocarbon	L68	11
T4: Unknown Fatty Acid	L05	40
T5: <del>BHT (2,6-Di-tert-butyl-4-methylphenol)</del>	<del>I63</del>	<del>17</del>
T6 Unknown Phenol	L84	14
T7 Unknown Phenol	L84	51

T5: 2,6-Di(1,1-Dimethylethyl)-4-methyl Phenol (BHT) I63 17

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

SEMI-VOLATILE ORGANIC ANALYSIS (SVOA)

Reported as total amounts in ug

ANALYSIS CODE: 733

UST-RD I. D.: 18750 DATE EXTRACTED: 5-8-89  
 CUST I. D.: C3P DATE ANALYZED: 5/16/89 D1 D2  
 ANALYST: ES/3C/LKT EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: - TOTAL DILUTION: DA D1 D2  
 INJECTION VOL(μL): 1 MATRIX: Foam

COMPOUND	CODE	MDL		FOUND	REPORTED
		SOIL	WATER		
CRESOL	B51	< 1.0 ug/g	< 10 ppb	<del>STAD</del>	<10
1, 2-DICHLOROBENZENE	B61	< 1.0 ug/g	< 10 ppb	↓	↓
1, 3-DICHLOROBENZENE	B62	< 1.0 ug/g	< 10 ppb	↓	↓
p-DICHLOROBENZENE	B63	< 1.0 ug/g	< 10 ppb	↓	↓
HEXACHLOROBENZENE	B89	< 1.0 ug/g	< 10 ppb	↓	↓
PENTACHLOROBENZENE	C26	< 1.0 ug/g	< 10 ppb	↓	↓
PENTACHLOROPHENOL	C28	< 5.0 ug/g	< 50 ppb	<del>1250</del>	250
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0 ug/g	< 10 ppb	↓	<10
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0 ug/g	< 10 ppb	↓	↓
HEXACHLOROPHENE	C54	< 1.0 ug/g	< 10 ppb	↓	↓
NAPHTHALENE	C55	< 1.0 ug/g	< 10 ppb	↓	↓
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0 ug/g	< 10 ppb	↓	↓
PHENOL	C57	< 1.0 ug/g	< 10 ppb	↓	↓
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0 ug/g	< 10 ppb	↓	↓
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0 ug/g	< 10 ppb	↓	↓
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0 ug/g	< 10 ppb	↓	↓
KEROSENE	C79	< 1000 ug/g	< 10 ppm	↓	↓
STRYCHNINE	C91	< 5.0 ug/g	< 50 ppb	<del>1250</del>	250
MALEIC HYDRAZIDE	C92	< 50.0 ug/g	< 500 ppb	<del>1250</del>	<100

5/2  
LKT

LKT  
5.13.89

NICOTINIE ACID	C93	< 10.0 ug/g	< 100 ppb	ND	<100
TRIBUTYLPHOSPHATE	I21	< 1.0 ug/g	< 10 ppb		
CHLOROBENZENE	L64	< 1.0 ug/g	< 10 ppb		

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.D.)

COMPOUND	CODE	EST. CONC.
T1: Bis(2-Ethylhexyl)phthalate	B40	50
T2: UnKnown Polycyclic Aromatic Hydrocarbon	L68	15
T3: UnKnown Fatty Acid	L05	96
T4: <del>BHT 2,6-Bis(1,1-Dimethyl)-4-methyl Phenol</del>	<del>L85</del>	<del>15</del>
T5: UnKnown Polycyclic Aromatic Hydrocarbon	L68	11
T6: UnKnown Phenol	L84	40
T4: 2,6-Bis(1,1-Dimethyl)-4-methyl Phenol (BHT)	I63	15

APPENDIX E

LABORATORY ANALYSES OF POLYURETHANE FOAM AND  
GLASS-FIBER FILTER SAMPLES - PHASE II SAMPLING

LABORATORY ANALYSES OF POLYURETHANE FOAM AND  
GLASS-FIBER FILTER SAMPLES - PHASE II SAMPLING

Laboratory analyses for SVOCs on the polyurethane foam and glass fiber filter samples from Phase II are presented in this appendix. Sampling for SVOCs were conducted during monitoring events "F", "G", and "J". The data in this appendix are presented using photocopies of the analysis laboratory's reporting sheets. The laboratory report for each sample is two pages long. The identification code of the sample is provided near the top of the first page on each of the sets of reporting sheets.

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-PD)

SEMI-VOLATILE ORGANIC ANALYSIS (ABN)

ANALYSIS CODE: 733 *Reported as total amount in  $\mu\text{g}$  units*

UST-RD I. D.: 19149 DATE EXTRACTED: 9/22/89  
 CUST I. D.: FOPBLK DATE ANALYZED: 9/25/89 D1 D2  
 ANALYST: KBA EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: \* TOTAL DILUTION: DA D1 D2  
 NORMAL SAMPLE SIZE: 1000 mL WATER, 10 g SOIL  
 INJECTION VOL( $\mu\text{L}$ ): 1  $\mu\text{L}$  MATRIX: \* SOIL (FOAM)

COMPOUND	CODE	CDL		FOUND	REPORTED
		SOIL ( $\mu\text{g/g}$ )	WATER (ppb)		
CRESOL	B51	< 1.0	< 10	ND	< 1.0
1, 2-DICHLOROBENZENE	B61	< 1.0	< 10		
1, 3-DICHLOROBENZENE	B62	< 1.0	< 10		
p-DICHLOROBENZENE	B63	< 1.0	< 10		
HEXACHLOROBENZENE	B89	< 1.0	< 10		
PENTACHLOROBENZENE	C26	< 1.0	< 10		
PENTACHLOROPHENOL	C28	< 5.0	< 50		< 5.0
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0	< 10		< 1.0
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0	< 10		
HEXACHLOROPHENE	C54	< 1.0	< 10		
NAPHTHALENE	C55	< 1.0	< 10		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0	< 10		
PHENOL	C57	< 1.0	< 10		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0	< 10		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0	< 10		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0	< 10		
KEROSENE	C79	< 1000	< 10		< 1000

9.29.89  
 UNITS =  $\mu\text{g}$

\* Polyurethane foam cartridge

9/26/89

9/27/89

COMPOUND	CODE	CDL		FOUND	REPORTED
		SOIL (ug/g)	WATER (ppb)		
STRYCHNINE	C91	<del>25.0</del> 4.0	< 10	ND	< 5.0 <del>ug/g</del>
MALEIC HYDRAZIDE	C92	<del>25.0</del> 4.0	< 10	}	< 50.0 <del>ug/g</del>
NICOTINIC ACID	C93	<del>25.0</del> 4.0	< 10		< 10.0 <del>ug/g</del>
TRIBUTYLPHOSPHATE	I21	< 1.0	< 10		< 1.0 <del>ug/g</del>
CHLOROBENZENE	L64	< 1.0	< 10		< 6.0 <del>ug/g</del>

LWIT-03 OCT 9, 1989

COMPOUND/(ug/sample)	CODE	SURROGATE LIMITS		NET FOUND	RECOVERY
		SOIL (ug/g)	WATER (ppb)		
2-FLUOROPHENOL/100	X01	2.5-13.1	48-106	6.49	64.9
PHENOL-D5/100	X02	2.4-11.3	35-110	8.16	81.6
NITROBENZENE-D5/50	X03	1.2-6.0	17.5-57	5.38	107.6
2-FLUOROBI PHENYL/50	X04	1.5-5.8	21.5-58	4.19	83.8
2,4,6-TRI BROMOPHENOL/100	X05	1.9-12.2	10-123	9.45	94.5
P-TERPHEYL/50	X06	0.9-6.9	16.5-70.5	3.66	73.2

TENTATIVELY IDENTIFIED COMPOUNDS (>25% OF NEAREST I.S.)

COMPOUND	CODE	EST. CONC.
T1: Bis(2-ethylhexyl) phthalate	B40	3.7 ug/g
T2: 2-Ethylhexanoic acid	J64	6.7 ug/g
T3: 2,6-Bis(1,1-dimethylethyl)-4-methylphenol	I63	2.3 ug/g
T4:		
T5:		

UST-RD I. D.: 19149 ANALYSIS DATE: 9/25/89

FOP

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-PD)

SEMI-VOLATILE ORGANIC ANALYSIS (ABN)

ANALYSIS CODE: 733

REPORTED AS TOTAL AMOUNT IN µg UNITS

UST-RD I. D.: 19150 DATE EXTRACTED: 9/22/89  
 CUST I. D.: FIP DATE ANALYZED: 9/25/89 D1 D2  
 ANALYST: CBA EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: \* TOTAL DILUTION: DA D1 D2  
 NORMAL SAMPLE SIZE: 1000 mL WATER, 10 g SOIL  
 INJECTION VOL(µL): 1 µL MATRIX: \* SOIL (FOAM)

