
Monitoring for PCBs at the Pilot Plant Complex, Aberdeen Proving Ground

REMOVED
DEC 20 1995
OSTI

Energy Systems Division
Argonne National Laboratory



Operated by The University of Chicago,
under Contract W-31-109-Eng-38, for the

United States Department of Energy

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ct

MASTER

Argonne National Laboratory

Argonne National Laboratory, with facilities in the states of Illinois and Idaho, is owned by the United States Government, and operated by the University of Chicago under the provisions of a contract with the Department of Energy.

This technical memo is a product of Argonne's Energy Systems (ES) Division. For information on the division's scientific and engineering activities, contact:

Director, Energy Systems Division
Argonne National Laboratory
Argonne, Illinois 60439-4815
Telephone (708) 252-3724

Presented in this technical memo are preliminary results of ongoing work or work that is more limited in scope and depth than that described in formal reports issued by the ES Division.

Publishing support services were provided by Argonne's Information and Publishing Division (for more information, see IPD's home page: <http://www.ipd.anl.gov>).

Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (423) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

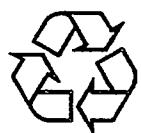
Monitoring for PCBs at the Pilot Plant Complex, Aberdeen Proving Ground

by J.F. Schneider, H.J. O'Neill, V.J. Cohut, D.C. Hayes,
D.P. O'Reilly, and R.E. Zimmerman

Center for Environmental Restoration Systems, Energy Systems Division,
Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439

July 1995

Work sponsored by United States Department of Defense,
United States Army, Aberdeen Proving Ground, Maryland



This report is printed on recycled paper.

Contents

Summary	1
1 Introduction.....	3
2 Methods and Procedures.....	6
3 Results and Discussion	7
3.1 Building E5618.....	7
3.2 Building E5625	7
3.3 Total PCB Content.....	8
4 Quality Assurance/Quality Control.....	17
5 Conclusions.....	18
6 References	19

Tables

1 Results of PCB Screening of the Pilot Plant Complex.....	9
2 Spiked Sample Results.....	17
3 Field Blank Results	17

Figures

1 Location of Aberdeen Proving Ground	4
2 General Layout of the Pilot Plant Complex.....	5
3 Layout of Building E5618, Showing Sampling Points	14
4 Layout of the First Floor of Building E5625, Showing Sampling Points.....	14
5 Layout of the Second Floor of Building E5625, Showing Sampling Points.....	15
6 Layout of the Third Floor of Building E5625, Showing Sampling Points	15

Figures (Cont.)

7	Layout of the Fourth Floor of Building E5625, Showing Sampling Points	16
8	Layout of the Roof of Building E5625, Showing Sampling Points	16

Monitoring for PCBs at the Pilot Plant Complex, Aberdeen Proving Ground

by

J.F. Schneider, H.J. O'Neill, V.J. Cohut, D.C. Hayes,
D.P. O'Reilly, and R.E. Zimmerman

Summary

The U.S. Army's Aberdeen Proving Ground has been a test site for a variety of munitions, including chemical warfare agents. The Pilot Plant Complex (PPC) at Aberdeen was the site of the development, manufacture, storage, and disposal of a number of chemical warfare agents. The objective of this study was to determine if there is polychlorinated biphenyl (PCB) contamination in the PPC.

The air in the PPC was sampled and analyzed for volatile organic compounds by Argonne National Laboratory in fall 1994, at which time PCBs were identified at low levels (1-50 ng/L) in some areas. The OSHA-allowable PCB exposure level for workers is 500 ng/L (time-weighted average). In this study, additional sampling for PCBs was done by taking wipe samples in areas suspected of having PCB contamination. The PCB survey of the PPC was intended to determine the relative degree of contamination present in the PPC and to assess whether the various structures exhibit PCB levels that exceed either the threshold limit value* of 0.5 mg/m³ (skin exposure value for Aroclor 1254) or the workplace exposure level† of 10 µg/100 cm².

The results of screening done by Argonne indicate that PCBs in the air of the PPC are well below acceptable levels. The total PCB burden of the surfaces in the PPC appears to be well below the 50-ppm regulatory level.‡ However, the study identified contaminated floor surfaces that exceed the acceptable level of 10 µg/100 cm² for a workplace. Areas in Building E5618 exceed 1,000 µg/100 cm², with a high reading of 21,100 µg/100 cm² in room C103. Building E5625 has several areas where PCBs exceed 100 µg/cm².

* American Conference of Governmental Industrial Hygienists.

† (40 CFR 761.125).

‡ (40 CFR 761.60).

