G-8020-0401 (557)

22002

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. M. Greene/RTP Files
J. E. Howes, Jr.
S. Snider/Contracts/RMO

September 13, 1982

Mr. Barry Martin
U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
MD-76
Research Triangle Park, North Carolina 27711

Dear Barry:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near Three
Landfills in the Bloomington, Indiana Area

Enclosed are six (6) copies of the protocol for a preliminary study on the subject Work Assignment. We anticipate initiating the field sampling program during the next period of favorable weather; therefore, please notify me promptly if you have any modifications or additions to the proposed protocol.

Very truly yours,

James E. Howes

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:lp

xc: D. L. Scott, EPA (3 copies)
J. Kemp, EPA/Contracts

PROTOCOL FOR A PRELIMINARY STUDY TO DETERMINE AMBIENT AIR CONCENTRATIONS OF PCB'S AT NEIL'S LANDFILL, BLOOMINGTON, INDIANA

1.0 SCOPE AND OBJECTIVE

Next summer, a program will be conducted to monitor PCB levels in ambient air over a 30-day period in the vicinity of three landfills in the Bloomington, Indiana, area. As a preliminary effort on this program, a limited monitoring program will be performed during the latter part of September, 1982, at one of the sites, Neil's Landfill. The objective of this study will be to (1) obtain preliminary estimates of PCB concentrations in the ambient air at the landfill site and (2) check out sampling, analysis, and sample handling procedures which will be employed in the summer study.

The sampling program will be performed over a three-day period during warm, sunny weather. Measurements will be performed over areas on the landfill where capacitors suspected of leakage are exposed (hot spots) to determine the vertical distribution of PCB's and the concentration at 1.8 meter above ground level. Samples collected during the study will be sent to Southwest Research Institute for PCB analysis.

2.0 SAMPLING PROTOCOL

Sampling will be conducted over a three-day period at Neil's Landfill over areas where capacitors suspected of leakage are visible on the surface of the ground. All sampling will be performed with DuPont P-4000A battery-operated pumps equipped with sampling cartridges consisting of a 20 mm i.d. x 10 cm long borosilicate glass tube containing a 22 mm dia. x 7.6 cm long polyurethane foam (PUF) plug. Measurements will be performed to determine the vertical distribution of PCB's and the PCB levels at 1.8 meters above ground level. Two sets of vertical profile measurements will be performed during the sampling program. These measurements will be made by sampling above two different "hot spot" areas on two different days using an array of five samplers located 2, 30, 60, 120, and 180 cm above ground level. On each of the three days, sampling will be

conducted over five "hot spot" areas with samplers placed 1.8 meters above ground level. One sampler will also be located on the up-wind periphery of the landfill site to measure background PCB levels. For all measurements, the samplers will be operated at a flow rate of about 3.8 lpm and sampling will be performed from 9:00 a.m. to 5:00 p.m. CDT.

The sampling pumps will be calibrated with a DuPont Calibrator before and after each sampling period.

During the sampling periods, wind speed, wind direction, and ambient temperature will be measured with an MRI portable weather station located on the landfill site. Relative humidity will be determined hourly during sampling with wet- and dry-bulb thermometers. An aneroid barometer will be used to obtain hourly barometric pressure readings.

3.0 ANALYSIS PROTOCOL

Analysis of the PUF plugs for PCB's will be performed by Southwest Research Institute. The analysis will consist of three steps: extraction of the PUF cartridges, analysis of the extract, and identification and quantification of the PCB's present. The following table shows the methods that will be used for each of the analysis steps.

Analysis Step	Method	Reference
Extraction	Soxhlet-5% ethyl ether in hexane	Anal. Chem. 49(12): 1668-1672
Separation	Gas chromatography-electron capture detection	EPA Method 608
Quantification and Identification	Webb and McCall	J. Chrom. Sci. 11:366-373

Data will be reported to BCL as the equivalent quantity of Arochlor 1242 in the samples.

4.0 QA/QC PROCEDURES

The program will include the following QA/QC activities.

- All sampling pumps will be calibrated before and after sampling.
- Two field blanks will be analyzed with the samples
- Co-located sampling (at 1.8 m) will be performed at one "hot spot" area during each of the three sampling days.
- Three unused sampling cartridges will be spiked with known concentrations of Arochlor 1242 by BCL and submitted to SwRI as blind samples.
- SwRI will perform analysis of reagent and method blanks and spiked samples along with the field samples.

5.0 SAMPLE HANDLING AND CUSTODY

Strict chain-of-custody procedures will be observed during the course of the program. A member of the sampling team will be on site during all sampling operations to ensure that there is no tampering with the samplers. All samples will be assigned a unique number code and will be stored in a locked area. All field and laboratory data and transfer of samples will be documented on standard forms or laboratory record books.

6.0 SCHEDULE AND ESTIMATED COST

The field sampling program will be conducted after September 15, 1982, during the first period of favorable weather conditions. Total cost for the preliminary study is estimated to be about $12,000.

G-8020-0401 (557)

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. Greene/RTP Files
J. E. Howes, Jr. (2)
S. Snider/Contracts/RMO

September 23, 1982

Mr. Barry Martin
U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near Three
Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the revised Protocol for a preliminary study on the subject Work Assignment.

Should you have any questions or comments, please call me at FTS 976-5269.

Very truly yours,

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:llp

xc: D. L. Scott, EPA (3 copies)
J. Kempf, EPA/Contracts

REVISED PROTOCOL FOR A PRELIMINARY STUDY TO DETERMINE AMBIENT AIR CONCENTRATIONS OF PCB'S AT NEIL'S LANDFILL, BLOOMINGTON, INDIANA

1.0 SCOPE AND OBJECTIVE

Next summer a program will be conducted to monitor PCB levels in ambient air over a 30-day period in the vicinity of three landfills in the Bloomington, Indiana, area. As a preliminary effort on this program, a limited monitoring program will be performed during the latter part of September, 1982, at one of the sites, Neil's Landfill. The objective of this study will check out sampling, analysis, and sample handling procedures which will be employed in the summer study. It is also anticipated that this limited study will yield preliminary estimates of ambient air concentrations of PCB's at the landfill site. However, since the study will be conducted in the Fall during which lower temperatures prevail, concentrations are expected to be lower than would be observed during Summertime conditions.

The sampling program will be performed over a three-day period during warm, sunny weather. Measurements will be performed over areas on the landfill where capacitors suspected of leakage are exposed (hot spots) to determine the vertical distribution of PCB's and the concentration at 1.8 meter above ground level. Samples collected during the study will be sent to Southwest Research Institute for PCB analysis.

2.0 SAMPLING PROTOCOL

Sampling will be conducted over a three-day period at Neil's Landfill over areas where capacitors suspected of leakage are visible on the surface of the ground. All sampling will be performed with DuPont P-4000A battery-operated pumps equipped with sampling cartridges consisting of a 20 mm i.d. x 10 cm long borosilicate glass tube containing a 22 mm dia. x 7.6 cm long polyurethane foam (PUF) plug. The field sampling will be conducted according to the plan shown in Table 1. Three sets of vertical profile measurements will be performed using an array of five samplers with the sampling cartridges located at 2, 30, 60, 120, and 180 cm above ground level.

TABLE 1. FIELD SAMPLING PLAN

Sampling Day	Sampling to be Performed	No. of Samples Generated
1	Vertical profile at Hot Spot A	5
	Vertical profile at Hot Spot B	5
	1.8 m samples at Hot Spots A - E	5
	Upwind background	1
2	Vertical profile at Hot Spot A	5
	1.8 m samples at Hot Spots A - E, co-located sampler at one of the Hot Spots	6
	Upwind background	1
3	1.8 m samples at Hot Spots A - E, co-located sampler at one of the Hot Spots	6
	Upwind background	1
	Subtotal	35
QA Samples	Field blank	1
	Control samples (cartridges spiked with known quantity of Aroclor 1242)	2
	Total Samples	38

Sample Breakdown:

Vertical profile	15
1.8 m above ground	15
Background	3
Co-located	2
Blank	1
Control	2
Total	38

The profile measurements will be performed during two days at the same hot spot and during one day at a different hot spot. Sampling at 1.8 m above ground level will be performed at five different hot spot areas on each of the three days. During two of the days, co-located samplers at 1.8 m above ground level will be deployed at one of the hot spots. One background sample will be taken at the upwind periphery of the landfill site on each of the three days. Quality assurance samples will include one field blank and two unused cartridges spiked with known quantities of Aroclor 1242. For all measurements the samplers will be operated at a flow rate of about 3.8 lpm and sampling will be performed from 9:00 a.m. to 5:00 p.m. CDT.

The sampling pumps will be calibrated with a DuPont Calibrator before and after each sampling period.

During the sampling periods, wind speed, wind direction, and ambient temperature will be measured with an MRI portable weather station located on the landfill site. Relative humidity will be determined hourly during sampling with wet- and dry-bulb thermometers. An aneroid barometer will be used to obtain hourly pressure readings.

3.0 ANALYSIS PROTOCOL

Analysis of the PUF plugs for PCB's will be performed by Southwest Research Institute. The analysis will consist of three steps: extraction of the PUF cartridges, analysis of the extract, and identification and quantification of the PCB's present. The following table shows the methods that will be used for each of the analysis steps.

Analysis Step	Method	Reference
Extraction	Soxhlet-5% ethyl ether in hexane	Anal. Chem.49(12): 1668-1672
Separation	Gas chromatography-electron capture detection	EPA Method 608
Quantification and Identification	Webb and McCall	J. Chrom. Sci. 11:366-373

Data will be reported to BCL as the equivalent quantity of Aroclor 1242 in the samples.

4.0 QA/QC PROCEDURES

The program will include the following QA/QC activities:

- All sampling pumps will be calibrated before and after sampling.
- One field blank will be analyzed with the samples
- Co-located sampling (at 1.8 m) will be performed at two "hot spot" areas during two of the sampling days.
- Two unused sampling cartridges will be spiked with known concentrations of Aroclor 1242 by BCL and submitted to SwRI as blind samples.
- SwRI will perform analysis of reagent and method blanks and spiked samples along with the field samples.

5.0 SAMPLE HANDLING AND CUSTODY

Strict chain-of-custody procedures will be observed during the course of the program. A member of the sampling team will be on site during all sampling operations to ensure that there is no tampering with the samplers. All samples will be assigned a unique number code and will be stored in a locked area. All field and laboratory data and transfer of samples will be documented on standard forms or laboratory record books.

6.0 SCHEDULE AND ESTIMATED COST

The field sampling program will be conducted after September 15, 1982, during the first period of favorable weather conditions. Total cost for the preliminary study is estimated to be about $13,000.

G-8020-0401 (557)

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. Greene/RTP Files
J. E. Howes, Jr.
S. Snider/Contracts/RMO

September 23, 1982

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the first Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:llp

xc: D. R. Scott, EPA/EMSL (3 copies)
J. Kempf, EPA Contracts

FIRST MONTHLY PROGRESS REPORT
(July 28 - August 31, 1982)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

September 23, 1982

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during

September/October, 1982, to evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

A visit to the three landfill sites was made on August 12, 1982, by B. E. Martin (EPA/RTP), J. Strecker (State of Indiana), and D. L. Sgontz and J. E. Howes, Jr. (BCL) to develop plans for the PCB monitoring program.

Preparation of the Work and Quality Assurance Project Plans for the 30-day monitoring study was initiated.

CURRENT PROBLEMS

Due to timing in initiating the study, it was not possible to perform the 30-day monitoring program during Summertime conditions when maximum PCB emission levels would be expected. Therefore, EPA has decided to delay this work until the Summer of 1983. A preliminary three-day monitoring study will be performed this Fall to evaluate the methodology to be employed in the monitoring program next Summer.

FUTURE WORK

A Work Plan for the three-day monitoring program to be conducted this Fall will be submitted to EPA. The Work and QA Project Plans for next summer's monitoring program will be completed and submitted to EPA for approval.

The preliminary, three-day monitoring program will be conducted during the latter part of September or the first part of October, 1982. Specific dates will depend on selection of a period when warm, sunny weather conditions prevail.

G-8020-0401 (557)

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. Greene/RTP Files
J. E. Howes, Jr.
S. Snider/Contracts/RMO

October 22, 1982

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the second Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes, Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:llp

xc: D. R. Scott, EPA/EMSL (3 copies)
J. Kempf, EPA Contracts

SECOND MONTHLY PROGRESS REPORT
September 1-30, 1982)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

October 22, 1982

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October, 1982, to

evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

A Work Plan for the preliminary monitoring program was submitted on September 13 and a revised Work Plan was submitted on September 23. Equipment was prepared for the field monitoring program.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program next summer.

FUTURE WORK

The preliminary monitoring program will be conducted during October when satisfactory weather conditions prevail. Preparation of the Work and QA Project Plans for next summer's program will continue.

G-8020-0401 (557)

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. Greene/RTP Files
J. E. Howes, Jr.
S. Snider/Contracts/RMO

November 12, 1982

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the third Monthly Progress Report on the subject work assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:llp

xc: D. R. Scott, EPA/EMSL (3 copies)
J. Kempf, EPA Contracts
Robert Lewis

THIRD MONTHLY PROGRESS REPORT
(October 1-31, 1982)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

November 12, 1982

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October, 1982, to

evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

The preliminary PCB monitoring program at Neil's Landfill was conducted on October 5 and 6. Sampling performed during the two days is summarized in Table 1. During the period, continuous wind speed, wind direction, and ambient temperature data were obtained. Barometric pressure and relative humidity measurements were taken hourly during the sampling periods. High temperatures each day were about 80-83 F with mostly sunny conditions. A storm front accompanied by heavy rains moved in during the afternoon of October 6. Therefore sampling was not conducted on the third day as proposed in the Work Plan.

The PUF air samples, blanks, and controls were sent to SwRI for analysis on October 12.

A signed copy of the chain-of-custody form was received from SwRI acknowledging receipt of the samples on October 15.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program next summer.

FUTURE WORK

SwRI will complete PCB analysis of the samples from the preliminary study by the end of November. A report on the study will be prepared and

submitted to EPA by December 10. Preparation of the Work and QA Project Plans for next summer's program will continue.

TABLE 1. FIELD SAMPLING SUMMARY

Sampling Day	Sampling Performed[a]	No. of Samples Collected
1	Vertical profile at Hot Spot A	5
	Vertical profile at Hot Spot b	5
	1.8 m samples at five Hot Spots, co-located sampler at one Hot Spot	6
	Upwind background	1
2	Vertical profile at Hot Spot A	5
	1.8 m samples at five Hot Spots co-located sampler at one Hot Spot	6
	Upwind background	1
	Subtotal	29
QA Samples	Field Blanks	2
	Control samples (cartridges spiked with known quantity of Aroclor 1242)	6
	Total Samples	37

(a) All sampling was performed from about 0900 to 1700 hrs CDT.

G-8020-0401 (557)

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. Greene/RTP Files
J. E. Howes, Jr. (2)
S. Snider/Contracts/RMO

December 17, 1982

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the fourth Monthly Progress Report on the subject Work Assignment. Please call me at FTS 676-8269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:llp

xc: D. R. Scott, EPA/EMSL (3 copies)
J. Kempf, EPA Contracts
Robert Lewis, EPA/EMSL

FOURTH MONTHLY PROGRESS REPORT
(November 1-30, 1982)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

December 17, 1982

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October, 1982, to

evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

The preliminary PCB monitoring program at Neil's Landfill was conducted on October 5 and 6. The PUF air samples, blanks, and controls were sent to SwRI for analysis on October 12. As of this report date, the analyses have not been received by BCL.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program next summer.

FUTURE WORK

SwRI will complete PCB analysis of the samples from the preliminary study by the end of December. A report on the study will be prepared and submitted to EPA by about January 15, 1983. Preparation of the Work and QA Project Plans for next summer's program will continue.

G-8020-0401 (545)

G. R. Smithson, Jr.
D. L. Sgontz
W. C. Baytos
J. Greene/RTP Files
J. E. Howes, Jr.(2)
S. Snider/Contracts/RMO

January 21, 1983

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the fifth Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH:llp

xc: D. R. Scott, EPA/EMSL (3 copies)
J. Kempf, EPA Contracts
Robert Lewis, EPA/EMSL

FIFTH MONTHLY PROGRESS REPORT
(December 1-31, 1982)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

January 21, 1983

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October, 1982, to

evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

The preliminary PCB monitoring program at Neil's Landfill was conducted on October 5 and 6. The PUF air samples, blanks, and controls were sent to SwRI for analysis on October 12. PCB analysis results were received from SwRI on December 29, 1982.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program next summer. Additional funding will be required to complete next summer's program according to the original scope.

FUTURE WORK

A report on the results of the preliminary study will be prepared and submitted to EPA by about January 30, 1983. Preparation of the Work and QA Project Plans for next summer's program will continue with a target submission date of March 1, 1983.

G-8020-0401 (545)

GR Smithson Jr
DL Sgontz
WC Baytos
JE Howes Jr (2)
JM Greene/RTP Files
S Snider/Contracts/RMO

February 22, 1983

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the sixth Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH/jg

Enc. (6)

xc: D. R. Scott, EPA/EMSL (3)
J. Kempf, EPA Contracts
R. Lewis, EPA/EMSL

SIXTH MONTHLY PROGRESS REPORT
(January 1-31, 1983)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

February 22, 1983

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October 1982, to evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring

program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used a a bais for detemining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

A draft report on the results of the preliminary monitoring program at Neil's was submitted to EPA on February 3, 1983.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program next summer. Additional funding will be required to complete next summer's program according to the original scope.

FUTURE WORK

Preparation of the Work and QA Project Plans for next summer's program will continue with a target submission date of March 1, 1983.

G-8020-0401 (545)

GR Smithson Jr
DL Sgontz
WC Baytos
JE Howes Jr (2)
JM Greene/RTP Files
S Snider/Contracts/RMO

March 21, 1983

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the seventh Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E Howes Jr

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH/jg

Enc. (6)

xc: D. R. Scott, EPA/EMSL (3)
J. Kempf, EPA Contracts
R. Lewis, EPA/EMSL

SEVENTH MONTHLY PROGRESS REPORT
(February 1-28, 1983)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

March 21, 1983

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October 1982, to evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring

program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

Preparation of the Work and QA Project Plans for this Summer's 30-day monitoring program at the three landfills has continued.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program during July-August 1983. Additional funding will be required to complete next Summer's program according to the original scope.

FUTURE WORK

Preparation of the Work and QA Project Plans for next Summer's program will be completed and the Plans will be submittd to EPA by March 31, 1983.

G-8020-0401 (545)

GR Smithson Jr
DL Sgontz
WC Baytos
JE Howes Jr (2)
JM Greene/RTP Files
S Snider/Contracts/RMO

April 21, 1983

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the eighth Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes, Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH/jg

Enc. (6)

xc: D. R. Scott, EPA/EMSL (3)
J. Kempf, EPA Contracts
R. Lewis, EPA/EMSL

EIGHTH MONTHLY PROGRESS REPORT
(March 1-31, 1983)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

April 21, 1983

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

This study is being conducted to support EPA Region V in establishing background air levels and determining PCB emissions in the atmosphere in and around the three landfill sites. A preliminary three-day monitoring study will be conducted at Neil's Landfill during September/October 1982, to evaluate PCB sampling, analysis, and sampling handling procedures. A more intensive 30-day monitoring

program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

The QA Project Plan for this Summer's 30-day monitoring program at the three landfills was submitted on March 31.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program during July-August 1983. Additional funding will be required to complete next Summer's program according to the original scope.

FUTURE WORK

The Work Plan for this Summer's program will be submitted to EPA by about April 20.

G-8020-0401 (545)

GR Smithson Jr
DL Sgontz
WC Baytos
JE Howes Jr (2)
JM Greene/RTP Files
S Snider/Contracts/RMO

May 16, 1983

Mr. Barry E. Martin
Environmental Monitoring Systems Laboratory
U.S. Environmental Protection Agency
MD-76
Research Triangle Park, North Carolina 27711

Dear Mr. Martin:

Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near
Three Landfills in the Bloomington, Indiana, Area

Enclosed are six (6) copies of the ninth Monthly Progress Report on the subject Work Assignment. Please call me at FTS 976-5269 if you have any questions or comments concerning the progress of this program.

Very truly yours,

James E. Howes Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office

JEH/jg

Enc. (6)

xc: D. R. Scott, EPA/EMSL (3)
J. Kempf, EPA Contracts
R. Lewis, EPA/EMSL

NINTH MONTHLY PROGRESS REPORT
(April 1-30, 1983)

on

AMBIENT MONITORING FOR PCB'S NEAR
THREE LANDFILLS IN THE BLOOMINGTON, INDIANA, AREA
Contract No. 68-02-3745 (WA-4)

to

ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

from

BATTELLE
Columbus Laboratories

May 16, 1983

INTRODUCTION

Three landfills in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCB's). The landfill sites are identified as: Neil's Landfill, Neil's Dump, and Lemon Lane Landfill. Surveys of these sites have indicated several areas where capacitors are visible at or above ground level. In most of these areas, leakage of the capacitors is suspected due to apparent wetting of the soil and damage to the surrounding vegetation. As a consequence of the leakage, PCB's may be emitted, thus creating an air pollution problem.

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program at all three landfills will be performed during the Summer of 1983. The latter study will provide data on PCB emission patterns and atmospheric pollution levels which will be used as a basis for determining the need for remedial action and the appropriate remedial action(s) to be taken.

PROGRESS DURING REPORT PERIOD

The Work Plan for this Summer's 30-day monitoring program at the three landfills was submitted on April 22.

CURRENT PROBLEMS

Completion date of the Work Assignment must be extended to permit conduct of the monitoring program during July-August 1983. Additional funding will be required to complete next Summer's program according to the original scope.

FUTURE WORK

The QA and Work Plans for this Summer's study are being reviewed by EPA. Approval of these Plans by EPA should be received by about May 31 to meet the proposed sampling schedule.

Preparation and check-out of equipment for the field study will begin about June 1. Start date for the field monitoring program is July 11.

ATTACHMENT NO. 2

Chain-of-Custody Record for Shipment of
Clean PUF Cartridges from SwRI to BCL and Analysis Data
for Clean PUF Sampling Cartridges

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 · 6220 CULEBRA ROAD · SAN ANTONIO, TEXAS 78284 · (512) 684-5111

DIVISION OF CHEMISTRY
AND CHEMICAL ENGINEERING

September 10, 1982

Received 9/13/82
J. Howes

Dr. James Howes
Battelle/Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

Subject: SwRI Project 01-7216-001

Dear Dr. Howes:

Please find enclosed 35 (plus four extra) individually wrapped pre-cleaned lo-vol sampling modules suitable for collection of PCB's from ambient air. Do not remove foil from receptacle until ready to sample.

We have also included an election capture gas chromatographic trace obtained from an extract of a cleaned plug and a calibration standard trace indicating Arochlor 1242.

Please sign and date the custody transfer form and return the original and yellow copy to me in the self-addressed envelope provided. You may maintain the pink and goldenrod copies for your records.

If you should have any questions please contact me at extension 2177 or Dr. Carter Nulton at extension 2228.

Sincerely,

Bonnie C. Fergus

Bonnie C. Fergus
Research Scientist

BCF:mhf

SOUTHWEST RESEARCH INSTITUTE

CUSTODY TRANSFER FORM

Sampling Site	Sample Type (Air, Water, etc.)	Ship To:
n/a	n/a	Dr. James [illegible] Battelle/Columbus Laboratories 505 King Avenue Columbus, Ohio 43201 (614) 424-5259
Sampling Personnel n/a (name) (phone) (date) (time)	**Sample Condition (pH, Temp, etc.)** n/a	Name of Shipper: [illegible] Ferguson Southwest Research Institute Address: 6220 Culebra Rd San Antonio, Texas 78284 Telephone: 684-5111, Ext. 2177 Date Shipped: 2-[illegible]-82 Air Bill No. [illegible]

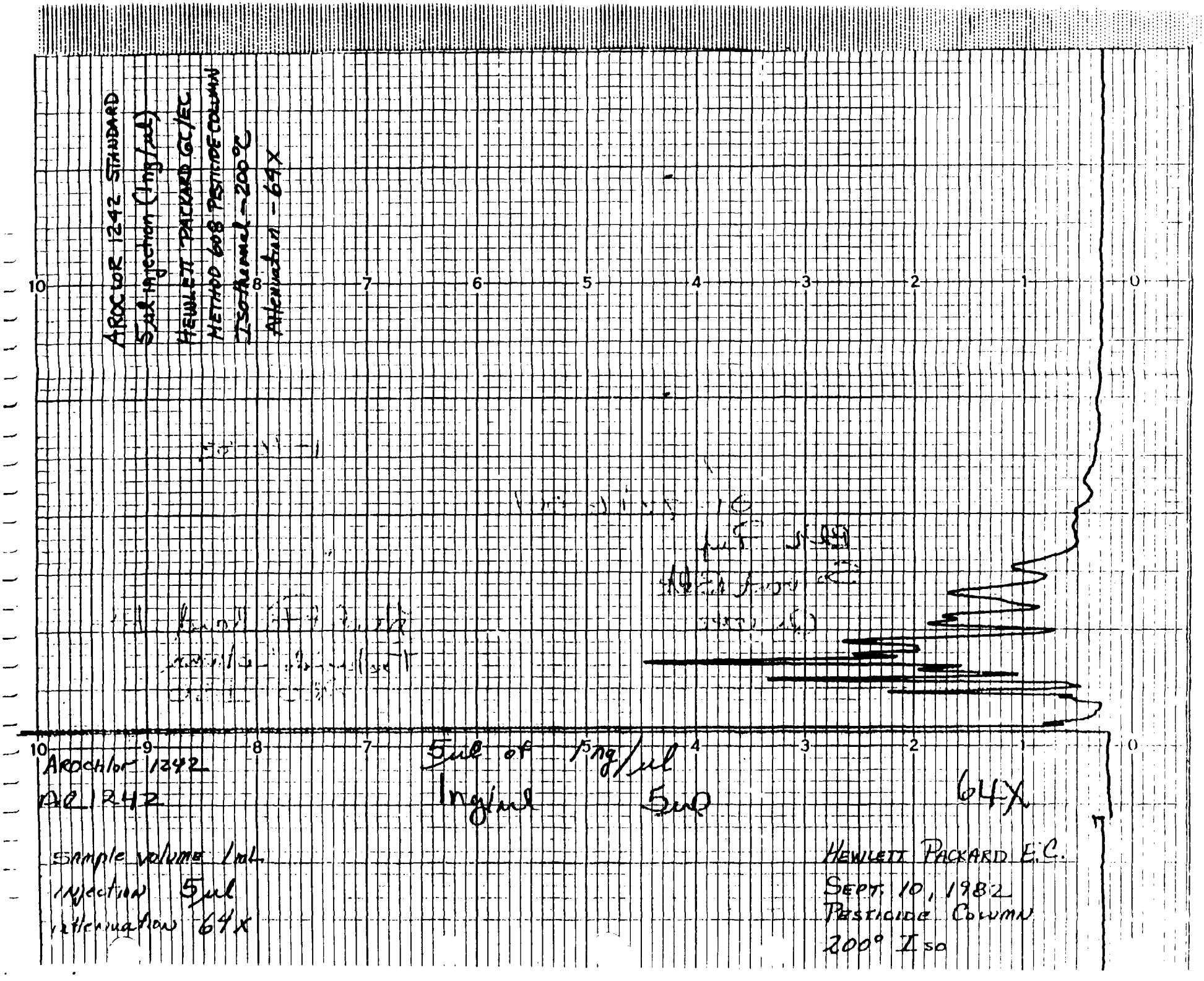
Sample ID	Description	Sample Condition on Receipt (temperature, breakage, etc.)
—	35 LO-VOL sampling modules	
	(plus four extra)	

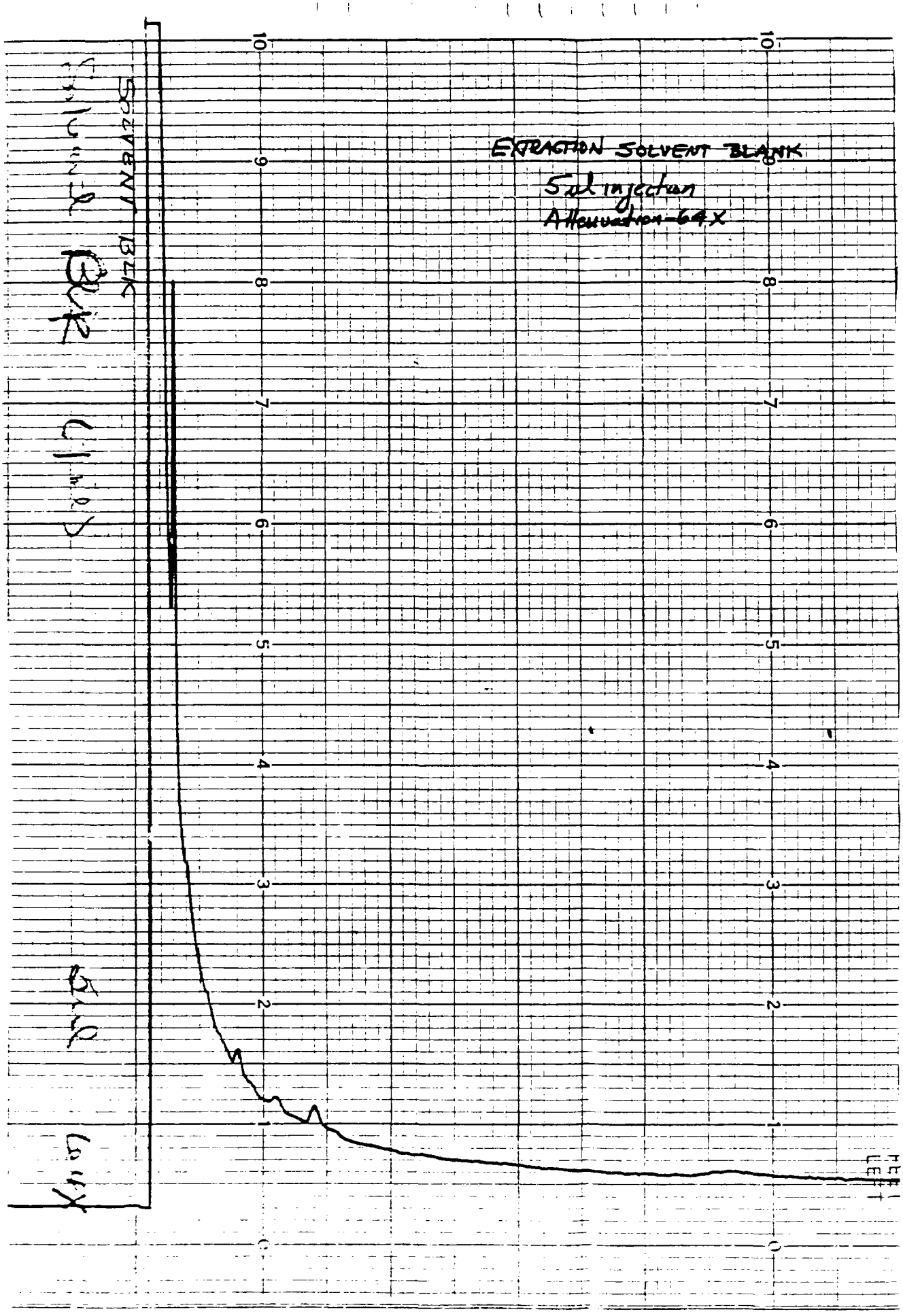
Additional Information:

Received by: _____

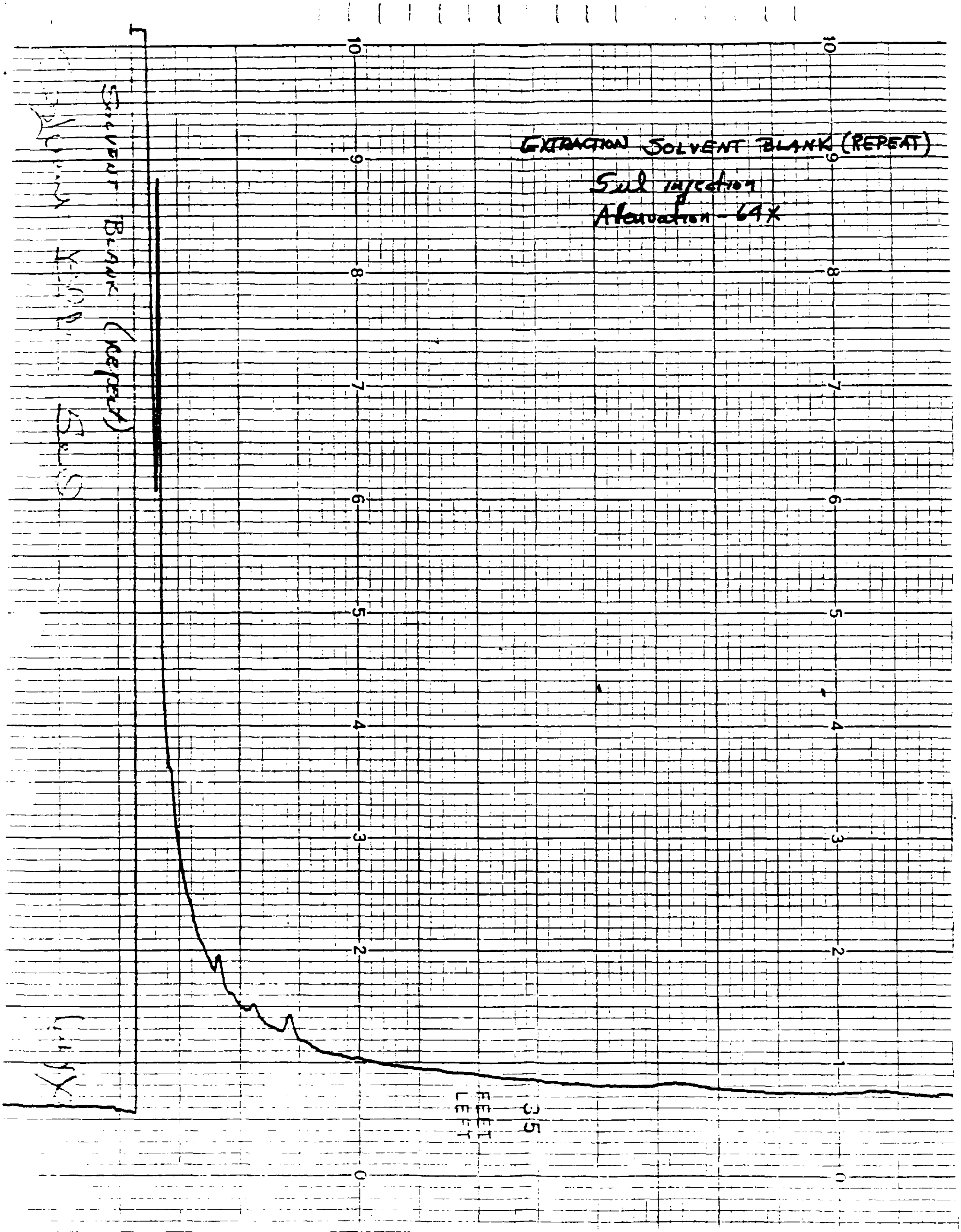
Date: _____

Time: _____

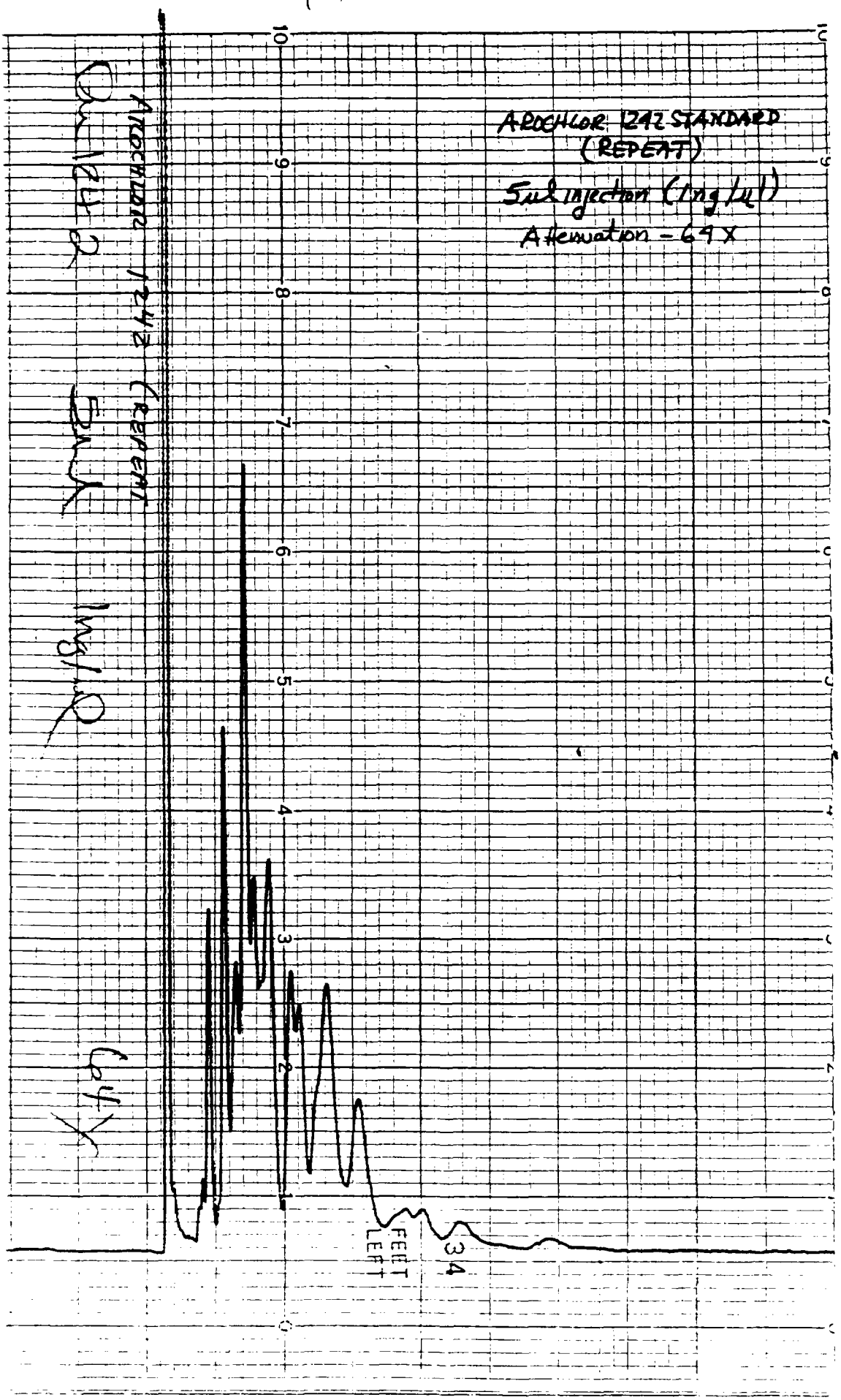

Aroclor 1242 Standard
5µl injection (1ng/µl)
Hewlett Packard GC/EC
Method 608 Pesticide Column
Isothermal - 200°C
Attenuation - 64X
10
9
8
7
6
5
4
3
2
1
0
Aroclor 1242
AQ1242
5µl of 1ng/µl
1ng/µl
5pg
64X
Sample volume 1mL
injection 5µl
attenuation 64X
Hewlett Packard E.C.
Sept. 10, 1982
Pesticide Column
200° Iso


EXTRACTION SOLVENT BLANK
5ul injection
Attenuation-64x
10
9
8
7
6
5
4
3
2
1
0

EXTRACT OF CLEANED PUF CARTRIDGE
5ul of 1ml
64X Attenuation
BLANK PUF: LO-VOL



EXTRACTION SOLVENT BLANK (REPEAT)
5ul injection
Attenuation - 64X
SOLVENT BLANK (REPEAT)
35 FEET LEFT


AROCHLOR 1242 STANDARD
(REPEAT)
5ul injection (1ng/µl)
Attenuation - 64 X
FEET
LEFT
34

Battelle
Columbus Laboratories

TABLE 6. DUPONT SAMPLING PUMP FLOW CALIBRATION

Work Performed By Howes / Bayless
Date/Time October 6, 1982, 0730 HRS
Amb. Temp. 21 C
Bar. Press. 29.20 in Hg
Flow Corr. Factor* 0.9645

Pump S/N	EPA No.	Battery ok	Low Flow Check ok	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg 1	2	3	Avg	Flow Meter Rdg, ℓ/m 0" Hg	10" Hg	Bubble Meter Flow cc/min	scc/min**	Avg. Flow from Pre- & Post Sampling Calibration, scc/min
A037		✓	✓	6.2	6.2	6.2	6.2	3.8	3.8	3871	3734	
A061		✓	✓	6.3	6.3	6.3	6.3	3.8	3.8	3810	3675	
A062		✓	✓	6.4	6.4	6.4	6.4	3.8	3.8	3750	3617	
A079		✓	✓	6.3	6.3	6.2	6.27	3.8	3.8	3828	3692	
A083		✓	✓	6.2	6.2	6.3	6.23	3.8	3.8	3852	3715	
A094		✓	✓	6.4	6.4	6.4	6.4	3.8	3.8	3750	3617	
A120		✓	✓	6.4	6.4	6.4	6.4	3.8	3.8	3750	3617	
A127		✓	✓	6.3	6.3	6.4	6.33	3.8	3.8	3791	3656	
A121		✓	✓	6.2	6.2	6.2	6.2	3.8	3.8	3871	3734	
A087		✓	✓	6.2	6.3	6.3	6.27	3.8	3.8	3828	3692	
A088		✓	✓	6.3	6.3	6.2	6.27	3.8	3.8	3828	3692	
A118		✓	✓	6.3	6.3	6.3	6.3	3.8	3.8	3810	3675	

*Correction to 25 C, 760 mm Hg (see tables).
**scc/✓ cc/min x correction factor.