COMPOUND	CODE	CDL		FOUND	REPORTED
		SOIL (µg/g)	WATER (ppb)		
CRESOL	B51	< 1.0	< 10	ND	< 1.0 <del>µg</del>
1, 2-DICHLOROBENZENE	B61	< 1.0	< 10		
1, 3-DICHLOROBENZENE	B62	< 1.0	< 10		
p-DICHLOROBENZENE	B63	< 1.0	< 10		
HEXACHLOROBENZENE	B89	< 1.0	< 10		
PENTACHLOROBENZENE	C26	< 1.0	< 10		
PENTACHLOROPHENOL	C28	< 5.0	< 50		< 5.0 <del>µg</del>
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0	< 10		< 1.0 <del>µg</del>
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0	< 10		
HEXACHLOROPHENE	C54	< 1.0	< 10		
NAPHTHALENE	C55	< 1.0	< 10		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0	< 10		
PHENOL	C57	< 1.0	< 10		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0	< 10		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0	< 10		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0	< 10		
KEROSENE	C79	< 1000	< 10		

18.72 9.29.89  
 2.05 9.27.89  
 2.05 = 1.0

\* Polyurethane foam cartridge FIP

92-26-89

9.27.89



UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-PD)

SEMI-VOLATILE ORGANIC ANALYSIS (SVOA)

ANALYSIS CODE: 733

REPORTED AS TOTAL AMOUNT IN µg UNITS

UST-RD I. D.: 19151 DATE EXTRACTED: 9/22/89  
 CUST I. D.: F2P DATE ANALYZED: 7/31/89 D1 D2  
 ANALYST: KBA EXTRACT DILUTION: DA D1 D2  
 SPLE WT(g)/VOL(mL) EXTRD.: \* TOTAL DILUTION: DA D1 D2  
 NORMAL SAMPLE SIZE: 1000 mL WATER, 10 g SOIL  
 INJECTION VOL(µL): 1 µL MATRIX: \* SOIL (FOAM)

COMPOUND	CODE	CDL		FOUND	REPORTED
		SOIL (µg/g)	WATER (ppb)		
CRESOL	B51	< 1.0	< 10	ND	< 1.0 <del>µg</del>
1, 2-DICHLOROBENZENE	B61	< 1.0	< 10		
1, 3-DICHLOROBENZENE	B62	< 1.0	< 10		
p-DICHLOROBENZENE	B63	< 1.0	< 10		
HEXACHLOROBENZENE	B89	< 1.0	< 10		
PENTACHLOROBENZENE	C26	< 1.0	< 10		
PENTACHLOROPHENOL	C28	< 5.0	< 50		< 5.0 <del>µg</del>
1, 2, 4, 5-TETRACHLOROBENZENE	C37	< 1.0	< 10		
1, 2, 4-TRICHLOROBENZENE	C43	< 1.0	< 10		
HEXACHLOROPHENE	C54	< 1.0	< 10		
NAPHTHALENE	C55	< 1.0	< 10		
1, 2, 3-TRICHLOROBENZENE	C56	< 1.0	< 10		
PHENOL	C57	< 1.0	< 10		
1, 3, 5-TRICHLOROBENZENE	C58	< 1.0	< 10		
1, 2, 3, 4-TETRACHLOROBENZENE	C59	< 1.0	< 10		
1, 2, 3, 5-TETRACHLOROBENZENE	C60	< 1.0	< 10		
KEROSENE	C79	< 1000	< 10		< 1000 <del>µg</del>

10/16/89  
 9:29 AM  
 10/16/89  
 10:00 AM

\* Polyurethane foam cartridge F2P

28  
9-26-89

W.C.  
9/27/89

5051652  
L-2-S-114

COMPOUND	CODE	CDL		FOUND	REPORTED
		SOIL (ug/g)	WATER (ppb)		
STRYCHNINE	C91	< 5.0 <del>1.0</del>	< 10	ND	< 5.0 <del>1.0</del>
MALEIC HYDRAZIDE	C92	< 5.0 <del>1.0</del>	< 10		< 5.0 <del>1.0</del>
NICOTINIC ACID	C93	< 10.0 <del>1.0</del>	< 10		< 10.0 <del>1.0</del>
TRIBUTYLPHOSPHATE	I21	< 1.0	< 10		< 1.0 <del>1.0</del>
CHLOROBENZENE	L64	< 1.0	< 10		< 1.0 <del>1.0</del>

COMPOUND/(ug/spg)	CODE	SURROGATE LIMITS		NET FOUND	RECOVERY
		SOIL (ug/g)	WATER (ppb)		
2-FLUOROPHENOL/100	X01	2.5-13.1	48-106	5.42	54.2
PHENOL-D5/100	X02	2.4-11.3	35-110	7.15	71.5
NITROBENZENE-D5/50	X03	1.2-6.0	17.5-57	3.75	75.0
2-FLUOROBIPHENYL/50	X04	1.5-5.8	21.5-58	3.42	68.4
2,4,6-TRIBROMOPHENOL/100	X05	1.9-12.2	10-123	8.83	88.3
P-TERPHEYL/50	X06	0.9-6.9	16.5-70.5	3.24	64.8

TENTATIVELY IDENTIFIED COMPOUNDS (25% OF NEAREST I.S.)

COMPOUND	CODE	EST. CONC.	NET FOUND	RECOVERY
T1: Bis(2-ethylhexyl)phthalate	B40	3.4 ug/g	(37ug FID) 3.4 ug	9.2%
T2: Unknown	I99	1.6 ug/g	1.6 ug	16%
T3: 2,6-Bis(1-Dimethylethyl)-4-methylphenol	I63	1.4 ug/g	1.4 ug	14%
T4:			23ug FID	
T5:				

UST-RD I.D.: 19151 ANALYSIS DATE: 9/25/89

F2P

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16349 DATE EXTRACTED: 1/24/90  
 CUST I. D.: G-1-P DATE ANALYZED: 1/30/90 D1 D2  
 ANALYST: SCP DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: OTHER (FCC10)  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

3/12/90

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	UG	COLUMN FOUND	COLUMN FOUND		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4, 4' -DDD	A40	<0.1		<0.1		<0.1	
4, 4' -DDE	A41	<0.1		<0.1		<0.1	
4, 4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		0.843	<1.0	<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

*DEB'S 2/1/90*

UST-RD I. D. 16349

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
DBC	X10	1.0	1.454	145.4%	20-150	
TCMX	X16	2.0	0	0	20-150	NI

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16350 DATE EXTRACTED: 1/24/90  
 CUST I. D.: C-2-P DATE ANALYZED: 1/24/90 D1    D2     
 ANALYST: SCR DILUTION: N/A D1    D2     
 INJECTION SIZE: 0.001 ml SAMPLE TYPE: CHOC / EGAM  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT:   

3/13/90

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
				FOUND	FOUND		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4,4' -DDD	A40	<0.1		<0.1		<0.1	
4,4' -DDE	A41	<0.1		<0.1		<0.1	
4,4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		0.907	<1.0	<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

LAB 2/14/90

UST-RD I. D. 1630

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
		FOUND	FOUND	FOUND	FOUND		
ENDOSULFAN I	A49	<0.1	<0.1	<0.1	<0.1		
ENDOSULFAN II	A52	<0.1	<0.1	<0.1	<0.1		
ENDO. SULFATE	P12	<0.5	<0.5	<0.5	<0.5		
CHLOROBENZYLATE	C62	<300	<300	<300	<300		

SURROGATE	CODE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
DBC	X10	1.0	1.324	132.4%	20-150	
TCMX	X16	2.0	1.671	83.6%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16351 DATE EXTRACTED: 1/24/90  
 CUST I. D.: G-4-P DATE ANALYZED: 1/30/90 DA D1 D2  
 ANALYST: SR DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: OTHER/ECOM  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

5/13/90

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN FOUND	COLUMN FOUND		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		0.105	<0.1	<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4,4'-DDD	A40	<0.1		<0.1		<0.1	
4,4'-DDE	A41	<0.1		<0.1		<0.1	
4,4'-DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

UST-RD I. D. 16351

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER ug	FOUND	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1	0.097	<0.1	<0.1	<0.1	
ENDOSULFAN II	A52	<0.1	<0.1			<0.1	
ENDO. SULFATE	P12	<0.5	<0.5			<0.5	
CHLOROBENZILATE	C62	<300	<300			<300	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS OTHER (%)	COMMENT
DBC	X10	1.0	1.259	125.9%	20-150	
TCMX	X16	2.0	2.19	106.0%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. - RICHMOND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16352 DATE EXTRACTED: 1/24/90  
 CUST I. D.: GA-P DATE ANALYZED: 1/30/90 D1 D2  
 ANALYST: SCR DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: Other/Ecom  
 SFL WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	UG	COLUMN	COLUMN		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4, 4' -DDD	A40	<0.1		<0.1		<0.1	
4, 4' -DDE	A41	<0.1		<0.1		<0.1	
4, 4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

*2/14/90*

UST-RD I. D. 16352

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
				FOUND	FOUND		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED	FOUND	RECOVERY	LIMITS	COMMENT
		(ug)	(ug)	(%)	(%)	
DBC	X10	1.0	1.417	141.7%	20-150	
TCMX	X16	2.0	1.350	67.5%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 9080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16353 DATE EXTRACTED: 1/24/90  
 CUST I. D.: C-1-C DATE ANALYZED: 1/30/90 D1 D2  
 ANALYST: SCP DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: CHOC/Filter  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	GROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4,4' -DDD	A40	<0.1		<0.1		<0.1	
4,4' -DDE	A41	<0.1		<0.1		<0.1	
4,4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