Data Check by/Date _____
Form I -012183

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Battelle
Columbus Laboratories

TABLE 7. DUPONT SAMPLING PUMP FLOW CALIBRATION

Work Performed By Howes/Baytos Amb. Temp. 27 C Flow Corr. Factor* 0.9326

Date/Time October 5, 1982 1830 hrs Bar. Press. 29.15 in Hg

Pump S/N	Sampler Location	Battery ok	Low Flow Check ok	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037	A-1, 2cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A079	A-1, 30cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A087	A-1, 60cm			6.1	6.2	6.1	6.13	3.8	3.8	3915	3651	3688
A080	A-1, 120cm			6.7	6.7	6.7	6.7	3.6	3.6	3582	3340	3532 *
A083	A-1, 180cm			6.2	6.1	6.2	6.17	3.8	3.8	3890	3628	3676
A061	A-2(1), 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A088	A-2(2), 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3651	3688
A032	A-3, 180cm											**
A062	A-4, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A092	B-1, 2cm											***
A094	B-1, 30cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A127	B-1, 60cm			6.3	6.1	6.2	6.3	3.8	3.8	3809	3552	3638
A120	B-1, 120cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A118	B-1, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A089	B-2, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A121	B-3, 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3651	3688
A125	U-1, 180cm			6.2	6.1	6.2	6.17	3.8	3.8	3890	3628	3676
		* Post-sampling flow 10% lower than pre-sampling flow.										
		** Pump stopped during sampling period.										
		*** Pump stopped during sampling period.										

*Correction to 25C, 760 mm Hg (see tables).

**scc = cc/min x correction factor.

Data ck by/Date _____

Form USPC 012182

CONFIDENTIAL

Battelle
Columbus Laboratories

TABLE 8. DUPONT SAMPLING FLOW CALIBRATION

Work Performed By Howes/Baytos
Date/Time October 6, 1982, 1845hrs
Amb. Temp. 25 C
Bar. Press. 29.10 in Hg
Flow Corr. Factor* 0.9412

Pump S/N	Sampler Location	Battery ok	Low Flow Check ok	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037	A-1, 2cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3689
A061	A-1, 30cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3659
A062	A-1, 60cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3630
A079	A-1, 120cm			6.1	6.2	6.2	6.17	3.8	3.8	3890	3661	3677
A083	A-1, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3679
A094	A-2, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3630
A120	A-4, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3630
A127	B-2, 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3685	3671 *
A181	B-3, 180cm			6.1	6.1	6.1	6.1	3.8	3.8	3934	3703	3719
A087	C-1(1), 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3685	3689
A088	C-1(2), 180cm			6.1	6.1	6.1	6.1	3.8	3.8	3934	3703	3698 **
A118	U-1, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3659

* Pump drive belt came off during sampling period.
** Pump drive belt broke during sampling period.

*Correction to 25 C, 760 mm Hg (see tables).
**scc = cc/min x correction factor.

Data Check by/Date _____
For: PC-012183

CONFIDENTIAL

ATTACHMENT NO. 3

BCL's Copy of the Chain-of-Custody Record
for Shipment of Samples from BCL
to SwRI for Analysis

CC. Smithson
Howes
Sgon-L

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. 5-8020-0403

Project Name: PCB MONITORING
EPA CONTRACT No 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature)
James E. Howes Jr / William C Bayton

Container No.	DATE	TIME	SEQ NO	SAMPLE ID NO.	SAMPLE TYPE: Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant	Liquid Adsorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
1				BCL-NL-100582-VP-A-002							X	1	
2				BCL-NL-100582-VP-A-030							X	1	
3				BCL-NL-100582-VP-A-060							X	1	
4				BCL-NL-100582-VP-A-120							X	1	
5				BCL-NL-100582-VP-A-180							X	1	
6				BCL-NL-100582-HS-A-1-1							X	1	
7				BCL-NL-100582-HS-A-1-2							X	1	
8				BCL-NL-100582-HS-A-2							X	1	
9				BCL-NL-100582-HS-A-3							X	1	
10				BCL-NL-100582-VP-B-002							X	1	
11				BCL-NL-100582-VP-B-030							X	1	
12				BCL-NL-100582-VP-B-060							X	1	
13				BCL-NL-100582-VP-B-120							X	1	
14				BCL-NL-100582-VP-B-180							X	1	
15				BCL-NL-100582-HS-B-4							X	1	
16				BCL-NL-100582-HS-B-5							X	1	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
Wm. C Bayton	10/12/82 4:02pm	Mike Taylor 10-15-82			
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

11-17 (10/79)

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. 68-8020-0403

Project Name: PCB MONITORING
EPA CONTRACT No 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howes Jr / William C Baxter

Container No.	DATE	TIME	SEQ. NO	SAMPLE ID NO.	Source Filter	Probe Wash / Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant / Liquid Adsorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
17				BCL-NL-10058Z-BKGD					X	1	
18				BCL-NL-10068Z-VP-A-002					X	1	
19				BCL-NL-10068Z-VP-A-030					X	1	
20				BCL-NL-10068Z-VP-A-060					X	1	
21				BCL-NL-10068Z-VP-A-120					X	1	
22				BCL-NL-10068Z-VP-A-180					X	1	
23				BCL-NL-10068Z-HS-A-1					X	1	
24				BCL-NL-10068Z-HS-A-3					X	1	
25				BCL-NL-10068Z-HS-C-6-1					X	1	
26				BCL-NL-10068Z-HS-C-6-2					X	1	
27				BCL-NL-10068Z-HS-B-4					X	1	
28				BCL-NL-10068Z-HS-B-5					X	1	
29				BCL-NL-10068Z-BKGD					X	1	
30				BCL-NL-FB-1					X	1	Field blank
31				BCL-NL-FB-2					X	1	Field blank
32				BCL-NL-CONTROL 1					X	1	Spiked Sample

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
Wm C. Baxter	10/14/82 1025	Mike Taylor 10-15-82			
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

11-17 (10/79)

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. G-8020-0403

Project Name: PCB MONITORING
EPA CONTRACT NO 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howard Jr. / William C Baylor

Station No.	DATE	TIME	SEQ NO	SAMPLE ID NO.	Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant Liquid Adsorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
33				BCL-NL-CONTROL 2						X	1	SPIKED SAMPLE
34				BCL-NL-CONTROL 3						X	1	" "
35				BCL-NL-CONTROL 4						X	1	" "
36				BCL-NL-CONTROL 5						X	1	" "
37				BCL-NL-CONTROL 6						X	1	" "

TOTAL No SAMPLES SHIPPED - 37

Federal Air EXP AIR BILL #
799 500822

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
William C Baylor	10/14/82 1602	Mike Taylor 10-15-82			
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

(10/79) 11-17

ATTACHMENT NO. 4

SwRI Report to BCL
on PCB Analysis Results

SOUTHWEST RESEARCH INSTITUTE

POST OFFICE DRAWER 28510 • 6220 CULEBRA ROAD • SAN ANTONIO, TEXAS, USA 78284 • (512) 684-5111 • TELEX 76-7357

DIVISION OF CHEMISTRY
AND CHEMICAL ENGINEERING

CC: Spartz

December 29, 1982

Dr. James Howes
Battelle/Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

Subject: SwRI Project 01-7216-001

Dear Dr. Howes:

Attached please find the results of the Aroclor 1242 analyses (Table I). Also, the results from three laboratory spikes, carried through with the other samples, are given in Table II. If you have any questions, please call me at extension 2228.

Very truly yours,

Bonnie Fuqua

for Carter P. Nulton
Manager
Mass Spectrometry

CPN:mhf
Attachment (2)

TABLE I. ANALYTICAL RESULTS

CONTAINER NUMBER	SAMPLE ID NO.	TOTAL NANOGRAMS * (WEIGHTED AVERAGE METHOD)		
1	BCL-NL-100582-VP-A-002	480000		
2	BCL-NL-100582-VP-A-030	58000		
3	BCL-NL-100582-VP-A-060	32000		
4	BCL-NL-100582-VP-A-120	9700		
5	BCL-NL-100582-VP-A-180	3900		
6	BCL-NL-100582-HS-A-1-1	3500		
7	BCL-NL-100582-HS-A-1-2	4100		
8	BCL-NL-100582-HS-A-2	2100		
9	BCL-NL-100582-HS-A-3	2800		
10	BCL-NL-100582-VP-B-002	1600000		
11	BCL-NL-100582-VP-B-030	SAMPLE LOST DURING LAB ACCIDENT		
12	BCL-NL-100582-VP-B-060	35000		
13	BCL-NL-100582-BP-B-120	11000		
14	BCL-NL-100582-VP-B-180	4200		
15	BCL-NL-100582-HS-B-4	5100		
16	BCL-NL-100582-HS-B-5	1000		
17	BCL-NL-100582-BKGD	ND		
18	BCL-NL-100682-VP-A-002	920000		
19	BCL-NL-100682-VP-A-030	47000		
20	BCL-NL-100682-VP-A-060	15000		
21	BCL-NL-100682-VP-A-120	5100		
22	BCL-NL-100682-VP_A-180	2300		
23	BCL-NL-100682-HS-A-1	3200		
24	BCL-NL-100682-HS-A-3	3100		
25	BCL-NL-100682-HS-C-6-1	4400		
26	BCL-NL-100682-HS-C-6-2	3500		
27	BCL-NL-100682-HS-B-4	3200		
28	BCL-NL-100682-HS-B-5	270		
29	BCL-NL-100682-BKGD	ND**		
30	BCL-NL-FB-1	ND		
31	BCL-NL-FB-2	ND	ng Added	% Recover
32	BCL-NL-Control 1	530	600	88.3
33	BCL-NL-Control 2	110	150	73.3
34	BCL-NL-Control 3	120	150	80.0
35	BCL-NL-Control 4	250	300	83.3
36	BCL-NL-Control 5	550	600	91.7
37	BCL-NL-Control 6	280	300	93.3
-	Solvent/Glassware Blank 1	ND		
-	Solvent/Glassware Blank 2	ND		
-	Solvent/Glassware Blank 3	ND		
-	Solvent/Glassware Blank 4	ND		

ND = None Detected
* = Minimum Detection Limit = 100 ng per plug
** = 3 of the 12 Aroclor 1242 electron capture peaks were present in the chromatogram of this sample

TABLE II. Recovery of Aroclor 1242 from PUF's spiked in the laboratory

TOTAL AMOUNT SPIKED (ng)	% RECOVERY
252	105
504	90
1007	91

ATTACHMENT NO. 5

Study Data Recorded in
Battelle Laboratory Record
Book No. 38163

This Laboratory Record Book is the property of

Name: WILLIAM C. BAYTOS

Project No./Dept. Manager: G-8020-0403 - J. Richard Schorr

Date: September 9, 1982

Please return it to BCL's Records Management Office when you

(1) no longer have a need for it

(2) wish to transfer it to another staff member

(3) terminate your employment at Battelle.

NOTE: Please use black or blue pen for all entries.

Work Performed by: | Project No. | Date of Work:

Title or Purpose: | Continued from:

PROJECT TITLE:

AMBIENT MONITORING FOR PCB's AT

THREE LANDFILL SITES IN

THE

BLOOMINGTON, INDIANA AREA -

U.S. EPA Contract No. 68-02-3745

Entered by: W Boyts | Date: 9-9-82 | Continued to:

Performances of this work observed by: | Disclosed to and understood by me:

Date: | Date:

Date: | Date:

Work Performed by: Don Lee Sgontz Project No. Y8020-0403 Date of Work: August 17, 18-19, 1982

Title or Purpose: Equipment obtained from - Continued from:
U.S. EPA - RTP

contacts at EPA/RTP
1. WILLIE MCLEOD - 919-541-3108 ERC ANNEX
2. STEVE SCARBOROUGH - (919) 541-2108 Monument Bldg.

the following equipment was picked at RTP -

quantity

35	DuPont P-4000 battery operated sampler.
25	- Battery charges - single
2	- " " - 5 per charger } note multiple charging strip is missing
2	Calibration system for DuPont Samplers
2	Triangle supports for 5-position - profile measurements
5.	Ring stand supports for 1 meter high
16.	Hi-Vol samplers - - Modified for PCB's
1.	Calibration system for Hi-Vol samples - (orifice, manometer - calibration curve).
4.	Motors, spare for Hi-Vol Samplers
	extra brushes for Hi-Vol motors
1.	Meteorological system, wind speed, direction, ambient temp, solar radiation, dew-point, battery operated
1.	Meteorological tower, with base - 10 - meter
4.	Generators - Honda - E-1500-K4
5.	" - Briggs and Stratton

— EQUIPMENT LIST ATTACHED —

Entered by: Wm C Baytos Date: 9/9/82 Continued to:

Performances of this work observed by: Date: Date:

Disclosed to and understood by me: Date: Date:

EQUIPMENT TO BE PICKED AT EPA/RTP (PCB FIELD STUDY) WES

Number of Items	Description of Item	Pickup from -
✓ 35	Du Pont P-4000 battery-operated samplers	Steve Scarabin/Ruth Barbour 2508 Monsanto
✓ ~~50~~ 35 ~~33~~25 +2	Battery chargers for DuPont samplers	Steve Scarabin/Ruth Barbour
~~3~~	~~5-unit battery charger for DuPont samplers~~	R.G. Lewis' secretary
✓ 2	Calibrator systems for Du Pont samplers	(1) Steve Scarabin/Ruth Barbour (1) R.G. Lewis secretary
✓ (2)	5 position Supports for Du Pont samplers for profile measurements	Willie McLeod
✓ (5)	~~1.0m~~ Supports for Du Pont samplers for hot spot meas.	Willie McLeod
✓ 17 16	Modified hi-vol samplers for PCB sampling (HAD 16)	Willie McLeod
✓ (1) (or more)	Orifice calibrator (orifice, manometer, calibration curve) for hi-vols	Willie McLeod
~~8~~ 4	SPARE HI-VOL MOTORS Extra brushes for Hi-vol motors	Willie McLeod
✓ (1)	Battery-powered meteorological system and enclosure (if necessary) for Wind speed, wind direction, amb. temperature, solar radiation, ~~relative humidity~~, and ~~barometric pressure (optional)~~ dew-point temperature.	Willie McLeod/Everett Quesnell
✓ (1)	10 meter aluminum meteorological tower with base	Willie McLeod/Everett Quesnell
✓ 4 ~~(or more)~~	Honda motor generators 1.6 g E-1500-K-4	Steve Scarabin/Ruth Barbour
~~my~~ others available 5	Motor generators EH	Willie McLeod

ATTACHMENT TO LAB RECORD BOOK, Pg 2

Work Performed by: W Baytos Project No. J 8020-0403 Date of Work: Sept. 10, 1982

Title or Purpose: Calibration and Operation Check on Continued from:

DuPont - P-4000 constant Flow Sampler.

Follow the Procedure described in the Operating Manual pg 4, to 10.

calibration ~~[illegible]~~ to get
8.0 – 3,750
7.9 – 3,79?
7.8 – 3,84?
7.6 – ?
7.4 – 4,0??

SN –	Battery check - red - good for 8 hrs.	Low Flow check: red light off.	Low Flow check: [illegible] light on.	Timer Switch positions all done in manual.	CALIBRATED adjusted for 3.8 l/min: 8" H2O 20"	25"	runs a	Remarks
AO - 32	✓	✓	✓	✓	7.8	7.8	does not adjust. 10 hr 11 m	takes about 30 sec to readjust to 8 [illegible]
37	✓	✓	✓	✓	7.8	7.8	9 h [illegible] m.	
38	✓	✓	✓	✓	7.8	7.8	9 h 7 m	dead at
61	✓	✓	✓	✓	7.8	7.8	dead	
62	✓	✓	✓	✓	7.8	7.8	9 h 9 m	
79	✓	✓	✓	✓	7.8	7.8	8 h 54 m	
80	✓	✓	✓	✓	7.8	–	9 h 5 m	slow to adj to increased pres drop
83	✓	✓	✓	✓	7.8	7.8	8 h 43 m	
87	✓	✓	✓	✓	7.6	7.6	8 h 38 m	
88	✓	✓	✓	✓	7.8	7.8	8 h 35 m	
89	✓	✓	✓	✓	7.8	7.8		
92	✓	✓	✓	✓	7.8	7.8		
94	✓	✓	✓	✓	7.8	7.8		
112	✓	✓	✓	✓	7.8	7.6		
118	✓	✓	✓	✓	7.8	7.8		
120	✓	✓	✓	✓	7.8	7.8		
121	✓	✓	✓	✓	7.8	7.8		
125	✓	✓	✓	✓	7.8	7.8		
126	✓	✓	✓	✓	7.8	7.8		
127	✓	✓	✓	✓	7.8	7.8		

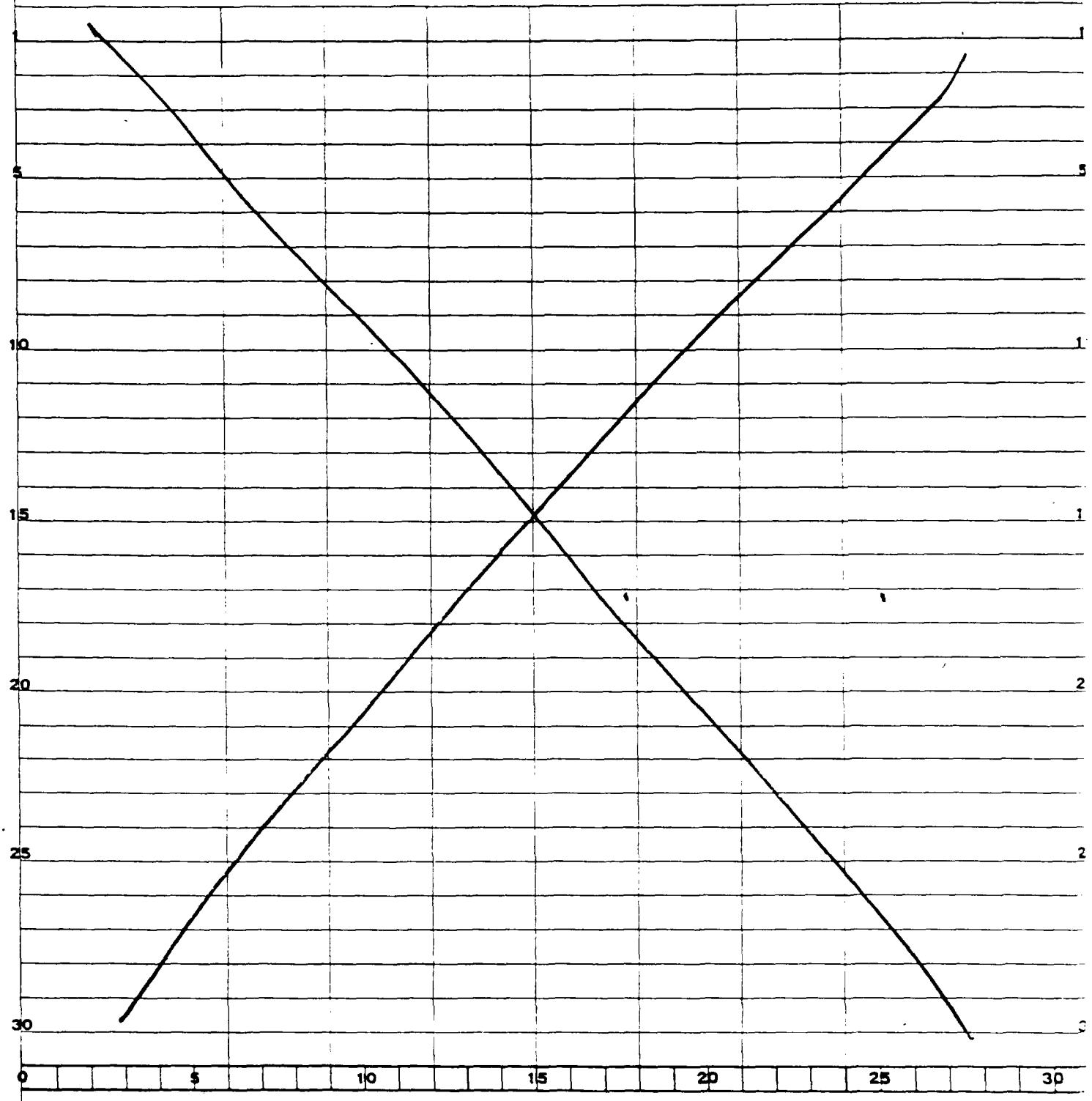
Entered by: Date: Continued to:

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

0 5 10 15 20 25 30

Work Performed by: Project No. Date of Work:

Title or Purpose: Continued from:



Entered by: Date: Continued to:

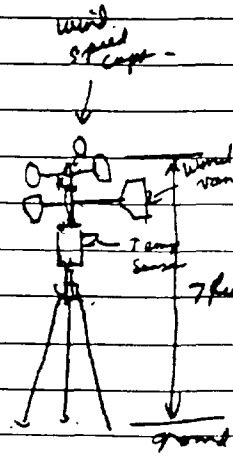
Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

Work Performed by: W Baytos Project No. 78020-0403 Date of Work: Sept. 13-14, 1982

Title or Purpose: Calibration of MRI-Weather Station Continued from:

Background: On the upcoming trip to Neils landfill, near Bloomington Indiana. The Neil's landfill is the largest of the 3 dump sites which are included in this program. For this test only the Dupont P-4000 samplers are planned to be taken, (no Hi volume samplers) Also, instead of the 30-meter weather tower which will be taken to when all 3-dump sites are monitored, only a portable 6-meter weather station will be taken -

MRI - weather station -
Meteorology Research, Inc - SN - 2142
model 1071



Checked out Temp recorder against : at 0 set at 20 mm/hr.

Checked out Wind indicator against house air - velocity unknown, we will have to assume that the factory calibration is good -

Checked out temp recorder against temp in room 72F. -

Check out Wind direction, part Compass north, V-notch pointing toward

Test strip attached : on next page

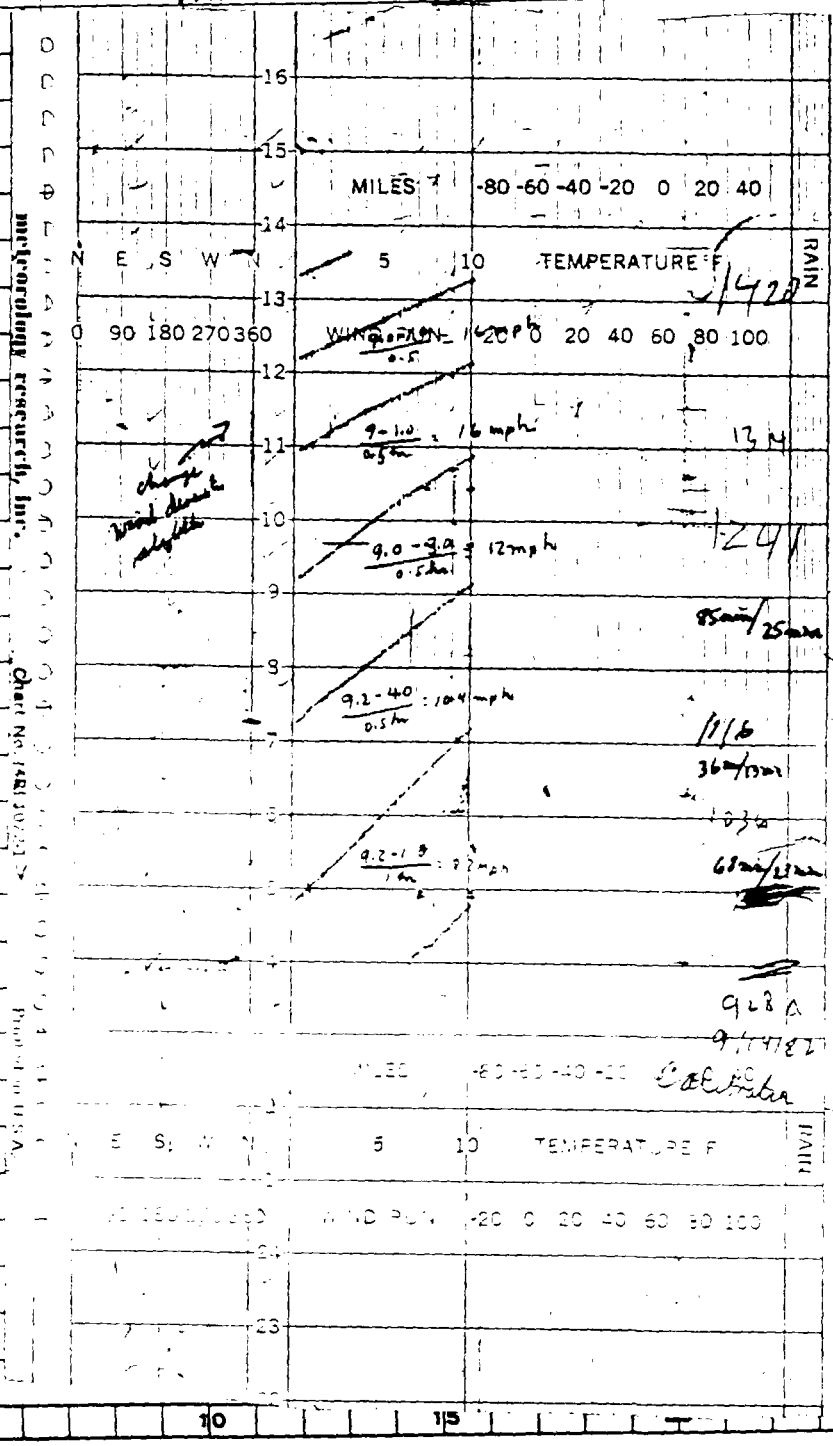
Entered by: W Baytos Date: 9/14/82 Continued to: p. 6

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

Work Performed by: WBayless Project No. 9820-0403 Date of Work: 9/14/82

Title or Purpose: Calibration Curves for Continued from:

HRI - weather station -



Entered by: WBayless Date: 9/14/82 Continued to:

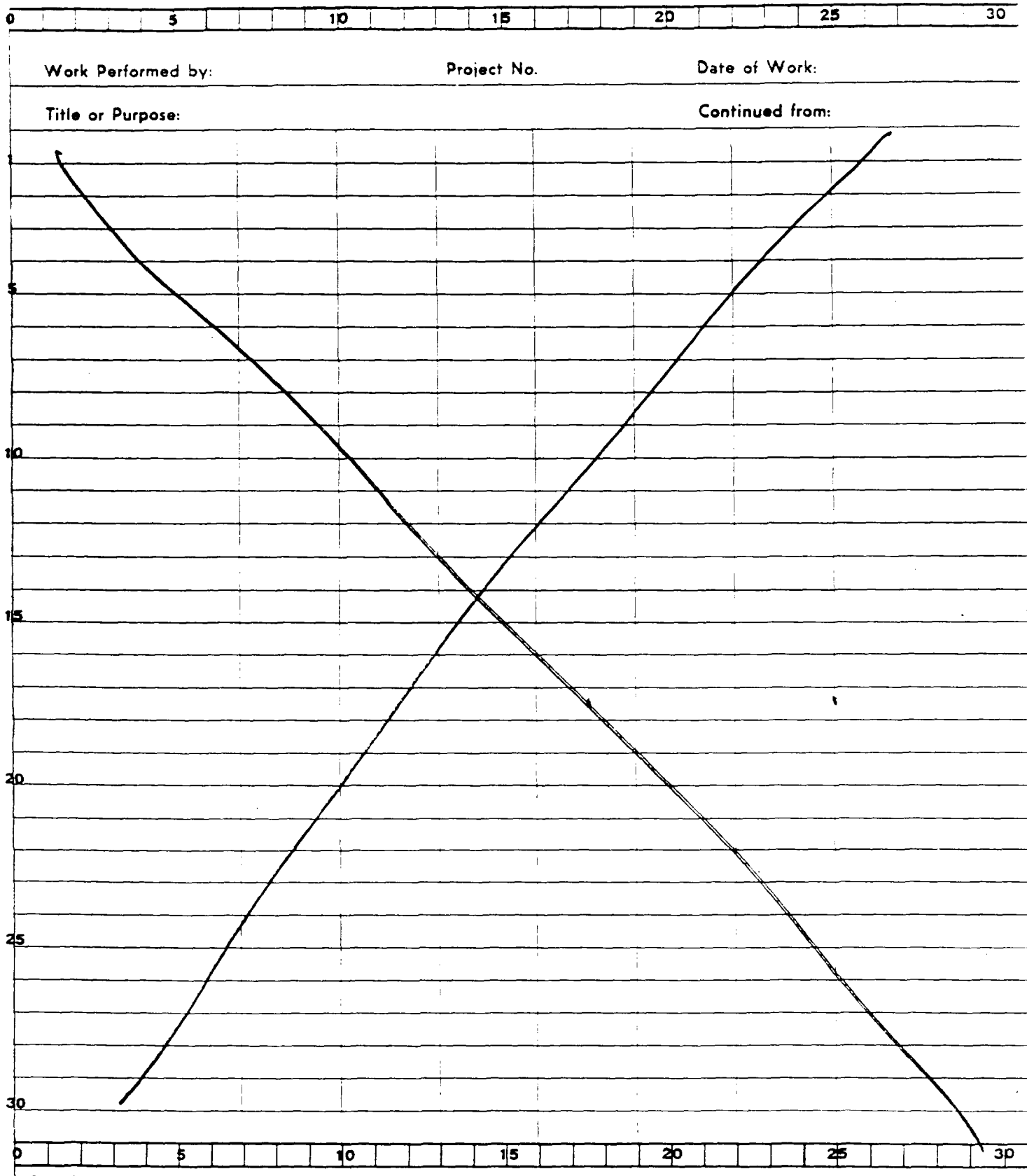
Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Project No. Date of Work:

Title or Purpose: Continued from:



Entered by: Date: Continued to:

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

Work Performed by: Bayless / Haven Project No. 6-8020-0403 Date of Work: 10/5/82

Title or Purpose: PCB Sampling - Pump Calibration / PRETEST Continued from:

Sample Pump S/N / Sampling location	Battery Check	Low Flow Check	Flow Rate Cal. (Pretest), sec/500cc 1st trial	2nd Trial	3rd trial	Avg sec/500cc	Flow Rate, lpm
A032 HS-A-2	✓	✓	7.4	7.4	7.4	7.4	4059 (set Hek
A032 ~~VP-A-2~~ N	✓	✓	7.9	7.9			3797
A037 VP-A-2	✓	✓	7.9	7.9			(3724 scc/min)
X A038 — NOT USED	✓	✓	7.8	7.8			– at low speed, it seem to fluctuat
A061 HS-A-1-1	✓	✓	7.9	7.9			
A062 HS-A-3	✓	✓	7.9	7.9			
A079 VP-A-30	✓	✓	7.9	7.9			3.8 l/min on gauge
A080 VRA-120	✓	✓	adj - control valve to read				3.8 l/m on ga
A083 VP-A-180	✓	✓	"				3.8 l/m on gauge
A087 VP-A-60	✓	✓	"				3.8 l/m
A088 HS-A-1-2	✓	✓	"				3.8 l/m
HS-B-4							
A089 ~~NOT USED~~	✓	✓	"				3.8
A092 VP-B-2	✓	✓	"				3.8
A094 VP-B-4	✓	✓	"				3.8
A112 NOT USED No Bleach		✓	"				Not used / NOT CA
A178 VP-B-180	✓	✓	"				3.8
A120 VP-B-120	✓	✓	"				3.8
A121 HS-B-5	✓	✓	"				3.8
A125 BKGD	✓	✓	"				3.8
A126 NOT USED	✓	✓	"				3.8
A127 ~~NOT USED~~ VP-B-60	✓	✓	"				3.8
4696	✓	✓				3.8	BP = 29.18" Hg
4803 NOT USED	✓	✓				3.8	R.T. 65 F
5726 none –						NOT CAL.	Corr =
5138 none						NOT CAL	0.9808

Entered by: WD Bayless / J. Haven Date: 10/5/82 Continued to:

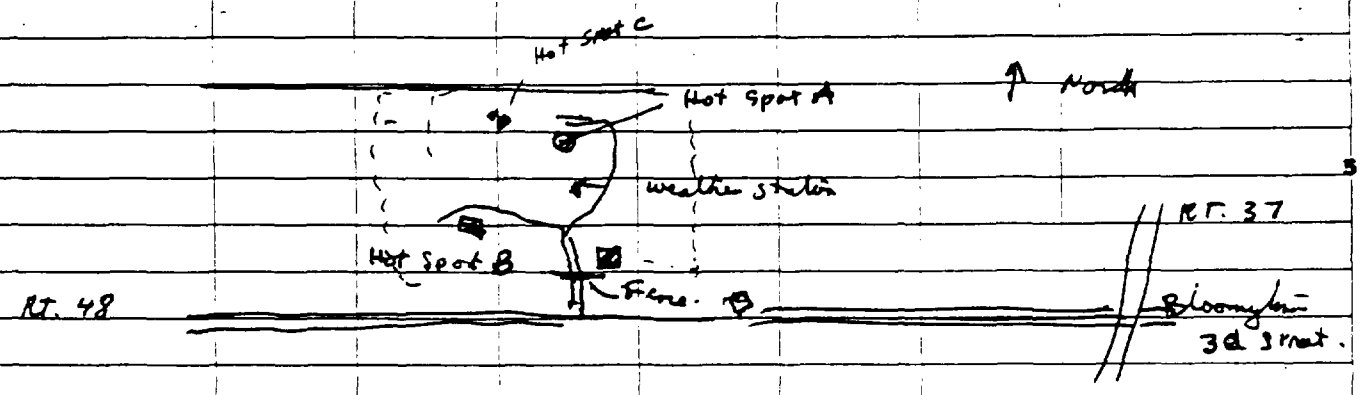
Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

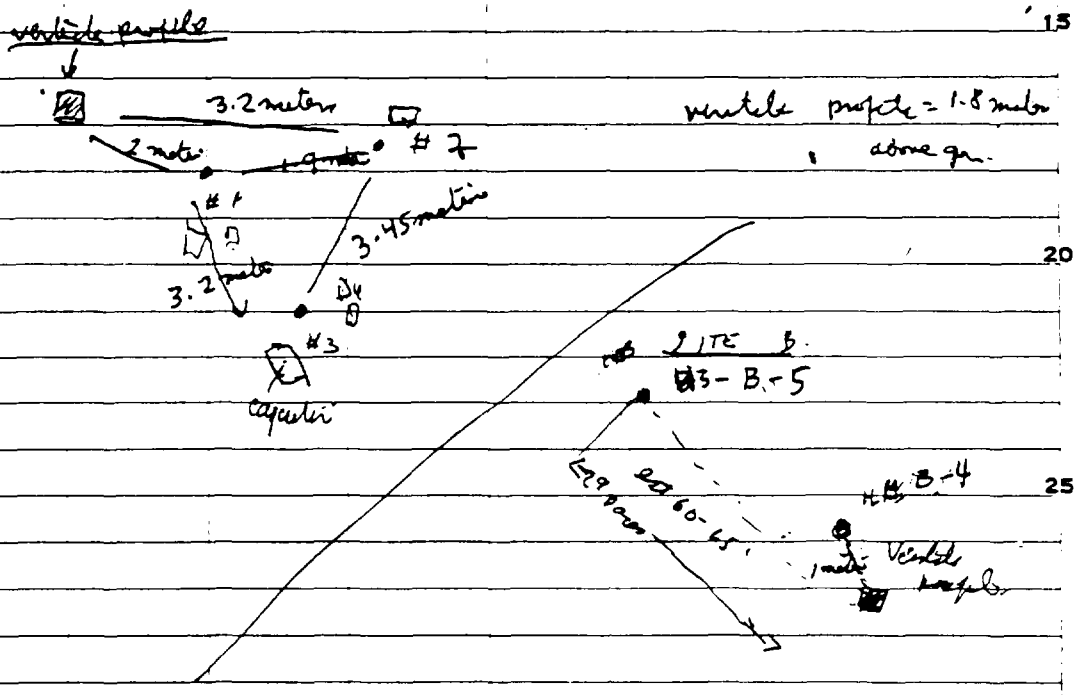
Date: Date:

Work Performed by: Bayless / Howes Project No. 8020-403 Date of Work: Oct. 5, 1982

Title or Purpose: Sampler Location Continued from:



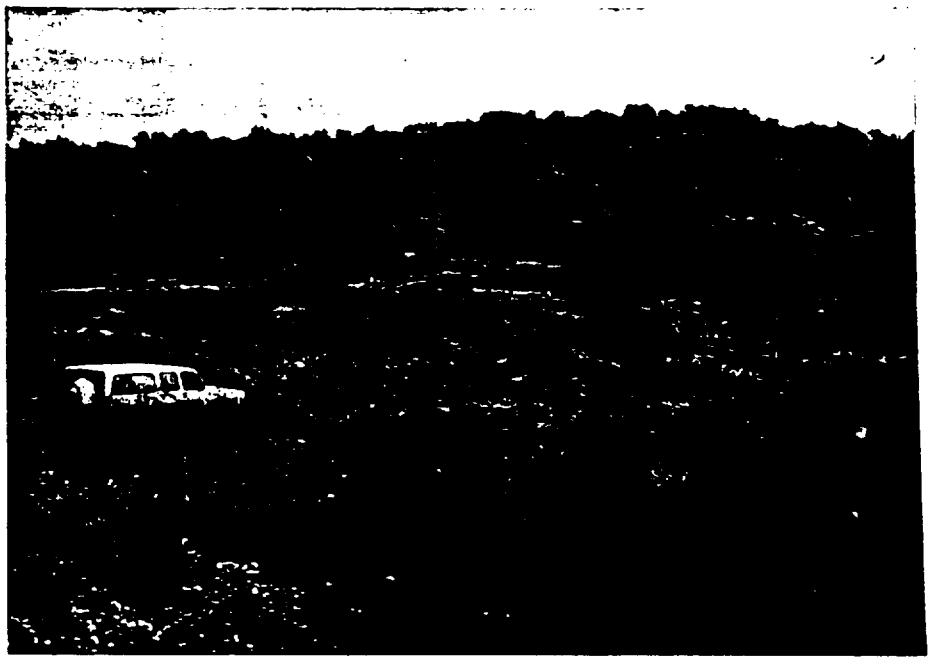
VIEW OF NEIL'S LANDFILL ATTACHED



Entered by: W Bayless Date: 10/5/82 Continued to:

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

ATTACHMENT TO LAB RECORD BOOK, Pg 9



VIEW OF NEIL'S LANDFILL

Work Performed by: Bayfas / Howes Project No. G-8020-0403 Date of Work: 10/5/82

Title or Purpose: Sampling Data - BCL-NL-100582- Continued from:

Sampling Site	Pump S/N	Start Time EDT/CDT	STOP Time EDT/CDT	PUMP TIMER	LOW FLOW IND.	
VP-A-2	A037	0855	1658	8h 3m	OK	
-30	A079	0855	1658	8h 3m	OK	
-60	A087	0855	1658	8h 3m	OK	
-120	A080	0855	1658	8h 3m	OK	
-180	A083	0855	1658	8h 3m	OK	
HS-A-1-1	A061	0855	1658	8h 3m	OK	
HS-A-1-2	A088	0855	1658	8h 3m	OK	
HS-A-2	A032	0855	1658	8h 3m	STOPPED	→ A032 PUMP (HS-A 1400 HRS - Checked pump NOT OPERATING
HS-A-3	A062	0855	1658	8h 3m	OK	
VP-B-2	A092	0920	~~1719~~	~~8hr~~ checked ?	✓	STOPPED when checked @ 1711
-30	A094	0920	1718	8h 3	✓	
-60	A127	0920	1719	8h 3	✓	
-120	A120 ✓	0920	1719	8hrs.	✓	
-180	A118 ✓	0920	1719	8hrs	✓	
HS-B-4	A089 ✓	0920	1720	8h	✓	
HS-B-5	A121 ✓	0920	1720	8hrs	✓	
BKGD	A125 ✓	0935	~~1735~~ 1736 ✓	8hrs	✓	located at Front gate -

Entered by: James E. Howes Jr Date: 10/5/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Bayless / Howes Project No G-8020-0403 Date of Work: 10/5/82

Title or Purpose: Barometer & RH Readings Continued from:

Time, CDT	Barometer, in Hg	RH, %	Wet Bulb, F	Dry Bulb, F	~~Amb Temp, F~~
0938 MST	29.30	91	67	69	
1030	29.29	69	71	79	
1130	29.29	56	69	81	
1230	29.28	59	70	81	
1330	29.28	59	70	81	
1430	29.25	60	74	85	
1530	29.24	51	71	85	
1630	29.25	60	73	84	
1730	29.22	75	72	78	

Entered by: James E. Howes Jr Date: 10/5/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Howes Project No G-8020-0403 Date of Work: 10/5/82

Title or Purpose: Photographs / Neil's Landfill Continued from:

Photo No	Date	Scene
1	10/5/82	~~PRI~~ Weather Sta. looking NORTH @ Neil's Landfill
2	"	" " " looking NE
3	"	Upwind, bkgd Sampling station, looking South
4	"	" " " , looking North
5	"	SAMPLING LOC. A, looking NORTH
6	"	" " " " EAST
7	"	" " " " South
8	"	" " " , VP ARRAY, Looking EAST
9	"	" " " , HS-1 co-located samplers, looking North
10	"	" " " VP ARRAY, looking North-east
11	"	Ground area, Sampling LOC A, looking N-E
12	— VOID — NO PHOTO —	
13	"	SAMPLING LOC B VP & HS-4, looking North-west
14	"	" " " VP & HS-4 looking east
15	"	" " " " " " "
16	"	" " " HS-5, looking N-E
17	"	Gen. view Site B, looking SE
18	"	Ground AREA HS-B-5
19	— VOID —	
20	"	GROUND AREA VP-HS-B-4 Ground area
21	"	" " " " " " " " "
22	10/6	Site BA general view, looking N-E
23	"	Sampling pump & cartridge
24	"	Ground area, base of VP assembly, Site A
25	"	VP Assembly, looking east, Site A
26	"	Site C looking South (11 cap - all apparent leakage
27	"	" , ground at base of spike stand
28	"	" looking south
29	"	Area w/ cap visible (5 whole cap + parts) Near C

Entered by: James E. Howes Date: 10/5 & 10/6, 1982 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Howes Project No G-8020-0403 Date of Work: 10/5/82

Title or Purpose: Photographs / Weather Synopsis 10/5 Continued from:

Photo No	Date	Scene						
30	10/6/82	Visible Cap: Near A&C Catalog Vehicle tracks						
31	"	"	"	"	"	"	"	
32	"	"	"	"	"	"	"	Same as 31 different view
33	"	Cap @ Base HS-A-1						
34	"	"	"	"	HS-A-3			
35								
36								

October 5, 1982 - Weather Synopsis

Sunup ~ 1100 Hrs Clear, no clouds, early morning ground fog which slowly burned off

11:00 HRS Increasing cloudy conditions, light cloud cover

1200 HRS Partly cloudy, ~ 20% cover

1300 HRS " " ~ 25% cover

1330 HR INCREASING CLOUDINESS, ~ 30-40% COVER, intermittent sunshine

1430 HRS Decreasing Cloudiness, ~ 15-20% cover, mostly sunny

1530 HRS Decreasing " 5-10% cover - some haze

1630 Clear, no clouds, hazy

1730 " " hazy

~ 15 cap. visible in Site A general area; 3 apparent leakers around HS-A-3, 4 apparent leakers near by HS-A-1, 5 (3 apparent leak near base of VP assembly.

Entered by: G. Howes Date: 10/5/82 Continued to:

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

Work Performed by: Howes Project No 6-8020-0103 Date of Work: 10/5/82

Title or Purpose: SAMPLE IDENTIFICATION CODE Continued from:

(1) VERTICAL PROFILE SAMPLES

BCL - NL - XXXXXX - VP - X - XXX

- BCL → Sampling Contractor
- NL → SITE CODE (NL - Neil's Landfill)
- XXXXXX → SAMPLING DATE MO/DAY/YR
- VP → Vertical PROFILE
- X → Sampling ~~Code~~ LOCATION A or B
- XXX → Sampler inlet height above ground, cm (2, 30, 60, 120, or 180)

(2) HOT SPOT SAMPLES

BCL - NL - XXXXXX - HS - X - X - X

- BCL - NL - XXXXXX → Same as above
- HS → Hot Spot
- X → Sampling location A or B
- X → HOT SPOT ID NO 1, 2, 3, 4, or 5
- X → 1 and 2 indicates Co-located sam

(3) BACKGROUND SAMPLES

BCL - NL - XXXXXX - BKGD

- BCL - NL - XXXXXX → Same as vertical profile
- BKGD → Background

(4) FIELD BLANK SAMPLE

BCL - NL - FB

Entered by: J. Howes Date: 10/5/82 Continued to:

Performances of this work observed by: Date: Date:

Disclosed to and understood by me: Date: Date:

Work Performed by: Howes Project No 6-8020-0403 Date of Work: 10/5/82

Title or Purpose: Post Test Flow Calibrations Continued from:

Sampling Location	Pump No	Bubble Meter Test, sec/cc 1st	2nd	3rd	Avg	Flow Rate, cc/min	Corrected Flow scc/min	
VP-B-60	A127	6.3	6.4	6.2	6.3	3809	3628	✓
VP-B-30	A094	6.2	6.2	6.2	6.2	3870	3687	✓
VP-B-180	A118	6.2	6.2	6.2	6.2	3870	3687	✓
VP-B 120	A120	6.2	6.2	6.2	6.2	3870	3687	
HS-A-1-2	A088	6.1	6.1	6.2	6.13	3915	3729	
HS-A-3	A062	6.2	6.2	6.2	6.2	3870	3687	
HS-A-1-1	A061	6.2	6.2	6.2	6.2	3870	3687	
VP-A-120	A080	6.7	6.7	6.7	6.7	3582	3412	TAKEN OUT OF USE
VP-A-2	A037	6.2	6.2	6.2	6.2	3870	3687	
VP-A-180	A083	6.2	6.1	6.2	6.17	3890	3687	
VP-A-60	A087	6.1	6.2	6.1	6.13	3915	3729	
VP-A-30	A079	6.2	6.2	6.2	6.2	3870	3687	
HS-B-5	A121	6.1	6.1	6.2	6.13	3915	3729	
HS-B-9	A089	6.2	6.2	6.2	6.2	3870	3687	
BKGD	A125	6.2	6.1	6.2	6.17	3890	3706	

Barometer 29.15 in Hg (740 mm Hg)

Temperature = 80°F (27°C)

Coef = 0.9526 ← For 760 mm Hg, 20°C

= 0.9322 ← For 760 mm Hg, 25°C

Entered by: James E. Howes Jr. Date: 10/5/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Howes Project No G-8020-0403 Date of Work: 10/6/82

Title or Purpose: Pretest Calibration of Samplers Continued from:

Pump No	Batt Ck	Lo Flow	Bubblemeter Test, sec/400cc				Flow	Corrected Flow Ck @
			1st trial	2nd trial	3rd trial	Avg	Rate, cc/min	
A037	✓	✓	6.2	6.2	6.2	6.2	3871	3763 ✓
A061	✓	✓	6.3	6.3	6.3	6.3	3810	3704 ✓
A062	✓	✓	6.4	6.4	6.4	6.4	3750	3696 ✓
A079	✓	✓	6.3	6.3	6.2	6.27	3828	3722 ✓
A083	✓	✓	6.2	6.2	6.3	6.23	3852	3745 ✓
A087	✓	✓	6.2	6.3	6.3	6.27	3828	3722 ✓
A088	✓	✓	6.3	6.3	6.2	6.27	3828	3722 ✓
A094	✓	✓	6.4	6.4	6.4	6.4	3750	3696 ✓
A118	✓	✓	6.3	6.3	6.3	6.3	3810	3704 ✓
A120	✓	✓	6.4	6.4	6.4	6.4	3750	3645 ✓
A121	✓	✓	6.2	6.2	6.2	6.2	3871	3763 ✓
A127	✓	✓	6.3	6.3	6.4	6.33	3791	3686 ✓
5138	✓	✓	6.2	6.2	6.2	6.2	3871	3763

Barometric Pressure – 29.20 in Hg (742 mm Hg)
Temperature – 70°F (21°C)
Correction = 0.9722

Correction factor for 760 mm, 20°C. Final data to be corrected to 25°C (Corr Factor = 0.96

Entered by: J. Howes Date: 10/6/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: BAYTOS / HOWES Project No. G-8020-0403 Date of Work: 10/6/82

Title or Purpose: SAMPLING DATA - BCL-NL-100682 - Continued from:

Sampling Site	Pump S/N	Start, Hr	Stop Hr	Pump Timer Rdg	Low Flow Chk	
BKGD	A118	0852	1721	8hr 31min	OK	
VP-A-002	A037	0900	1700	8hr-2m	✓	
-030	A061	0900	1700	8h -2m	✓	
-060	A062	0900	1700	8h 2-m	✓	
-120	A079	0900	1700	8h 2m	✓	
-180	A083	0900 ~~No sample / brake cartridge - no spare~~	1700	8h-2m	✓	
HS-A-1	A094	0900	1700	8hr-2min	~~[illegible]~~ ok ✓	
HS A-2	NO SAMPLE / STATION MOVED TO SITE "C"					
HS-A-~~B~~3	A120	0900	1700	8h-2m	~~[illegible]~~ ok ✓	
HS-C-6-1	A087	0859	1~~8~~659	8hr 3min		~~[illegible]~~
HS-C-6-2	A088	0859	1659		←	Belt broke during samplin
~~HS-B-4~~						
HS-B-4	A127	0847	———	———	ON →	Belt came off dur.. Sampling period
HS-B-5	A121	0847	~~8~~1647	8hr 2min	✓ ok	

Entered by: J. Howes Date: 10/6/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Baytos/Howes Project No. G-8020-0403 Date of Work: 10/6/82

Title or Purpose: Climatological & Meteorological Data Continued from:

Time CDT	Barometer, in Hg	Dry bulb, F	Wet Bulb, F	RH %	
0800	29.28	65	63	90	
0900	29.28	68	65	85	
1000	29.31	74	69	78	– 1015 Check weather station report [illegible] corrected
1100	29.28	78	70	68	
1200	29.24	80	74	76	
1300	29.20	80	73.5	74	
1400	29.18	81.5	72	64	
1500	29.17	83	72.5	62	
1600	29.14	81.5	71.5	62	
1700					

Weather Synopsis

CDT	
0800 Hrs	Clear, very light clouds, decreasing as sun comes up.
0900	" " " ", full sunlight.
1000	", very light, hazy clouds, full sunlight
1100	Clear, Hi. ~~cirro~~ cirrus clouds, " "
1200	Clouds Developing 30% of full sunshine
1300	Rapidly incr. cloud cover, ~80% cover
1400	Cloudiness decreasing, partly sunny
1500	Partly sunny, cloudy in west, gusting winds
1600	Completely overcast

Entered by: G. Howes. Date: 10/6/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

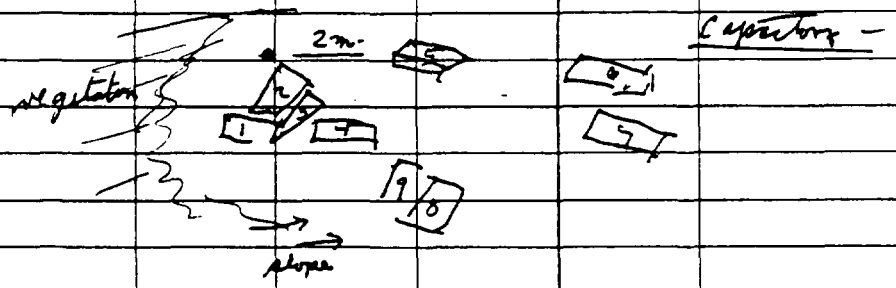
Date: Date:

Date: Date:

Work Performed by: Howes / Bayless Project No. 8020-0403 Date of Work: 10/6/82

Title or Purpose: Samplee Location Continued from:

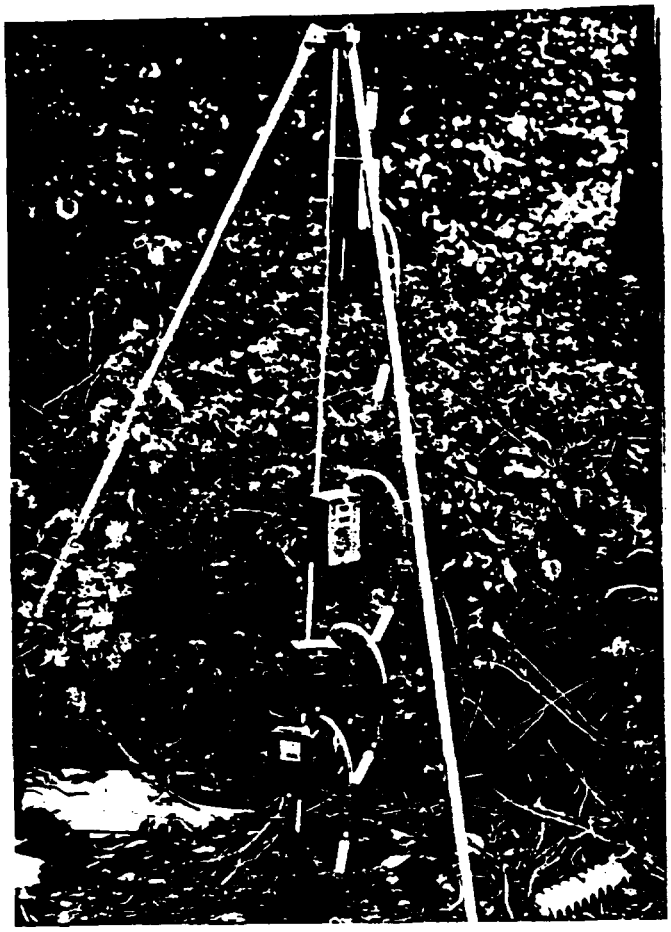
Site C

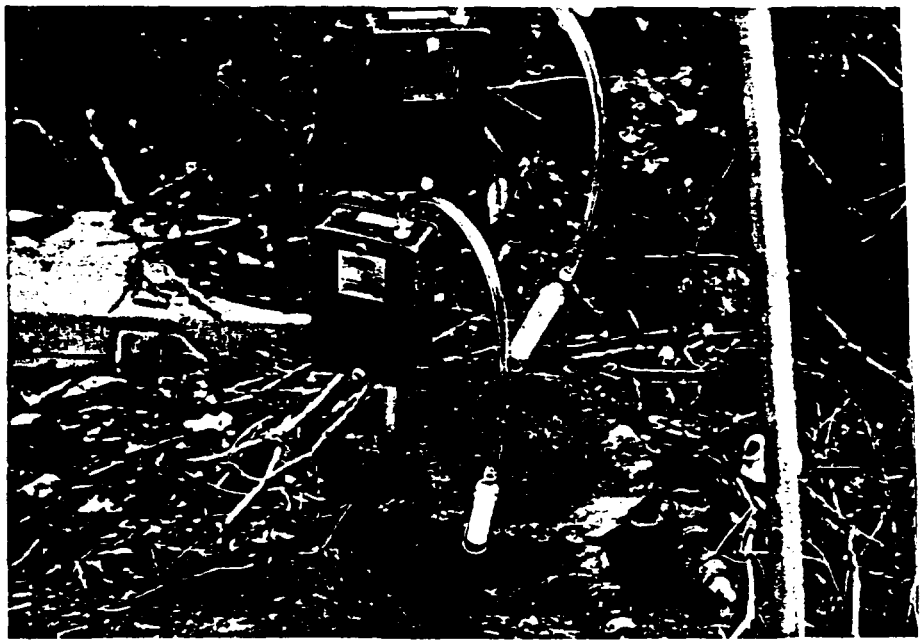


Pictures of sampling station at Site A Attached

Entered by: WBayless Date: 10/6/82 Continued to:

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:





ATTACHMENT TO LAB RECORD BOOK, Pg 19

WEDNESDAY

Work Performed by: J. Howes Project No. 4802a-0403 Date of Work: Oct. 6, 1982

Title or Purpose: Post Sampling Calibration Continued from:

Pump #	Bubblemeter, 0 cc/400cc #1	#2	#3	Avg	Flow cc/min	Correct Flow SCC/MIN
A037	6.2	6.2	6.2	6.2	3871	3699
A061	6.2	6.2	6.2	6.2	3871	3699
A062	6.2	6.2	6.2	6.2	3871	3699
A079	6.1	6.2	6.2	6.17	3890	3717
A083	6.2	6.2	6.2	6.2	3871	3699
A087	6.1	6.1	6.2	6.13	3915	3741
A088	6.1	6.1	6.1	6.1	3934	3759
A094	6.2	6.2	6.2	6.2	3871	3699
A118	6.2	6.2	6.2	6.2	3871	3699
A120	6.2	6.2	6.2	6.2	3871	3699
A121	6.1	6.1	6.1	6.1	3934	3759
A127	6.1	6.1	6.2	6.13	3915	3741

738 mm Hg)

Barometer – 29.08 in Hg

Temperature – 77° F (25°C)

Correction = 0.9556 (For 760 mm Hg, 20°C)

Correction = 0.9398 (For 760 mm Hg, 25°C)

Entered by: James E. Howes Jr Date: 10/6/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: Howes / Barnes Project No. 8020-0403 Date of Work: Oct. 7, 1982

Title or Purpose: Plot Plan of Neil's Landfill Showing Areas Sampled during October 5 & 6, 1982 Continued from:

PLOT PLAN ATTACHED

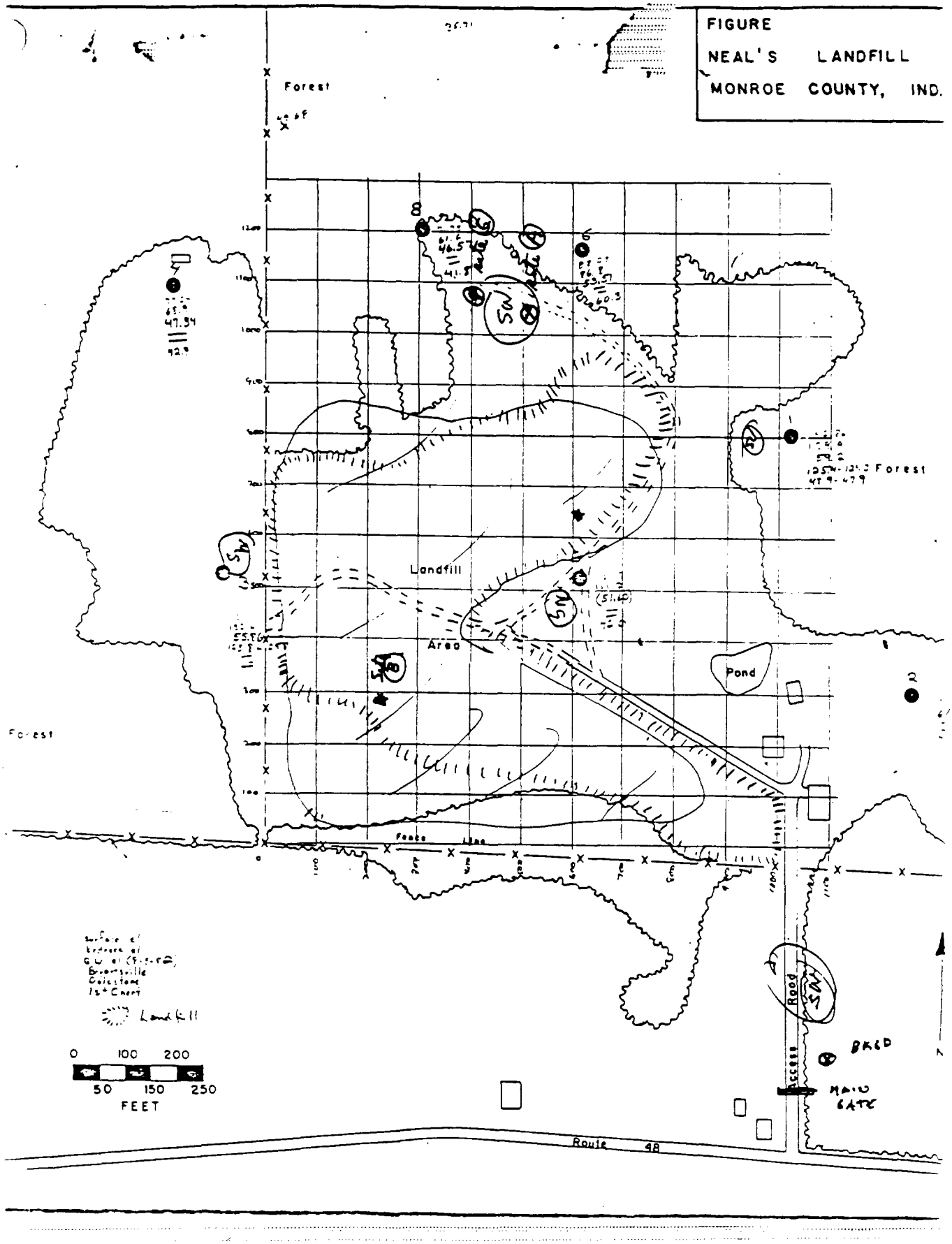
Entered by: James E. Howes Jr. Date: 10/7/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

ATTACHMENT TO LAB RECORD BOOK, Pg 21



Work Performed by: W Bayless · Project No. 8020-0403 Date of Work: Oct. 12, 1982

Title or Purpose: Shipment of PUF Continued from:

Shipped two boxes containing 37 Polyurethane Foam Cartridges.

to:

DR. CARTER NOLTON
C/o SOUTHWEST RESEARCH
6220 CULEBRA ROAD.
SAN ANTONIO, TX. 78284.

Shipped by Federal Air Express.
Bill of Lading number 7 91500 822.

Chain of Custody Forms were enclosed, thus, when Carter Nolton receives the shipment, he is to sign for it and send the ~~the~~ custodial forms to Battelle -

Attached to this data page are copies of the chain-of-custody forms

CHAIN-OF-CUSTODY FORMS ATTACHED

1) Copies of Forms sent to SwRI with samples (3 pages)
2) Copies of Forms acknowledging receipt of sample by SwRI (3 pages)

Entered by: W C Bayless Date: 10/12/82 Continued to:

Performances of this work observed by: | Disclosed to and understood by me:

Date: | Date:

Date: | Date:

FORMS SENT TO SWRL WITH SAMPLES

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Project No. 8020-0403

Project Name: PCB MONITORING
EPA CONTRACT No 68-02
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howes Jr / William C Bayless

Sample No.	DATE	TIME	SEQ NO	SAMPLE ID NO.	SAMPLE TYPE: Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant	Liquid Adsorbant	PUF CARTRIDGE	NUMBER OF CONTAINERS	Remarks
1				BCL-NL-100582-VP-A-002							X	1	
2				BCL-NL-100582-VP-A-030							X	1	
3				BCL-NL-100582-VP-A-060							X	1	
4				BCL-NL-100582-VP-A-120							X	1	
5				BCL-NL-100582-VP-A-180							X	1	
6				BCL-NL-100582-HS-A-1-1							X	1	
7				BCL-NL-100582-HS-A-1-2							X	1	
8				BCL-NL-100582-HS-A-2							X	1	
9				BCL-NL-100582-HS-A-3							X	1	
10				BCL-NL-100582-VP-B-002							X	1	
11				BCL-NL-100582-VP-B-030							X	1	
12				BCL-NL-100582-VP-B-060							X	1	
13				BCL-NL-100582-VP-B-120							X	1	
14				BCL-NL-100582-VP-B-180							X	1	
15				BCL-NL-100582-HS-B-4							X	1	
16				BCL-NL-100582-HS-B-5							X	1	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
Wm. C Bayless	10/12/82 4:02pm.				
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

11-17 (10/79)

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No.: 5-B020-0403

Project Name: PCB MONITORING
EPA CONTRACT No 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howes Jr / William C. Baxter

Container No.	DATE	TIME	SEQ. NO	SAMPLE ID NO.	Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant	Liquid Absorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
17				BCL-NL-100582-BKGD							X	1	
18				BCL-NL-100682-VP-A-002							X	1	
19				BCL-NL-100682-VP-A-030							X	1	
20				BCL-NL-100682-VP-A-060							X	1	
21				BCL-NL-100682-VP-A-120							X	1	
22				BCL-NL-100682-VP-A-180							X	1	
23				BCL-NL-100682-HS-A-1							X	1	
24				BCL-NL-100682-HS-A-3							X	1	
25				BCL-NL-100682-HS-C-6-1							X	1	
26				BCL-NL-100682-HS-C-6-2							X	1	
27				BCL-NL-100682-HS-B-4							X	1	
28				BCL-NL-100682-HS-B-5							X	1	
29				BCL-NL-100682-BKGD							X	1	
30				BCL-NL-FB-1							X	1	Field blank
31				BCL-NL-FB-2							X	1	Field blank
32				BCL-NL-CONTROL 1							X	1	Spiked Sample

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
Wm C. Baxter	10/18/82 1402				
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

11-17 (10/79)

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. G-8020-0403

Project Name: PCB MONITORING
EPA CONTRACT NO 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howard Jr. / William C Bayless

Container No.	DATE	TIME	SEQ. NO	SAMPLE ID NO.	SAMPLE TYPE: Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant	Liquid Absorbant	PUF CARTRIDGE	NUMBER OF CONTAINERS	Remarks
33				BCL-NL-CONTROL 2							X	1	SPIKED SAMPLE
34				BCL-NL-CONTROL 3							X	1	" "
35				BCL-NL-CONTROL 4							X	1	" "
36				BCL-NL-CONTROL 5							X	1	" "
37				BCL-NL-CONTROL 6							X	1	" "

TOTAL NO SAMPLES SHIPPED - 37

Federal Air EXP AIR BILL #
7995008822

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
William C Bayless	10/17/82 1602				
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

11-17 (10/79)

SIGNED FORMS - WING
RECEIPT OF SAMPLE BY SWRI

CC: Smithson - Hayes
Howes Sgontz

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. G-8020-0403

Project Name: PCB MONITORING EPA CONTRACT No 68-02 WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howes Jr / William C Boyton

Container No.	DATE	TIME	SEQ NO	SAMPLE ID NO.	SAMPLE TYPE: Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant	Liquid Adsorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
1				BCL-NL-100582-VP-A-002							X	1	
2				BCL-NL-100582-VP-A-030							X	1	
3				BCL-NL-100582-VP-A-060							X	1	
4				BCL-NL-100582-VP-A-120							X	1	
5				BCL-NL-100582-VP-A-180							X	1	
6				BCL-NL-100582-HS-A-1-1							X	1	
7				BCL-NL-100582-HS-A-1-2							X	1	
8				BCL-NL-100582-HS-A-2							X	1	
9				BCL-NL-100582-HS-A-3							X	1	
10				BCL-NL-100582-VP-B-002							X	1	
11				BCL-NL-100582-VP-B-030							X	1	
12				BCL-NL-100582-VP-B-060							X	1	
13				BCL-NL-100582-VP-B-120							X	1	
14				BCL-NL-100582-VP-B-180							X	1	
15				BCL-NL-100582-HS-B-4							X	1	
16				BCL-NL-100582-HS-B-5							X	1	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
Wm. C Boyton	10/12/82 4:02pm	Mike Taylor 10-15-82			
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

11-17 (10/79)

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. 8020-0403

Project Name: PCB MONITORING
EPA CONTRACT No 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howes Jr / William C Bayton

Station No.	DATE	TIME	SEQ NO	SAMPLE ID NO.	Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger	Solid Absorbant	Liquid Absorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
17				BCL-NL-100582-BKGD								X	1	
18				BCL-NL-100682-VP-A-002								X	1	
19				BCL-NL-100682-VP-A-030								X	1	
20				BCL-NL-100682-VP-A-060								X	1	
21				BCL-NL-100682-VP-A-120								X	1	
22				BCL-NL-100682-VP-A-180								X	1	
23				BCL-NL-100682-HS-A-1								X	1	
24				BCL-NL-100682-HS-A-3								X	1	
25				BCL-NL-100682-HS-C-6-1								X	1	
26				BCL-NL-100682-HS-C-6-2								X	1	
27				BCL-NL-100682-HS-B-4								X	1	
28				BCL-NL-100682-HS-B-5								X	1	
29				BCL-NL-100682-BKGD								X	1	
30				BCL-NL-FB-1								X	1	Field blank
31				BCL-NL-FB-2								X	1	Field blank
32				BCL-NL-CONTROL 1								X	1	Spiked Sample

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
Wm C Bayton	10/12/82 1702 PM	Mike Taylor 10-13-82			
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

(10/79) 11-17

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

Proj. No. 3-8020-0903

Project Name: PCB MONITORING
EPA CONTRACT NO 68-02-3745
WORK ASSIGNMENT No 4

SAMPLERS: (Signature) James E. Howard Jr. / William C Baylor

Container No.	DATE	TIME	SEQ NO	SAMPLE ID NO.	SAMPLE TYPE: Source Filter	Probe Wash	Impinger Catch	Ambient Filter	Ambient Impinger Solid Absorbant	Liquid Adsorbant	PUF Cartridge	NUMBER OF CONTAINERS	Remarks
33				BCL-NL-CONTROL 2							X	1	SPIKED SAMPLE
34				BCL-NL-CONTROL 3							X	1	" "
35				BCL-NL-CONTROL 4							X	1	" "
36				BCL-NL-CONTROL 5							X	1	" "
37				BCL-NL-CONTROL 6							X	1	" "

TOTAL No SAMPLES SHIPPED - 37

Federal Air EXP AIR BILL #
7995006822

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received (Signature)
William C Baylor	10/14/82 1602	Mike Taylor			
Relinquished by (Signature)	Date/Time	Received by (Signature)	Relinquished by (Signature)	Date/Time	Received (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	

(10/79) 11-17

Work Performed by: Jaunty Project No. 68020-0403 Date of Work: 10-12-82

Title or Purpose: Preparation of PCB standard for Spiking of Low Volume Sample Cartridges. Continued from: —

PCB STandard = NBS 1581 AROCLOR 1242 in transformer oil (1000 µg PCB/gram)

Procedure: 10 ml Volumetric flask tared and NBS stand. added. 1.0 g added to 10 ml Vol. flask and diluted to 10 ml with Hexane. = 100 mg/ml Hexane

Cartridge Spl. #	PCB 100 mg/ml Hexane	nanograms ng Spk.	# of Cartridges
	15	150	2
	30	300	2
	60	600	2

Samples sent to SwRI on 10/12/82. Following sample identification

			CONTAINER No.
BCL-NL-Control 1	600	ng Aroclor 1242	32
2	150	"	33
3	150	"	34
4	300	"	35
5	600	"	36
6	300	"	37

Entered by: Jaunty Date: 10-12-82 Continued to: —

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

24

Work Performed by: J. Howes Project No. G-8020-040 Date of Work: 1/4/83

Title or Purpose: Report of PCB Analysis from SwRI Continued from:

LETTER REPORT FROM SwRI ATTACHED.
(3 pages)

Entered by: James E. Howes Jr Date: 1/4/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

SOUTHWEST RESEARCH INSTITUTE

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DIVISION OF CHEMISTRY
AND CHEMICAL ENGINEERING

December 29, 1982

ATTACHMENT TO LAB
RECORD BOOK, Page 29.

Dr. James Howes
Battelle/Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

Subject: SwRI Project 01-7216-001

Dear Dr. Howes:

Attached please find the results of the Aroclor 1242 analyses (Table I). Also, the results from three laboratory spikes, carried through with the other samples, are given in Table II. If you have any questions, please call me at extension 2228.