UST-RD I. D. 16353

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED	FOUND	RECOVERY	LIMITS	COMMENT
		(ug)	(ug)	(%)	OTHER	
DBC	X10	1.0	1.144	114.4%	20-150	
TCMX	X16	2.0	<del>0</del> 0.999	<del>0</del> 500%	20-150	<del>NI</del>

SR 9/14/90

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16351 DATE EXTRACTED: 1/24/90  
 CUST I. D.: C-2-G DATE ANALYZED: 1/30/90 D1 D2  
 ANALYST: SR DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: Other / Filter  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
		OTHER	MG				
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4, 4' -DDD	A40	<0.1		<0.1		<0.1	
4, 4' -DDE	A41	<0.1		<0.1		<0.1	
4, 4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

2/14/90 *SR*

UST-RD I. D. 16354

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
ARC	X10	1.0	1.087	108.7%	20-150	
TCMX	X16	2.0	2.646	132.3%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. - RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16355 DATE EXTRACTED: 1/24/90  
 CUST I. D.: C4-G DATE ANALYZED: 1/30/90 D1 D2  
 ANALYST: SCR DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: Other / Filter  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
				FOUND	FOUND		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4, 4' -DDD	A40	<0.1		<0.1		<0.1	
4, 4' -DDE	A41	<0.1		<0.1		<0.1	
4, 4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

2/14/90 *SCR*

6.6

UST-RD I. D. 16355

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
DBC	X10	1.0	1.102	110.2%	20-150	
TCMK	X16	2.0	2.338	116.9%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16356 DATE EXTRACTED: 1/24/90  
 CUST I. D.: 10-6 DATE ANALYZED: 1/30/90 DA D1 D2  
 ANALYST: SCR DILUTION: N/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: CHOC/Filter  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
		OTHER	ug				
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4,4'-DDD	A40	<0.1		<0.1		<0.1	
4,4'-DDE	A41	<0.1		<0.1		<0.1	
4,4'-DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

2/14/90 *SCR*

UST-RD I. D. 16356

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS OTHER (%)	COMMENT
DBC	X10	1.0	1.088	108.8%	20-150	
TCMX	X16	2.0	2.095	104.8%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE OTHER

UST-RD I. D.: 16354 DATE RECEIVED: 1/22/90  
 CUST I. D.: G26 DATE EXTRACTED: 1/24/90  
 ANALYST: HAK DATE ANALYZED: 2/1/90 DA D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: from pump & filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	1.15	115 %	20-150	
TCMX	X17	2.0	2.47	123.5 %	20-150	

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/2/90 JBB  
 LK

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16353 DATE RECEIVED: 1/22/90  
 CUST I. D.: GIG DATE EXTRACTED: 1/24/90  
 ANALYST: HAK DATE ANALYZED: 2/1/90 DA D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: From pump + filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	0.80	80 %	20-150	
TCMX	X17	2.0	1.69	84.5 %	20-150	

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/2/90 JAB  
 66

UNITED STATES TESTING COMPANY, INC. RICHMOND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16352 SOL 999 DATE RECEIVED: 1/22/90  
 CUST I. D.: GOP DATE EXTRACTED: 1/24/90  
 ANALYST: HAK DATE ANALYZED: 2/1/90 DA D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: from pump & filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: 999 /6 - Possible double spike of surrogate added - Sample is  
was a extract from a filter and cannot be re-extracted since the filter is spent.

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15 1.0	2.34	234 %	20-150	/G
TCMX	X17 2.0	3.5	175 %	20-150	/G

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

*HAK* 2/2/90 *DBS*  
*Lot*

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 10451  
~~46350~~ re 1/6/90 DATE RECEIVED: 1/22/90  
 CUST I. D.: G 4 P DATE EXTRACTED: 1/24/90  
 ANALYST: NAK DATE ANALYZED: 2/1/90 DA D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: 3000 pump + filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SUBROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	0.97	97 %	20-150	
TCMX	X17	2.0	2.07	103.5 %	20-150	

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/2/90 DRB  
LA

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE OTHER

UST-RD I. D.: 16349 DATE RECEIVED: 1/22/90  
 CUST I. D.: GIP DATE EXTRACTED: 1/24/90  
 ANALYST: HCK DATE ANALYZED: 2/1/90 D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: From pump & filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1015	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	0.99092	92 %	20-150	
TCMX	X17	2.0	1.72	86 %	20-150	

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

*2/2/90 DBB*  
*LSA*

UNITED STATES TESTING COMPANY, INC. RICHMOND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16350  
~~16354~~ 4K 1/6/90 DATE RECEIVED: 1/22/90  
 CUST I. D.: G 2 P DATE EXTRACTED: 1/24/90  
 ANALYST: NAK DATE ANALYZED: 2/1/90 D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: From pump & filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	1.06	106 %	20-150	
TCMX	X17	2.0	2.44	122 %	20-150	

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

2/2/90 *[Signature]*  
*[Signature]*

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16355 DATE RECEIVED: 1/22/90  
 CUST I. D.: G4G DATE EXTRACTED: 1/24/90  
 ANALYST: AAK DATE ANALYZED: 2/1/90 DA D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: From pump & filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	1.00	100 %	20-150	
TCMX	X17	2.0	2.75	112.5 %	20-150	

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

UNITED STATES TESTING COMPANY, INC. RICHMOND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16356 DATE RECEIVED: 1/22/90  
 CUST I. D.: GPG DATE EXTRACTED: 1/24/90  
 ANALYST: HAK DATE ANALYZED: 3/1/90 DA D1 D2  
 INJECTION SIZE: 0.002 ml DILUTION: DA D1 N/A D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: Transpare Filter TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1		< 1	
ARO 1221	A55	2.00	< 2		< 2	
ARO 1232	A56	1.00	< 1		< 1	
ARO 1242	A57	1.00	< 1		< 1	
ARO 1248	A58	1.00	< 1		< 1	
ARO 1254	A59	1.00	< 1		< 1	
ARO 1260	A60	1.00	< 1		< 1	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	0.73	73 %	20-150	
TCMX	X17	2.0	1.46	73 %	20-150	

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/2/90 JLB  
 688

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 8090

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16357 DATE EXTRACTED: 1/31/90  
 CUST I. D.: 16342-G DATE ANALYZED: 2/6/90 D1 D2  
 ANALYST: SCR DILUTION: 1/A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: CHOC / Filter  
 SPLE WT(g)/VOL(ml) EXTRACTED: 1/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL	PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER ug	COLUMN	COLUMN		
			FOUND	FOUND		
ENDRIN	A33	<0.1	<0.1		<0.1	
METHOXYCHLOR	A34	<3.0	<3.0		<3.0	
TOXAPHENE	A35	<1.0	<1.0		<1.0	
ALPHA BHC	A36	<0.1	<0.1		<0.1	
BETA BHC	A37	<0.1	<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1	<0.1		<0.1	
DELTA BHC	A39	<0.1	<0.1		<0.1	
4,4' -DDD	A40	<0.1	<0.1		<0.1	
4,4' -DDE	A41	<0.1	<0.1		<0.1	
4,4' -DDT	A42	<0.1	<0.1		<0.1	
HEPTACHLOR	A43	<0.1	<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1	<0.1		<0.1	
KEPONE	A45	<1.0	<1.0		<1.0	
DIELDRIN	A46	<0.1	<0.1		<0.1	
ALDRIN	A47	<0.1	<0.1		<0.1	
CHLORDANE	A48	<1.0	<1.0		<1.0	

UST-RD I. D. 16357

CONSTITUENT	CODE	C301		PRIMARY	CONFIRM	COMMENT
		OTHER	ug	COLUMN	COLUMN	
				FOUND	FOUND	RESULT
ENDOSULFAN I	A49	<0.1		<0.1		<0.1
ENDOSULFAN II	A52	<0.1		<0.1		<0.1
ENDO. SULFATE	P12	<0.5		<0.5		<0.5
CHLOROBENZILATE	C62	<300		<300		<300

SURROGATE	CODE	EXPECTED	FOUND	RECOVERY	LIMITS	COMMENT
		(ug)	(ug)	(%)	(%)	
DBC	X10	1.0	0.819	81.9%	20-150	
TCMX	X16	2.0	1.309	65.5%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 3080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16358 DATE EXTRACTED: 1/31/90  
 CUST I. D.: 16345-G DATE ANALYZED: 2/6/90 DA D1 D2  
 ANALYST: SR DILUTION: 1/A DA D1 D2  
 INJECTION SIZE: 0.04 ml SAMPLE TYPE: CHG / Filter  
 SPLE WT(g)/VOL(mL) EXTRACTED: 1/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL OTHER ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ENDRIN	A33	<0.1	<0.1		<0.1	
METHOXYCHLOR	A34	<3.0	<3.0		<3.0	
TOXAPHENE	A35	<1.0	<1.0		<1.0	
ALPHA BHC	A36	<0.1	<0.1		<0.1	
BETA BHC	A37	<0.1	<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1	<0.1		<0.1	
DELTA BHC	A39	<0.1	<0.1		<0.1	
4, 4' -DDD	A40	<0.1	<0.1		<0.1	
4, 4' -DDE	A41	<0.1	<0.1		<0.1	
4, 4' -DDT	A42	<0.1	<0.1		<0.1	
HEPTACHLOR	A43	<0.1	<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1	<0.1		<0.1	
KEPONE	A45	<1.0	<1.0		<1.0	
DIENDRIN	A46	<0.1	<0.1		<0.1	
ALDRIN	A47	<0.1	<0.1		<0.1	
CHLORDANE	A48	<1.0	<1.0		<1.0	