Very truly yours,

Bonnie Fuqua

for Carter P. Nulton
Manager
Mass Spectrometry

CPN:mhf
Attachment (2)

TABLE I. ANALYTICAL RESULTS

CONTAINER NUMBER	SAMPLE ID NO.	TOTAL NANOGRAMS * (WEIGHTED AVERAGE METHOD)
1	BCL-NL-100582-VP-A-002	480000
2	BCL-NL-100582-VP-A-030	58000
3	BCL-NL-100582-VP-A-060	32000
4	BCL-NL-100582-VP-A-120	9700
5	BCL-NL-100582-VP-A-180	3900
6	BCL-NL-100582-HS-A-1-1	3500
7	BCL-NL-100582-HS-A-1-2	4100
8	BCL-NL-100582-HS-A-2	2100
9	BCL-NL-100582-HS-A-3	2800
10	BCL-NL-100582-VP-B-002	1600000
11	BCL-NL-100582-VP-B-030	SAMPLE LOST DURING LAB ACCIDENT
12	BCL-NL-100582-VP-B-060	35000
13	BCL-NL-100582-BP-B-120	11000
14	BCL-NL-100582-VP-B-180	4200
15	BCL-NL-100582-HS-B-4	5100
16	BCL-NL-100582-HS-B-5	1000
17	BCL-NL-100582-BKGD	ND
18	BCL-NL-100682-VP-A-002	920000
19	BCL-NL-100682-VP-A-030	47000
20	BCL-NL-100682-VP-A-060	15000
21	BCL-NL-100682-VP-A-120	5100
22	BCL-NL-100682-VP_A-180	2300
23	BCL-NL-100682-HS-A-1	3200
24	BCL-NL-100682-HS-A-3	3100
25	BCL-NL-100682-HS-C-6-1	4400
26	BCL-NL-100682-HS-C-6-2	3500
27	BCL-NL-100682-HS-B-4	3200
28	BCL-NL-100682-HS-B-5	270
29	BCL-NL-100682-BKGD	ND**
30	BCL-NL-FB-1	ND
31	BCL-NL-FB-2	ND
32	BCL-NL-Control 1	530
33	BCL-NL-Control 2	110
34	BCL-NL-Control 3	120
35	BCL-NL-Control 4	250
36	BCL-NL-Control 5	550
37	BCL-NL-Control 6	280
-	Solvent/Glassware Blank 1	ND
-	Solvent/Glassware Blank 2	ND
-	Solvent/Glassware Blank 3	ND
-	Solvent/Glassware Blank 4	ND

ND = None Detected
* = Minimum Detection Limit = 100 ng per plug
** = 3 of the 12 Aroclor 1242 electron capture peaks were present in the chromatogram of this sample

TABLE II. Recovery of Aroclor 1242 from PUF's spiked in the laboratory

TOTAL AMOUNT SPIKED (ng)	% RECOVERY
252	105
504	90
1007	91

Work Performed by: J. Howes Project No G-8020-0401 Date of Work: 1/4/83

Title or Purpose: Summary of PCB Sampling Results Continued from: 19/5/82

Sampling Location		Pump S/N	Pre-test Flow, slpm	Post Test Flow, slpm	Average Flow, slpm	Sampling Time, min	Total Spld Volume, scm	PCB in Trap, ug	Air Conc, ug PCB/scm
Vertical Profile Site A	2cm	A037	3.724	3.687	3.706	480	1.78	480	270
	30cm	A079	3.724	3.687	3.706	480	1.78	58	33
	60cm	A087	3.724	3.729	3.727	480	1.79	32	18
	120cm	A080	3.724	3.412	3.568	480	1.71	9.7	6
	180cm	A083	3.724	3.687	3.706	480	1.78	3.9	2
Hot Spots Site A	1-1	A061	3.724	3.687	3.706	480	1.78	3.5	2
	1-2	A088	3.724	3.729	3.727	480	1.79	4.1	2
	-2	A032	3.724	STOPPED DURING SAMPLING PERIOD		—	—	2.1	—
	-3	A062	3.724	3.687	3.706	480	1.78	2.8	2
Vertical Profile Site B	2cm	A092	3.724	—	3.724	480	1.79	1600	894
	30cm	A094	3.724	3.687	3.706	480	1.78	LOST IN LAB	—
	60cm	A127	3.724	3.628	3.676	480	1.76	35	20
	120cm	A120	3.724	3.687	3.706	480	1.78	11	6
	180cm	A118	3.724	3.687	3.706	480	1.78	4.2	2
Hot Spots Site B	-4	A089	3.724	3.687	3.706	480	1.78	5.1	3
	-5	A121	3.724	3.729	3.727	480	1.79	1.0	0.6
Background		A125	3.724	3.706	3.715	480	1.78	<0.1	<0.06

Flows CORRECTED TO 760 mm Hg, 20°C

Final Data corrected to 760 mm Hg, 25°C

Entered by: James E. Howes Jr Date: 1/4/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: J. Howes Project No G-8020-0401 Date of Work: 1/4/83

Title or Purpose: Summary of PCB Results 10/6/82 Continued from:

Sampling Location	Pump S/N	Pre-Test Flow, slpm	Post-Test Flow, slpm	Average Flow, slpm	Sampling Time	Total Sple Vol, scm	PCB in Plug, ug	PCB in Air
VP-A-002	A037	3.763	3.699	3.731	480	1.79	920	514
VP-A-030	A061	3.704	3.699	3.702	480	1.78	47	26
VP-A-060	A062	3.646	3.699	3.673	480	1.76	15	8.5
VP-A-120	A079	3.722	3.717	3.720	480	1.79	5.1	2.8
VP-A-180	A083	3.745	3.699	3.722	480	1.79	2.3	1.3
HS-A-1	A094	3.646	3.699	3.673	480	1.76	3.2	1.8
HS-A-3	A120	3.645	3.699	3.672	480	1.76	3.1	1.8
HS-C-6-1	A087	3.722	3.741	~~3.7315~~ 3.732	480	1.79	4.4	2.5
HS-C-6-2	A088	3.722	3.759	3.741	480	*	3.5	
HS-B-4	A127	3.686	3.741	3.714		*	3.2	
HS-B-5	A121	3.763	3.759	3.761	480	1.81	0.3	0.2
BKGD	A118	3.704	3.699	3.702	509	1.88	<0.1	<0.05

* Sampler malfunction during sampling period

↑

Flows corrected to 760 mm Hg, 20°C

Final data corrected to 760 mm Hg, 25°C

Entered by: James E. Howes Jr. Date: 1/4/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: J. Howes Project No. 6-8020-0401 Date of Work: 1/4/83

Title or Purpose: Results of Control and Blank Samples Continued from:

Control Samples (See Pg 23)

Sample No	ng Added	ng Found	Recovery %*
BCL-NL-CONTROL 1	600	530	88.3
" " " 2	150	110	73.3
" " " 3	150	120	80.0
" " " 4	300	250	83.3
" " " 5	600	550	91.7
" " " 6	300	280	93.3

* Recovery % = $\frac{\text{ng found}}{\text{ng Added}}$ (100)

SwRI Lab blanks (Blank extractions - contribution from solvents & glassware

	ng found
Blank 1	<100
2	<100
3	<100
4	<100

Field blanks (Unused cartridges carried through field program)

	ng found
BCL-FB-1	<100
BCL-FB-2	<100

Entered by: James E. Howes Date: 1/4/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: J. Howes / W. Bayless Project No. G-8020-0401 Date of Work: 10/5-10/6/82

Title or Purpose: Meteorological Data / Neils Land fill Continued from:

MRI WEATHER STATION
STRIPCHART DATA
ATTACHED

Entered by: James E. Howes Jr. Date: 2/3/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

Work Performed by: J Howes Project No. G8020-0401 Date of Work: 2/3/83

Title or Purpose: Final PCB Monitoring Results - Neil's Landfill Continued from:
October 5, 1982

TABLE ATTACHED

Entered by: James E. Howes Jr Date: 2/3/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

ATTACHMENT TO LAB RECORD BOOK, Pg 29

TABLE 2. PCB MONITORING RESULTS AT NEIL'S LANDFILL

Date	Sampling Location	Sampling Height Above Ground, cm	Sampling Time, Min.	Avg. Sampling Rate, scc/min.	Total Sample Volume, scm	Quantity PCBs in Cartridge, µg [a]	PCB Conc. in Air, µg/scm [a]
11/5/82	A-1	2	483	3667	1.77	480	271
	A-1	30	483	3667	1.77	58	33
	A-1	60	483	3688	1.78	32	18
	A-1	120	483	3532	1.71	9.7	5.7
	A-1	180	483	3676	1.78	3.9	2.2
	A-2(1) [b]	180	483	3667	1.77	3.5	2.0
	A-2(2) [b]	180	483	3688	1.78	4.1	2.3
	A-3	180	(c)	(c)	(c)	2.1	(c)
	A-4	180	483	3667	1.77	2.8	1.6
	B-1	2	(d)	(d)	(d)	1600	(d)
	B-1	30	479	3667	1.76	(e)	(e)
	B-1	60	479	3638	1.74	35	20
	B-1	120	479	3667	1.76	11	6.3
	B-1	180	479	3667	1.76	4.2	2.4
	B-2	180	480	3667	1.76	5.1	2.9
	B-3	180	480	3688	1.77	1.0	0.6
	U-1 (Bkgd.)	180	480	3676	1.76	<0.1	<0.06

(a) Reported as Aroclor 1242.
(b) Co-located samplers.
(c) Pump was not running when checked at 1400 hrs.; unable to determine sample volume.
(d) Pump was not running when checked at 1716 hrs.; unable to determine sample volume.
(e) Sample lost in handling during analysis.

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Work Performed by: J. Howes Project No. 8020-0401 Date of Work: 2/3/83

Title or Purpose: Final PCB Monitoring Data - Neil's Landfill Continued from:
October 6, 1982

TABLE ATTACHED

Entered by: James E. Howes Jr Date: 2/3/83 Continued to:

Performances of this work observed by:	Disclosed to and understood by me:
Date:	Date:
Date:	Date:

ATTACHMENT TO LAB RECORD BOOK, Pg 30

TABLE 2. (continued)

Date	Sampling Location	Sampling Height Above Ground, cm	Sampling Time, Min.	Avg. Sampling Rate, scc/min.	Total Sample Volume, scm	Quantity PCBs in Cartridge, µg [a]	PCB Conc. in Air, µg/scm [a]
11/6/82	A-1	2	480	3689	1.77	920	520
	A-1	30	480	3659	1.76	47	27
	A-1	60	480	3630	1.74	15	8.6
	A-1	120	480	3677	1.76	5.1	2.9
	A-1	180	480	3679	1.77	2.3	1.3
	A-2	180	480	3630	1.74	3.2	1.8
	A-4	180	480	3630	1.74	3.1	1.8
	B-2	180	(b)	(b)	(b)	3.2	(b)
	B-3	180	480	3734	1.79	0.3	0.2
	C-1(1) [c]	180	480	3689	1.77	4.4	2.5
	C-1(2) [c]	180	(d)	(d)	(d)	3.5	(d)
	U-1 (Bkgd.)	180	509	3659	1.86	<0.1	<0.05

(a) Reported as Aroclor 1242.
(b) Pump drive belt came off during sampling period; unable to determine sample volume.
(c) Co-located samplers.
(d) Pump drive belt broke during sampling period; unable to determine sample volume.

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Work Performed by: J. Howes Project No G-8020-040 / Date of Work: 2/3/83

Title or Purpose: Summary of Meteorological Data — Neil's Landfill, October 5 & 6, 1982 Continued from:

TABLE ATTACHED

Entered by: James E. Howes Jr Date: 2/3/83 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

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ATTACHMENT TO LAB RECORD BOOK, Pg 31.

TABLE 3. WIND SPEED, WIND DIRECTION, AND AMBIENT TEMPERATURE DATA

Date	Time	Avg. Temperature °F	°C	Avg. Wind Speed Miles/Hour	Avg. Wind Direction, Deg. (Compass)
11/5/82	0700-0800	56	13	1.2	170
	0800-0900	63	17	1.5	170
	0900-1000	70	21	2.6	160
	1000-1100	77	25	2.8	175
	1100-1200	82	28	4.5	180
	1200-1300	83	28	3.3	180
	1300-1400	84	29	4.3	190
	1400-1500	86	30	3.8	180
	1500-1600	83	28	4.5	185
	1600-1700	81	27	3.2	200
	1700-1800	79	26	1.3	180
	1800-1900	70	21	1.0	180
	1900-2000	65	18	0.2	190
	2000-2100	61	16	0.4	210
	2100-2200	60	16	0.4	240
	2200-2300	59	15	2.1	180
	2300-2400	60	16	2.9	175
11/6/82	0000-0100	60	16	2.3	175
	0100-0200	60	16	2.2	175
	0200-0300	59	15	3.3	175
	0300-0400	59	15	3.5	175
	0400-0500	59	15	3.6	175
	0500-0600	60	16	4.5	165
	0600-0700	61	16	5.1	160
	0700-0800	63	17	6.1	160
	0800-0900	65	18	4.6	160
	0900-1000	71	22	5.8	160
	1000-1100	77	25	6.1	175
	1100-1200	81	27	6.7	190
	1200-1300	82	28	5.4	190
	1300-1400	82	28	5.1	190
	1400-1500	82	28	8.3	190
	1500-1600	81	27	8.6	185
	1600-1700	81	27	5.9	180
	1700-1800	(a)		5.7	180
	1800-1900	(a)		4.7	170
	1900-2000	(a)		4.6	170

(a) Temperature marker malfunctioned; did not record on chart.

Work Performed by: J. Howes Project No. G-8020-090 Date of Work: 2/3/82

Title or Purpose: Summary of Meteorological Data Continued from:

Neil's Landfill, October 5 & 6, 1982

TABLE ATTACHED

Entered by: James E. Howes Jr. Date: 2/3/82 Continued to:

Performances of this work observed by: Disclosed to and understood by me:

Date: Date:

Date: Date:

CONFIDENTIAL ATTACHMENT TO LAB RECORD BOOK, Pg 32.

TABLE 4. RELATIVE HUMIDITY AND BAROMETRIC PRESSURE DATA

Date	Time, CDT	RH, %	Barometric Pressure, mm Hg
11/5/82	0938	91	744
	1030	69	744
	1130	56	744
	1230	59	744
	1330	59	744
	1430	60	743
	1530	51	743
	1630	60	743
	1730	75	742
11/6/82	0800	90	744
	0900	85	744
	1000	78	744
	1100	68	744
	1200	76	743
	1300	74	742
	1400	64	741
	1500	62	741
	1600	62	740

ATTACHMENT NO. 6

BCL's Draft Final
Report on the Monitoring
Study at Neil's Landfill

CONFIDENTIAL

Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201
Telephone (614) 424-6424
Telex 24-5454

February 3, 1983

Mr. Barry Martin (MD-76)
Environmental Monitoring Systems Laboratory
U. S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

Dear Barry:

EPA Contract No. 68-02-3745 (WA-4)
Ambient Monitoring for PCB's Near Three
Landfills in the Bloomington, Indiana Area

Enclosed are six (6) copies of a draft report on the preliminary PCB monitoring program conducted at Neil's Landfill. Please call me at FTS 976-5269 if you have any questions or comments concerning the report.

Sincerely,

James E. Howes Jr.

James E. Howes, Jr.
Project Manager
Environmental Programs Office
Environmental Technology Section

JEH:jp

xc: D. L. Scott, EMSL/EPA/RTP (3 copies)
J. Kempf, CMD/EPA/RTP
R. G. Lewis, EMSL/EPA/RTP

Enclosures

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DRAFT REPORT

on

A PRELIMINARY STUDY TO DETERMINE AMBIENT AIR CONCENTRATIONS OF PCB'S AT NEIL'S LANDFILL, BLOOMINGTON, INDIANA

EPA Contract No. 68-02-3745
Work Assignment No. 4

Prepared for

Barry Martin, EPA Project Officer
Environmental Monitoring Systems Laboratory
U. S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

February 3, 1983

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

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SECTION 1

INTRODUCTION

During the Summer of 1983, a program will be conducted to monitor PCB levels in ambient air over a 30-day period in the vicinity of three landfills in the Bloomington, Indiana, area. As a preliminary effort on this program, a limited monitoring program was performed during October, 1982, at one of the sites, Neil's Landfill. The objective of this study was to check out sampling, analysis, and sample handling procedures which will be employed in next summer's study. It is also anticipated that this limited study would yield preliminary estimates of ambient air concentrations of PCB's at the landfill site.

The sampling program was performed by Battelle's Columbus Laboratories (BCL) over a two-day period during predominately warm, sunny weather. Measurements of PCB in the ambient air were performed over areas on the landfill where capacitors suspected of leakage are exposed (hot spots) to determine the vertical distribution of PCB's and the concentration at 1.8 meter above ground level. Polyurethane foam cartridge samples collected during the study were analyzed for PCB's by Southwest Research Institute.

SECTION 2

EXPERIMENTAL PROCEDURES

AMBIENT AIR SAMPLING

The sampling program was conducted at Neil's Landfill near Bloomington, Indiana, on October 5 and 6, 1982. Samples were taken over landfill areas designated Locations A, B, and C, where capacitors suspected of leakage were visible on the surface of the ground. Sampling was also performed each day at an up-wind location (designated Location U) to obtain data on background levels of PCB's. The general location of the sampling areas on the landfill site as shown in Figure 1. The photographs presented in Figures 2 through 5 show the four sampling locations.

Ambient air sampling was performed with DuPont P4000A battery-operated pumps equipped with PCB sampling cartridges consisting of a 20 mm i.d. x 10 cm long borosilicate glass tubes containing a pre-extracted 22 mm dia x 7.6 cm long polyurethane foam (PUF) cartridge (1). Sampling was performed from approximately 0900-1700 hrs each day using procedures described by Lewis, et. al. (2, 3). Nominal sampling rates were approximately 3700 scc/min. Flow calibrations of the sampling pumps were performed twice each day; in the morning before the start of the sampling period and in the evening after termination of sampling.

Samples were collected at the various landfill locations as shown in Table 1 to determine the vertical distribution of PCB's in the air at various heights above the ground and to measure PCB concentrations at 180 cm above ground level. Vertical concentration profile measurements were performed with a vertical array of five sampling systems (see Figures 2 and 3). The inlets of the cartridges of the five samplers were positioned at 2, 30, 60, 120, and 180 cm above ground level. Single sampling systems shown in Figures

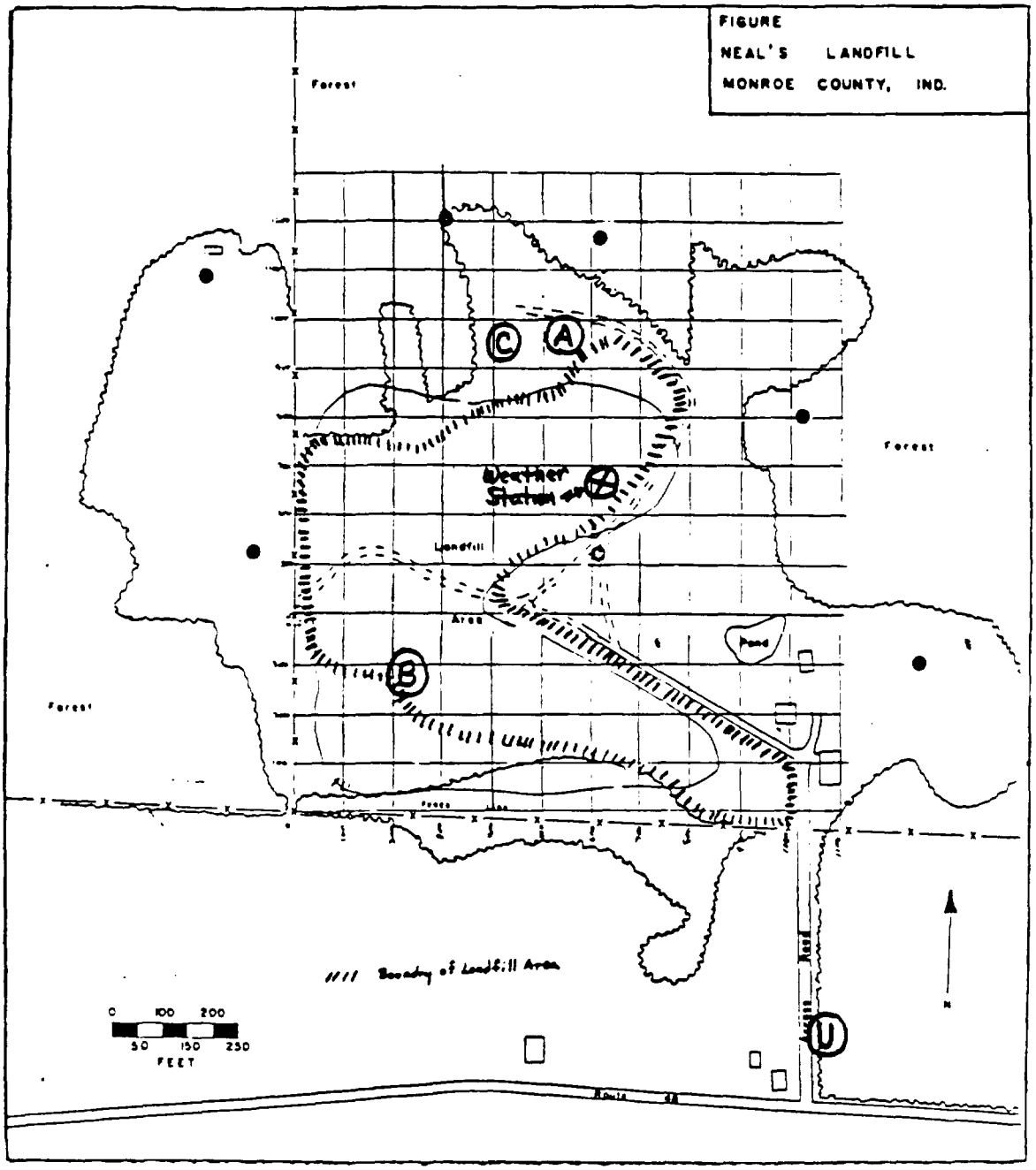

Figure 1. Plot Plan of Neil's Landfill showing areas in which PCB sampling was conducted

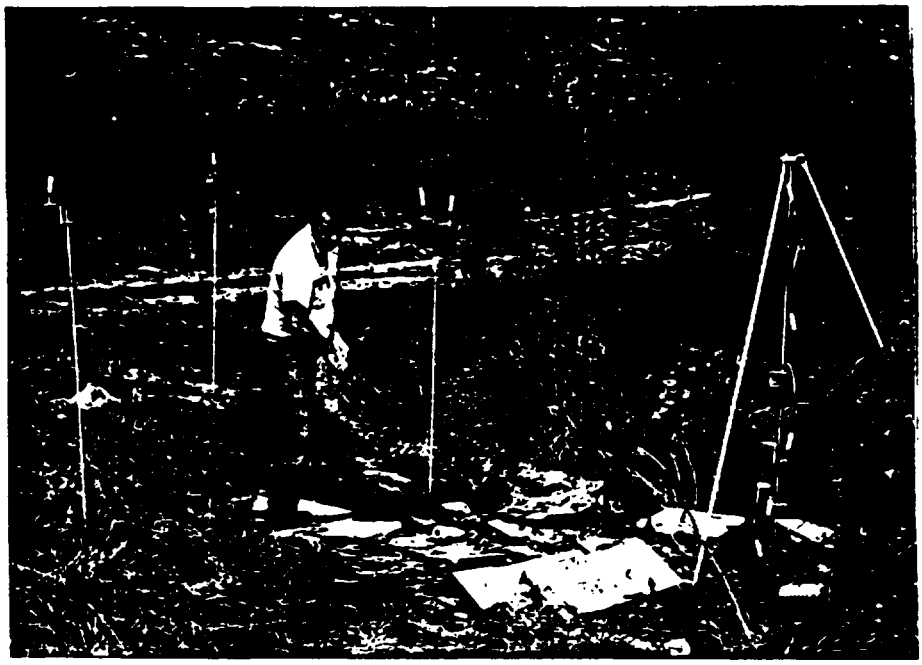

Figure 2. Sampling Location A

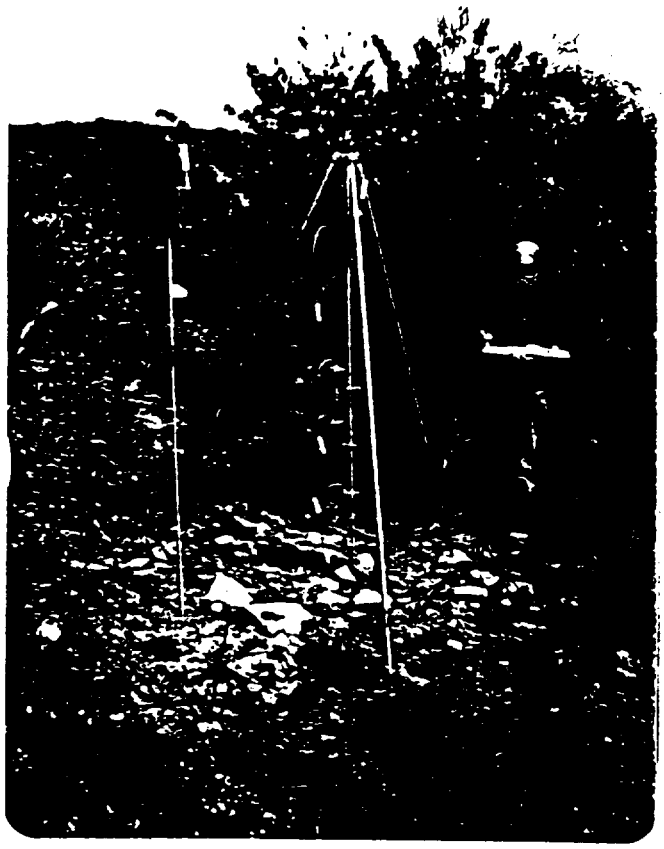

Figure 3. Sampling Location B

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Figure 4. Sampling Location C

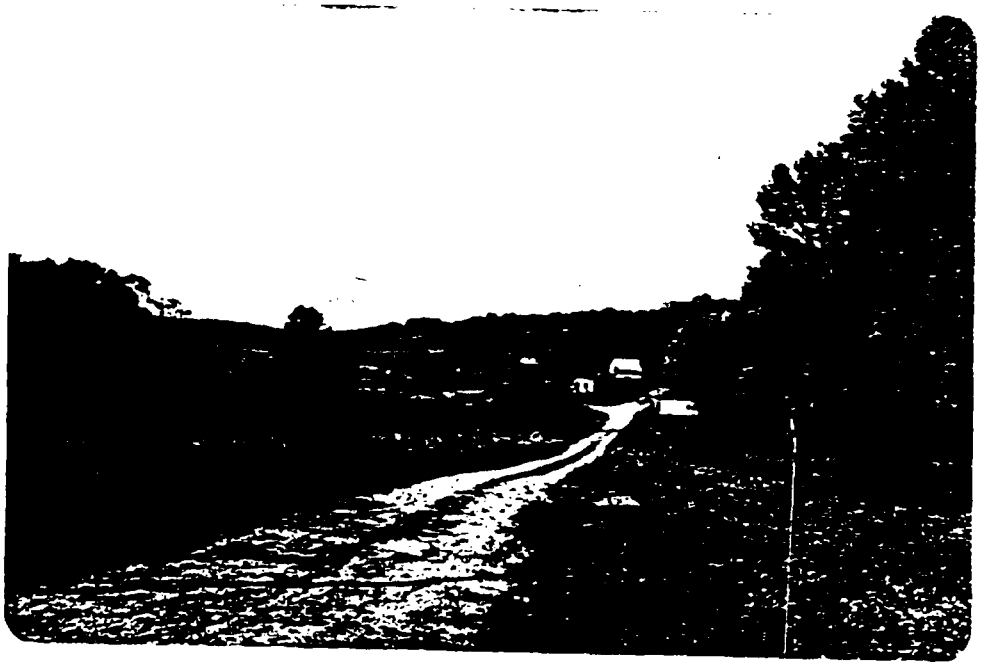

Figure 5. Sampling Location U

TABLE 1. SAMPLING PERFORMED AT NEIL'S LANDFILL

Date	Sampling Location	Sample Type	Sampling Period, hrs. CDT Start	Sampling Period, hrs. CDT End	No. Samples Collected
11/5/82	A-1	Vertical Profile at 2, 30, 60, 120 & 180 cm	0855	1658	5
	A-2	180 cm, co-located	0855	1658	2
	A-3	180 cm	0855	1658	1
	A-4	180 cm	0855	1658	1
	B-1	Vertical Profile at 2, 30, 60, 120 & 180 cm	0920	1719	5
	B-2	180 cm	0920	1720	1
	B-3	180 cm	0920	1720	1
	U-1	180 cm, upwind background	0935	1735	1
11/6/82	A-1	Vertical profile at 2, 30, 60, 120 & 180 cm	0900	1700	5
	A-2	180 cm	0900	1700	1
	A-4	180 cm	0900	1700	1
	B-2	180 cm	0847	-	1
	B-3	180 cm	0847	1647	1
	C-1	180 cm, co-located	0859	1659	2
	U-1	180 cm, upwind background	0852	1721	1
				Total	29

1, 2, and 4 were used to perform the measurements at 180 cm above ground level. Co-located monitoring at 180 cm was performed at one location each day to obtain data to estimate the precision of the measurements (see Figure 3).

PCB ANALYSIS

Analysis for PCB's in the PUF cartridges was performed by Soxhlet extraction with 5 percent ether in hexane according to the procedure described by Lewis, et. al. (4) and PCB's in the extract were determined by gas chromatography with electron capture detection as described in EPA Method 608 (5). Identification and quantification of PCB's in the samples were performed by the technique described by Webb and McCall (6).

2.3 METEOROLOGICAL MEASUREMENTS

Continuous measurements of wind speed, wind direction, and ambient temperature were performed during the two sampling days with a MRI portable weather station. The weather station was located in an elevated, unobstructed area near the center of the landfill (see Figure 1).

Relative humidity was determined hourly during the sampling periods with wet- and dry-bulb thermometers. An aneroid barometer was used to obtain hourly barometric pressure readings during the sampling periods.

SECTION 3

RESULTS AND DISCUSSION

The results of PCB measurements in ambient air at Neil's Landfill are presented in Table 2. The PCB concentrations are reported in μg/scm, i.e., micrograms PCB (as Aroclor 1242) per standard cubic meter of air (25 C, 760 mm Hg). PCB's were found in all samples taken in areas where capacitors suspected of leakage were visible at or above ground level. PCB's were not detected in the up-wind background samples (MDC = ~0.05 μg/scm).

The highest levels of PCB's, 268-514 μg/scm, were found in samples collected at 2 cm above ground level. Vertical concentrations decreased sharply to about 2 μg/scm at 180 cm above ground level. The range of PCB concentrations in air samples taken at 180 cm was 0.2-2.9 μg/scm.

The results of meteorological measurements made during the two-day sampling program are shown in Tables 3 and 4. The wind speed, wind direction, and ambient temperature data given in Table 3 are averages for hourly periods. The relative humidity and barometric pressure data are individual readings taken at approximately hourly intervals during the 8-hr sampling periods.

The high temperature during the sampling period on October 5, 1982 was 30 C (86 F). Until about 1100 hrs the sky was clear; thereafter there was partial cloudiness (15-30 percent cloud cover) which decreased during the end of the sampling period. On October 6, the high temperature was 28 C (82 F). The sky was clear until about 1000 hrs. For the remainder of the sampling period, there was increasing cloudiness as stormy weather moved into the area from the southwest. During the sampling days, winds were generally from the south (180 degrees). There was no precipitation during either of the days on which sampling was conducted.

TABLE 2. PCB MONITORING RESULTS AT NEIL'S LANDFILL

Date	Sampling Location	Sampling Height Above Ground, cm	Sampling Time, Min.	Avg. Sampling Rate, scc/min.	Total Sample Volume, scm	Quantity PCBs in Cartridge, µg [a]	PCB Conc. in Air, µg/scm [a]
11/5/82	A-1	2	483	3667	1.77	480	271
	A-1	30	483	3667	1.77	58	33
	A-1	60	483	3688	1.78	32	18
	A-1	120	483	3532	1.71	9.7	5.7
	A-1	180	483	3676	1.78	3.9	2.2
	A-2(1) [b]	180	483	3667	1.77	3.5	2.0
	A-2(2) [b]	180	483	3688	1.78	4.1	2.3
	A-3	180	(c)	(c)	(c)	2.1	(c)
	A-4	180	483	3667	1.77	2.8	1.6
	B-1	2	(d)	(d)	(d)	1600	(d)
	B-1	30	479	3667	1.76	(e)	(e)
	B-1	60	479	3638	1.74	35	20
	B-1	120	479	3667	1.76	11	6.3
	B-1	180	479	3667	1.76	4.2	2.4
	B-2	180	480	3667	1.76	5.1	2.9
	B-3	180	480	3688	1.77	1.0	0.6
	U-1 (Bkgd.)	180	480	3676	1.76	<0.1	<0.06

(a) Reported as Aroclor 1242.
(b) Co-located samplers.
(c) Pump was not running when checked at 1400 hrs.; unable to determine sample volume.
(d) Pump was not running when checked at 1716 hrs.; unable to determine sample volume.
(e) Sample lost in handling during analysis.

TABLE 2. (continued)

Date	Sampling Location	Sampling Height Above Ground, cm	Sampling Time, Min.	Avg. Sampling Rate, scc/min.	Total Sample Volume, scm	Quantity PCBs in[a] Cartridge, µg	PCB Conc. in[a] Air, µg/scm
11/6/82	A-1	2	480	3689	1.77	920	520
	A-1	30	480	3659	1.76	47	27
	A-1	60	480	3630	1.74	15	8.6
	A-1	120	480	3677	1.76	5.1	2.9
	A-1	180	480	3679	1.77	2.3	1.3
	A-2	180	480	3630	1.74	3.2	1.8
	A-4	180	480	3630	1.74	3.1	1.8
	B-2	180	(b)	(b)	(b)	3.2	(b)
	B-3	180	480	3734	1.79	0.3	0.2
	C-1(1)[c]	180	480	3689	1.77	4.4	2.5
	C-1(2)[c]	180	(d)	(d)	(d)	3.5	(d)
	U-1 (Bkgd.)	180	509	3659	1.86	<0.1	<0.05

(a) Reported as Aroclor 1242.
(b) Pump drive belt came off during sampling period; unable to determine sample volume.
(c) Co-located samplers.
(d) Pump drive belt broke during sampling period; unable to determine sample volume.

TABLE 3. WIND SPEED, WIND DIRECTION, AND AMBIENT TEMPERATURE DATA

Date	Time	Avg. Temperature °F	°C	Avg. Wind Speed Miles/Hour	Avg. Wind Direction, Deg. (Compass)
11/5/82	0700-0800	56	13	1.2	170
	0800-0900	63	17	1.5	170
	0900-1000	70	21	2.6	160
	1000-1100	77	25	2.8	175
	1100-1200	82	28	4.5	180
	1200-1300	83	28	3.3	180
	1300-1400	84	29	4.3	190
	1400-1500	86	30	3.8	180
	1500-1600	83	28	4.5	185
	1600-1700	81	27	3.2	200
	1700-1800	79	26	1.3	180
	1800-1900	70	21	1.0	180
	1900-2000	65	18	0.2	190
	2000-2100	61	16	0.4	210
	2100-2200	60	16	0.4	240
	2200-2300	59	15	2.1	180
	2300-2400	60	16	2.9	175
11/6/82	0000-0100	60	16	2.3	175
	0100-0200	60	16	2.2	175
	0200-0300	59	15	3.3	175
	0300-0400	59	15	3.5	175
	0400-0500	59	15	3.6	175
	0500-0600	60	16	4.5	165
	0600-0700	61	16	5.1	160
	0700-0800	63	17	6.1	160
	0800-0900	65	18	4.6	160
	0900-1000	71	22	5.8	160
	1000-1100	77	25	6.1	175
	1100-1200	81	27	6.7	190
	1200-1300	82	28	5.4	190
	1300-1400	82	28	5.1	190
	1400-1500	82	28	8.3	190
	1500-1600	81	27	8.6	185
	1600-1700	81	27	5.9	180
	1700-1800	(a)		5.7	180
	1800-1900	(a)		4.7	170
	1900-2000	(a)		4.6	170

(a) Temperature marker malfunctioned; did not record on chart.

TABLE 4. RELATIVE HUMIDITY AND BAROMETRIC PRESSURE DATA

Date	Time, CDT	RH, %	Barometric Pressure, mm Hg
11/5/82	0938	91	744
	1030	69	744
	1130	56	744
	1230	59	744
	1330	59	744
	1430	60	743
	1530	51	743
	1630	60	743
	1730	75	742
11/6/82	0800	90	744
	0900	85	744
	1000	78	744
	1100	68	744
	1200	76	743
	1300	74	742
	1400	64	741
	1500	62	741
	1600	62	740

SECTION 4

QUALITY ASSURANCE DATA

FLOW CALIBRATIONS

The results of flow calibrations of the DuPont sampling pumps are given in Tables 5 through 8. On the morning of the first day (October 5), five pumps were calibrated with the bubble meter. During these calibrations, the flow meter on the DuPont calibrator unit was adjusted to the bubble meter flow rate. The flow meter was then used to calibrate the remainder of the DuPont sampling pumps. Subsequent calibrations of all sampling pumps was performed with the bubble meter since it was felt that this method would be more accurate.

SPIKE SAMPLES

A set of six PUF cartridges spiked with known quantities of Aroclor 1242 was submitted by BCL to Southwest Research Institute (SwRI) along with the ambient air samples. NBS/SRM 1581, Arochlor 1242 in transformer oil, was used to prepare the spiked samples. Data on the concentration of PCB's in the spiked samples was not given to SwRI. Results of analysis of the spiked samples are presented in Table 9. Also shown in Table 9 are results of analysis of Aroclor 1242-spiked PUF cartridges prepared and analyzed by SwRI.

FIELD AND LABORATORY BLANKS

Two field blanks and four laboratory blanks were analyzed with the ambient air samples. The field blanks were PUF cartridges that had been carried through all the field operations except sampling. The analysis was performed by the same procedures used for the actual samples. The laboratory

blanks were obtained by performing the extractions using the solvents and glassware used for the sample analysis, but not including the PUF cartridge.

PCB's were not detected in any of the blank samples above the minimum detectable limit of 100 ng/PUF cartridge.

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TABLE 5. DUPONT SAMPLING PUMP FLOW CALIBRATION

Work Performed By Howes/Baytos Amb. Temp. 18 C Flow Corr. Factor* 0.9978

Date/Time October 5, 1982 0700 hrs Bar. Press. 29.18 in Hg

Pump S/N	EPA No.	Battery ok	Low Flow Check ok	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037		✓	✓	6.3	6.3	—	6.3	3.8	3.8	3809	3724	
A079		✓	✓	6.3	6.3	—	6.3	3.8	3.8	3809	3724	
A087		✓	✓					3.8	3.8		3724	
A080		✓	✓					3.8	3.8		3724	
A083		✓	✓					3.8	3.8		3724	
A061		✓	✓	6.3	6.3	-	6.3	3.8	3.8	3809	3724	
A088		✓	✓					3.8	3.8		3724	
A032		✓	✓	6.3	6.3	—	6.3	3.8	3.8	3809	3724	
A062		✓	✓	6.3	6.3	—	6.3	3.8	3.8	3809	3724	
A092		✓	✓					3.8	3.8		3724	
A094		✓	✓	-				3.8	3.8		3724	
A127		✓	✓					3.8	3.8		3724	
A120		✓	✓					3.8	3.8		3724	
A118		✓	✓					3.8	3.8		3724	
A089		✓	✓					3.8	3.8		3724	
A121		✓	✓					3.8	3.8		3724	
A125		✓	✓					3.8	3.8		3724	
				-								

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

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TABLE 6. DUPONT SAMPLING PUMP FLOW CALIBRATION

Work Performed By Howes / Bayles Amb. Temp. 21 C Flow Corr. Factor*
Date/Time October 6, 1982, 0730 HRS Bar. Press. 29.20 in Hg 0.9645

Pump S/N	EPA No.	Battery ok	Low Flow Check ok	Calibration Data								Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037		✓	✓	6.2	6.2	6.2	6.2	3.8	3.8	3871	3734	
A061		✓	✓	6.3	6.3	6.3	6.3	3.8	3.8	3810	3675	
A062		✓	✓	6.4	6.4	6.4	6.4	3.8	3.8	3750	3617	
A079		✓	✓	6.3	6.3	6.2	6.27	3.8	3.8	3828	3692	
A083		✓	✓	6.2	6.2	6.3	6.23	3.8	3.8	3852	3715	
A094		✓	✓	6.4	6.4	6.4	6.4	3.8	3.8	3750	3617	
A120		✓	✓	6.4	6.4	6.4	6.4	3.8	3.8	3750	3617	
A127		✓	✓	6.3	6.3	6.4	6.33	3.8	3.8	3791	3656	
A121		✓	✓	6.2	6.2	6.2	6.2	3.8	3.8	3871	3734	
A087		✓	✓	6.2	6.3	6.3	6.27	3.8	3.8	3828	3692	
A088		✓	✓	6.3	6.3	6.2	6.27	3.8	3.8	3828	3692	
A118		✓	✓	6.3	6.3	6.3	6.3	3.8	3.8	3810	3675	
				-								

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

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TABLE 7. DUPONT SAMPLING PUMP FLOW CALIBRATION

Work Performed By Howes/Baytos Amb. Temp. 27 C Flow Corr. Factor* 0.9326

Date/Time October 5, 1982 1830 Hrs Bar. Press. 29.15 in Hg

Pump S/N	Sampler Location	Battery ok	Low Flow Check ok	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037	A-1, 2cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A079	A-1, 30cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A087	A-1, 60cm			6.1	6.2	6.1	6.13	3.8	3.8	3915	3651	3688
A080	A-1, 120cm			6.7	6.7	6.7	6.7	3.6	3.6	3582	3340	3532 *
A083	A-1, 180cm			6.2	6.1	6.2	6.17	3.8	3.8	3890	3628	3676
A061	A-2(1), 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A088	A-2(2), 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3651	3688
A032	A-3, 180cm											**
A062	A-4, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A092	B-1, 2cm											***
A091	B-1, 30cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A127	B-1, 60cm			6.3	6.1	6.2	6.3	3.8	3.8	3809	3552	3638
A120	B-1, 120cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A118	B-1, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A089	B-2, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3610	3667
A121	B-3, 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3651	3688
A125	U-1, 180cm			6.2	6.1	6.2	6.17	3.8	3.8	3890	3628	3676

* Post-sampling flow 10% lower than pre-sampling flow.