2/14/90 SR

UST-RD I. D. 16358

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<C1		<C1	
ENDOSULFAN II	A52	<0.1		<C1		<C1	
ENDO. SULFATE	P12	<0.5		<C5		<C5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
DBC	X10	1.0	0.780	78.0%	20-150	
TCMX	X16	2.0	0.997	49.9%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 3080

ANALYSIS CODE: 729 OTHER

UST-RD I. D. #: 16359 DATE EXTRACTED: 1/31/90  
 CUST I. D. #: 16340-C DATE ANALYZED: 3/1/90 DA 21 22  
 ANALYST: SR DILUTION: N/A DA 21 22  
 INJECTION SIZE: 0.04 uL SAMPLE TYPE: Chlor/Ethyl  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	GROL OTHER ug	PRIMARY	CONFIRM	RESULT	COMMENT
			COLUMN FOUND	COLUMN FOUND		
ENDRIN	A33	<0.1	<0.1		<0.1	
METHOXYCHLOR	A34	<3.0	<3.0		<3.0	
TOXAPHENE	A35	<1.0	<1.0		<1.0	
ALPHA BHC	A36	<0.1	<0.1		<0.1	
BETA BHC	A37	<0.1	<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1	<0.1		<0.1	
DELTA BHC	A39	<0.1	<0.1		<0.1	
4,4' -DDD	A40	<0.1	<0.1		<0.1	
4,4' -DDE	A41	<0.1	<0.1		<0.1	
4,4' -DDT	A42	<0.1	<0.1		<0.1	
HEPTACHLOR	A43	<0.1	<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1	<0.1		<0.1	
KEPONE	A45	<1.0	<1.0		<1.0	
DIELDRIN	A46	<0.1	<0.1		<0.1	
ALDRIN	A47	<0.1	<0.1		<0.1	
CHLORDANE	A48	<1.0	<1.0		<1.0	

*3/1/90*

UST-RD I. D. 16359

CONSTITUENT	CODE	TROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<0.1		<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS OTHER (%)	COMMENT
DBC	X10	1.0	0.693	69.3%	20-150	
TCMX	X16	2.0	1.015	50.8%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 3080

ANALYSIS CODE: 729 OTHER

UST-RD I. D. : 16360 DATE EXTRACTED: 1/31/90  
 CUST I. D. : 16339-G DATE ANALYZED: 3/6/90 DA 01 D2  
 ANALYST: SCR DILUTION: N/A DA 01 D2  
 INJECTION SIZE: 0.000 ml SAMPLE TYPE: CHOC  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
				FOUND	FOUND		
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4,4' -DDD	A40	<0.1		<0.1		<0.1	
4,4' -DDE	A41	<0.1		<0.1		<0.1	
4,4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

UST-RD I. D. 16-366

CONSTITUENT	CODE	CROW		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<C1		<C1	
ENDOSULFAN II	A52	<0.1		<C1		<C1	
ENDO. SULFATE	P12	<0.5		<C5		<C5	
CHLOROBENZILATE	C62	<300		<C0		<C0	

SUBROGATE		EXPECTED	FOUND	RECOVERY	LIMITS	COMMENT
		(ug)	(ug)	(%)	OTHER (%)	
DBC	X10	1.0	0.787	78.7%	20-150	
TCMX	X15	2.0	1.310	65.5%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 1080

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16361 DATE EXTRACTED: 1/31/90  
 CUST I. D.: 16342-P DATE ANALYZED: 3/5/90 DA 01 02  
 ANALYST: SCR DILUTION: N/A DA 01 02  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: CHOC / FOCM  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDRIN	A33	<0.1		<C1		<C1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<C1		<C1	
BETA BHC	A37	<0.1		<C1		<C1	
LINDANE ( BHC)	A38	<0.1		<C1		<C1	
DELTA BHC	A39	<0.1		<C1		<C1	
4,4'-DDD	A40	<0.1		<C1		<C1	
4,4'-DDE	A41	<0.1		<C1		<C1	
4,4'-DDT	A42	<0.1		<C1		<C1	
HEPTACHLOR	A43	<0.1		<C1		<C1	
HEPTEPOXIDE	A44	<0.1		<C1		<C1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<C1		<C1	
ALDRIN	A47	<0.1		<C1		<C1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

UST-RD I.D. 1636

CONSTITUENT	CODE	GROW		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	UP	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		<C1		<C1	
ENDOSULFAN II	A52	<0.1		<C1		<C1	
ENDO. SULFATE	P12	<0.5		<C5		<C5	
CHLOROBENZILATE	C82	<100		<300		<300	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
DBC	X10	1.0	0.953	95.3%	20-150	
TCMX	X16	2.0	1.288	64.4%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 9040

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 16344 DATE EXTRACTED: 1/31/70  
 CUST I. D.: 16339-D DATE ANALYZED: 2/6/70 DA 01 02  
 ANALYST: SCR DILUTION: 1/A DA 01 02  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: CHOC / F-GID  
 SPLR WT(g)/VOL(mL) EXTRACTED: 1/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
		OTHER	ug				
ENDRIN	A33	<0.1		<0.1		<0.1	
METHOXYCHLOR	A34	<3.0		<3.0		<3.0	
TOXAPHENE	A35	<1.0		<1.0		<1.0	
ALPHA BHC	A36	<0.1		<0.1		<0.1	
BETA BHC	A37	<0.1		<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1		<0.1		<0.1	
DELTA BHC	A39	<0.1		<0.1		<0.1	
4, 4' -DDD	A40	<0.1		<0.1		<0.1	
4, 4' -DDE	A41	<0.1		<0.1		<0.1	
4, 4' -DDT	A42	<0.1		<0.1		<0.1	
HEPTACHLOR	A43	<0.1		<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1		<0.1		<0.1	
KEPONE	A45	<1.0		<1.0		<1.0	
DIELDRIN	A46	<0.1		<0.1		<0.1	
ALDRIN	A47	<0.1		<0.1		<0.1	
CHLORDANE	A48	<1.0		<1.0		<1.0	

UST-RD I.D. 10/2/90

CONSTITUENT	CODE	GROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	UG	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		0.092	0.01	<0.1	
ENDOSULFAN II	A52	<0.1		0.05	0.01	<0.1	
ENDO. SULFATE	P12	<0.5		0.05	0.05	<0.5	
CHLOROBENZILATE	C52	<100		<300	<300	<300	

SURROGATE	CODE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS	COMMENT
					OTHER (%)	
DBC	X10	1.0	1.053	105.3%	20-150	
TCMX	X16	2.0	0.839	43.0%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 3080

ANALYSIS CODE: 729 OTHER

UST-RD I. D. : 16363 DATE EXTRACTED: 1/31/61  
 CUST I. D. : 1-340-P DATE ANALYZED: 3/16/60 DA 01 02  
 ANALYST: SCR DILUTION: N/A DA 01 02  
 INJECTION SIZE: 0.004ml SAMPLE TYPE: CHOC/EGG  
 SPLE WT(g)/VOL(mL) EXTRACTED: N/A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQI	PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER USE	COLUMN	COLUMN		
ENDRIN	A33	<0.1	<0.1		<0.1	
METHOXYCHLOR	A34	<3.0	<3.0		<3.0	
TOXAPHENE	A35	<1.0	<1.0		<1.0	
ALPHA BHC	A36	<0.1	<0.1		<0.1	
BETA BHC	A37	<0.1	<0.1		<0.1	
LINDANE ( BHC)	A38	<0.1	<0.1		<0.1	
DELTA BHC	A39	<0.1	<0.1		<0.1	
4, 4' -DDD	A40	<0.1	<0.1		<0.1	
4, 4' -DDE	A41	<0.1	<0.1		<0.1	
4, 4' -DDT	A42	<0.1	<0.1		<0.1	
HEPTACHLOR	A43	<0.1	<0.1		<0.1	
HEPTEPOXIDE	A44	<0.1	<0.1		<0.1	
KEPONE	A45	<1.0	<1.0		<1.0	
DIELDRIN	A46	<0.1	<0.1		<0.1	
ALDRIN	A47	<0.1	<0.1		<0.1	
CHLORDANE	A48	<1.0	<1.0		<1.0	

UST-RD I. O. 16363

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
ENDOSULFAN I	A49	<0.1		0.102	<0.1	<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SURROGATE	CODE	EXPECTED	FOUND	RECOVERY	LIMITS	COMMENT
		(ug)	(ug)	(%)	(%)	
DBC	X10	1.0	0.912	91.2%	20-150	
TCMX	X16	2.0	0.942	47.1%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC., RICHLAND DIVISION (UST-RD)