** Pump stopped during sampling period.

*** Pump stopped during sampling period.

*Correction to 25C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor

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TABLE 8. DUPONT SAMPLING FLOW CALIBRATION

Work Performed By Howes/Baytos Amb. Temp. 25 C Flow Corr. Factor*
Date/Time October 6, 1982, 1845hrs Bar. Press. 29.10 in Hg 0.9412

Pump S/N	Sampler Location	Battery ok	Low Flow Check ok	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, l/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A037	A-1, 2cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3689
A061	A-1, 30cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3659
A062	A-1, 60cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3630
A079	A-1, 120cm			6.1	6.2	6.2	6.17	3.8	3.8	3890	3661	3677
A083	A-1, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3679
A094	A-2, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3630
A120	A-4, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3630
A127	B-2, 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3685	3671 *
A121	B-3, 180cm			6.1	6.1	6.1	6.1	3.8	3.8	3934	3703	3719
A087	C-1(1), 180cm			6.1	6.1	6.2	6.13	3.8	3.8	3915	3685	3689
A088	C-1(2), 180cm			6.1	6.1	6.1	6.1	3.8	3.8	3934	3703	3698 **
A118	U-1, 180cm			6.2	6.2	6.2	6.2	3.8	3.8	3871	3643	3659

* Pump drive belt came off during sampling period.

** Pump drive belt broke during sampling period.

*Correction to 25 C, 760 mm Hg (see tables).
**scc/min = cc/min x correction factor.

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TABLE 9. RESULTS OF ANALYSIS OF SPIKE SAMPLES

Sample No.	Aroclor 1242 Added, ng	Aroclor 1242 Found, ng	% Recovery
BCL Control 1	600	530	88.3
BCL " 2	150	110	73.3
BCL " 3	150	120	80.0
BCL " 4	300	250	83.3
BCL " 5	600	550	91.7
BCL " 6	300	280	93.3
SwRI 1	252	265	105
SwRI 2	504	454	90
SwRI 3	1007	916	91

SECTION 5

REFERENCES

1. Lewis, R. G. and MacLeod, K. E., "Portable Sampler for Pesticides and Semivolatile Industrial Organic Chemicals in Air", Analytical Chemistry, 54, 310-315 (February 1982).

2. Lewis, R. G., "Procedures for Sampling and Analysis of Polychlorinated Biphenyls in the Vicinities of Hazardous Waste Disposal Sites", March 16, 1982.

3. Lewis, R. G., Jackson, M. D., and MacLeod, K. E., "Protocol for Assessment of Human Exposure to Airborne Pesticides", EPA-600/2-80-180 (August 1980).

4. Lewis, R. G., Brown, A. R., and Jackson, M. D., "Evaluation of Polyurethane Foam for Sampling of Pesticides, Polychlorinated Biphenyls, and Polychlorinated Naphthalenes in Ambient Air", Analytical Chemistry, 49, 1668-1672 (October 1977).

5. Federal Register, 44, No. 233, Monday, December 3, 1979, 69501-69509.

6. Webb, R. G. and McCall, A. C., "Quantitative PCB Standards for Electron Capture Gas Chromatography", Journal of Chromatographic Science, 11, July 1973.

ATTACHMENT NO. 8

SwRI Laboratory Notes,
Records, and Analytical Data

8-19-82

[illegible]

ordered sulfites, K-D's, etc (Reliance Glass)
solvents (Dulman Kraft)
shipping jars (Jeffery)
drying tubes (Curtin)

Time charge change from 01-0754 to 01-7216-001

SGI - 250 custom air sampling cartridges $1000⁰⁰
$4 each

CPI SALES - 28 sq. ft. #10 mesh SS screen
.047 diameter wire .053 opening $47.12

Olympic Products Co - 6 sq yd polyurethane foam
$48.60

8-20-82

Delivered SS screen to M.C. Specialty, 1035 Eaton, 657-0521 Skip Ward
2½" discs, 3/8" center hole punch

Began cutting large PUF's ~45 large

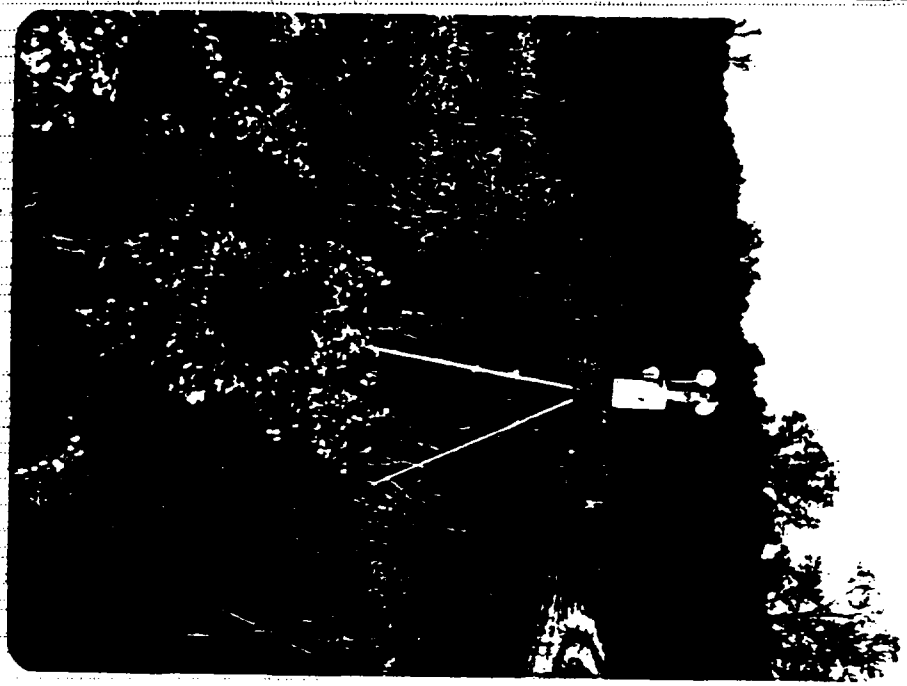
8-21-82

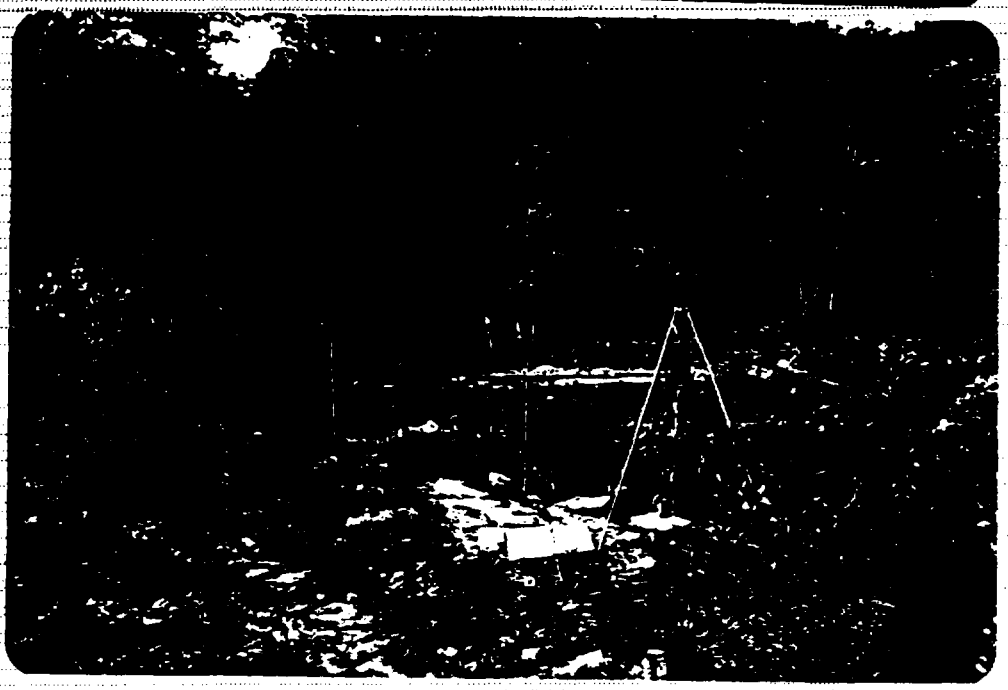
Set up 18 large PUFs to cycle w/ Acetone -
- blew out circuit breakers
- lost water line.

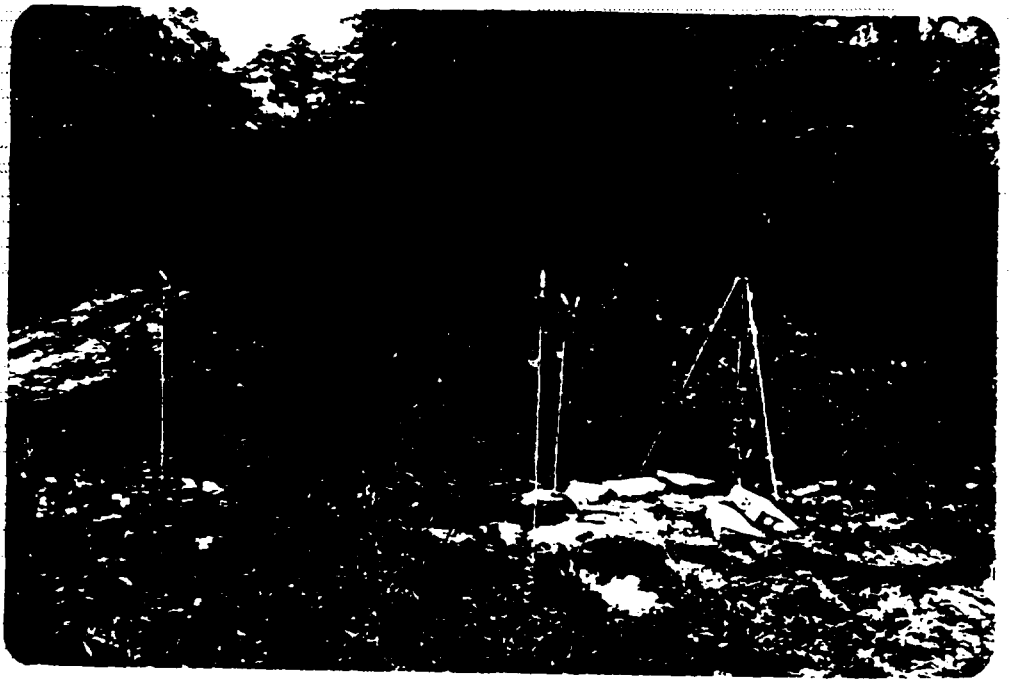
Phil cut 30 more plugs (large)

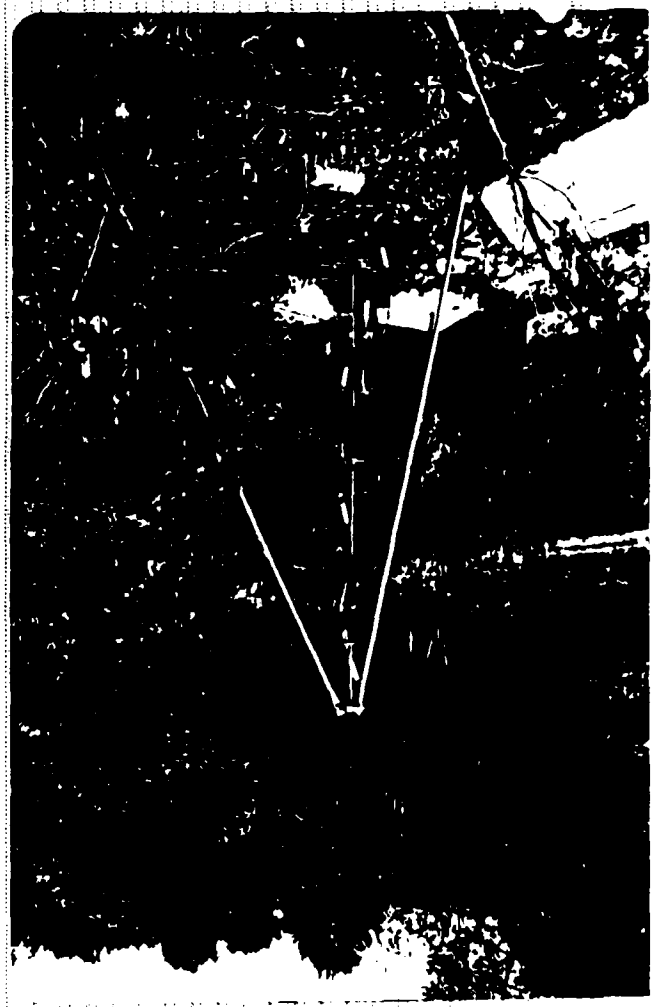
ATTACHMENT NO. 9

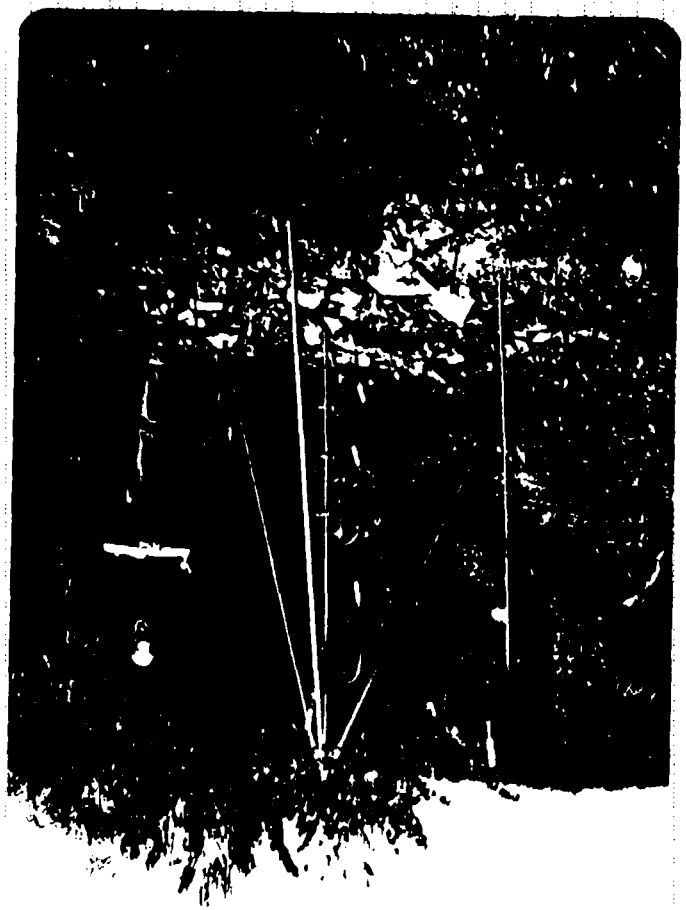
Photographs Taken at
Neil's Landfill During Field
Monitoring Program,
October 5 and 6, 1982

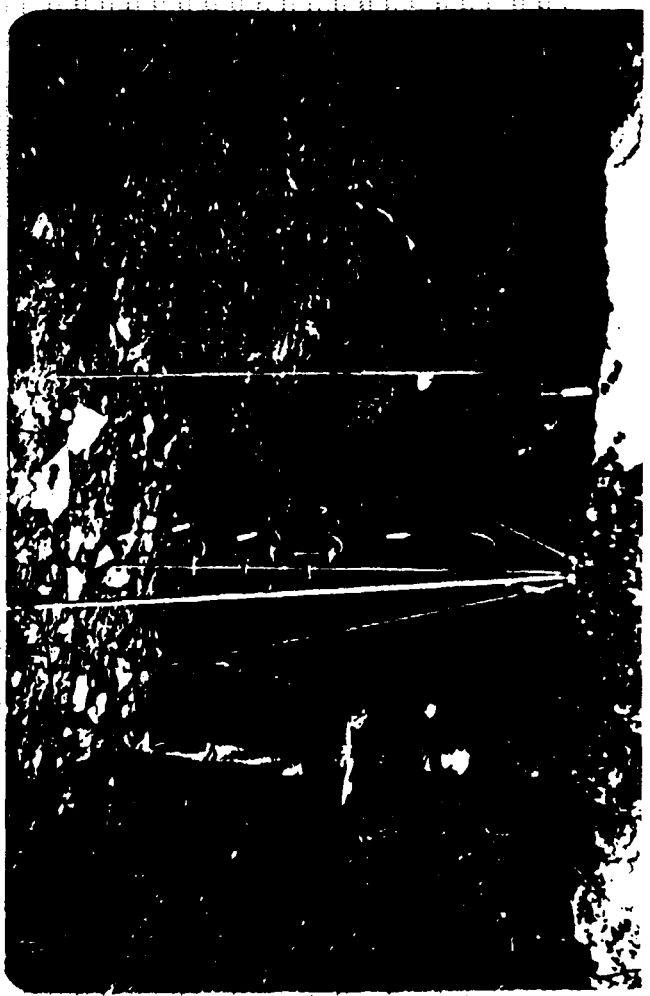


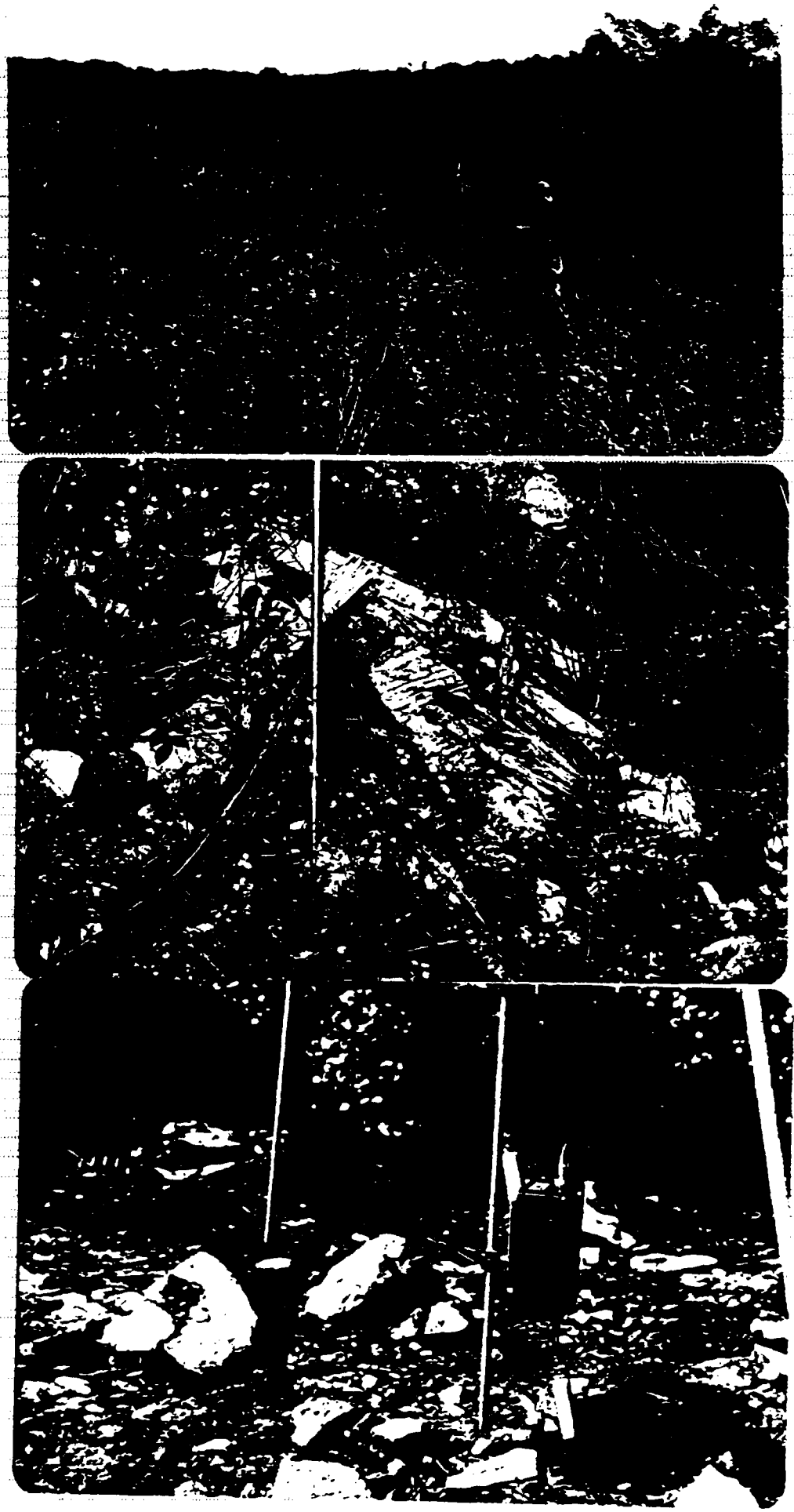


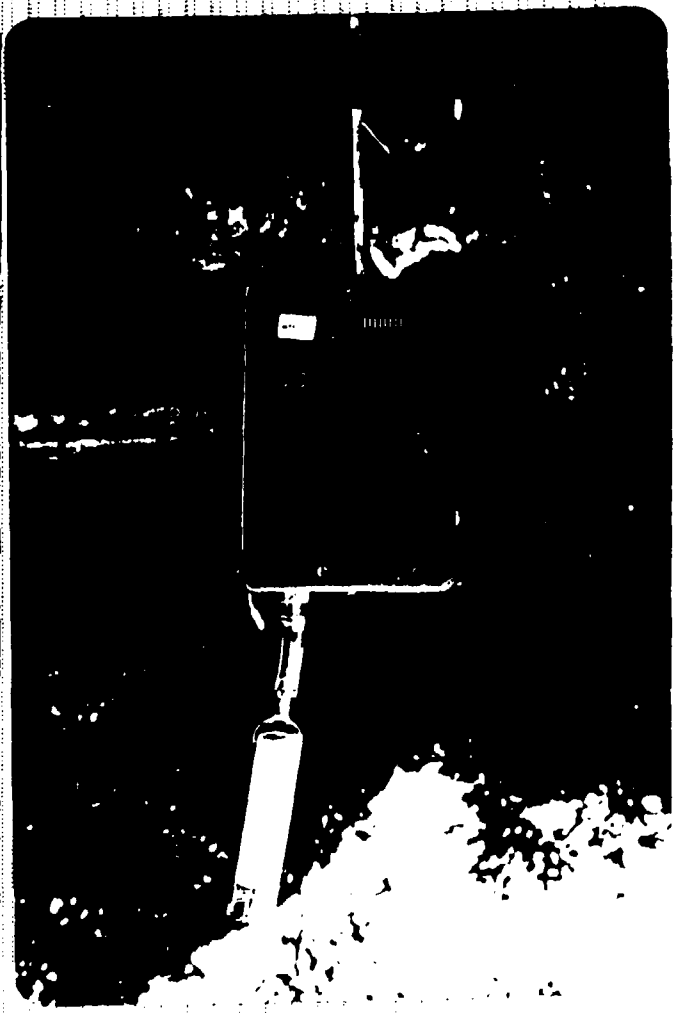


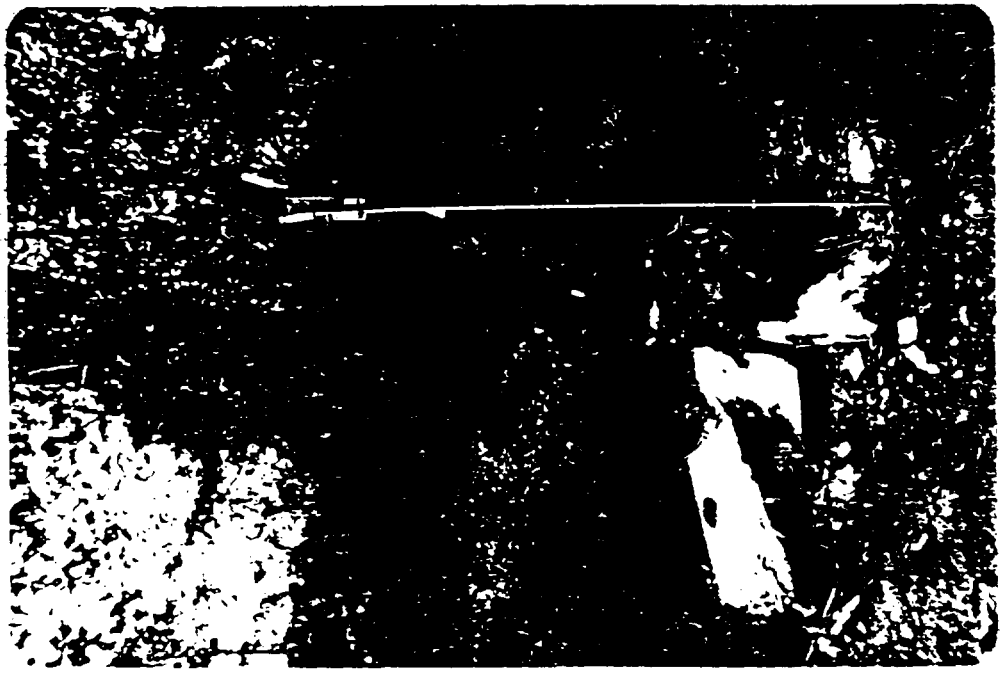


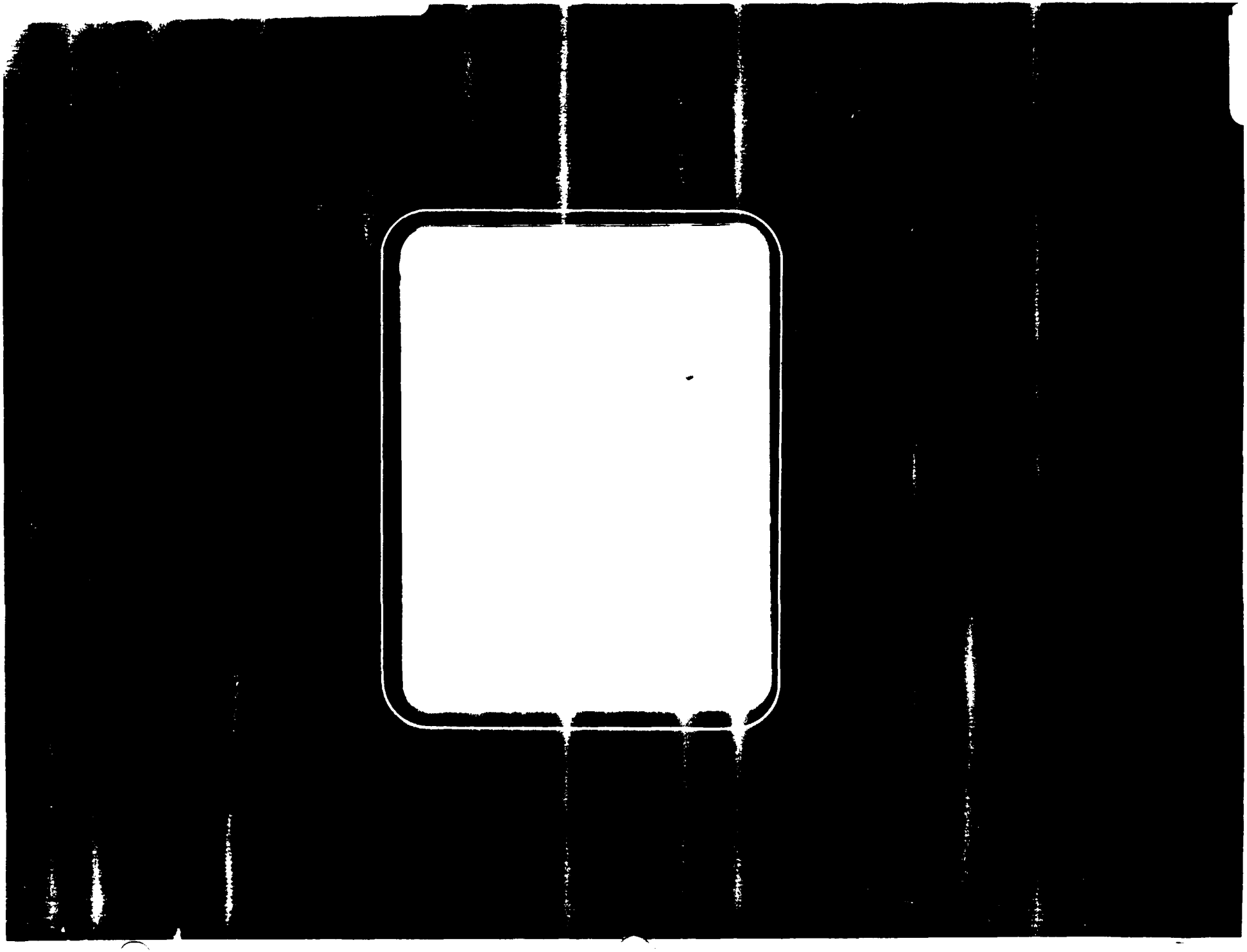












EPA/600/4-86/018
March 1986

AMBIENT MONITORING FOR PCB AFTER REMEDIAL CLEANUP OF TWO LANDFILLS IN THE BLOOMINGTON, INDIANA AREA

by

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A monitoring program was conducted to determine PCB levels in ambient air on and in the vicinity of two landfills at which interim remedial cleanup measures have been performed. The landfill sites are in the Bloomington, Indiana area. The sampling locations and methods used were the same as employed in a pre-cleanup monitoring program conducted during June and July, 1983.

Monitoring data obtained at former hot spots (on the sites where exposed capacitors were visible) showed a marked reduction from the pre-cleanup monitoring levels. However, PCB concentrations measured at downwind locations at the site boundaries during the pre- and post-cleanup monitoring were approximately the same.

Collocated monitoring conducted during the study showed that both the low- and high-volume sampling methods yielded reliable, reproducible measurements of airborne PCB levels.

This report was submitted in fulfillment of Contract No. 68-02-3745, Work Assignment No. 18 by Battelle Columbus Laboratories under sponsorship of the U.S. Environmental Protection Agency. This report covers the period from May 1984 to March 1985 and the field work was completed as of October 1984.

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FOREWORD

Measurement and monitoring research efforts are designed to anticipate potential environmental problems, to support regulatory actions by developing an in-depth understanding of the nature and processes that impact health and the ecology, to provide innovative means of monitoring compliance with regulations, and to evaluate the effectiveness of health and environmental protection efforts through the monitoring of long-term trends. In support of this objective, the Environmental Monitoring Systems Laboratory (EMSL), Research Triangle Park, North Carolina, has the responsibility for: assessment of environmental monitoring technology and systems; implementation of agency-wide quality assurance programs for air pollution measurement systems; and supplying technical support to other groups in the Agency including the Office of Air, Noise and Radiation, the Office of Toxic Substances and the Office of Enforcement.

In 1983, EMSL/RTP in conjunction with EPA Region 5 conducted a monitoring study at three landfills in the Bloomington, Indiana area to access the release of PCBs into the air and to establish a baseline prior to any remedial activities. Since that study was completed, interim remedial cleanup of two of the three landfills has been accomplished. In July 1984, a follow up study was conducted by EMSL/RTP to provide EPA Region 5 with data on airborne PCB levels following the interim cleanup of the two landfills. This document details the monitoring activities and the results obtained from the sampling at the two landfills.

Thomas R. Hauser, Ph.D.
Director
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ABSTRACT

A monitoring program was conducted to determine PCB levels in ambient air on and in the vicinity of two landfills at which interim remedial cleanup measures have been performed. The landfill sites are in the Bloomington, Indiana area. The sampling locations and methods used were the same as employed in a pre-cleanup monitoring program conducted during June and July, 1983.

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LIST OF ABBREVIATIONS

km -- kilometer

m -- meter

cm -- centimeter

mm -- millimeter

L/min -- liters per minute

scm/min -- standard cubic meters per minute (25°C, 760 mm Hg)

µg -- microgram (10^{-6} grams)

m/s -- meters per second

C -- degrees Centigrade

ppb -- parts per billion by volume

mL -- milliliter

ACKNOWLEDGMENT

The authors express appreciation to Dr. Robert G. Lewis for his assistance during the planning and conduct of the program. We also recognize the efforts of Donald L. Sgontz, Jr. and Todd Lemmon in conducting the field monitoring program and of Dr. Carter Noulton (Southwest Research Institute, San Antonio, TX) who was responsible for the analytical program. We are grateful for the excellent cooperation of Dr. Noulton and his staff throughout the study.

SECTION 1

INTRODUCTION

Three landfill sites in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCBs). They are identified as: Neal's Landfill, Neal's Dump and Lemon Lane Landfill. Visual surveys of these sites have shown several areas where capacitors are visible at or above ground level. In most of the areas leakage of the capacitors is suspected, due to apparent wetting of the soil and damage to the surrounding vegetation; as a consequence PCBs may be emitted, thus creating an air pollution problem.

During June and July 1983, a field program was conducted to monitor PCB levels in the ambient air at selected locations on and surrounding the three landfill areas[1]. Airborne PCB measurements on the sites were performed at localized areas (hot spots) where leaking capacitors were evident. Measurements were made at locations in the vicinity of the sites to determine upwind background levels and downwind emission levels.

During the Spring of 1984, interim remedial cleanup measures were conducted at Neal's Landfill and Neal's Dump to reduce PCB emissions from the sites. Following the cleanup operations, monitoring was performed to determine the reduction of airborne PCB levels on, and in, the vicinity of the two landfill sites. The monitoring locations and procedures employed were the same as those used in the previous study. Battery-operated, personal-type pump systems were used to sample during 8-hour daytime periods at a fixed height above hot spots. High volume systems were employed to sample for 24-hour periods at hot spots, upwind background location and downwind site perimeter locations. Vertical concentration profiles at hot spot areas, during 8-hour daytime periods, were determined with an array of five battery-operated sampling systems, positioned at different elevations above ground level. Polyurethane foam (PUF) cartridges were employed in all the sampling systems to collect PCBs from the ambient air. The quantity of PCBs collected in the PUF cartridges during sampling was determined by extraction and analysis of the extract by electron-capture gas chromatography using EPA Method 608. Meteorological conditions (wind speed and direction, temperature and relative humidity) were monitored, during sampling at the sites, to assist in interpretation of the PCB measurements.

This study was conducted to provide EPA Region V with data on airborne PCB levels following interim remedial cleanup of the two landfill sites.

SECTION 2

CONCLUSIONS

The results of the monitoring program show that the interim remedial cleanup reduced airborne PCB at former hot spots on the landfill. Airborne PCB levels at the downwind site boundaries remain approximately the same as observed during the pre-cleanup monitoring.

Modification of the high volume samplers by replacement of the conventional motor with a by-pass type, significantly improved the reliability and durability of this unit.

SECTION 3

RECOMMENDATIONS

The methodology used in this program has been refined; based on experience gained in several previous field studies. It has been demonstrated that the equipment and procedures yield reliable data; they are therefore recommended for similar future studies.

SECTION 4

EXPERIMENTAL PROCEDURES

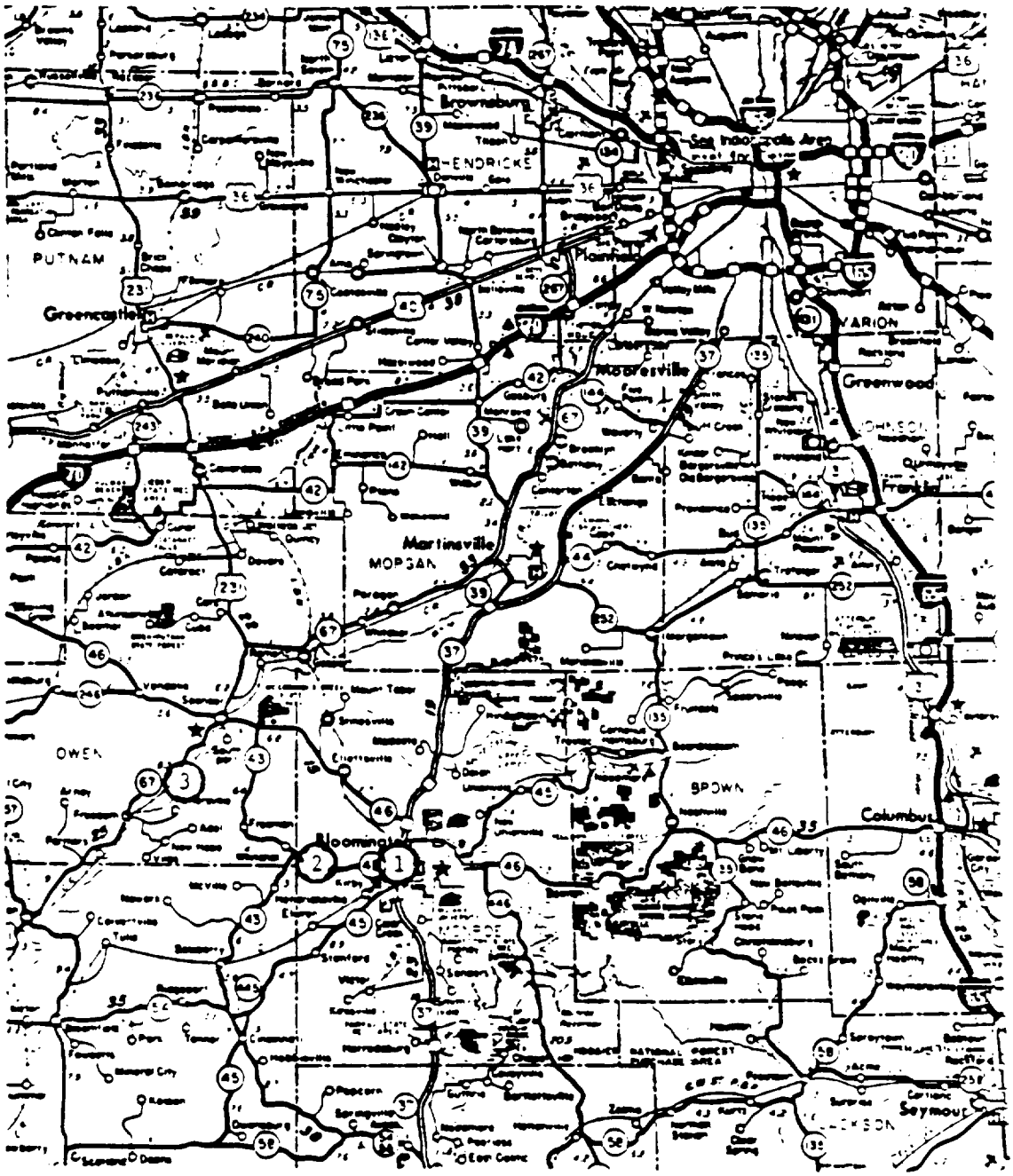
SITE/SAMPLING LOCATION DESCRIPTIONS

PCB monitoring was performed at two landfills located in a westerly direction within approximately a 5-mile radius of the city of Bloomington, IN. The respective locations of the landfills are shown on the map segment presented in Figure 1. Brief descriptions of the landfill sites and sampling locations at each site, follow.