ENHANCED PESTICIDES - ANALYSIS METHOD 4040

ANALYSIS CODE: 729 OTHER

UST-RD I. D.: 1632 DATE EXTRACTED: 1/31/90  
 CUST I. D.: 6245-P DATE ANALYZED: 2/6/90 DA D1 D2  
 ANALYST: SCR DILUTION: 1/1A DA D1 D2  
 INJECTION SIZE: 0.004 ml SAMPLE TYPE: Choc / Fruit  
 SPLE WT(g)/VOL(mL) EXTRACTED: 1/1A  
 PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CROL		PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
		OTHER	ug				
ENDRIN	A33	<0.1		<C1		<C1	
METHOXYCHLOR	A34	<3.0		<30		<30	
TOXAPHENE	A35	<1.0		<10		<10	
ALPHA BHC	A36	<0.1		<C1		<C1	
BETA BHC	A37	<0.1		<C1		<C1	
LINDANE ( BHC)	A38	<0.1		<C1		<C1	
DELTA BHC	A39	<0.1		<C1		<C1	
4,4'-DDD	A40	<0.1		<C1		<C1	
4,4'-DDE	A41	<0.1		<C1		<C1	
4,4'-DDT	A42	<0.1		<C1		<C1	
HEPTACHLOR	A43	<0.1		<C1		<C1	
HEPTEPOXIDE	A44	<0.1		<C1		<C1	
KEPONE	A45	<1.0		<10		<10	
DIELDRIN	A46	<0.1		<C1		<C1	
ALDRIN	A47	<0.1		<C1		<C1	
CHLORDANE	A48	<1.0		<10		<10	

UST-RD I. D. 16343

CONSTITUENT	CODE	CROL		PRIMARY	CONFIRM	RESULT	COMMENT
		OTHER	ug	COLUMN	COLUMN		
				FOUND	FOUND		
ENDOSULFAN I	A49	<0.1		0.085	<0.1	<0.1	
ENDOSULFAN II	A52	<0.1		<0.1		<0.1	
ENDO. SULFATE	P12	<0.5		<0.5		<0.5	
CHLOROBENZILATE	C62	<300		<300		<300	

SUBROGATE		EXPECTED	FOUND	RECOVERY	LIMITS	COMMENT
		(ug)	(ug)	(%)	(%)	
DBC	X10	1.0	0.975	97.5%	20-150	
TCMX	X16	2.0	0.850	42.5%	20-150	

Final Extract Volume: Other - 10.0 mL

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 157 MIXED WASTE OTHER

UST-RD I. D.: 16357 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16342-G DATE EXTRACTED: 1/31/90  
 ANALYST: AGK DATE ANALYZED: 2/22/90 21 22  
 INJECTION SIZE: 0.002 ml DILUTION: DL D1 N/A 22  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: Filts TOTAL DIL.: \_\_\_\_\_  
 SAMPLE TYPE: other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	2.00	< 2.0		< 2.0	
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	110	110	2	20-150
TCMX	X17	2.0	186	93	2	20-150

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/28/90 AGK

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE OTHER

UST-RD I. D.: 16358 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16345-G DATE EXTRACTED: 1/31/90  
 ANALYST: ARK DATE ANALYZED: DA 2/22/90 D1 2/22/90 D2  
 INJECTION SIZE: 0.002ml DILUTION: 2A 21 1/10 22  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: Filter TOTAL DIL.: 1/10  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	<del>2.00</del> 20.0	< 20.0 <sup>DI</sup>		< 20.0 <sup>DI</sup>	
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	113	113%	20-150	
TCMX	X17	2.0	338	169%	20-150	1I

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

2/28/90 *DBB*

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE OTHER

UST-RD I. D.: 16359 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16340-G DATE EXTRACTED: 1/31/90  
 ANALYST: AKK DATE ANALYZED: 2A 2/22/90 2/22/90  
 INJECTION SIZE: 0.002ml DILUTION: 2A 21 1:10 22  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: filter TOTAL DIL.: 1:10  
 SAMPLE TYPE: other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	<del>2.00</del> 20.0	< 20.0 <sup>DL</sup>		< 20.0 <sup>DL</sup>	
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	1.06	106	80	20-150
TCMX	X17	2.0	2.70	135	80	20-150

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/28/90 *AKK*

PCB REPORT

ANALYSIS CODE: 157 MIXED WASTE OTHER

UST-RD I. D.: 16350 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16339-6 DATE EXTRACTED: 1/31/90  
 ANALYST: AKK DATE ANALYZED: 2A 2/22/90 2/22/90  
 INJECTION SIZE: 0.002ml DILUTION: 2A 21 1:10 22  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: Filter TOTAL DIL.: 1:10  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	<del>200</del> 20.0	< 20.0	DI	< 20.0	DI
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	115	115	6	20-150
TCMX	X17	2.0	274	137	6	20-150

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

2/28/90 ESB

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

RCE REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16351 DATE RECEIVED: 1/30/90  
CUST I. D.: 16342-P DATE EXTRACTED: 1/31/90  
ANALYST: HJK DATE ANALYZED: 2/22/90 21 22  
INJECTION SIZE: 0.002 ml DILUTION: 2A 21 N/A 22  
SAMPLE WT(g)/VOL(mL) EXTRACTED: Falco TOTAL DIL.: \_\_\_\_\_  
SAMPLE TYPE: other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	2.00	< 2.0		< 2.0	
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE	EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15 1.0	1.13	113 %	20-150	
TCMX	X17 2.0	1.74	87 %	20-150	

Sample Size: \_\_\_\_\_  
Final Volume: Other 10 mL

2/28/90 DBS

PCB REPORT

ANALYSIS CODE: 157 MIXED WASTE, OTHER

UST-RD I. D.: 16362 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16345-P DATE EXTRACTED: 1/31/90  
 ANALYSIS: APK DATE ANALYZED: 2A 2/22/90 2/22/90  
 INJECTION SIZE: 0.002ml DILUTION: 2A D1 1:10 D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: Filter TOTAL DIL.: 1:10  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	<del>2.00</del> 20.0	< 20.0		< 20.0	51
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	117	117%	20-150	
TCMX	X17	2.0	476	248%	20-150	/I

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

2/28/90 JBB

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE, OTHER

UST-RD I. D.: 16363 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16340-P DATE EXTRACTED: 1/31/90  
 ANALYST: HPK DATE ANALYZED: 2A 2/22/90 21 2/22/90 22  
 INJECTION SIZE: 0.002ml DILUTION: 2A 21 1:10 22  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: Filter TOTAL DIL.: 1:10  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	<del>2.00</del> 20.0	< 20.0	DI	< 20.0	DI
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	1.13	113%	20-150	
TCMX	X17	2.0	4.53	226.5%	20-150	/I

Sample Size: \_\_\_\_\_  
 Final Volume: Other 10 mL

2/28/90 *HPK*

UNITED STATES TESTING COMPANY, INC. RICHLAND DIVISION (UST-RD)

PCB REPORT

ANALYSIS CODE: 757 MIXED WASTE OTHER

UST-RD I. D.: 16364 DATE RECEIVED: 1/30/90  
 CUST I. D.: 16339-P DATE EXTRACTED: 1/31/90  
 ANALYST: HAK DATE ANALYZED: DA 2/22/90 2/23/90  
 INJECTION SIZE: 0.002ml DILUTION: DA D1 1:10 D2  
 SAMPLE WT(g)/VOL(mL) EXTRACTED: 3ul TOTAL DIL.: 1:10  
 SAMPLE TYPE: Other

PROCEDURE COMMENT: \_\_\_\_\_

CONSTITUENT	CODE	CRQL ug	PRIMARY COLUMN FOUND	CONFIRM COLUMN FOUND	RESULT	COMMENT
ARO 1016	A54	1.00	< 1.0		< 1.0	
ARO 1221	A55	<del>2.00</del> 20.0	< 20.0		< 20.0	
ARO 1232	A56	1.00	< 1.0		< 1.0	
ARO 1242	A57	1.00	< 1.0		< 1.0	
ARO 1248	A58	1.00	< 1.0		< 1.0	
ARO 1254	A59	1.00	< 1.0		< 1.0	
ARO 1260	A60	1.00	< 1.0		< 1.0	

SURROGATE		EXPECTED (ug)	FOUND (ug)	RECOVERY (%)	LIMITS (%)	COMMENT
DBC	X15	1.0	1.20	120 %	20-150	
TCMX	X17	2.0	4.57	228.5 %	20-150	/I

Sample Size: \_\_\_\_\_

Final Volume: Other 10 mL

2/28/90 *ILB*

APPENDIX F

LABORATORY ANALYSES OF FILTER SAMPLES PARTICULATES (HEAVY METALS)

## LABORATORY ANALYSES OF FILTER SAMPLES FOR PARTICULATES (HEAVY METALS)

Laboratory analyses of particulates collected on filter samples are presented in this appendix. Filter samples were collected during monitoring events "B" and "C". The data in this appendix are presented using photocopies of the analysis laboratory's reporting sheets. At the top of each column of data is a sample identification code. Several sections of each filter were analyzed independently. Separate results are reported for the bottom, middle, and top section of each filter sample.

X-RAY FLUORESCENCE ANALYSIS

DATE: 6-10-99  
ANALYST: R. SANDERS  
TYPE OF MATERIAL: FILTERS

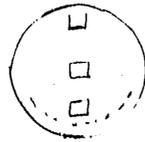
ELEMENTS ASSOCIATED WITH THIS SAMPLE SET:

AL  
SI  
P  
S

DESCRIPTION OF XRF TECHNIQUES USED

1  
2  
3  
4  
5  
6  
7  
8  
9  
10

The filters were excited Bottom, Middle, and Top. Because there was a visible gradient to the deposit the sd. also proved to be difficult to quantify because of the scattering generated absorption correction that was too large. The paper was stripped off one of the samples and a standard correction generated was applied to all samples.



*R. Sanders*  
6-10-99

ANALYST:  
PHONE:

RON SANDERS  
6 3877

SS UNITS	EL	FE 52UG./CH2 T-FILM		CIF BOTTOM		CIF MIDDLE		CIF TOP				
TI												
			+/-		+/-		+/-		+/-			
PPM	AL	0.320	0.076	AL	0.516	0.093	AL	0.342	0.087	HL	0.330	0.091
PPM	SI	0.414	0.045	SI	0.541	0.054	SI	0.412	0.048	SI	0.417	0.050
PPM	P	0.050	0.021	P	< 0.053		P	< 0.050		P	< 0.053	
PPM	S	0.491	0.037	S	0.090	0.030	S	0.129	0.029	S	0.136	0.030
PPM	CL	0.117	0.018	CL	< 0.041		CL	< 0.038		CL	< 0.040	
PPM	K	0.150	0.011	K	0.048	0.007	K	0.030	0.006	K	0.033	0.006
PPM	CA	0.083	0.007	CA	0.117	0.009	CA	0.110	0.008	CA	0.114	0.009
PPM	FE	52.5	2.6	FE	0.268	0.019	FE	0.137	0.012	FE	0.140	0.012
ZR												
			+/-		+/-		+/-		+/-			
PPM	SI	< 0.77		SI	< 1.2		SI	< 1.1		SI	< 1.2	
PPM	P	< 0.53		P	< 0.06		P	< 0.74		P	< 0.87	
PPM	S	0.66	0.21	S	< 0.72		S	< 0.68		S	< 0.71	
PPM	CL	0.23	0.10	CL	< 0.33		CL	< 0.38		CL	< 0.33	
PPM	K	0.152	0.035	K	< 0.076		K	< 0.074		K	< 0.077	
PPM	CA	0.061	0.026	CA	0.207	0.036	CA	0.139	0.033	CA	0.137	0.034
PPM	TI	< 0.062		TI	< 0.037		TI	0.035	0.017	TI	0.046	0.018
PPM	V	0.036	0.014	V	< 0.028		V	< 0.026		V	< 0.028	
PPM	CR	< 0.028		CR	< 0.021		CP	< 0.019		CR	0.020	0.010
PPM	NI	< 0.025		NI	< 0.016		NI	< 0.015		NI	< 0.017	
PPM	FE	52.5	2.6	FE	0.268	0.019	FE	0.137	0.012	FE	0.140	0.012
PPM	CO	< 0.094		CO	< 0.013		CO	< 0.011		CO	< 0.012	
PPM	NI	0.062	0.009	NI	< 0.007		NI	< 0.007		NI	< 0.007	
PPM	CU	0.009	0.003	CU	0.051	0.006	CU	0.119	0.009	CU	0.050	0.006
PPM	ZH	0.007	0.002	ZH	0.025	0.004	ZH	0.065	0.006	ZH	0.016	0.004
PPM	GA	< 0.003		GA	< 0.006		GA	< 0.006		GA	< 0.006	
PPM	HG	< 0.011		HG	< 0.021		HG	0.020	0.009	HG	< 0.020	
PPM	SE	< 0.003		SE	< 0.006		SE	< 0.005		SE	< 0.006	
PPM	PB	< 0.011		PB	< 0.021		PB	< 0.020		PB	< 0.021	
PPM	AS	0.008	0.002	AS	< 0.008		AS	< 0.007		AS	< 0.008	
PPM	BR	0.005	0.006	BR	< 0.005		BR	< 0.005		BR	< 0.005	
PPM	RB	< 0.005		RB	< 0.008		RB	< 0.008		RB	< 0.008	
HG												
			+/-		+/-		+/-		+/-			
PPM	U	< 0.015		U	< 0.041		U	< 0.042		U	< 0.042	
PPM	SR	< 0.007		SR	< 0.015		SR	0.019	0.007	SR	< 0.015	
PPM	Y	0.007	0.003	Y	< 0.016		Y	< 0.015		Y	< 0.016	
PPM	ZP	< 0.007		ZP	< 0.015		ZP	< 0.015		ZP	< 0.016	
PPM	NB	< 0.007		NB	< 0.015		NB	< 0.015		NB	< 0.016	
PPM	MO	< 0.007		MO	< 0.016		MO	< 0.015		MO	< 0.016	
AM												
			+/-		+/-		+/-		+/-			
PPM	RU	< 0.15		PU	< 0.22		PU	< 0.23		PU	< 0.24	
PPM	PH	< 0.14		PH	< 0.23		PH	< 0.24		PH	0.28	0.12
PPM	PD	< 0.15		PD	< 0.24		PD	< 0.23		PD	< 0.23	
PPM	HG	< 0.16		HG	< 0.25		HG	< 0.25		HG	< 0.26	
PPM	CD	< 0.16		CD	< 0.27		CD	< 0.26		CD	< 0.27	
PPM	IN	< 0.16		IN	< 0.26		IN	< 0.25		IN	< 0.28	
PPM	SH	< 0.17		SH	< 0.29		SH	< 0.28		SH	< 0.29	
PPM	SB	< 0.18		SB	< 0.31		SB	< 0.28		SB	< 0.32	
PPM	TC	< 0.19		TE	< 0.33		TE	< 0.32		TE	< 0.33	
PPM	I	< 0.22		I	< 0.33		I	< 0.34		I	< 0.38	
PPM	CS	< 0.23		CS	< 0.38		CS	< 0.37		CS	< 0.40	
PPM	OH	< 0.27		OH	< 0.44		OH	< 0.44		OH	< 0.44	
PPM	LH	< 0.31		LH	< 0.47		LH	< 0.46		LH	< 0.48	
PPM	CE	< 0.34		CE	< 0.51		CE	< 0.56		CE	< 0.59	

SS UNITS	EL	C2F		C2F MIDDLE		C2F TOP
TI						
PPM	AL	0.348	+/-	AL	0.355	0.092
PPM	SI	0.498	0.090	SI	0.403	0.051
PPM	P	< 0.055	0.053	P	< 0.055	0.054
PPM	S	0.086	0.031	S	0.139	0.031
PPM	CL	< 0.042	0.044	CL	< 0.044	0.041
PPM	K	0.062	0.007	K	0.058	0.007
PPM	CA	0.136	0.010	CA	0.116	0.009
PPM	FE	0.313	0.021	FE	0.212	0.016
ZR						
PPM	SI	< 1.3	+/-	SI	< 1.2	+/-
PPM	P	< 0.98		P	< 0.88	
PPM	S	< 0.76		S	< 0.73	
PPM	CL	< 0.34		CL	< 0.33	
PPM	K	0.127	0.043	K	< 0.079	
PPM	CA	0.197	0.039	CA	0.172	0.035
PPM	TI	0.681	0.048	TI	1.332	0.080
PPM	V	< 0.033		V	< 0.048	
PPM	CR	< 0.023		CR	< 0.028	
PPM	MN	< 0.017		MN	< 0.016	
PPM	FE	0.313	0.021	FE	0.212	0.016
PPM	CO	< 0.013		CO	< 0.012	
PPM	NI	< 0.007		NI	< 0.007	
PPM	CU	0.035	0.005	CU	0.026	0.005
PPM	ZN	0.059	0.005	ZN	0.058	0.006
PPM	GA	< 0.006		GA	< 0.006	
PPM	HG	< 0.021		HG	< 0.020	
PPM	SE	< 0.006		SE	< 0.006	
PPM	PB	0.035	0.012	PB	< 0.022	
PPM	AS	< 0.008		AS	< 0.008	
PPM	BR	< 0.006		BR	< 0.006	
PPM	RB	< 0.009		RB	< 0.008	
AG						
PPM	U	< 0.044	+/-	U	< 0.042	+/-
PPM	SR	< 0.016		SR	< 0.016	
PPM	Y	< 0.017		Y	< 0.017	
PPM	ZR	< 0.017		ZR	< 0.016	
PPM	NB	< 0.016		NB	< 0.016	
PPM	MO	< 0.017		MO	< 0.016	
AM						
PPM	RU	< 0.25	+/-	RU	0.25	0.11
PPM	PH	< 0.25		PH	< 0.25	
PPM	PD	< 0.25		PD	< 0.24	
PPM	AG	< 0.26		AG	< 0.27	
PPM	CD	< 0.29		CD	< 0.27	
PPM	IN	< 0.28		IN	< 0.28	
PPM	SN	< 0.31		SN	< 0.31	
PPM	SB	< 0.33		SB	< 0.32	
PPM	TE	< 0.37		TE	< 0.37	
PPM	I	< 0.39		I	< 0.39	
PPM	CS	< 0.47		CS	< 0.47	
PPM	OH	< 0.44		OH	< 0.46	
PPM	LH	< 0.49		LH	< 0.49	
PPM	CE	< 0.58		CE	< 0.55	