Neal's Landfill

Neal's Landfill is located in Monroe County, directly north of Route 48, approximately 4.5 miles west of Bloomington, IN. It is located on privately-owned property. In general, the landfill proper is heavily overgrown with weeds and brush. Several dirt lanes permit use of vehicles for transit within the landfill area. The west, north and east extremities of the site are bordered by wooded areas. The general area is rather remote and very lightly populated; the nearest residences being located south of the landfill along Route 48. The closest residence is approximately 180 m (600 ft) from the landfill proper and is located near the gate to the landfill area. Preliminary visual surveys have identified approximately eight different areas on the landfill where PCB-containing capacitors are visible at or above ground level.

PCB monitoring at Neal's Landfill was performed at 7 of the 10 previous sampling locations shown in Figure 2. Three locations, designated A, C and E, were localized areas (hot spots) on the landfill proper where, prior to the remedial cleanup, leaking capacitors were visible at or above ground level. At Locations A and C, approximately 10-12 capacitors were visible. At each location, the capacitors were strewn over an area of approximately 10 m^2. Location E was a smaller area (1-2 m^2) where approximately three capacitors were exposed. Locations 2 through 4 were along the northern perimeter of the site, nominally downwind from the fill area. Distances from the edge of the fill area to these sampling locations ranged from approximately 12 m (Location 2) to 64 m (Location 4). Selection of the downwind monitoring locations was constrained by heavily wooded areas along the northern boundary of the site. The upwind monitoring point (U) was located near the gate at the entrance to the landfill site. Hot spot Locations B and D, and downwind Location 1, were sampling points used in the pre-cleanup monitoring program.



(1) Lemon Lane Landfill (previous study site)

(2) Neal's Landfill

(3) Neal's Dump

Figure 1. Location of landfill sites.

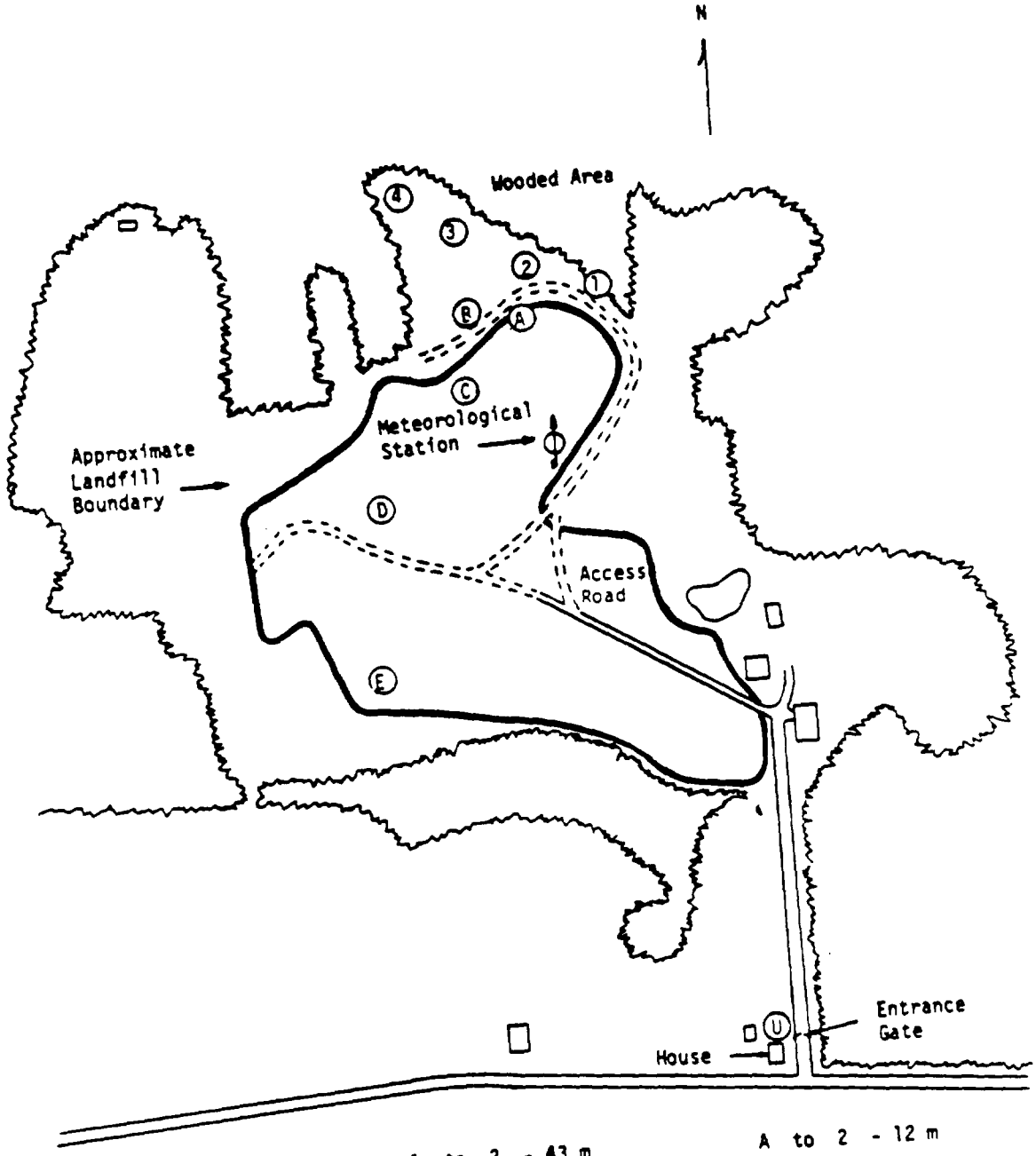


Figure 2. Monitoring locations at Neal's Landfill.

Neal's Dump

Neal's Dump is located in Owen County, directly off Pottersville Road, approximately 4 miles south of Spencer, IN. The site is approximately 21 driving miles west-northwest of Bloomington, IN. It is located on privately-owned property and encompasses an area of approximately 100 x 200 ft (~0.5 acres). The site is heavily overgrown with weeds and small brush. Woods border the north and west perimeters of the site. Several residences (houses and house trailers) along Potterville Road are situated on properties which border the east side of the landfill. Visual surveys have identified two small areas on the landfill site where PCB-containing capacitors are visible at ground level.

PCB monitoring at Neal's Dump was performed at three of the four previous sampling locations shown in Figure 3. Location A was a small area (~1 m^2) on the landfill where approximately three capacitors were visible prior to the remedial cleanup. Sampling Location DW was near a mobile home which is situated approximately east of the landfill area. Location U was near a mobile home situated south and generally upwind of the landfill area. Distances between the sampling locations are shown in Figure 3. Location B was a small hot spot area on the landfill which was used as a sampling location in the pre-cleanup monitoring program.

EQUIPMENT

PCB Sampling Systems

The PCB field monitoring was performed using low-volume and high-volume sampling systems developed and evaluated by Lewis, et al.[2,3,4] The components of the low volume sampling system, (shown in Figure 4) consist of a DuPont P-4000A, battery-operated, constant flow sampling pump and a polyurethane foam (PUF) cartridge to remove PCBs from the sampled air. The pumps operate on battery power for at least 8 hours at approximately 3.8 L/min; the flow rate which was used for the PCB sampling. LED indicators in the unit show battery charge level, low flow during sampling, and elapsed sampling time.

The sampling cartridges consist of a 20 mm (i.d.) x 10 cm long borosilicate glass tube into which is fitted, under slight compression, a 22 mm dia. x 7.6 cm long cylinder of PUF. The exit end of the glass envelope is drawn down to 7 mm (o.d.) to permit coupling the PUF cartridge to the pump inlet with a section of Tygon tubing.

The components of the EPA high volume sampler are shown in Figure 5. The system consists of a conventional high volume sampler modified by addition of an inlet head which accommodates a PUF sampling cartridge. The sampling head is comprised of an aluminum housing which holds a 10 cm diameter particulate filter (Pallflex 2500 QAST quartz) followed by a glass sampling cartridge containing a PUF plug. The sampling cartridge is constructed from a 60 mm i.d. x 125 mm borosilicate glass cylinder, into which is fitted, under a slight compression, a 62 mm o.d. x 7.6 cm PUF plug.

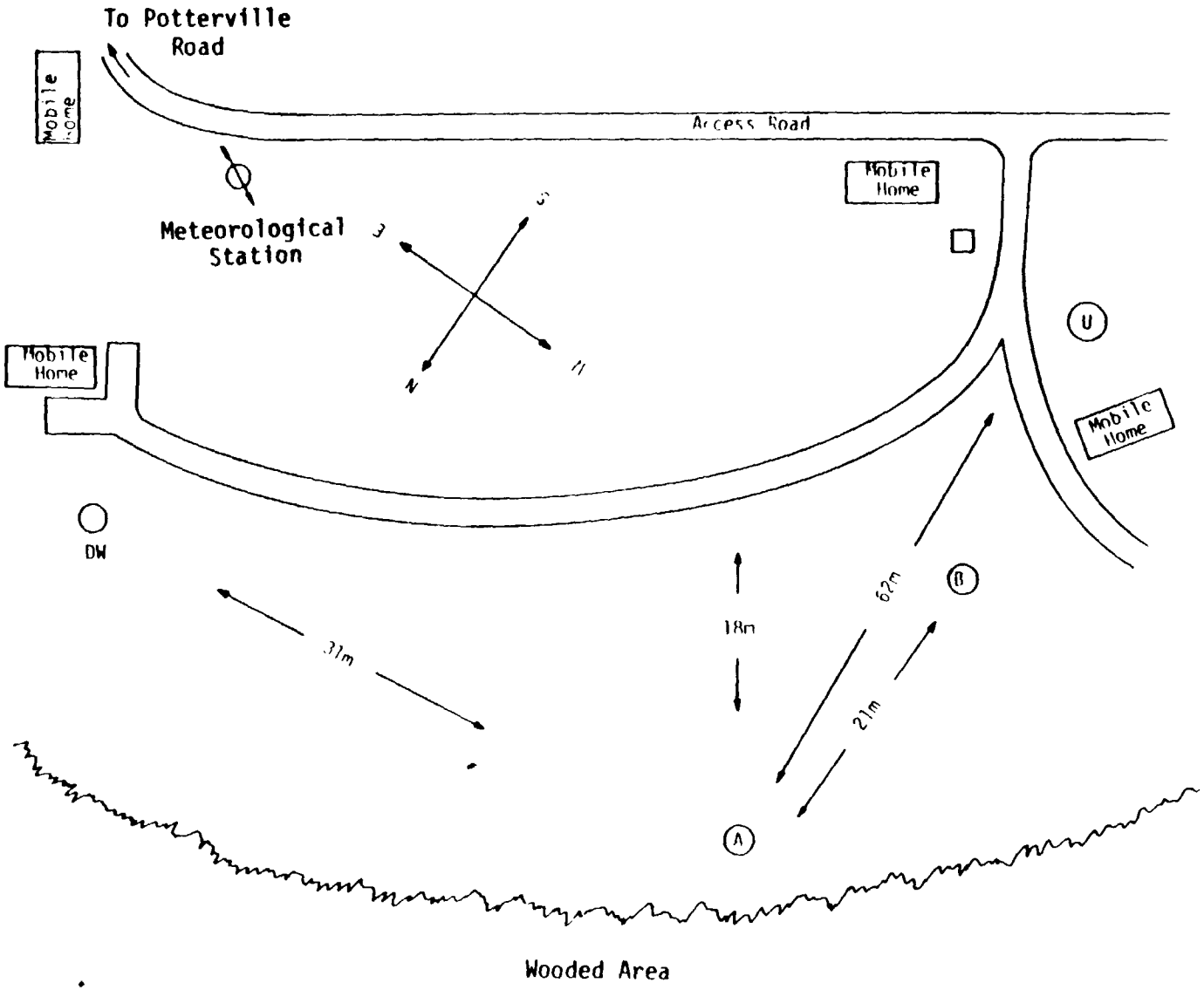


Figure 3. Monitoring locations at Neal's Dump.

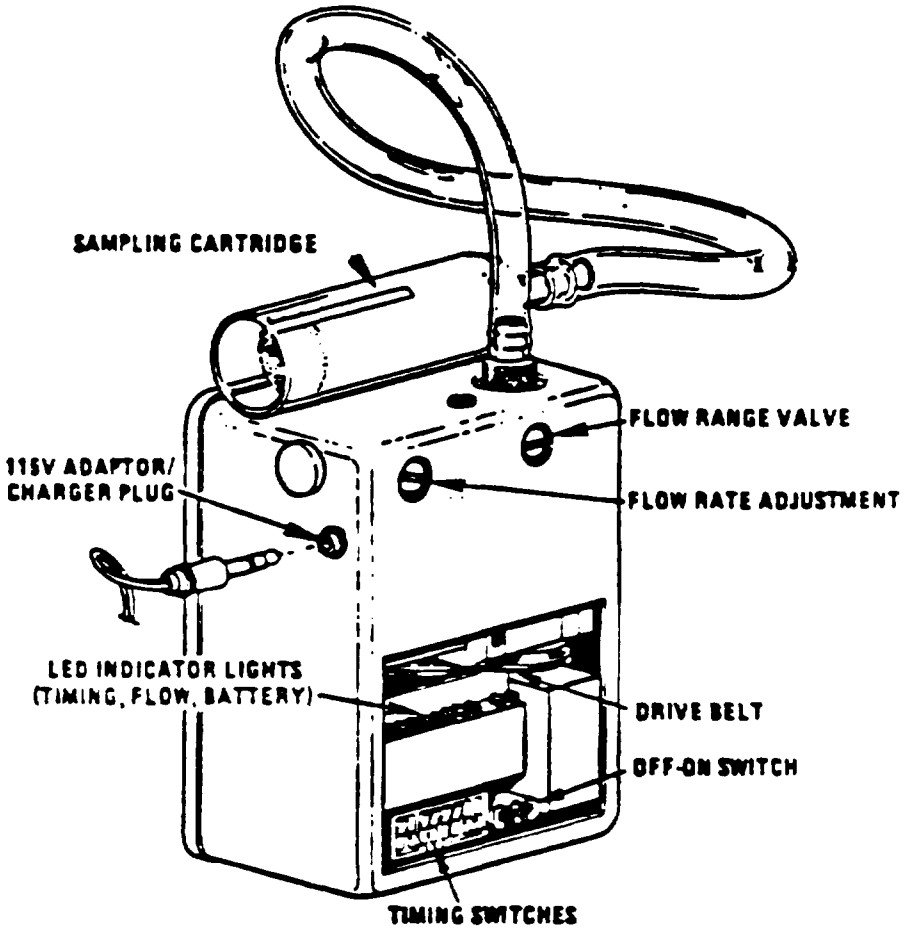


Figure 4. Low volume PCB sampler.

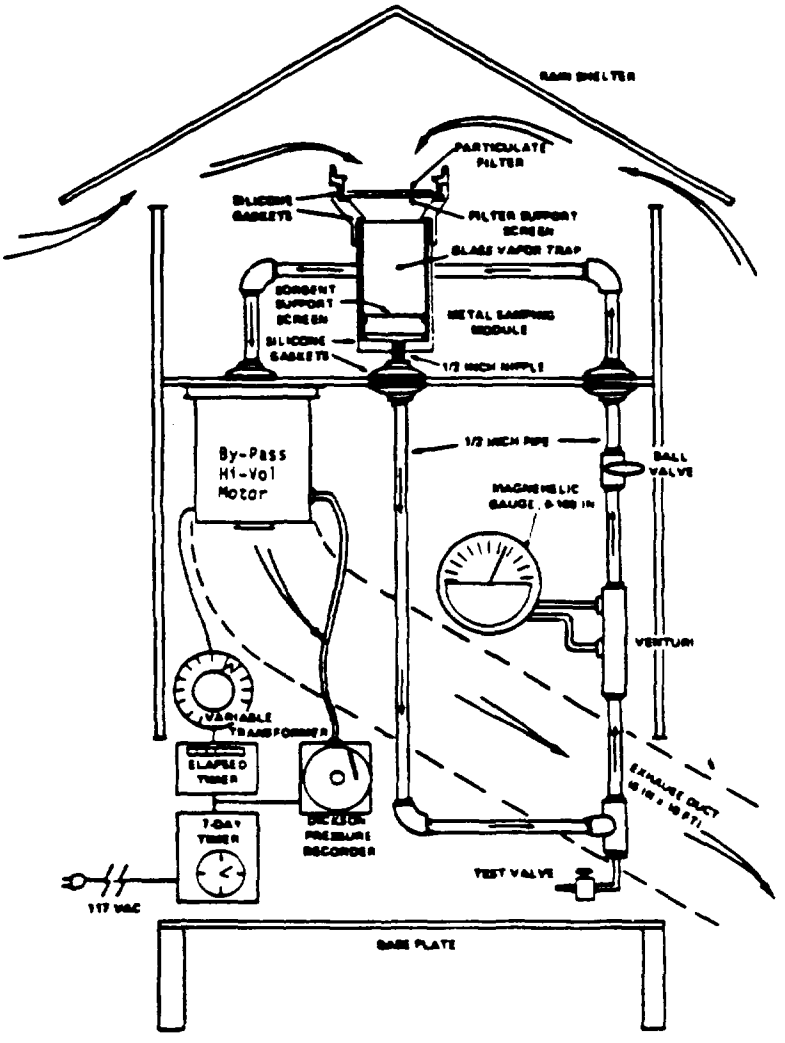


Figure 5. EPA high volume ambient air sampler.

The PUF plug is held in place by a screen supported on indentations near the bottom of the glass cylinder. Silicone rubber gaskets are used at each end of the cartridge to seal it in the sampler head. The conventional high volume sampler motors were replaced with a by-pass type for this study. This eliminated sampler failures encountered in the previous study due to overheating of the throttled-down conventional high volume motors.

For PCB sampling, the high volume units are operated at a flow rate of approximately 0.226 m^3/min (~8 cfm). A calibrated venturi tube with attached Magnehelic gauge provides a measure of the sampler flow rate. Other components in the system include: a) a valve to regulate flow, b) a Variac to control motor speed and c) an elapsed timer. A duct attached to the motor was used to direct the exhaust downwind from the sampler. At remote locations where line power was not available, the high volume samplers were operated from 1500 W gasoline-powered motor generators placed approximately 10 m downwind from the high volume sampling units. The motor generators were fitted with 5-gallon gasoline tanks to permit operation for about 18 hours between refueling.

Meteorological Stations

Continuous measurements of wind speed, wind direction and ambient temperature were obtained with Meterology Research, Inc. portable weather stations. One station was operated at Neal's Landfill and another system was operated at Neal's Dump during the sampling periods at the respective sites.

Relative humidity was determined from wet/dry-bulb temperature measurements.

PCB MONITORING PROCEDURES

As in the previous study, three different sampling procedures: (i.e.) a) low-volume, b) vertical profile and c) high-volume, were used to measure ambient air PCB concentrations and emission patterns on and in the vicinity of the landfill sites. These procedures were adapted from the protocol developed by Lewis, et al.[5,6] for monitoring hazardous waste sites.

DuPont P-4000A battery-operated, low volume samplers (flow rate ~3.8 L/min) were used to sample the ambient air at hot spots on the landfill sites and at upwind locations. The samplers were positioned with inlets of the PUF cartridges at 1.8 m above ground level. Sampling at hot spots was performed immediately downwind of the hot spot area over 8-hr day-time periods from approximately 0900 to 1700 hrs CDT.

Measurements of the vertical PCB concentration profiles were performed with a vertical array of five DuPont low volume samplers. The array was positioned directly over a hot spot area with inlets of the PUF cartridges at 2, 30, 60, 120, and 180 cm above ground level. Sampling was performed, for approximately 8-hr periods, starting at ~0900 and terminating at ~1700 hrs CDT.

EPA high volume systems (flow rate -8 cfm) were used to collect approximately 24-hr samples upwind of the sites, at hot spots on the sites, and along the downwind perimeter of the sites. The EPA samplers were situated with the inlets approximately 1.2 m above ground level and were located, to the extent possible, in areas where air flow was unrestricted in the windward direction.

The types and locations of samples collected at each site are summarized in Table 1 and discussed in the following sections. Detailed descriptions of the low- and high-volume sampling procedures are provided in Appendix A.

Neal's Landfill

Monitoring at Neal's Landfill was conducted on July 24, 25, 27, and 28, 1984. The following sampling was performed each day of the four-day monitoring program. Monitoring with low volume samplers was performed at three different hot spot locations on the site. Vertical profile measurements were made at one hot spot. High volume samples were obtained at one upwind location, one hot spot area on the site, and at three locations along the downwind perimeter of the site. High volume samples were collected for 24-hr periods at the hot spot location and at the three downwind locations. Motor generator units were used to provide electrical power for the high volume samplers operated at the hot spot and along the downwind perimeter of the site. Line power from a nearby residence was used to operate the upwind high volume sampler.

TABLE 1. SAMPLING PROGRAM SUMMARY

Site/Sampling Dates (1984)	Sampling Location[a]	Type of Sampling Performed[b]
Neal's Landfill July 24, 25, 27, and 28	HS-A	8hrLV, 8hrVP
	-C	8hrLV, 24hrHV, 8hrVP
	-E	8hrLV
	DW-2	24hrHV
	-3	24hrHV
	-4	24hrHV
	UW	24hrHV
Neal's Dump July 25 and 27	HS-A	8hrLV, 24hrHV
	DW	24hrHV
	UW	24hrHV

(a) HS - hot spot, DW - downwind, and UW - upwind.
(b) LV - DuPont low volume sampler, HV - EPA high volume sampler, and VP - in-line vertical array of five DuPont low volume samplers.

Neal's Dump

Monitoring at Neal's Dump was performed concurrently with the sampling activities at Neal's Landfill on July 25 and 27, 1984. The following sampling was performed each day of the two-day monitoring program. Low volume sampling was performed at one hot spot on the site and 24-hr high volume samples were obtained at one upwind location, one hot spot on the site, and one downwind location. The upwind and downwind high volume samplers were operated off line power from nearby residences. A motor generator unit was used to supply power to the sampler operated at the hot spot on the landfill. Vertical profile measurements were not performed at Neal's Dump.

SAMPLE HANDLING

Strict chain-of-custody procedures, as described in the NEIC Manual[7], were employed to the extent possible in all sample handling activities associated with this study. On-site visual surveillance was maintained during all daytime sampling periods to ensure that there was no tampering with the sampling systems. The high volume units used for 24 hr sampling were sealed with locks during unattended nighttime operation.

Immediately after removal from the samplers, all PUF cartridges coded with a unique sample number were returned to sealed glass bottles. The bottle caps were then sealed with chain-of-custody tape and stored in an ice chest at about 4°C until shipment to Southwest Research Institute (SwRI), San Antonio, Texas; for PCB analysis. All transfers of clean PUF cartridges and field samples were accompanied by chain-of-custody forms.

PCB ANALYSIS PROCEDURE

Analysis for PCBs in the PUF cartridges (and high volume filters) was performed according to the procedure described in the EPA Manual of Analytical Methods[8]. The steps in the analysis procedure included; a) Soxhlet extraction of the foam plugs (and filters in the case of high volume samplers) with 5 percent ether in hexane; b) concentration of the extract to 1 mL and c) determination of PCBs in an aliquot of the extract by electron capture-gas chromatography using EPA Method 608[9]. Identification and quantification of Aroclor 1242 and 1260 in the samples was performed by the technique described by Webb and McCall[10].

PCB analyses were performed by SwRI. A stepwise description of the analytical procedure which was used is given in Appendix B.

METEOROLOGICAL MEASUREMENTS

Measurements of wind speed, wind direction and ambient temperature were performed with Meteorological Research, Inc. (MRI) portable weather stations.

One unit was located at Neal's Landfill and a second unit was used to collect meteorological data at Neal's Dump. Strip chart data from the meteorological systems was manually reduced to obtain hourly averages. Relative humidity data were obtain from wet/dry-bulb temperature measurements made periodically during daytime sampling periods.

SECTION 5

RESULTS AND DISCUSSION

The PCB concentrations in ambient air, measured at locations on Neal's Landfill/Dump and in their vicinity after the interim remedial cleanup, are shown in Tables 2 and 3 respectively. Field sampling data associated with collection of the samples at each site are given in Appendix C. Meteorological data recorded during the field study are presented in Appendix F.

As shown in Table 4, post-cleanup PCB levels measured at hot spots on the sites, show a decrease from the pre-cleanup levels. However, at HS-A and HS-C on Neal's Landfill and HS-A on Neal's Dump, there appears to be residual contamination which gives rise to airborne PCB concentrations that are slightly above background levels.

In general, there is very little difference in pre- and post-cleanup PCB levels measured at the downwind locations at the two landfills. The pre- and post-cleanup levels measured upwind at Neal's Dump were approximately the same. PCB levels observed upwind of Neal's Landfill during the post-cleanup monitoring program were higher than those measured during the pre-cleanup monitoring.

During the post-cleanup monitoring period, maximum temperatures were in the range of 25 to 28^{o}C and there was frequent rainfall. In contrast, maximum temperatures during the pre-cleanup monitoring period were frequently in excess of 38^{o}C and there was an absence of rainfall.

TABLE 2. RESULTS OF PCB MONITORING AT NEAL'S LANDFILL

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Stop[a]	Sampling Time, min	Average Sampling Rate, L/min[b]	Total Sample Volume, scm	PCB Collected, µg	PCB Concentration in Ambient Air, µg/scm[c]
7/24/84	HS-A	8hr LV	0946	1746	480	3.653	1.75	1.5	0.9
		8hr LV	0946	1746	480	3.530	1.69	2.4	1.4
		VP-2	0950	1750	480	3.493	1.68	5.4	3.2
		VP-30	0950	1750	480	3.639	1.75	3.2	1.8
		VP-60	0950	1750	480	3.610	1.73	2.1	1.2
		VP-120	0950	1750	480	3.493	1.68	2.3	1.4
		VP-180	0950	1750	480	3.542	1.70	0.6	0.4
	HS-C	8hr LV	0956	1757	481	3.640	1.75	4.4	2.5
		24hr HV	0913	0803*	1370	227	311	1200	3.9
		24hr HV	0916	0803*	1367	227	310	1500	4.8
		VP-2	1000	1759	479	3.623	1.74	20.0	11.5
		VP-30	1000	1759	479	3.598	1.72	10.0	5.8
		VP-60	1000	1759	479	3.641	1.74	8.8	5.1
		VP-120	1000	1759	479	3.394	1.63	5.1	3.1
		VP-180	1000	1759	479	3.559	1.70	4.3	2.5
	HS-E	8hr LV	1007	1808	481	3.523	1.69	ND (<0.08)	<0.05
	UW	24hr HV	0841	0745*	1384	227	314	57	0.2
	DW-2	24hr HV	-	-	-	-	-	-	(d)
	DW-3	24hr HV	0923	0827*	1384	227	314	370	1.2
	DW-4	24hr HV	0934	0840*	1386	227	315	170	0.5

TABLE 2. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop[a]	Sampling Time, min	Average Sampling Rate, L/min[b]	Total Sample Volume, scm	PCB Collected, µg	PCB Concentration in Ambient Air, µg/scm[c]
7/25/84	HS-A	8hr LV	0858	1657	479	3.799	1.82	-	(e)
		8hr LV	0858	1657	479	3.753	1.80	1.4	0.8
		VP-2	0902	1659	477	3.620	1.73	5.1	2.9
		VP-30	0902	1659	477	3.799	1.81	2.4	1.3
		VP-60	0902	1659	477	3.663	1.75	2.0	1.1
		VP-120	0902	1659	477	3.672	1.75	1.4	0.8
		VP-180	0902	1659	477	3.657	1.74	0.9	0.5
	HS-C	8hr LV	0907	1705	478	3.765	1.80	3.0	1.7
		24hr HV	0822	0750*	1408	227	320	990	3.1
		24hr HV	0822	0750*	1408	227	320	1300	4.1
		VP-2	0911	1707	476	3.729	1.78	38.0	21.3
		VP-30	0911	1707	476	3.784	1.80	8.1	4.5
		VP-60	0911	1707	476	3.774	1.80	3.1	1.7
		VP-120	0911	1707	476	3.774	1.80	3.9	2.2
		VP-180	0911	1707	476	3.666	1.75	3.8	2.2
	HS-E	8hr HV	0917	1715	478	3.777	1.81	ND (<0.08)	<0.04
	UW	24hr HV	0754	0740*	1426	227	323	64	0.2
	DW-2	24hr HV	-	-	-	-	-	-	(d)
	DW-3	24hr HV	0838	0800*	1402	227	318	270	0.8
	DW-4	24hr HV	0849	0757*	1388	227	315	180	0.6

TABLE 2. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop[a]	Sampling Time, min	Average Sampling Rate, L/min[b]	Total Sample Volume, scm	PCB Collected, µg	PCB Concentration in Ambient Air, µg/scm[c]
7/27/84	HS-A	8hr LV	0828	1628	480	3.639	1.75	1.1	0.6
		8hr LV	0828	1628	480	3.642	1.75	1.0	0.6
		VP-2	0831	1630	479	3.668	1.76	5.2	3.0
		VP-30	0831	1630	479	3.680	1.76	2.1	1.2
		VP-60	0831	1630	479	3.682	1.76	1.7	1.0
		VP-120	0831	1630	479	3.636	1.74	1.6	0.9
		VP-180	0831	1630	479	3.654	1.75	1.0	0.6
	HS-C	8hr LV	0836	1636	480	3.712	1.78	3.0	1.7
		24hr HV	0817	0825*	1448	227	329	1200	3.6
		24hr HV	0817	0825*	1448	227	329	1300	4.0
		VP-2	0839	1637	478	3.670	1.75	26.0	14.9
		VP-30	0839	1637	478	3.712	1.77	10.0	5.6
		VP-60	0839	1637	478	3.697	1.77	9.1	5.1
		VP-120	0839	1637	478	3.721	1.78	3.9	2.2
		VP-180	0839	1637	478	3.689	1.76	3.1	1.8
	HS-E	8hr LV	0847	1647	480	3.637	1.75	ND (<0.08)	<0.05
	UW	24hr HV	0751	0800*	1449	227	329	97	0.3
	DW-2	24hr HV	0811	0815*	1444	227	328	350	1.1
	DW-3	24hr HV	0820	0837*	1457	227	331	280	0.8
	DW-4	24hr HV	0822	0847*	1465	227	333	140	0.4

TABLE 2. (Continued)

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Sampling Period, Hrs CDT Stop[a]	Sampling Time, min	Average Sampling Rate, L/min[b]	Total Sample Volume, scm	PCB Collected, µg	PCB Concentration in Ambient Air, µg/scm[c]
7/28/84	HS-A	8hr LV	0901	1701	480	3.803	1.83	0.8	0.4
		8hr LV	0901	1701	480	3.663	1.76	0.7	0.4
		VP-2	0904	1704	480	3.636	1.75	4.1	2.3
		VP-30	0904	1704	480	3.660	1.76	1.9	1.1
		VP-60	0904	1704	480	3.660	1.76	1.5	0.9
		VP-120	0904	1704	480	3.697	1.77	1.2	0.7
		VP-180	0904	1704	480	3.721	1.79	0.8	0.4
	HS-C	8hr LV	-	-	-	-	-	-	(f)
		24hr HV	0835	0827*	1432	227	325	1100	3.4
		24hr HV	0835	0827*	1432	227	325	1500	4.6
		VP-2	0910	1711	481	3.648	1.75	29	16.6
		VP-30	0910	1711	481	3.689	1.77	7.3	4.1
		VP-60	0910	1711	481	3.651	1.76	6.2	3.5
		VP-120	0910	1711	481	3.645	1.75	2.9	1.7
		VP-180	0910	1711	481	3.736	1.80	2.7	1.5
	HS-E	8hr LV	0919	1723	484	3.651	1.77	ND (<0.08)	<0.05
	UW	24hr HV	0805	0808*	1443	227	327	72	0.2
	DW-2	24hr HV	0835	0827*	1432	227	325	450	1.4
	DW-3	24hr HV	0845	0835*	1430	227	325	280	0.9
	DW-4	24hr HV	0852	0835*	1421	227	323	140	0.4

FOOTNOTES FOR TABLE 2.

(a) Asterisk indicates that stop time was on the following day, i.e., sampling time was ~24 hours.

(b) Liters/minute at 25 C, 760 mm Hg.

(c) Reported as micrograms of Aroclor 1242 per standard cubic meter (25 C, 760 mm Hg).

(d) Motor generator failed, sample void.

(e) Sample lost during analysis.

(f) Support pole fell over; sample void.

TABLE 3. RESULTS OF PCB MONITORING AT NEAL'S DUMP

Sampling Date	Sampling Location	Sample Type	Sampling Period, Hrs CDT Start	Stop[a]	Sampling Time, min	Average Sampling Rate, L/min[b]	Total Sample Volume, scm	PCB Collected, µg	PCB Concentration in Ambient Air, µg/scm[c]
7/25/84	HS-A	8hr LV	0904	-	-	-	-	-	(d)
		8hr LV	0904	1704	480	3.669	1.76	1.6	0.9
		24hr HV	0837	(e)	625	227	142	400	2.8
		24hr HV	0836	(e)	624	227	142	390	2.7
	UW	24hr HV	0812	0806*	1434	227	326	60	0.2
	DW	24hr HV	0823	0832*	1449	227	329	45	0.1
7/27/84	HS-A	8hr LV	0852	1652	480	3.675	1.76	1.5	0.9
		8hr LV	0852	1652	480	3.694	1.77	1.5	0.8
		24hr HV	0836	0837*	1441	227	327	980	3.0
		24hr HV	0836	0837*	1441	227	327	1000	3.1
	UW	24hr HV	0821	0823*	1442	227	327	48	0.1
	DW	24hr HV	0843	0854*	1451	227	329	41	0.1

(a) Asterisk indicates that stop time was on the following day, i.e., sampling time was ~24 hours.

(b) Liters/minute at 25 C, 760 mm Hg.

(c) Reported as micrograms of Aroclor 1242 per standard cubic meter (25 C, 760 mm Hg).

(d) Sample pump failed.

(e) Motor generator failed, sampling time determined from elapsed timer.

TABLE 4. COMPARISON OF PRE- AND POST-CLEANUP MONITORING DATA

Sampling Location	Sample Type	Range of PCB Concentrations (µg/SCM) Found	
		Pre-Cleanup	Post-Cleanup
Neal's Landfill			
HS-A	8hr LV	5.1-11	0.4-1.4
	VP-2cm	552-1053	2.3-3.2
	VP-30cm	56-120	1.1-1.8
	VP-60cm	30-49	0.9-1.2
	VP-120cm	10-23	0.7-1.4
	VP-180cm	6.4-13	0.4-0.6
HS-C	8hr LV	5.3-12	1.7-2.5
	24hr LV	5.2-14	3.1-4.8
	VP-2cm	941-1108	11.5-21.3
	VP-30cm	111-157	4.1-5.8
	VP-60cm	40-62	1.7-5.1
	VP-120cm	15-21	1.7-3.1
	VP-180cm	8.6-16	1.5-2.5
HS-E	8hr LV	7.3-18	ND(<0.04)
UW	24hr HV	0.08-0.09	0.2-0.3
DW-2	24hr HV	0.8-1.8	1.1-1.4
DW-3	24hr HV	0.8-1.8	0.8-1.2
DW-4	24hr HV	0.3-0.7	0.4-0.6
Neal's Dump			
HS-A	8hr LV	7.9-19	0.8-0.9
	24hr HV	23-61	2.7-3.1
UW	24hr HV	0.1-0.2	0.1-0.2
DW	24hr HV	0.1-0.2	0.1

SECTION 6

QUALITY ASSURANCE DATA SUMMARY

Quality control and quality assurance procedures were implemented in this study in accordance with a formal plan approved by the Quality Assurance Division (QAD), EPA/RTP[11]. The QC/QA procedures were designed to provide quality control of all steps in the PCB measurements and to permit quantitative assessment of data quality. The QC/QA data obtained during the study are summarized in the following sections.

FLOW CALIBRATIONS

Low Volume Sampling Pumps

The Du Pont P-4000A sampling pumps were calibrated with a Du Pont calibrator system. The calibrator system consists of a 500 cc bubble tube and a Magnehelic flow meter to measure flow rate and a Magnehelic pressure gauge and a needle valve to introduce a flow resistance to check the constant flow performance of the pumps.

Calibration of the pumps was performed twice each sampling day: in the morning before the start of the sampling period and in the evening after termination of sampling. During the morning calibration, the pumps were also checked to determine that: a) the battery was fully charged, b) that constant flow was maintained at a 254 mm Hg pressure drop and that c) the low flow indicator functioned properly.

The flow calibration data obtained during the study are presented in Appendix D. The differences between the pre- and post-sampling flow calibrations ranged from +1.4 to -5.8 percent. Generally, flows measured after sampling were slightly less than those determined before sampling due possibly to discharge of the batteries during sampling. With the exception of three occasions, all the pre- and post-sampling flow calibrations 60 determinations) agreed to within $\pm$ 5 percent.

High Volume Samplers

Calibration of the EPA high volume samplers was performed before starting and at the end of the field sampling program. Calibration of the high volume samplers was performed with an orifice assembly obtained from General Metal Works. The calibration curve supplied with the orifice is shown in Appendix D. Calibration data for the high volume samplers is also given in Appendix D.

FLOW AUDIT

A flow audit of the samplers used in the study was performed by the Environmental Monitoring Systems Laboratory, Quality Assurance Division. The audit was conducted on July 24 and 25 during actual field sampling operations at Neal's Landfill and Neal's Dump. A copy of the report which describes the audit procedures and results is provided in Appendix E. Based on a pre- and post-sampling audit of 16 Du Pont pumps (32 audit flow checks), the average difference between the operator and audit flow rate values was -2.6 percent, with a maximum difference of only -3.7 percent. The average difference between the BCL and audit flow rates obtained from the audit of five high volume samplers (10 audit flow checks) was +7.2 percent. With the exception of one value (+11.25 percent), all audit and operator flow rates agreed within ±10 percent.