SS UNITS	EL	C3F MIDDLE		C3F TOP		C3F BOTTOM		C0F (BLANK)				
T1												
PPM	AL	0.276	0.004	AL	0.307	0.005	AL	0.350	0.007	AL	< 0.15	+/-
PPM	SI	0.265	0.043	SI	0.300	0.045	SI	0.404	0.052	SI	0.005	0.034
PPM	P	< 0.052		P	< 0.050		P	< 0.051		P	< 0.051	
PPM	S	0.075	0.029	S	0.084	0.020	S	0.089	0.029	S	< 0.057	
PPM	CL	< 0.040		CL	< 0.030		CL	< 0.040		CL	< 0.040	
PPM	K	0.020	0.006	K	0.026	0.006	K	0.041	0.006	K	< 0.010	
PPM	CA	0.005	0.007	CA	0.091	0.000	CA	0.122	0.009	CA	0.040	0.006
PPM	FE	0.200	0.019	FE	0.164	0.013	FE	0.692	0.040	FE	0.915	0.051
ZR												
PPM	SI	< 1.2		SI	< 1.2		SI	1.40	0.59	SI	< 1.1	+/-
PPM	P	< 0.95		P	< 0.83		P	< 0.83		P	< 0.61	
PPM	S	< 0.70		S	< 0.60		S	< 0.70		S	< 0.32	
PPM	CL	< 0.32		CL	< 0.31		CL	< 0.32		CL	< 0.20	
PPM	K	< 0.000		K	< 0.075		K	< 0.070		K	< 0.073	
PPM	CA	0.162	0.036	CA	0.093	0.033	CA	0.303	0.042	CA	< 0.059	
PPM	TI	0.041	0.010	TI	0.030	0.010	TI	0.121	0.021	TI	< 0.035	
PPM	Y	< 0.027		Y	< 0.026		Y	< 0.027		Y	< 0.027	
PPM	CR	< 0.020		CR	0.021	0.010	CR	< 0.021		CR	< 0.021	
PPM	FM	< 0.017		FM	< 0.016		FM	< 0.016		FM	< 0.016	
PPM	FE	0.200	0.019	FE	0.164	0.013	FE	0.692	0.040	FE	0.035	0.000
PPM	CO	< 0.012		CO	< 0.012		CO	< 0.015		CO	< 0.011	
PPM	HI	< 0.007		HI	< 0.007		HI	0.009	0.003	HI	< 0.006	
PPM	CU	0.040	0.006	CU	0.029	0.005	CU	0.036	0.005	CU	0.024	0.005
PPM	ZH	0.031	0.004	ZH	0.010	0.003	ZH	0.019	0.004	ZH	0.014	0.003
PPM	GA	< 0.006		GA	< 0.006		GA	< 0.006		GA	< 0.006	
PPM	HG	< 0.019		HG	< 0.020		HG	< 0.019		HG	< 0.020	
PPM	SE	< 0.006		SE	< 0.006		SE	< 0.005		SE	< 0.006	
PPM	PB	< 0.021		PB	< 0.020		PB	0.030	0.011	PB	< 0.021	
PPM	AS	< 0.000		AS	< 0.007		AS	< 0.000		AS	< 0.005	
PPM	BR	< 0.005		BR	< 0.005		BR	< 0.005		BR	< 0.006	
PPM	RB	< 0.000		RB	< 0.000		RB	< 0.000		RB	< 0.000	
AG												
PPM	U	< 0.043		U	< 0.020		U	< 0.031		U	< 0.044	+/-
PPM	SR	< 0.016		SR	< 0.015		SR	< 0.016		SR	< 0.016	
PPM	Y	< 0.017		Y	< 0.015		Y	< 0.016		Y	< 0.017	
PPM	ZP	< 0.017		ZR	< 0.015		ZR	0.040	0.009	ZR	< 0.017	
PPM	NB	< 0.016		NB	0.017	0.000	NB	< 0.016		NB	< 0.017	
PPM	MO	< 0.016		MO	< 0.015		MO	< 0.017		MO	< 0.017	
HM												
PPM	RIJ	< 0.24		RU	< 0.22		RU	< 0.22		PU		+/-
PPM	PH	< 0.24		RH	< 0.23		RH	< 0.23		PH		
PPM	PD	< 0.24		PD	< 0.22		PD	< 0.22		PD		
PPM	HG	< 0.27		HG	< 0.24		HG	< 0.24		HG		
PPM	CD	< 0.27		CD	< 0.25		CD	< 0.25		CD		
PPM	IH	< 0.27		IH	< 0.25		IH	< 0.25		IH		
PPM	SH	< 0.29		SH	< 0.20		SN	< 0.20		SH		
PPM	SB	< 0.30		SB	< 0.29		SB	< 0.29		SB		
PPM	TE	< 0.32		TE	< 0.33		TE	< 0.33		TE		
PPM	I	< 0.35		I	< 0.33		I	< 0.33		I		
PPM	CS	< 0.42		CS	< 0.30		CS	< 0.30		CS		
PPM	DA	< 0.43		DA	< 0.42		DA	< 0.42		DA		
PPM	LA	< 0.40		LA	< 0.40		LA	< 0.40		LA		
PPM	CE	< 0.59		CE	< 0.55		CE	< 0.55		CE		



SS UNITS	EL	B2F (4389)AMB (BOT)		B2F MID		B2F TOP			
T1									
UG/CM2	AL	0.58	0.13	AL	0.64	0.12	AL	0.58	0.11
UG/CM2	SI	1.079	0.089	SI	0.960	0.082	SI	0.814	0.074
UG/CM2	P	0.059	0.028	P	< 0.068		P	0.067	0.026
UG/CM2	S	0.313	0.031	S	0.294	0.043	S	0.292	0.029
UG/CM2	CL	0.067	0.028	CL	< 0.061		CL	0.060	0.026
UG/CM2	K	0.134	0.012	K	0.107	0.011	K	0.091	0.010
UG/CM2	CA	0.209	0.014	CA	0.181	0.013	CA	0.182	0.013
UG/CM2	FE	0.351	0.025	FE	0.370	0.025	FE	0.512	0.032
ZR									
UG/CM2	SI	< 1.5		SI	< 1.5		SI	< 1.5	
UG/CM2	P	< 0.03		P	< 1.1		P	< 0.01	
UG/CM2	S	< 0.45		S	< 0.91		S	< 0.45	
UG/CM2	CL	< 0.26		CL	< 0.41		CL	< 0.26	
UG/CM2	K	< 0.11		K	< 0.10		K	< 0.10	
UG/CM2	CA	0.204	0.045	CA	0.220	0.046	CA	0.222	0.045
UG/CM2	TI	0.077	0.023	TI	0.095	0.024	TI	0.057	0.023
UG/CM2	V	< 0.032		V	< 0.031		V	< 0.033	
UG/CM2	CR	0.029	0.014	CR	< 0.027		CR	< 0.027	
UG/CM2	MN	< 0.021		MN	0.021	0.010	MN	0.026	0.011
UG/CM2	FE	0.354	0.025	FE	0.374	0.026	FE	0.510	0.032
UG/CM2	CO	< 0.016		CO	< 0.017		CO	< 0.017	
UG/CM2	NI	< 0.009		NI	< 0.008		NI	< 0.009	
UG/CM2	CU	0.256	0.017	CU	0.100	0.009	CU	0.125	0.010
UG/CM2	ZH	0.131	0.010	ZH	0.056	0.006	ZH	0.063	0.007
UG/CM2	GA	< 0.007		GA	< 0.008		GA	< 0.007	
UG/CM2	HG	0.020	0.013	HG	< 0.025		HG	< 0.025	
UG/CM2	SE	< 0.007		SE	< 0.007		SE	< 0.007	
UG/CM2	PB	< 0.020		PB	< 0.027		PB	< 0.027	
UG/CM2	AS	< 0.007		AS	< 0.010		AS	< 0.007	
UG/CM2	BR	< 0.007		BR	< 0.007		BR	< 0.007	
UG/CM2	RB	< 0.010		RB	< 0.010		RB	< 0.010	
AG									
UG/CM2	U	< 0.033		U	< 0.048		U	< 0.046	
UG/CM2	SR	< 0.017		SR	< 0.017		SR	< 0.017	
UG/CM2	Y	< 0.017		Y	< 0.017		Y	< 0.010	
UG/CM2	ZR	< 0.020		ZR	< 0.019		ZR	< 0.010	
UG/CM2	NB	< 0.010		NB	< 0.010		NB	< 0.010	
UG/CM2	MO	< 0.010		MO	< 0.019		MO	< 0.010	
AM									
UG/CM2	PU	< 0.21		PU	< 0.21		PU	< 0.20	
UG/CM2	RH	< 0.19		RH	< 0.19		RH	< 0.19	
UG/CM2	PD	< 0.22		PD	< 0.21		PD	0.25	0.10
UG/CM2	AG	< 0.23		AG	< 0.23		AG	< 0.23	
UG/CM2	CD	< 0.24		CD	< 0.24		CD	< 0.23	
UG/CM2	IN	< 0.25		IN	< 0.25		IN	< 0.25	
UG/CM2	SN	< 0.27		SN	< 0.27		SN	< 0.26	
UG/CM2	SB	< 0.31		SB	< 0.29		SB	< 0.29	
UG/CM2	TE	< 0.20		TE	< 0.20		TE	< 0.20	
UG/CM2	I	< 0.32		I	< 0.32		I	< 0.30	
UG/CM2	CS	< 0.37		CS	< 0.37		CS	< 0.37	
UG/CM2	DA	< 0.37		DA	< 0.38		DA	0.50	0.10
UG/CM2	LH	< 0.41		LH	< 0.40		LH	< 0.39	
UG/CM2	CE	< 0.55		CE	< 0.52		CE	< 0.49	