FIELD BLANKS

Field blanks were analyzed with the ambient air samples collected at each landfill site. The blanks, which were low volume and high volume PUF cartridges carried throughout all field operations except sampling. The PCB level in all the field blanks was below a minimum detectable concentration of 0.02 µg Aroclor 1242.

STANDARDS ANALYSIS

A set of samples consisting of PUF cartridges, spiked with known quantities of Aroclor 1242, were analyzed during the study. They were prepared by Battelle Columbus Laboratories and submitted to SwRI for analysis along with the ambient air samples. The set of standards contained six, clean, unused, PUF cartridges (three low volume and three high volume) spiked with either 0.95, 4.72, or 9.44 µg of Aroclor 1242. National Bureau of Standards/ Standard Reference Material (NBS/SRM) 1581 (Aroclor 1242 in transformer oil) was used to prepare the standards.

The results obtained from analysis of the standards are shown in Table 5. Recoveries determined for individual samples ranged from 84 to 105 percent. Variations in recovery do not appear to be correlated with either cartridge type (low volume or high volume) or concentration over the spiking range. The median recovery from all the low volume cartridges and all the high volume cartridges was 89 and 100 percent, respectively.

COLLOCATED MONITORING DATA

During the field study, pairs of low volume (LV) and high volume (HV) samplers were operated for the same time period at the same sampling location to estimate the reproducibility of the measurement methods.

TABLE 5. SPIKED CARTRIDGE ANALYSIS RESULTS

Cartridge Type	Aroclor 1242 Added, µg	Aroclor 1242 Found, µg	Recovery, %
LV	9.44	9.7	103
LV	0.95	0.8	84
LV	4.72	4.2	89
HV	0.95	1.0	105
HV	4.72	4.7	100
HV	9.44	8.7	92

The data obtained from collocated low volume samplers is shown in Table 6. Good agreement between the pairs of measurements was obtained especially in view of the low PCB levels.

PCB concentrations measured by collocated high volume samplers are given in Table 7. The median difference calculated from all the paired high volume sampler measurements is 15.6 percent. The results show excellent agreement between the sampler pairs, considering that the units were positioned approximately one meter apart (to minimize sampler interaction) and spatial variations in airborne PCB levels could contribute to differences observed by the two systems.

TABLE 6. COLLOCATED LOW VOLUME SAMPLER DATA[a]

Site	Sampling Date	Sampling Location	PCB Conc. in Air, µg/scm	Percent Difference in Pair
Neal's Landfill	7/24/84	HS-A	0.9 1.4	43.5
	7/27/84	HS-A	0.6 0.6	0.0
	7/28/84	HS-A	0.4 0.4	0.0
Neal's Dump	7/27/84	HS-A	0.9 0.8	11.8
			Median	5.9

(a) Separation between sampling cartridge inlets was approximately 15 cm.

TABLE 7. COLLOCATED HIGH VOLUME SAMPLER DATA[a]

Site	Sampling Date	Sampling Location (Type)	PCB Conc. in Air, µg/scm	Percent Difference in Pair
Neal's Landfill	7/24/84	HS-C	3.9 4.8	20.7
	7/25/84	HS-C	3.1 4.1	27.8
	7/27/84	HS-C	3.6 4.0	10.5
	7/28/84	HS-C	3.4 4.6	30.0
Neal's Dump	7/25/84	HS-A	2.8 2.7	3.6
	7/27/84	HS-A	3.0 3.1	3.3
			Median	15.6

(a) Separation between sampler inlets was approximately 1 meter.

REFERENCES

1. Sgontz, D. L. and Howes, J. E., Jr., "Ambient Monitoring for PCB Near Three Landfills in the Bloomington, Indiana Area", Final Report to U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Research Triangle Park, North Carolina 27711. Contract No. 68-02-3745 (WA-4), January 1985.

2. Lewis, R. G. and MacLeod, K. E., "Portable Sampler for Pesticides and Semivolatile Industrial Organic Chemicals in Air", Analytical Chemistry, 54, No. 2, pp. 310-315 (February 1982).

3. Lewis, R. G., Brown, A. R., and Jackson, M. D., "Evaluation of Polyurethane Foam for Sampling of Pesticides, Polychlorinated Biphenyls, and Polychlorinated Napthalenes in Ambient Air", Analytical Chemistry, 49, No. 12, pp. 1668-1672 (October 1977).

4. Lewis, R. G. and Jackson, M. D., "Modification and Evaluation of a High-Volume Air Sampler for Pesticides and Semivolatile Industrial Organic Chemicals", Analytical Chemistry, 54, No. 3, pp. 592-594 (March 1982).

5. Lewis, R. G., Jackson, M. D., and MacLeod, K. E., "Protocol for Assessment of Human Exposure to Airborne Pesticides", EPA-600/2-80-180 (August 1980).

6. Lewis, R. G. "Procedures for Sampling and Analysis of Polychlorinated Biphenyls in the Vicinities of Hazardous Waste Disposal Sites", Advanced Analysis Techniques Branch, Environmental Monitoring Systems Laboratory, Research Triangle Park, NC 27711 (March 16, 1982).

7. National Enforcement Investigations Center (NEIC) Policies and Procedures Manual, EPA-330/9-78-001-R, May 1978 (Revised October 1979).

8. Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples, EPA-600/8-80-038 (June 1980).

9. Federal Register, Volume 44, No. 233, Monday, December 3, 1979, pp. 69501-69509.

10. Webb, R. G. and McCall, A. C., "Quantitative PCB Standards for Electron Capture Gas Chromatography", Journal of Chromatographic Science, 11, pp. 366-373 (July 1973).

11. Quality Assurance Project Plan for Ambient Monitoring for PCBs Near Three Landfills in the Bloomington, Indiana Area, Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency (March 31, 1983).

APPENDIX A

OPERATING PROCEDURES FOR DU PONT LOW VOLUME AND EPA HIGH VOLUME SAMPLERS

Step-wise procedures used to perform sampling with the Du Pont low volume and EPA high volume sampling systems are given below. The procedures follow the protocol that Lewis, et al[5,6] have developed for PCB monitoring.

Du Pont Low Volume Samplers

(1) Calibrate the flow rate of the Du Pont pumps in the morning before starting the day's sampling activities.

(2) At the field site, place pumps at designated sampling locations. Record pump S/N and corresponding sampling location I.D. on the Sampling Data Form (Figure A-1).

(3) a) Using latex gloves*, remove a clean PUF cartridge from its sample bottle, carefully unwrap the aluminum foil from the cartridge. b) Fold aluminum foil, replace in sample bottle, and tightly close the bottle cap. c) Connect the PUF sampling cartridge to the DuPont pump sampling inlet using a short piece (12-18 in.) of Tygon tubing. d) Record the PUF cartridge number on Sampling Data Form.

(4) a) Using metal three-prong clamps that have been rinsed with B&J hexane, mount the PUF cartridges on the sampler support rod in a vertical position with the inlet pointing downward. b) Position cartridge inlets as follows: up-wind and "hot-spots" - 1.8 m above ground level, vertical profiles - 2, 30, 60, 120, and 180 cm above ground level. c) Record cartridge height above ground on Sampling Data Form.

(5) a) Turn pumps on and begin sampling period at 0900 hrs CDT (±30 minutes). b) Record starting clock time on Sampling Data Form. c) During the sampling period check pumps at least every 2 hours for proper operation. d) Record any abnormal conditions on Sampling Data Form.

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* Note: Clean latex gloves must be worn at all times when handling the PUF cartridges.

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site _____ Date _____ Performed by _____

Sampler S/N	Sampling Location ID	Height Above Ground, cm	PUF Cart No	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr mm	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				

[a] Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by _____ Date _____

Figure A-1. Du Pont low volume PCB sampling data form.

(6) a) After sampling for 8 ±0.5 hrs, terminate sampling period by turning pumps off. b) Record clock time that pump was turned off on Sampling Data Form. c) Just before turning pumps off, push test button on pump and check low flow light and the elapsed time indicator lights. If low flow light comes on, it indicates that a low flow condition existed during the sampling period, e.g., Tygon tubing crimped, cartridge plugged, pump stopped, etc). d) Record results of the low flow check on Sampling Data Form. e) Record elapsed time from the pump timer on the Sampling Data Form as a check on the clock time.

(7) As soon as possible after termination of sampling, remove the PUF cartridge from the Tygon sample line (using latex gloves), wrap cartridge in its original aluminum foil wrapping, and place in the original sample bottle. Cap tightly, label bottle with sampling data and sample I.D., and seal the bottle cap with a strip of "Evidence Tape".

(8) After recovery, store all samples on ice in a locked ice chest. Maintain storage under these conditions until samples are shipped to SwRI for analysis.

(9) Re-calibrate the flow rate of the DuPont pumps after completing the day's sampling activities.

EPA Samplers

(1) Place calibrated EPA hi-vol units at designated sampling locations. Record the hi-vol S/N and corresponding sampling location I.D. on the Sampling Data Form (Figure A-2).

(2) Using latex gloves, remove a clean PUF cartridge from its sample bottle and carefully unwrap the aluminum foil from the cartridge. Fold aluminum foil, replace in sample bottle, and tightly close the bottle cap.

(3) Insert the PUF cartridge into the hi-vol sampler head, making sure that both the top and bottom silicone rubber gaskets are in place. Attach the top section of sampler head and tighten to seal the PUF cartridge in place. Place a new Pallflex 2500 QAST quartz fiber filter in the top of the sampling head and seal in place with the retaining ring. Record PUF cartridge number and indication that new filter was installed on Sampling Data Form.

(4) Turn the hi-vol unit on and begin sampling period at 0800 hrs CDT (±60 minutes) for 24-hour samples. Check to ensure that the hi-vol motor exhaust duct is directed downwind. Record starting clock time, elapsed-timer reading and Variac setting on the Sampling Data Form. After the initial 5 minutes of operation, obtain a reading from the Magnehelic gauge and record the clock time and gauge reading on the Sampling Data Form (Space 1).

Battelle

HIGH VOLUME PCB SAMPLING DATA

Site ____________________ Date ____________________ Performed by ____________________

Sampler S/N	Sampling Location I.D.	New Filter I.D.	PUF Cart No.	Variac Setting	Clock Time			Sampler Timer			Venturi Readings Time/Magnehelic in H_2O				Comments[a]
					Start hr CDT	Stop hr CDT	Min Elapsed	Start min	Stop min	Min Elapsed	1	2	3	4	

(a) Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by ____________________ Date ____________________

Figure A-2. High volume PCB sampling data form.

(5) Monitor sampler for proper operation during the remainder of the daylight hours. Obtain a Magnehelic gauge reading on each hi-volume at approximately 6-hour intervals and record readings and clock times at which the readings were taken on the Sampling Data Form (Spaces 3 and 4).

(6) Before leaving the site in the evening, secure samplers by padlocking access doors on the units.

(7) On the following morning after an elapsed sampling time of 24 $\pm$0.5 hrs, terminate sampling period by turning the hi-vol unit off. Just before turning unit off, obtain a reading from the Magnehelic gauge and record the reading along with the clock time on the Sampling Data Form (Space 4). Record clock time the unit was turned off and the elapsed timer reading on the Sampling Data Form.

(8) As soon as possible after termination of sampling, remove the filter and PUF cartridge from the hi-vol unit sampling head. Using latex gloves, remove the filter retaining ring and with a hexane-rinsed metal spatula remove filter. Fold the filter in half with the face containing the particulate catch inward and then fold in half again. Completely wrap the filter in a piece of hexane-rinsed aluminum foil and place in the PUF cartridge bottle. Remove the PUF cartridge from sampler head, completely wrap with the original aluminum foil wrapping and place in original sample bottle. Label bottle with sampling data and sample I.D. Cap tightly, label bottle with sampling data, and seal the bottle cap with a strip of "Evidence Tape".

(9) After recovery, store all samples on ice in a locked ice chest. Maintain storage under these conditions until samples are shippped to SwRI for analysis.

APPENDIX B

PCB ANALYSIS PROCEDURE

PUF Cartridge Cleanup

All PUF cartridges were cleaned to remove contamination and interferences prior to use for ambient air monitoring. The clean up was performed by Soxhlet extraction of each PUF plug with 5% ether/hexane for a period of at least 16 hours according to Steps (10) through (16) of the PCB analysis procedure. One PUF plug from each batch of 20 processed through the cleanup steps was re-extracted and analyzed according to the PCB analysis procedure to assure that the plugs are acceptable for field sampling.

Following clean-up, the sampling cartridges (PUF plug in a glass envelope) were wrapped in hexane-rinsed aluminum foil and then individually sealed in cleaned glass bottles (with hexane-rinsed aluminum foil liners in caps) for shipment to the field sampling site.

PCB Analysis Procedure

The PUF cartridges were analyzed for PCB's by a) Soxhlet extraction of the foam plugs as described by Lewis[2], b) concentration of the extract, and c) determination of PCB's by EPA Method 608[10]. The analyses was performed according to the following procedure.

I. Equipment and Reagents Required for PUF Sample Extraction

1. Glassware
   500 mL boiling flasks
   300 mL capacity Soxhlet extractors
   3 ball condensers
   500 mL Kuderna-Danish apparatus
   15 mL receiver tubes
   Synder columns
   Filter tubes (Corning 9480-32)
   Pre-scored (1 mL, 5mL) amber glass vials with teflon-lined caps
   9" long disposable transfer (Pasteur) pipets
   Wash all glassware with Alconox; rinse with deionized water, acetone, hexane, and deionized water; then fire in kiln (500 C)

2. Equipment
   Extraction Apparatus, Multi-Unit Heater (CMS 119-362)
   Blunt-end forceps
   Surgical tongs (approximately 12")

Steam bath
Nitrogen blow-down evaporator
Glass wool (Heater overnight at 350 C in muffle furnace)
Boiling granules (Heater overnight at 500 C in kiln)
Teflon wash bottles

3. Reagents
Burdick and Jackson, Distilled in Glass Solvents:
Acetone
Hexane
Ethyl Ether (Preserved with Ethanol)
Sodium Sulfate, 12-60 mesh, Anhydrous (Baker 5-3375) (Heated overnight at 500°C in kiln).

II. Sample Receipt and Extraction

1. Log samples in log book. Note any damage to sample or irregularities (i.e., EPA chain of custody tape broken).

2. Prepare 5% ethyl ether in hexane. Prepare by case lot of hexane. Remove 200 mL of hexane from freshly opened bottle and add 180 mL of freshly opened ethyl ether (preserved with ethanol).

3. Rinse condenser towers with 5% ether/hexane.

4. Wipe off lab bench with 5% ether/hexane.

5. Add 300 mL of 5% ether/hexane to 500 mL boiling flask. Add boiling granules (no more than 3 granules).

6. Dim lights in laboratory before removing first sample. Rinse a large sheet of aluminum foil with 5% ether/hexane. Be sure to use waste rinse container. Place foil, rinsed side up, on lab bench. Use this for forceps and tongs. Rinse forceps and tongs with 5% ether/hexane.

7. Carefully remove sampling cartridge from jar and unwrap aluminum foil. Handle cartridge minimally, placing it on its own aluminum foil wrapping.

8. Note in project log book any breakage or damage to sampling cartridge.

9. With pre-rinsed forceps, carefully remove the foam plug (PUF) from the sampling cartridge.

10. Place the PUF in the Soxhlet, and connect the Soxhlet to the 500 mL boiling flask. (If hi-vol sample, also place corresponding particulate filter in Soxhlet with PUF plug). Wet the joint with 5% ether/hexane. Place the forceps on the aluminum foil wrapping. Label the boiling flask with sample I.D.

11. Taking the pre-rinsed tongs, adjust the PUF in the Soxhlet to wedge it midway along the length of the siphon. Rinse the tongs into the Soxhlet with the 5% ether/hexane. Rinse the forceps, glass sampling cartridge, and aluminum foil wrapping with 5% ether/hexane into the Soxhlet. Place the forceps and tongs on the aluminum foil sheet. Dispose of the aluminum foil wrapping and place the glass cartridge aside for washing and recycling.

12. Connect the Soxhlet to the condenser, wetting the glass joint with 5% ether/hexane for a good seal.

13. Repeat the process for the day's samples being sure to include a solvent blank, field blank, and a control sample.

14. Check water flow to condenser towers, and turn on heating units.

15. As samples begin to boil, check Soxhlets making sure they are filling and siphoning properly (4 cycles/hour). Allow samples to cycle overnight or for a minimum of 16 hours.

16. Turn off heating units and allow samples to cool to room temperature. Be sure the lights are dim.

17. Set up Kuderna-Danish (K-D) with receiver tubes. Add one boiling granule to each set up. Label the K-D's with the sample I.D.

18. Pack filter tubes with glass wool and sodium sulfate. Place tube in neck of K-D.

19. Carefully remove Soxhlet and boiling flask from condenser tower. Drain remaining solvent into boiling flask.

20. Carefully pour sample through filter tube into K-D. Rinse boiling flask 3 times with hexane. Swirling hexane along sides of boiling flask. Once sample has drained, rinse down filter tube with hexane.

21. Attach Snyder column to K-D and rinse Snyder column to wet joint.

22. Place K-D on steam bath and evaporate sample to approximately 5 mL. Do not let sample go to dryness.

23. Remove sample from steam bath, rinsing Snyder column with a minimum of hexane. Allow sample to cool.

24. Remove sample from K-D, making sure to label receiver tube.

25. Rinse nitrogen blow down spouts with hexane and place samples so as to further concentrate. Transfer samples to pre-scored vials using transfer pipets. Rinse receiver tube 3 times making a quantitative transfer. Concentrate samples to 1 mL or per instruction from analyst.

26. Make a master list of all samples prepared, date received, and processed. Give the list and sample extracts to the GC analyst.

III. GC Analysis (EPA Method 608)

1. Analyze samples using the following GC operating conditions.

Column:	Supelcoport 100/120 mesh coated with 1.5% SP-2250/1.95% SP-2401 packed in glass (180 cm x 4 mm ID)
Carrier:	5% methane/95% Argon at 60 mL/min
Column Temperature:	200 C, isothermal
Detector:	ECD

2. Calibrate the system daily with a minimum of three injections of calibration standards which have been referenced to NBS/SRM 1581 (Aroclor 1242 in oils)

3. Inject 2-5 µL of the sample extract using the solvent-flush technique. Smaller (1.0 µL) volumes can be injected if automatic devices are employed. Record the volume injected to the nearest 0.05 µL and the resulting peak size, in area units.

4. If the peak area exceeds the linear range of the system, dilute the extract and reanalyze.

IV. Quality Control (QC)

1. Analyze one laboratory blank per each batch of 20 samples.

2. Analyze one laboratory spike per each batch of 20 samples.

APPENDIX C

FIELD SAMPLING DATA

The data recorded during the field sampling programs at Neal's Landfill and Neal's Dump are presented in this appendix.

Battelle
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DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Landfill Date 7/24/84 Performed by Sgantz, Jr./Sgantz, Sr./Lemmon

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr:min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
5138	NL-LV-HSA-1	180	L58	0946	1746	480	—	No	
A092	NL-LV-HSA-2	180	L54	0946	1746	480	—	No	
5136	NL-VP-HSA-2	2	L59	0950	1750	480	—	No	
9806	NL-VP-HSA-30	30	L60	0950	1750	480	—	No	
5116	NL-VP-HSA-60	60	L53	0950	1750	480	8:00	No	
A083	NL-VP-HSA-120	120	L55	0950	1750	480	—	No	
A087	NL-VP-HSA-180	180	L56	0950	1750	480	8:05	No	
A037	NL-LV-HSC	180	L49	0956	1757	481	8:04	No	
A061	NL-VP-HSC-2	2	L50	1000	1759	479	8:00	No	
A143	NL-VP-HSC-30	30	L51	1000	1759	479	—	No	
A126	NL-VP-HSC-60	60	L52	1000	1759	479	—	No	
A121	NL-VP-HSC-120	120	L12	1000	1759	479	—	No	
A032	NL-VP-HSC-180	180	L11	1000	1759	479	—	No	
A062	NL-LV-HSE	180	L9	1007	1808	481	8:05	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc

Data Checked by Todd F. Lemmon Date 8/14/84

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Landfill Date 7/25/84 Performed by Sgontz, Sr / Sgontz, Jr.

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT Start	Sampling Period, hr CDT Stop	Sampling Time, min	Pump Timer, hr:min	Lo Flow Indication? Yes/No	Comments[a]
A092	NL-LV-HSA-1	180	L7	0858	1657	479	8:01	No	
A037	NL-LV-HSA-2	180	L10	0858	1657	479	8:01	No	
A143	NL-VP-HSA-2	2	L8	0902	1659	477	7:59	No	
9806	NL-VP-HSA-30	30	L6	0902	1659	477	7:59	No	
5157	NL-VP-HSA-60	60	L5	0902	1659	477	7:59	No	
A087	NL-VP-HSA-120	120	L4	0902	1659	477	7:59	No	
A083	NL-VP-HSA-180	180	L3	0902	1659	477	7:59	No	
A127	NL-LV-HSC	180	L16	0907	1705	478	8:00	No	* Rain from 11:45 - 12:20
A061	NL-VP-HSC-2	2	L15	0911	1707	476	7:59	No	
4696	NL-VP-HSC-30	30	L14	0911	1707	476	7:59	No	
A089	NL-VP-HSC-60	60	L13	0911	1707	476	7:59	No	
5138	NL-VP-HSC-120	120	L17	0911	1707	476	7:59	No	
A118	NL-VP-HSC-180	180	L18	0911	1707	476	7:59	No	
A126	NL-VP-HSE	180	L19	0917	1715	478	8:00	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc

Data Checked by Todd E. Fimmen Date 8/14/84

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Landfill Date 7/27/84 Performed by Sgontz, Sr / Sgontz, Jr.

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr:min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A126	NL-LV-HSA-1	180	L48	0828	1628	480	8:00	No	
A092	NL-LV-HSA-2	180	L47	0828	1628	480	8:00	No	
A037	NL-VP-HSA-2	2	L46	0831	1630	479	8:00	No	
A089	NL-VP-HSA-30	30	L45	0831	1630	479	8:00	No	
5157	NL-VP-HSA-60	60	L44	0831	1630	479	8:00	No	
A120	NL-VP-HSA-120	120	L43	0831	1630	479	8:00	No	
5116	NL-VP-HSA-180	180	L42	0831	1630	479	8:00	No	
9806	NL-LV-HSC	180	L23	0836	1636	480	8:00	No	
A087	NL-VP-HSC-2	2	L37	0839	1637	478	8:00	No	
A118	NL-VP-HSC-30	30	L38	0839	1637	478	8:00	No	
A062	NL-VP-HSC-60	60	L39	0839	1637	478	8:00	No	
A127	NL-VP-HSC-120	120	L41	0839	1637	478	8:00	No	
5138	NL-VP-HSC-180	180	L40	0839	1637	478	8:00	No	
A143	NL-LV-HSE	180	L24	0847	1647	480	8:00	No	

(a) Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Simmon Date 8/14/84

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Landfill Date 7/28/84 Performed by Lemmon/Sgontz, Sr/Sgontz, Jr

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr:min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A089	NL-LV-HSA-1	180	L61	0901	1701	480	8:00	No	
A143	NL-LV-HSA-2	180	L66	0901	1701	480	8:00	No	
5157	NL-VP-HSA-2	2	L67	0904	1704	480	8:00	No	
5138	NL-VP-HSA-30	30	L68	0904	1704	480	8:00	No	
A126	NL-VP-HSA-60	60	L64	0904	1704	480	8:00	No	
A092	NL-VP-HSA-120	120	L63	0904	1704	480	8:00	No	
9806	NL-VP-HSA-180	180	L62	0904	1704	480	8:00	No	
A121	NL-LV-HSC	180	L70	0910	—	—	—	—	Sample void; pole fell over
A120	NL-VP-HSC-2	2	L2	0910	1711	481	8:02	No	
A118	NL-VP-HSC-30	30	L20	0910	1711	481	8:02	No	
A079	NL-VP-HSC-60	60	L65	0910	1711	481	8:02	No	* Rain from about
A062	NL-VP-HSC-120	120	L1	0910	1711	481	8:02	No	1:00-4:00pm
A061	NL-VP-HSC-180	180	L22	0910	1711	481	8:02	No	
A037	NL-LV-HSE	180	L21	0919	1723	484	—	No	

[a] Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd F. Lemmon Date 8/15/84

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Dump Date 7/25/84 Performed by Lemmon

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cart. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr:min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A120	ND-LV-HSA-1	180	L35	0904	1204	180	—	Yes	Rain caused pump to fail } VOID
A062	ND-LV-HSA-1	180	L31	1204	1704	300	4:58	No	Replaced pump & cartridge }
A121	ND-LV-HSA-2	180	L36	0904	1704	480	7:45	No	*Sample analyzed by SwRI

[a] Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by Todd G. Lemmon Date 8/14/84

Battelle
Columbus Laboratories

DU PONT LOW VOLUME PCB SAMPLING DATA

Site Neal's Dump Date 7/27/84 Performed by Lemmon

Sampler S/N	Sampling Location I.D.	Height Above Ground, cm	PUF Cert. No.	Sampling Period, hr CDT		Sampling Time, min	Pump Timer, hr-min	Lo Flow Indication? Yes/No	Comments[a]
				Start	Stop				
A061	ND-LV-HSA-1	180	L28	0852	1652	480	8:02	No	
A079	ND-LV-HSA-2	180	L32	0852	1652	480	8:02	No	

[a] Record any abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked By Todd F. Limmison Date 8/14/84

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLING DATA

Site: Neal's Landfill Date: 7/24/84 Performed by: Lemmon/Sgontz, Jr./Sgontz, Sr

Sample ID	Sampling Location ID	Blue Filter (√)	PUF Cart. No.	Vortec Setting	Clock Time: Start, hr CST	Clock Time: Stop, hr CST	Clock Time: Elapsed	Sampler Time: Start, min	Sampler Time: Stop, min	Sampler Time: Elapsed	Vacuum Readings, Time/Magnehelic in H2O: 1	2	3	4	Comments[a]
0002	NL-HV-UW	✓	H30		0841	0745	1384	70295	71687	1392	41				
HEW2	NL-HV-DW2	✓	H26		0902	—	—	15724	—	—	42				Sample void; generator failure
EPA-93	NL-HV-HSC-1	✓	H35		0913	0803	1370	15834	17116	1282	41				
EPA-94	NL-HV-HSC-2	✓	H36		0916	0803	1367	86479	87761	1282	42				
EPA-95	NL-HV-DW3	✓	H32		0923	0827	1384	67985	69398	1413	41				
6302	NL-HV-DW4	✓	H34		0934	0840	1386	12462	13863	1401	46				
					(7/24)	(7/25)									

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling etc

Data Checked by: Todd F. Lemmon Date: 8/15/84

Battelle

HIGH VOLUME PCB SAMPLING DATA

Site Neal's Landfill Date 7/25/84 Performed by Sgontz, Jr / Sgontz, Sr

Sample ID	Sampling Location ID	Filter (✓)	PUF Cart. No.	Vortex Sensing	Clock Time			Sampler Timer			Venturi Readings Time/Magnehelic on H₂O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, min	Stop, min	Min Elapsed	1	2	3	4	
0002	NL-HV-UW	✓	H43		0754	0740	1426	71696	73123	1427	41				
EPA-93	NL-HV-HSC-1	✓	H38		0822	0750	1408	17124	18487	1363	41				
EPA-94	NL-HV-HSC 2	✓	H42		0822	0750	1408	87769	89132	1363	42				* Moderate rain from 1145 - 1220 (7/25/84)
EPA-95	NL-HV-DW3	✓	H41		0838	0800	1402	69401	70794	1393	41				
6302	NL-HV-DW4	✓	H37		0849	0757	1388	13865	15237	1372	46				* Hard rain from 0600 - 0645 (7/26/84)
					(7/25)	(7/26)									

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked By Todd Fr Sgontz Date 8/15/84

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLING DATA

Site Neal's Landfill Date 7/27/84 Performed by Sgontz, Jr / Sgontz, Sr

Sampler S/N	Sampling Location ID	Flow Meter (✓)	PUF Cart. No.	Vacuum Sensing	Clock Time			Sampler Time			Vacuum Readings Time/Magnitude in H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Elapsed Time	Start, min	Stop, min	Elapsed Time	1	2	3	4	
0002	NL-HV-UW	✓	H13		0751	0800	1449	74574	76025	1451	41				
WEW2	NL-HV-DW2	✓	H22		0811	0815	1444	16089	17538	1449	42				
EPA-91	NL-HV-HSC-1	✓	H45		0817	0825	1448	18487	19868	1401	41				
EPA-94	NL-HV-HSC-2	✓	H46		0817	0825	1448	89132	90533	1401	42				
EPA-92	NL-HV-DW3	✓	H18		0820	0837	1457	70794	72221	1427	41				
6302	NL-HV-DW4	✓	H48		0822	0817	1465	15237	16707	1470	46				
					(7/27)	(7/28)									

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked By Todd F. Spencer Date 8/15/84

Battelle

HIGH VOLUME PCB SAMPLING DATA

Site: Neal's Landfill Date: 7/28/84 Performed by: Lemmon/Sgontz, Jr./Sgontz, Sr

Sample ID	Sampling Location ID	Flow Meter Y/N	PUF Cert. No.	Vortex Cleaning	Clock Time: Start, hr CDT	Clock Time: Stop, hr CDT	Clock Time: Hrs Elapsed	Sampler Time: Start, min	Sampler Time: Stop, min	Sampler Time: Min Elapsed	Manom. Readings Tube/Magnehelic in H_2O: 1	2	3	4	Comments[a]
0002	NL-HV-UW	✓	H4		0805	0808	1443	76028	77475	1447	41				
HEW2	NL-HV-DW2	✓	H25		0823	0822	1439	17538	18964	1426	42				
EPA-93	NL-HV-HSC-1	✓	H17		0835	0827	1432	19888	21276	1388	41				
EPA-94	NL-HV-HSC-2	✓	H2		0835	0827	1432	90533	91921	1388	42				
EPA-95	NL-HV-DW3	✓	H21		0845	0835	1430	72221	73704	1483	41				
6302	NL-HV-DW4	✓	H6		0852	0835	1421	16707	18131	1424	46				
					(7/28)	(7/29)									

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation, PUF cartridge condition or handling, etc.

Data Checked by: Todd F. Lemmon Date: 8/15/84

Battelle

HIGH VOLUME PCB SAMPLING DATA

Site Neal's Dump Date 7/25/84 Performed by Lemmon

Sampler ID	Sampling Location ID	Glass Filter (✓)	PUF Cart. No.	Vacuum Reading	Clock Time Start, hr CDT	Clock Time Stop, hr CDT	Clock Time Min Elapsed	Sampler Timer Start, min	Sampler Timer Stop, min	Sampler Timer Min Elapsed	Venturi Readings Time/Magnehelic in H_2O 1	2	3	4	Comments[a]
EPA-11	ND-HV-NW	✓	H44		0812	0806	1434	56969	58449	1480	43				
EPA-13	ND-HV-DW	✓	H39		0823	0832	1449	16562	18009	1447	42				
EPA-92	ND-HV-HSA 1	✓	H33		0837	–	–	69369	69994	625	41				bad spark plug caused generator failure; sampler timer readings will be used for elapsed time.
EPA-90	ND-HV-HSA-2	✓	H29		0838	–	–	8895	9519	624	40				
					(7/25)	(7/26)									

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation. PUF cartridge condition or handling, etc.

Data Checked By Todd F. Lemmon Date 8/15/84

Battelle

HIGH VOLUME PCB SAMPLING DATA

Site Neal's Dump Date 7/27/84 Performed by Lemmon

Sampler ID#	Sampling Location ID	Flow Power (✓)	PUF Cart. No.	Vacuum Setting	Clock Time			Sampler Timer			Venturi Readings Time/Magnehelic on H_2O				Comments[a]
					Start, hr CDT	Stop, hr CDT	Min Elapsed	Start, mm	Stop, mm	Min Elapsed	1	2	3	4	
EPA-11	ND-HV-ULW	✓	H12		0821	0823	1442	58460	59960	1500	43				
EPA 13	ND-HV-DW	✓	H3		0843	0854	1451	19462	20912	1450	41				
EPA-12	ND HV HSA 1	✓	H8		0836	0837	1441	70000	71386	1386	42				
EPA-10	ND HV HSA-2	✓	H11		0836	0837	1441	9525	10911	1386	40				
					(7/27)	(7/28)									

[a] Record any evidence of tampering with sampler and/or abnormalities in sampler operation (PUF cartridge condition or handling, etc.)

Data Checked by Todd F. Lemmon Date 8/15/84

APPENDIX D

FLOW CALIBRATION DATA

The records of daily flow rate calibration of the low volume and high volume samplers are shown in this appendix. For the DuPont pumps, the first horizontal column shows the pre-sampling calibration data and the second column shows the post-sampling calibration data. The average flow computed from the pre- and post-sampling calibrations is shown and the percentage differences between the pre- and post-test flow rate calibrations are given. A negative value indicates that the flow rate determined from the post-sampling calibration was lower than that determined from the pre-sampling calibration.

The high volume samplers were calibrated at the beginning and end of the field sampling program with an orifice obtained from General Metals, Inc. The calibration curve for the orifice is provided at the end of the appendix.

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DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon / Sgontz Jr. Calibrator S/N _____ Amb. Temp. AM 23°C PM 24°C

Date/Time 7/24/84 AM 0650 PM 1830 Stop Watch S/N _____ Bar. Press. AM 748 mm Hg PM 746 mm Hg

Flow Corr. Factor* AM 0.9630 PM 0.9553

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, sec/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	sec/min**	
A121	174618	Yes	Yes	6.68	6.68	6.69	6.68	3.59	3.59	3593	3460	(-3.8%)
				6.90	6.88	6.89	6.89	3.49	3.49	3483	3327	3394
A143	174613	"	"	6.32	6.32	6.29	6.31	3.85	3.85	3803	3662	(-3.5%)
				6.49	6.51	6.48	6.49	3.61	3.61	3698	3533	3598
A062	174632	"	"	6.35	6.38	6.38	6.37	3.80	3.79	3768	3629	(-5.8%)
				6.71	6.73	6.69	6.71	3.57	3.57	3577	3417	3523
A037	174624	"	"	6.28	6.29	6.31	6.29	3.79	3.79	3816	3675	(-1.9%)
				6.37	6.36	6.35	6.36	3.77	3.74	3774	3605	3640
A032	174630	"	"	6.41	6.38	6.39	6.39	3.79	3.79	3756	3617	(-3.2%)
				6.54	6.56	6.54	6.55	3.50	3.50	3664	3500	3559
A083	174625	"	"	6.46	6.43	6.44	6.44	3.78	3.78	3727	3589	(-5.3%)
				6.76	6.76	6.74	6.75	3.50	3.50	3556	3397	3493
A061	174628	"	"	6.27	6.28	6.27	6.27	3.79	3.79	3828	3686	(-3.4%)
				6.42	6.44	6.46	6.44	3.53	3.52	3727	3560	3623
A126	174616	"	"	6.29	6.29	6.27	6.28	3.78	3.78	3822	3681	(-2.2%)
				6.36	6.36	6.38	6.37	3.55	3.53	3768	3600	3641
A087	174615	"	"	6.40	6.39	6.40	6.40	3.80	3.79	3750	3611	(-3.8%)
				6.60	6.60	6.59	6.60	3.58	3.55	3636	3473	3542
5138	176801	"	"	6.22	6.19	6.20	6.20	3.81	3.81	3871	3728	(-4.1%)
				6.40	6.42	6.40	6.41	3.55	3.53	3744	3577	3653
5116	176819	"	"	6.27	6.30	6.26	6.28	3.79	3.71	3822	3681	(-3.9%)
				6.48	6.49	6.48	6.48	3.62	3.62	3704	3538	3610

*Correction to 25 C, 760 mm Hg (see tables).

**sec/min = cc/min x correction factor

Data Check by/Date Todd M. Lemmon 8/10/84

Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon/Sgontz Jr. Calibrator S/N _____ Amb. Temp. AM 23 °C PM 24 °C
Date/Time 7/24/84 AM 0650 PM 1830 Stop Watch S/N _____ Bar. Press. AM 748 mm Hg PM 746 mm Hg
Flow Corr. Factor* AM 0.9630 PM 0.9523

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, cc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	cc/min**	
5136	176798	Yes	Yes	6.43	6.44	6.45	6.44	3.78	3.78	3727	3589	(-5.3%)
				6.74	6.75	6.76	6.75	3.38	3.38	3556	3397	3493
A092	174620	"	"	6.41	6.41	6.39	6.40	3.79	3.79	3750	3611	(-4.5%)
				6.66	6.65	6.64	6.65	—	—	3609	3448	3530
9806	174626	"	"	6.31	6.31	6.30	6.31	3.78	3.78	3803	3662	(-1.3%)
				6.33	6.34	6.35	6.34	3.59	3.59	3785	3616	3639

*Correction to 25 C, 760 mm Hg (see tables).
**sec/min = cc/min x correction factor.