SS UNITS	EL	BF3 MID		BF3 TOP		B3F(4389) D WIND(BOT)			
T1									
UG/CM2	AL	0.43	0.12	AL	0.39	0.12	AL	0.62	0.12
UG/CM2	SI	0.845	0.079	SI	0.814	0.078	SI	0.939	0.084
UG/CM2	P	< 0.068		P	< 0.071		P	< 0.068	
UG/CM2	S	0.221	0.042	S	0.198	0.043	S	0.308	0.043
UG/CM2	CL	0.062	0.031	CL	< 0.062		CL	0.088	0.031
UG/CM2	K	0.081	0.010	K	0.097	0.010	K	0.128	0.011
UG/CM2	CA	0.181	0.013	CA	0.174	0.013	CA	0.218	0.014
UG/CM2	FE	0.446	0.029	FE	0.401	0.027	FE	0.487	0.031
ZR									
UG/CM2	SI	< 1.6		SI	< 1.6		SI	< 1.5	
UG/CM2	P	< 1.1		P	< 1.2		P	< 1.1	
UG/CM2	S	< 0.92		S	< 0.97		S	< 0.91	
UG/CM2	CL	< 0.43		CL	< 0.44		CL	< 0.41	
UG/CM2	K	0.187	0.052	K	< 0.11		K	< 0.18	
UG/CM2	CA	0.256	0.048	CA	0.251	0.048	CA	0.321	0.049
UG/CM2	TI	< 0.046		TI	0.087	0.025	TI	0.083	0.024
UG/CM2	V	< 0.031		V	< 0.035		V	< 0.034	
UG/CM2	CR	< 0.026		CR	< 0.027		CR	< 0.027	
UG/CM2	MN	< 0.021		MN	< 0.023		MN	< 0.022	
UG/CM2	FE	0.458	0.029	FE	0.405	0.027	FE	0.492	0.032
UG/CM2	CO	< 0.017		CO	< 0.017		CO	< 0.016	
UG/CM2	NI	0.012	0.005	NI	< 0.009		NI	0.037	0.006
UG/CM2	CU	0.042	0.007	CU	0.070	0.008	CU	0.074	0.008
UG/CM2	ZN	0.016	0.005	ZN	0.037	0.006	ZN	0.031	0.005
UG/CM2	GA	< 0.007		GA	< 0.008		GA	< 0.008	
UG/CM2	HG	< 0.026		HG	< 0.028		HG	< 0.026	
UG/CM2	SE	< 0.007		SE	< 0.007		SE	< 0.007	
UG/CM2	PB	< 0.027		PB	< 0.029		PB	< 0.027	
UG/CM2	AS	< 0.010		AS	< 0.010		AS	< 0.010	
UG/CM2	BR	< 0.007		BR	< 0.007		BR	< 0.007	
UG/CM2	RB	< 0.018		RB	< 0.011		RB	< 0.018	
AG									
UG/CM2	U	< 0.044		U	< 0.033		U	< 0.045	
UG/CM2	SR	< 0.017		SR	< 0.017		SR	< 0.017	
UG/CM2	Y	< 0.018		Y	< 0.017		Y	< 0.018	
UG/CM2	ZR	< 0.019		ZR	< 0.019		ZR	< 0.018	
UG/CM2	NB	< 0.017		NB	< 0.017		NB	< 0.018	
UG/CM2	MO	< 0.018		MO	< 0.019		MO	< 0.018	
AM									
UG/CM2	RU	< 0.19		RU	< 0.28		RU	< 0.28	
UG/CM2	RH	< 0.18		RH	< 0.19		RH	< 0.19	
UG/CM2	PD	< 0.21		PD	< 0.22		PD	< 0.22	
UG/CM2	AG	< 0.23		AG	< 0.24		AG	< 0.23	
UG/CM2	CD	< 0.23		CD	< 0.24		CD	< 0.23	
UG/CM2	IH	< 0.24		IH	< 0.25		IH	< 0.24	
UG/CM2	SH	< 0.24		SH	< 0.27		SH	0.38	0.12
UG/CM2	SB	< 0.28		SB	< 0.38		SB	< 0.29	
UG/CM2	TE	< 0.28		TE	< 0.31		TE	< 0.31	
UG/CM2	I	< 0.38		I	< 0.39		I	< 0.38	
UG/CM2	OS	< 0.37		OS	< 0.38		OS	< 0.38	
UG/CM2	OH	< 0.41		OH	< 0.42		OH	< 0.42	
UG/CM2	LH	< 0.39		LH	< 0.41		LH	< 0.41	
UG/CM2	CE	< 0.46		CE	< 0.53		CE	< 0.48	

80F (BLANK)

55 UG/CM2 MN

AL	0.26	+/-	AL	0.29	+/-
SI	0.410	0.055	SI	0.249	0.053
P	< 0.047		P	< 0.072	
S	< 0.030		S	0.232	0.044
CL	< 0.040		CL	0.068	0.061
K	< 0.014		K	< 0.014	
CA	0.057	0.007	CA	0.002	0.009
FE	0.142	0.015	FE	< 0.14	
		+/-			+/-
SI	< 1.5		SI	< 1.6	
P	< 0.05		P	< 1.2	
S	< 0.46		S	< 1.00	
CL	< 0.27		CL	1.10	0.25
K	< 0.099		K	< 0.11	
CA	0.095	0.042	CA	< 0.094	
TI	< 0.045		TI	< 0.053	
V	< 0.036		V	< 0.048	
CR	< 0.029		CR	< 0.046	
MN	< 0.022		MN	60.0	3.0
FE	0.144	0.015	FE	< 0.14	
CO	< 0.015		CO	< 0.016	
NI	< 0.010		NI	< 0.010	
CU	0.026	0.006	CU	0.079	0.008
ZN	0.015	0.004	ZN	0.064	0.007
GA	< 0.008		GA	< 0.008	
HG	< 0.027		HG	< 0.028	
SE	< 0.007		SE	< 0.008	
PB	< 0.029		PB	< 0.029	
AS	< 0.007		AS	< 0.011	
BR	< 0.007		BR	0.009	0.004
RB	< 0.010		RB	< 0.011	
		+/-			+/-
U	< 0.045		U	< 0.048	
SR	< 0.017		SR	< 0.018	
Y	< 0.010		Y	< 0.019	
ZR	< 0.020		ZR	< 0.020	
NB	< 0.018		NB	< 0.019	
MO	< 0.018		MO	< 0.019	
		+/-			+/-
RU	< 0.21		RU	< 0.21	
PH	< 0.20		PH	< 0.20	
PD	< 0.22		PD	< 0.22	
AG	< 0.24		AG	< 0.24	
CD	< 0.24		CD	< 0.24	
IN	< 0.25		IN	< 0.26	
SN	0.30	0.13	SN	< 0.20	
SB	< 0.30		SB	< 0.30	
TE	< 0.31		TE	< 0.32	
I	< 0.34		I	< 0.33	
CS	< 0.36		CS	< 0.30	
OH	< 0.39		OH	< 0.43	
LH	< 0.41		LH	< 0.42	
CE	< 0.51		CE	< 0.50	

APPENDIX G

LABORATORY ANALYSES OF FILTER SAMPLES FOR ASBESTOS

## LABORATORY ANALYSES OF FILTER SAMPLES FOR ASBESTOS

Laboratory analyses for asbestos fibers are presented in this appendix. Sampling for asbestos fibers was conducted during monitoring event "D". The results of the laboratory analysis of the three filter cartridges used during this monitoring event are reported in a letter from the analysis laboratory. Each filter sample is identified by a sample number and sampling data description.



HANFORD ENVIRONMENTAL  
HEALTH FOUNDATION

May 31, 1989

CO 14035

Pacific Northwest Laboratory  
MSIN K6-08

Attn: Gail L. Laws

ANALYSIS OF FIBER CONTENT AS AN INDICATION OF ASBESTOS EXPOSURE - WP# M69058

The three samples received May 25, 1989, reportedly from the Horn Rapids Landfill, have been analyzed for fiber content using the approved NIOSH Analytical Method 7400. It should be noted that the method does not distinguish between asbestos and nonasbestos fibers but rather uses 400 power phase contrast microscopy to count all particles with an overall length exceeding 5 microns ( $\mu$ ) and a length-to-width ratio of 3:1 or greater. Results are as follows:

<u>Sample #</u>	<u>Sampling Data</u>	<u>Date</u>	<u>Air Vol.</u>	<u>Fibers</u>	<u>Fibers</u>
		<u>1989</u>	<u>(L)</u>	<u>/Field</u>	<u>&gt;5 <math>\mu</math>/cc</u>
D1A	Cassette #A263-A	2-23	89.1	<0.03	<0.02
D2A	Cassette #A550-A	2-23	96.6	<0.03	<0.02
DA	Cassette #N680-A (Blank)	2-23	--	<0.03	--

If there are questions concerning this report, please contact us.

*K. A. Lavaty*

K. A. Lavaty  
Environmental Health Sciences

jt

**END**

**DATE FILMED**

11 / 1 / 90