Data Check by/Date Todd Sgontz Jr. 8/10/84
Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon / Sgontz Jr Calibrator S/N _____ Amb. Temp. AM 23°C PM 24°C Flow Corr. Factor* AM 0.9617 PM 0.9567

Date/Time 7/25/84 AM 0630 PM 1800 Stop Watch S/N _____ Bar. Press. AM 727 mm Hg PM 727 mm Hg

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, scc/600 cc, 0" Hg				Flow Meter Rdg, f/m		Bubble Meter Flow		Avg. Flow from Pre & Post Sampling Calibration, scc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	scc/min**	
A118	174611	Yes	Yes	6.26	6.26	6.28	6.27	3.81	3.81	3828	3681	(-0.8%)
				6.30	6.29	6.28	6.29	3.80	3.80	3816	3651	3666
A143	174613	"	"	6.30	6.30	6.30	6.30	3.75	3.75	3810	3664	(-2.4%)
				6.43	6.43	6.41	6.42	3.79	3.79	3738	3576	3620
5157	176787	"	"	6.23	6.24	6.24	6.24	3.80	3.80	3846	3699	(-1.9%)
				6.34	6.34	6.31	6.33	3.79	3.79	3791	3627	3663
A083	174625	"	"	6.25	6.26	6.27	6.26	3.80	3.80	3834	3687	(-1.6%)
				6.34	6.32	6.34	6.33	3.79	3.79	3791	3627	3657
A087	174615	"	"	6.25	6.22	6.25	6.24	3.80	3.80	3846	3699	(-1.5%)
				6.31	6.31	6.28	6.30	3.80	3.80	3810	3645	3672
A037	174624	"	"	6.09	6.09	6.11	6.10	3.78	3.77	3934	3783	(-1.6%)
				6.18	6.16	6.16	6.17	3.89	3.89	3890	3722	3753
A121	174618	"	"	6.25	6.26	6.28	6.26	3.76	3.73	3834	3687	(-1.0%)
				6.29	6.29	6.29	6.29	3.82	3.82	3816	3651	3669
A062	174632	"	"	6.21	6.22	6.22	6.22	3.77	3.73	3859	3711	(-2.0%)
				6.30	6.31	6.32	6.31	3.75	3.72	3803	3638	3675
A126	174616	"	"	6.08	6.09	6.06	6.08	3.80	3.79	3947	3796	(-1.0%)
				6.11	6.11	6.11	6.11	3.79	3.75	3928	3758	3777
A089	174633	"	"	6.07	6.09	6.11	6.09	3.80	3.79	3941	3790	(-0.8%)
				6.09	6.11	6.13	6.11	3.75	3.72	3928	3758	3774
5138	176801	"	"	6.04	6.06	6.08	6.08	3.80	3.80	3947	3796	(-1.2%)
				6.11	6.12	6.13	6.12	3.69	3.68	3922	3752	3774

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

Data Check by/Date Todd Th. Lemmon 8/10/84

Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon/Sparks Jr Calibrator S/N _____ Amb. Temp. AM 23 °C PM 24 °C Flow Corr. Factor* AM 0.9617 PM 0.9562

Date/Time 7/25/84 AM 0630 PM 1800 Stop Watch S/N _____ Bar. Press. AM 747 mm Hg PM 747 mm Hg

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, cc/400 cc, 0" Hg				Flow Meter Rdg, l/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, cc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	cc/min**	
A061	174628	Yes	Yes	6.10	6.09	6.12	6.10	3.79	3.79	3934	3783	(-2.9%)
				6.24	6.25	6.25	6.25	3.53	3.51	3840	3674	3729
A127	174622	"	"	6.11	6.09	6.08	6.09	3.79	3.78	3941	3790	(-1.3%)
				6.13	6.14	6.14	6.14	3.61	3.60	3909	3740	3765
4696	176817	"	"	6.02	6.04	6.04	6.03	3.80	3.79	3980	3828	(-2.3%)
				6.13	6.13	6.16	6.14	3.90	3.90	3909	3740	3784
A092	174620	"	"	6.05	6.05	6.07	6.06	3.81	3.80	3960	3808	(-0.5%)
				6.05	6.08	6.06	6.06	3.92	3.92	3960	3789	3799
9806	174626	"	"	6.03	6.03	6.04	6.03	3.79	3.79	3980	3828	(-1.5%)
				6.07	6.09	6.10	6.09	3.63	3.62	3941	3770	3799

*Correction to 25 C, 760 mm Hg (see tables).

**cc/min = cc/min x correction factor.

Data Check by/Date Todd E. Lemmon 8/10/84

Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon / Sgontz, Jr. Calibrator S/N _____ Amb. Temp. AM 21 °C PM 21 °C

Date/Time 7/27/84 AM 0630 PM 1800 Stop Watch S/N _____ Bar. Press. AM 745 mm Hg PM 745 mm Hg

Flow Corr. Factor* AM 0.9688 PM 0.9688

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, l/m		Bubble Meter Flow		Avg. Flow from Pre & Post Sampling Calibration, cc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	cc/min**	
A089	174633	Yes	Yes	6.29	6.26	6.28	6.28	3.82	3.82	3822	3703	(-1.3%)
				6.36	6.36	6.35	6.36	3.71	3.71	3774	3656	3680
A126	174616	"	"	6.30	6.34	6.34	6.33	3.79	3.79	3791	3673	(-1.9%)
				6.46	6.43	6.47	6.45	3.68	3.68	3721	3605	3639
5116	176819	"	"	6.26	6.26	6.27	6.26	3.80	3.80	3834	3714	(-3.3%)
				6.45	6.49	6.47	6.47	3.70	3.68	3709	3593	3654
A120	174612	"	"	6.33	6.32	6.31	6.32	3.79	3.79	3797	3679	(-2.3%)
				6.47	6.47	6.47	6.47	3.69	3.69	3709	3593	3636
A092	174620	"	"	6.32	6.31	6.34	6.32	3.80	3.80	3797	3679	(-2.0%)
				6.46	6.44	6.44	6.45	3.70	3.70	3721	3605	3642
5138	176801	"	"	6.22	6.23	6.21	6.22	3.81	3.80	3859	3739	(-2.7%)
				6.39	6.40	6.38	6.39	3.75	3.72	3756	3639	3689
9806	174626	"	"	6.22	6.21	6.22	6.22	3.82	3.82	3859	3739	(-1.5%)
				6.33	6.31	6.29	6.31	3.72	3.72	3803	3684	3712
A143	174613	"	"	6.36	6.37	6.35	6.36	3.79	3.79	3774	3656	(-1.1%)
				6.43	6.43	6.44	6.43	3.99	3.99	3733	3617	3637
A061	174628	"	"	6.24	6.23	6.23	6.23	3.81	3.80	3852	3732	(-3.1%)
				6.42	6.43	6.44	6.43	3.73	3.72	3733	3617	3675
A079	174621	"	"	6.24	6.25	6.26	6.25	3.80	3.79	3840	3720	(-1.4%)
				6.34	6.34	6.34	6.34	3.79	3.78	3785	3667	3694
A087	174615	"	"	6.30	6.30	6.32	6.31	3.78	3.76	3803	3684	(-0.8%)
				6.35	6.35	6.37	6.36	3.80	3.79	3774	3656	3670

*Correction to 25 C, 760 mm Hg (see tables).

**sec/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 8/10/84

Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon / Sgontz Jr Calibrator S/N _____ Amb. Temp. AM 21°C PM 21°C Flow Corr. Factor* AM 0.9688 PM 0.9688

Date/Time 7/27/84 AM 0630 PM 1800 Stop Watch S/N _____ Bar. Press. AM 745 mm Hg PM 745 mm Hg

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, cc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	sec/min**	
5157	176787	Yes	Yes	6.25	6.26	6.27	6.26	3.79	3.79	3834	3714	(-1.7%)
				6.36	6.37	6.37	6.37	3.79	3.78	3768	3650	3682
A127	174622	"	"	6.22	6.23	6.25	6.23	3.79	3.79	3852	3732	(-0.6%)
				6.26	6.28	6.28	6.27	3.83	3.82	3828	3709	3721
A037	174624	"	"	6.26	6.28	6.29	6.28	3.77	3.75	3822	3703	(-1.9%)
				6.40	6.40	6.40	6.40	3.78	3.76	3750	3633	3668
A118	174611	"	"	6.22	6.23	6.25	6.23	3.80	3.80	3852	3732	(-1.1%)
				6.28	6.30	6.32	6.30	3.82	3.81	3810	3691	3712
A062	174632	"	"	6.26	6.26	6.28	6.27	3.81	3.81	3828	3709	(-0.7%)
				6.29	6.31	6.33	6.31	3.80	3.80	3803	3684	3697

*Correction to 25 C, 760 mm Hg (see tables).

**sec/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 8/13/84

Form DSPC 012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Leminon/Sgontz Jr. Calibrator S/N _____ Amb. Temp. AM 21°C PM 21°C
Date/Time 7/28/84 AM 0645 PM 1800 Stop Watch S/N _____ Bar. Press. AM 748 mm Hg PM 747 mm Hg
Flow Corr. Factor* AM 0.9727 PM 0.9714

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, cc/600 cc, 0" Hg				Flow Meter Rdg, ℓ/m		Bubble Meter Flow		Avg. Flow from Pre- & Post Sampling Calibration, cc/min
				1	2	3	Avg	0" Hg	10" Hg	cc/min	cc/min**	
A121	174618	Yes	Yes	6.09	6.09	6.08	6.09	3.95	3.90	3941	3833	(-2.2%)
				6.24	6.22	6.21	6.22	3.82	3.82	3859	3749	3791
A089	174633	"	"	6.19	6.17	6.18	6.18	3.88	3.88	3883	3777	(+1.4%)
				6.10	6.08	6.10	6.09	3.99	3.99	3941	3828	3803
A126	174616	"	"	6.39	6.38	6.37	6.38	3.70	3.70	3762	3659	(0.0%)
				6.38	6.38	6.35	6.37	3.75	3.75	3768	3660	3660
A143	174613	"	"	6.37	6.35	6.36	6.36	3.70	3.70	3774	3671	(-0.5%)
				6.37	6.39	6.38	6.38	3.80	3.80	3762	3654	3663
5157	176787	"	"	6.29	6.29	6.29	6.29	3.71	3.71	3816	3712	(-4.1%)
				6.53	6.55	6.56	6.55	3.72	3.72	3664	3559	3636
A061	174628	"	"	6.20	6.21	6.22	6.21	3.87	3.85	3865	3759	(-1.2%)
				6.27	6.28	6.29	6.28	3.73	3.70	3822	3713	3736
A062	174632	"	"	6.38	6.39	6.40	6.39	3.79	3.78	3756	3653	(-0.4%)
				6.40	6.42	6.42	6.41	3.52	3.51	3744	3637	3645
A079	174621	"	"	6.36	6.38	6.39	6.38	3.80	3.79	3762	3659	(-0.4%)
				6.38	6.40	6.42	6.40	3.55	3.54	3750	3643	3651
A118	174611	"	"	6.34	6.35	6.36	6.35	3.80	3.80	3780	3677	(+0.7%)
				6.28	6.30	6.32	6.30	3.63	3.61	3810	3701	3689
A120	174612	"	"	6.36	6.39	6.39	6.38	3.80	3.80	3762	3659	(-0.6%)
				6.39	6.41	6.43	6.41	3.56	3.54	3744	3637	3648
A092	174620	"	"	6.31	6.33	6.33	6.32	3.81	3.80	3797	3693	(+0.2%)
				6.29	6.30	6.32	6.30	3.80	3.79	3810	3701	3697

*Correction to 25 C, 760 mm Hg (see tables).
**cc/min = cc/min x correction factor.

Data Check by/Date Todd Ellis Leminon 8/13/84
Form DSPC-012183

Battelle
Columbus Laboratories

DUPONT SAMPLING PUMP FLOW CALIBRATION

Performed by Lemmon/Spaltz, Jr. Calibrator S/N _____ Amb. Temp. AM 21 °C PM 21 °C Flow Corr. Factor* AM 8.9727

Date/Time 7/28/84 AM 0655 PM 1808 Stop Watch S/N _____ Bar. Press. AM 748 mm Hg PM 747 mm Hg PM 8.9714

Pump S/N	EPA No.	Battery ok? (Yes/No)	Low Flow Check ok? (Yes/No)	Calibration Data: Bubble Meter, sec/400 cc, 0" Hg 1	2	3	Avg	Flow Meter Rdg, ℓ/m 0" Hg	10" Hg	Bubble Meter Flow cc/min	sec/min**	Avg. Flow from Pre- & Post Sampling Calibration, sec/min
5138	176801	Yes	Yes	6.38	6.39	6.39	6.39	3.80	3.79	3756	3653	(+0.4%)
				6.35	6.36	6.38	6.36	3.77	3.77	3774	3666	3660
9806	174626	"	"	6.31	6.31	6.31	6.31	3.81	3.80	3803	3699	(+1.2%)
				6.22	6.23	6.23	6.23	3.85	3.82	3852	3742	3721
A037	174624	"	"	6.38	6.39	6.39	6.39	3.78	3.76	3756	3653	(-0.1%)
				6.38	6.39	6.34	6.39	3.53	3.51	3756	3649	3651

*Correction to 25 C, 760 mm Hg (see tables).

**scc/min = cc/min x correction factor.

Data Check by/Date Todd H. Lemmon 8/13/84

Form DSPC 012183

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Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon/Sgontz, Jr. Calibration Venturi S/N _____ Ambient Temperature _____ °C

Date/Time 7/24/84 0830 Manometer S/N _____ Bar. Press. _____ mm Hg

Sampler S/N	Variac Setting, V	Timer OK? Yes/No	Calibration Venturi Data: Manometer, in. H_2O	Calibration Venturi Data: Flow Rate, scfm (a)	Sampler Venturi Data: Magnehelic, in. H_2O	Sampler Venturi Data: Flow Rate, scfm (b)	% Difference, Cal. & Spls. Venturi Flow Rates	Comments
0002		Yes	5.4	8	41	*		
HEW2		"	5.4	8	42	*		
EPA-91		"	5.4	8	41	*		
EPA-94		"	5.4	8	42	*		
EPA-95		"	5.4	8	41	*		
6302		"	5.4	8	46	*		
EPA-11		"	5.4	8	43	*		
EPA-13		"	5.4	8	42	*		
EPA-92		"	5.4	8	41	*		
EPA-90		"	5.4	8	40	*		

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi-Vol unit.

Data check by Todd F. Lemmon Date 8/9/84

* assumed to be ~8 scfm

Battelle
Columbus Laboratories

HIGH VOLUME PCB SAMPLER FLOW CALIBRATION

Performed by Lemmon/Syontz, Jr Calibration Venturi S/N _____ Ambient Temperature _____ °C

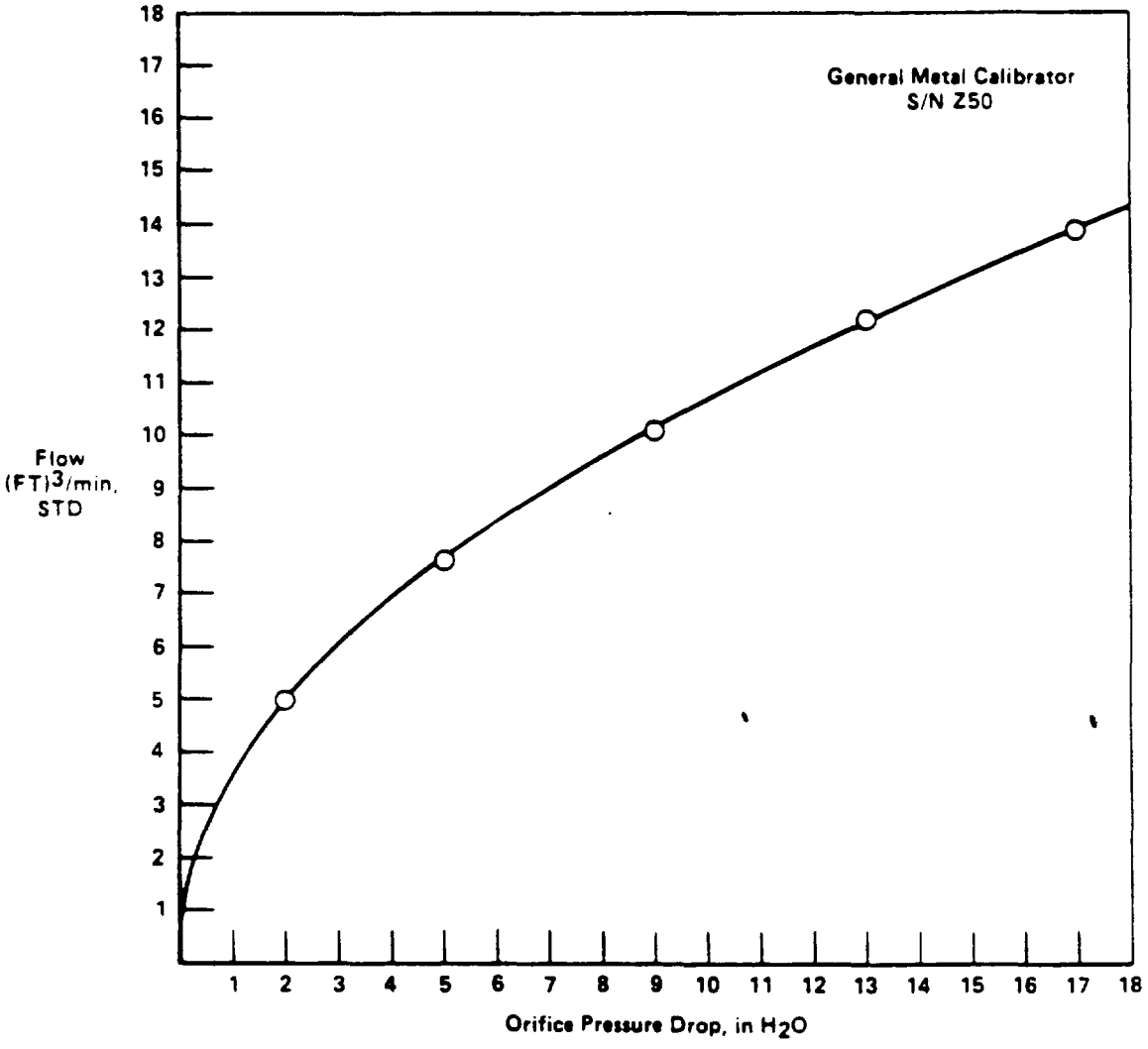
Date/Time 7/29/84 0830 Manometer S/N _____ Bar. Press. _____ mm Hg

Sampler S/N	Varlac Setting, V	Timer OK? Yes/No	Calibration Venturi Data		Sampler Venturi Data		% Difference, Cal. & Spld. Venturi Flow Rates	Comments
			Manometer, in. H_2O	Flow Rate, m^3/min (a)	Manometer, in. H_2O	Flow Rate, m^3/min (b)		
0002		Yes	5.4	8	41	*		
HEW2		"	5.4	8	42	*		
EPA-91		"	5.4	8	41	*		
EPA-94		"	5.4	8	42	*		
EPA-95		"	5.4	8	41	*		
6302		"	5.4	8	46	*		
EPA-11		"	5.4	8	43	*		
EPA-13		"	5.4	8	42	*		
EPA-92		"	5.4	8	41	*		
EPA-90		"	5.4	8	40	*		

(a) From Calibration Tables for Calibration Venturi Tube.
(b) From Calibration Tables for Venturi Tube in each Hi Vol unit.

Data check by Todd G. Lemmon Date 8/15/84

* assumed to be ~8 scfm



Flow Vs Pressure Drop for Hi Vol Calibrator

APPENDIX E

EPA FLOW AUDIT REPORT

Introduction

On July 24 and 25, 1984, a flow audit was conducted on the sampling devices used to monitor airborne PCB's at Neal's Landfill in Bloomington, Indiana. Sixteen DuPont samplers and six pesticide samplers (8 cfm) were audited. The audits were conducted before and after each sampling period.

Summary

The sampling portion of this study is being conducted very well. The audit showed the average error in flow for both sampler types was within the ±10 percent tolerance interval. For the DuPont battery operated samplers, the individual flow errors were all less than -4.0 percent. For the pesticide samplers (8 cfm), the individual flow errors for all but one sampler were less than ±10 percent.

A Battelle employee was present throughout each 8-hour sampling period and the gate to the landfill was locked (to secure the sampling area) during the 24-hour sampling period. I observed very careful handling and sealing of the samples by the Battelle employees conducting the sampling portion of the monitoring project.

Audit Procedures

Flows were audited using two laminar flow elements (LFE's), S/N 702254 and S/N 705638, which had been verified with LFE's calibrated by the National Bureau of Standards. The laminar flow elements were carefully chosen so they would not impede the flow through the pumps and would introduce a pressure drop into the system of less than 2 inches of water. The flows were measured by placing the LFE's upstream of the blank sampling media. A clean filter (DuPont sampler) or polyurethane foam plug (8 cfm sampler) was used to simulate actual initial operating conditions.

Since the DuPont portable sampling pumps were being calibrated in the motel room, the pumps used at both sites were audited immediately after Battelle's pre-sampling flow calibration and in the evening at the end of the 8-hour sampling period. Twenty pumps were audited in the morning and sixteen in the evening. Four were carried to the field as spares but not utilized.

Six pesticide samplers (8 cfm) were audited in the field prior to their respective sampling periods; five were audited at the end of their 24-hour sampling period. One sampler did not complete the sampling period because the portable generator failed.

Results

As shown in Table I, all the DuPont pumps are performing very well; the average difference was -2.6 percent and the maximum was only -3.7 percent. This negative figure does indicate a small amount of systematic bias. Thus, the DuPont samplers showed individual as well as average percent differences below the 10 percent limit set by QAD as a maximum allowable error.

On the other hand, the average percent difference for the 8 cfm samplers was +7.2 percent (Table II). The 8 cfm samplers showed one individual difference exceeding the 10 percent QAD allowable error. The errors exhibited on the 8 cfm may require further explanation and investigation, but I believe part of the error can be attributed to the difficulty in obtaining accurate readings from a magnehelic.

TABLE I. FLOW AUDIT - BLOOMINGTON, INDIANA

Pump Serial Number	Initial Calibration Flow, cc/min	Final Calibration Flow, cc/min	Audit Flow cc/min	Difference cc/min	Difference Percent
A-087	3699		3800	101	-2.7
A-087		3645	3763	118	-3.1
A-037	3783		3880	87	-2.2
A-037		3722	3840	118	3.1
A-127	3790		3861	71	-1.8
A-127		3740	3860	120	-3.1
4696	3828		3891	63	-1.6
4696		3740	3880	140	-3.6
5157	3699		3792	93	-2.5
5157		3627	3752	125	-3.3

All Flows at STP

TABLE I. (Continued)

	Pump Serial Number	Initial Calibration Flow, cc/min	Final Calibration Flow, cc/min	Audit Flow cc/min	Difference cc/min	Percent	
	A-092	3808		3892	84	-2.2	
	A-092		3789	3880	91	-2.3	
	A-083	3687		3811	124	-3.3	
	A-083		3627	3704	77	-2.1	
	9806	3828		3891	63	-1.6	
	9806		3770	3889		-3.1	
	A-089	3790		3893	103	-2.6	
	A-089		3758	3881	123	-3.2	
	A-118	3681		3803	122	-3.2	
	A-118		3651	3772	121	-3.2	

All Flows at STP

TABLE I. (Continued)

	Pump Serial Number	Initial Calibration Flow, cc/min	Final Calibration Flow, cc/min	Audit Flow cc/min	Difference cc/min	Percent	
	5138	3796		3893	97	-2.5	
	5138		3752	3890	138	-3.5	
	A-061	3783		3883	100	-2.6	
	A-061		3674	3790	116	-3.1	
	A-143	3664		3743	79	-2.1	
	A-143		3576	3713	137	-3.7	
	A-121	3687		3803	116	-3.1	
	A-121		3651	3763	112	-3.0	
	A-062	3711		3823	112	-2.9	
	A-062		3638	3772	134	-3.6	

All Flows at STP

TABLE I. (Continued)

	Pump Serial Number	Initial Calibration Flow, cc/min	Final Calibration Flow, cc/min	Audit Flow cc/min	Difference cc/min	Percent	
	A-126	3796		3903	107	-2.7	
	A-126		3758	3861	103	-2.7	
				Average		-2.60	

All Flows at STP

TABLE II. FLOW AUDIT - BLOOMINGTON, INDIANA

	Pump Serial Number	Initial Calibration Flow, cc/min	Final Calibration Flow, cc/min	Audit Flow cc/min	Difference cc/min	Percent	
	EPA-0002	226,528		210,982	15,546	7.4	
	EPA-0002		226,528	213,353	13,175	6.2	
	EPA-91	226,528		207,194	19,334	9.3	
	EPA-91		226,528	213,499	13,029	6.5	
	EPA-94	226,528		212,723	13,805	6.5	
	EPA-94		226,528	219,361	7,167	3.3	
	EPA-95	226,528		203,792	22,736	11.25	
	EPA-95		226,528	208,026	18,502	8.9	

All Flows at STP

TABLE II. (Continued)

	Pump Serial Number	Initial Calibration Flow, cc/min	Final Calibration Flow, cc/min	Audit Flow cc/min	Difference cc/min	Percent	
	6302	226,528		210,712	15,816	7.5	
	6302		226,528	214,456	12,072	5.6	
				Average		7.2	

All Flows at STP

APPENDIX F

METEOROLOGICAL DATA

The meteorological data obtained during the field study are presented in this appendix. The wind speed, wind direction, and ambient temperature measurements were performed with Meteorological Research, Inc. (MRI) portable weather stations located at both Neal's Landfill and Neal's Dump. Periodic relative humidity measurements were performed with a psychometer.

METEOROLOGICAL DATA[a]

Date: 7/24/84 Site: Neal's Landfill

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000				
1000-1100				
1100-1200			32	48
1200-1300			32	48
1300-1400			32	48
1400-1500			32	52
1500-1600			32	52
1600-1700			30	61
1700-1800			30	62
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/27/84 Site: Neal's Landfill

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				76
0900-1000				71
1000-1100				59
1100-1200	0.5	210	22	
1200-1300	0.6	180	24	
1300-1400	0.7	210	24	54
1400-1500	0.4	180	24	56
1500-1600	0.3	200	25	52
1600-1700	0.1	185	25	
1700-1800	0.1	170	25	
1800-1900	0.0	220	24	
1900-2000	0.0	220	22	
2000-2100	0.0	290	18	
2100-2200	0.0	280	16	
2200-2300	0.0	200	14	
2300-2400	0.0	210	13	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/28/84 Site: Neal's Landfill

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.0	240	14	
0100-0200	0.0	250	15	
0200-0300	0.0	210	15	
0300-0400	0.0	210	16	
0400-0500	0.0	10	15	
0500-0600	0.0	300	15	
0600-0700	0.0	330	16	
0700-0800	0.0	120	16	
0800-0900	0.0	140	18	
0900-1000	0.0	230	22	76
1000-1100	0.0	190	23	71
1100-1200	0.1	230	26	
1200-1300	0.4	280	26	
1300-1400	0.4	260	23	
1400-1500	0.0	80	20	
1500-1600	0.3	300	21	
1600-1700	0.1	230	17	
1700-1800	0.0	250	17	
1800-1900	0.0	230	19	
1900-2000	0.0	280	19	
2000-2100	0.0	210	19	
2100-2200	0.0	330	17	
2200-2300	0.0	10	15	
2300-2400	0.0	20	15	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/29/84 Site: Neal's Landfill

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.0	20	13	
0100-0200	0.0	60	13	
0200-0300	0.0	65	13	
0300-0400	0.0	100	13	
0400-0500	0.0	190	12	
0500-0600	0.0	195	12	
0600-0700	0.0	190	11	
0700-0800	0.0	175	11	
0800-0900	0.0	145	12	
0900-1000	0.0	175	15	
1000-1100				
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/25/84 Site: Neal's Dump

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100				
0100-0200				
0200-0300				
0300-0400				
0400-0500				
0500-0600				
0600-0700				
0700-0800				
0800-0900				
0900-1000				
1000-1100	1.3	35	26	75
1100-1200	1.0	40	25	84
1200-1300	0.8	40	23	92
1300-1400	1.1	90	25	
1400-1500	1.3	85	28	
1500-1600	1.3	85	28	80
1600-1700	1.3	95	28	76
1700-1800	1.0	70	28	68
1800-1900	0.5	75	27	
1900-2000	0.6	85	26	
2000-2100	0.3	45	23	
2100-2200	0.4	85	22	
2200-2300	0.4	95	21	
2300-2400	0.3	15	20	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/26/84 Site: Neal's Dump

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.3	5	19	
0100-0200	0.4	210	19	
0200-0300	0.3	40	19	
0300-0400	0.2	30	18	
0400-0500	0.3	220	18	
0500-0600	0.3	0	18	
0600-0700	0.7	310	19	
0700-0800	0.7	120	19	
0800-0900	0.6	220	20	
0900-1000	0.8	100	22	
1000-1100	1.4	115	25	
1100-1200	1.0	120	28	
1200-1300	1.3	170	30	
1300-1400	2.9	220	26	
1400-1500	1.3	245	20	
1500-1600	1.0	220	21	
1600-1700	1.4	270	23	
1700-1800	1.2	280	24	
1800-1900	1.7	275	23	
1900-2000	2.1	280	22	
2000-2100	1.3	300	19	
2100-2200	1.0	290	17	
2200-2300	1.1	305	17	
2300-2400	1.2	335	17	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/27/84 Site: Neal's Dump

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	1.1	350	17	
0100-0200	0.9	350	17	
0200-0300	0.6	290	17	
0300-0400	0.6	310	17	
0400-0500	0.5	320	17	
0500-0600	0.5	290	17	
0600-0700	0.7	280	16	
0700-0800	0.9	20	17	
0800-0900	1.1	30	18	
0900-1000	1.3	20	20	
1000-1100	1.3	320	21	
1100-1200	1.3	0	23	
1200-1300	1.3	20	25	
1300-1400	1.3	30	26	
1400-1500	1.2	10	27	
1500-1600	1.1	30	27	
1600-1700	1.3	340	26	
1700-1800	1.1	20	26	
1800-1900	0.6	50	25	
1900-2000	0.4	20	23	
2000-2100	0.3	40	20	
2100-2200	0.2	65	17	
2200-2300	0.1	70	16	
2300-2400	0.2	60	16	

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

METEOROLOGICAL DATA[a]

Date: 7/28/84 Site: Neal's Dump

Time Period Hrs, CDT	Avg. Wind Speed, m/s	Avg. Wind Direction, °Compass	Ambient Temp., °C	Relative Humidity, %
0000-0100	0.4	120	15	
0100-0200	0.3	90	16	
0200-0300	0.2	120	16	
0300-0400	0.1	140	16	
0400-0500	0.4	100	16	
0500-0600	0.1	70	16	
0600-0700	0.1	80	16	
0700-0800	0.4	160	17	
0800-0900	0.6	300	20	76
0900-1000	0.9	320	22	
1000-1100	1.1	315	26	71
1100-1200				
1200-1300				
1300-1400				
1400-1500				
1500-1600				
1600-1700				
1700-1800				
1800-1900				
1900-2000				
2000-2100				
2100-2200				
2200-2300				
2300-2400				

(a) Data obtained with MRI portable weather station at 2.5 meters above ground level.

United States
Environmental Protection
Agency

Environmental Monitoring
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Research Triangle Park, NC 27711

Research and Development EPA-600____ _____ 1985

PROJECT SUMMARY

Ambient Monitoring for PCB After Remedial Cleanup of Two Landfills in the Bloomington, Indiana Area

D. L. Sgontz and J. E. Howes, Jr.

A monitoring program was conducted to determine PCB levels in ambient air on and in the vicinity of two landfills at which interim remedial cleanup measures have been performed. The landfill sites are in the Bloomington, Indiana area. The sampling locations and methods used were the same as employed in a pre-cleanup monitoring program conducted during June and July, 1983.

Monitoring data obtained at former hot spots on the sites (where exposed capacitors were visible) showed a marked reduction from the pre-cleanup monitoring levels. However, PCB concentrations measured at downwind locations at the site boundaries during the pre- and post-cleanup monitoring were approximately the same.

Collocated monitoring conducted during the study showed that both the low- and high-volume sampling methods yielded reliable, reproducible measurements of airborne PCB levels.

This Project Summary was developed by EPA's Environmental Monitoring Systems Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

INTRODUCTION

Three landfills sites in the Bloomington, Indiana, area have been used for disposal of capacitors containing polychlorinated biphenyls (PCBs). They are identified as: Neal's Landfill, Neal's Dump and Lemon Lane Landfill. Visual surveys of these sites have shown several areas where capacitors are visible at or above ground level. In most of the areas leakage of the capacitors is suspected, due to apparent wetting of the soil and damage to the surrounding vegetation; as a consequence PCBs may be emitted, thus creating an air pollution problem.

During June and July 1983, a field program was conducted to monitor PCB levels in the ambient air at selected locations on, and surrounding, the three landfill areas. Airborne PCB measurements on the sites were performed at localized areas (hot spots) where leaking capacitors were evident. Measurements were made at locations in the vicinity of the sites to determine upwind background levels and downwind emission levels.

During the Spring of 1984, interim remedial cleanup measures were conducted at Neal's Landfill and Neal's Dump to reduce PCB emissions from the sites. Following the cleanup operations, monitoring was performed to determine the reduction of airborne PCB levels on, and in, the vicinity of the two landfill sites. The monitoring locations and procedures employed were the same as those used in the previous study. Battery-operated, personal-type pump systems were used to sample during 8-hour daytime periods at a fixed height above hot spots. High volume systems were employed to sample for 24-hour periods at hot spots, upwind background location and downwind site perimeter locations. Vertical concentration profiles at hot spot areas, during 8-hour daytime periods, were

determined with an array of five battery-operated sampling systems, positioned at different elevations above ground level. Polyurethane foam (PUF) cartridges were employed in all the sampling systems to collect PCBs from the ambient air. The quantity of PCBs collected in the PUF cartridges during sampling was determined by extraction and analysis of the extract by electron-capture gas chromatography using EPA Method 608. Meteorological conditions (wind speed and direction, temperature and relative humidity) were monitored, during sampling at the sites, to assist in interpretation of the PCB measurements.

This study was conducted to provide EPA Region V with data on airborne PCB levels following interim remedial cleanup of the two landfill sites.

EXPERIMENTAL PROCEDURES

PCB MONITORING PROCEDURES

As in the previous study, three different sampling procedures: (i.e.) a) low-volume, b) vertical profile and c) high-volume, were used to measure ambient air PCB concentrations and emission patterns on and in the vicinity of the landfill sites.

DuPont P-4000A battery-operated, low volume samplers (flow rate ~3.8 L/min) were used to sample the ambient air at hot spots on the landfill sites and at upwind locations. The samplers were positioned with inlets of the PUF cartridges at 1.8 m above ground level. Sampling at hot spots was performed immediately downwind of the hot spot area over 8-hr day-time periods from approximately 0900 to 1700 hrs CDT.

Measurements of the vertical PCB concentration profiles were performed with a vertical array of five DuPont low volume samplers. The array was

positioned directly over a hot spot area with inlets of the PUF cartridges at 2, 30, 60, 120, and 180 cm above ground level. Sampling was performed, for approximately 8-hr periods, starting at ~0900 and terminating at ~1700 hrs CDT.

EPA high volume systems (flow rate ~8 cfm) were used to collect approximately 24-hr samples upwind of the sites, at hot spots on the sites, and along the downwind perimeter of the sites. The EPA samplers were situated with the inlets approximately 1.2 m above ground level and were located, to the extent possible, in areas where air flow was unrestricted in the windward direction.

The types and locations of samples collected at each site are summarized in Table 1.

PCB ANALYSIS PROCEDURE

Analysis for PCBs in the PUF cartridges (and high volume filters) was performed according to the procedure described in the EPA Manual of Analytical Methods. The steps in the analysis procedure included: a) Soxhlet extraction of the foam plugs (and filters in the case of high volume samplers) with 5 percent ether in hexane; b) concentration of the extract to 1 mL and c) determination of PCBs in an aliquot of the extract by electron capture-gas chromatography using EPA Method 608. PCB analyses were performed by SwRI.

TABLE 1. SAMPLING PROGRAM SUMMARY

Site/Sampling Dates (1984)	Sampling Location[a]	Type of Sampling Performed[b]
Neal's Landfill	HS-A	8hrLV, 8hrVP
July 24, 25, 27, and 28	-C	8hrLV, 24hrHV, 8hrVP
	-E	8hrLV
	DW-2	24hrHV
	-3	24hrHV
	-4	24hrHV
	UW	24hrHV
Neal's Dump	HS-A	8hrLV, 24hrHV
July 25 and 27	DW	24hrHV
	UW	24hrHV

(a) HS - hot spot, DW - downwind, and UW - upwind.
(b) LV - DuPont low volume sampler, HV - EPA high volume sampler, and VP - in-line vertical array of five DuPont low volume samplers.

METEOROLOGICAL MEASUREMENTS

Measurements of wind speed, wind direction and ambient temperature were performed with Meteorological Research, Inc. (MRI) portable weather stations. One unit was located at Neal's Landfill and a second unit was used to collect meteorological data at Neal's Dump. Strip chart data from the meteorological systems was manually reduced to obtain hourly averages. Relative humidity data were obtained from wet/dry bulb temperature measurements made periodically during daytime sampling periods.

RESULTS AND DISCUSSION

The PCB concentrations in ambient air, measured at locations on Neal's Landfill/Dump and in their vicinity after the interim remedial cleanup, are shown in Table 2.

As shown in the table, post-cleanup PCB levels measured at hot spots on the sites, show a decrease from the pre-cleanup levels. However, at HS-A and HS-C on Neal's Landfill and HS-A on Neal's Dump, there appears to be residual contamination which gives rise to airborne PCB concentrations that are slightly above background levels.

In general, there is very little difference in pre- and post-cleanup PCB levels measured at the downwind locations at the two landfills. The pre- and post-cleanup levels measured upwind at Neal's Dump were approximately the same. PCB levels observed upwind of Neal's Landfill during the post-cleanup monitoring program were higher than those measured during the pre-cleanup monitoring.

TABLE 2. COMPARISON OF PRE- AND POST- CLEANUP MONITORING DATA

Sampling Location	Sample Type	Range of PCB Concentrations (µg/SCM) Found	
		Pre-Cleanup	Post-Cleanup
Neal's Landfill			
HS-A	8hr LV	5.1-11	0.4-1.4
	VP-2cm	552-1053	2.3-3.2
	VP-30cm	56-120	1.1-1.8
	VP-60cm	30-49	0.9-1.2
	VP-120cm	10-23	0.7-1.4
	VP-180cm	6.4-13	0.4-0.6
HS-C	8hr LV	5.3-12	1.7-2.5
	24hr LV	5.2-14	3.1-4.8
	VP-2cm	941-1108	11.5-21.3
	VP-30cm	111-157	4.1-5.8
	VP-60cm	40-62	1.7-5.1
	VP-120cm	15-21	1.7-3.1
	VP-180cm	8.6-16	1.5-2.5
HS-E	8hr LV	7.3-18	ND(<0.04)
UW	24hr HV	0.08-0.09	0.2-0.3
DW-2	24hr HV	0.8-1.8	1.1-1.4
DW-3	24hr HV	0.8-1.8	0.8-1.2
DW-4	24hr HV	0.3-0.7	0.4-0.6
Neal's Dump			
HS-A	8hr LV	7.9-19	0.8-0.9
	24hr HV	23-61	2.7-3.1
UW	24hr HV	0.1-0.2	0.1-0.2
DW	24hr HV	0.1-0.2	0.1

During the post-cleanup monitoring period, maximum temperatures were in the range of 25 to 28°C and there was frequent rainfall. In contrast, maximum temperatures during the pre-cleanup monitoring period were frequently in excess of 38°C and there was an absence of rainfall.

The results of the monitoring program show that the remedial cleanup reduced airborne PCB at former hot spots on the landfill. Airborne PCB levels at the downwind site boundaries remain approximately the same as observed during the pre-cleanup monitoring.

CONCLUSIONS

The results of the monitoring program show that the interim remedial cleanup reduced airborne PCB at former hot spots on the landfill. Airborne PCB levels at the downwind site boundaries remain approximately the same as observed during the pre-cleanup monitoring.

Modification of the high volume samplers by replacement of the conventional motor with a by-pass type significantly improved the reliability and durability of this unit.

D. L. Sgontz and J. E. Howes, Jr. are with Battelle's Columbus Laboratories, Columbus, OH 43201
Barry E. Martin is the EPA Project Officer (see below).

The complete report, entitled "Ambient Monitoring for PCB After Remedial Cleanup of Two Landfills in the Bloomington, Indiana Area: (Order No. ; cost: subject to change), will be available only from:
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

The EPA Project Officer can be contacted at:
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