1 Introduction

The U.S. Army's Aberdeen Proving Ground (APG) has been the test site for a variety of munitions, including chemical warfare agents (CWA). The Pilot Plant Complex (PPC) at APG was the site of the development, manufacture, storage, and disposal of CWA. The PPC is located in the Edgewood Area (EA) of Aberdeen, which is situated 21 miles northeast of Baltimore, in the Atlantic Coastal Plain, in an area to the west of Chesapeake Bay (Figure 1). The area in which the PPC is located sits in the Canal Creek basin. The complex, originally designated Complex 87, was constructed in 1941 prior to the entry of the United States into World War II; it contains nine buildings, as shown in Figure 2.

The complex was closed in 1986. Since that time, all equipment, piping, and conduit in the buildings have been removed. The buildings have been sampled and declared free of surface CWA contamination as a result of air sampling by using the military system (Lattin 1994).

The air in the PPC was sampled and analyzed for volatile organic compounds by Argonne National Laboratory (ANL) in fall 1994, at which time polychlorinated biphenyls (PCBs) were identified at low levels (1-50 ng/L) in some of the areas (Schneider et al. 1995). The OSHA-allowable PCB exposure level for workers is 500 ng/L (time-weighted average). Consequently, wipe sampling for PCBs was performed to determine the relative degree of contamination present in the PPC and to assess whether the various structures exhibit PCB levels that exceed either the threshold limit value* of 0.5 mg/m³ (skin exposure value for Aroclor 1254) or the workplace exposure level† of 10 mg/100 cm³. In addition, the PCB survey will supply supporting information as to whether the total PCB burden of the PPC will exceed the regulatory level (50 ppm) for classifying demolition rubble as hazardous waste.‡

* American Conference of Governmental Industrial Hygienists.

† (40 CFR 761.125).

‡ (40 CFR 761.60).

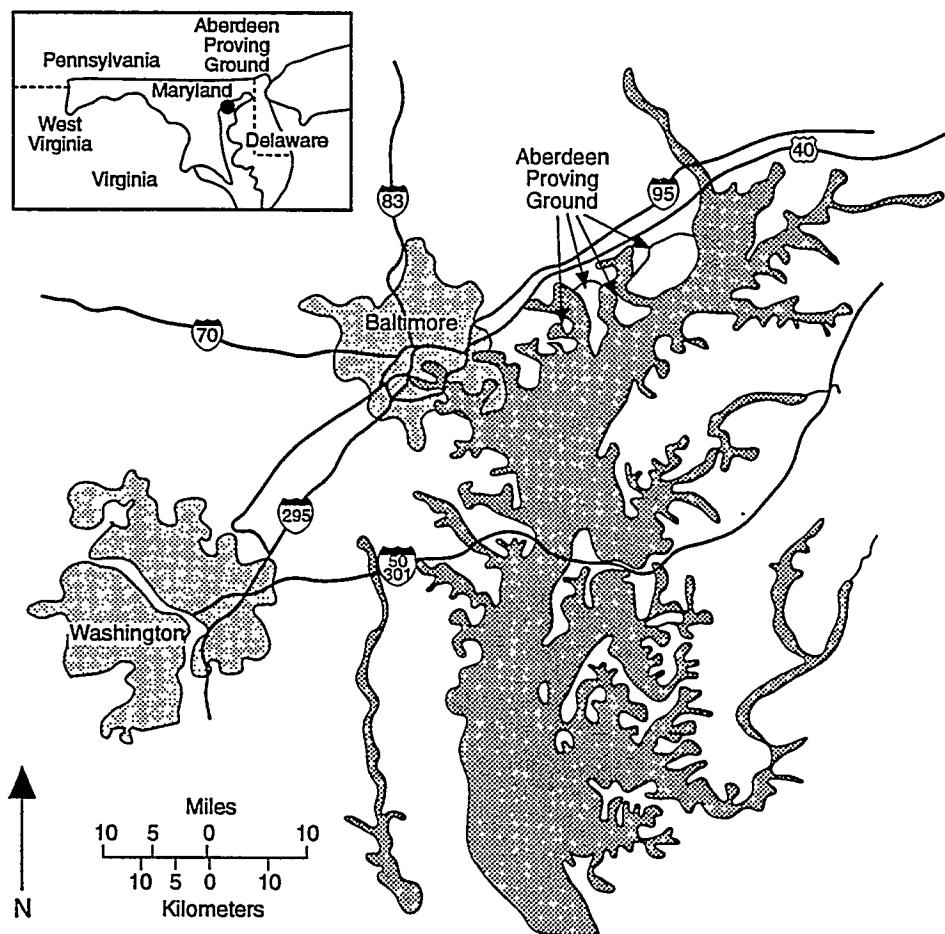


FIGURE 1 Location of Aberdeen Proving Ground

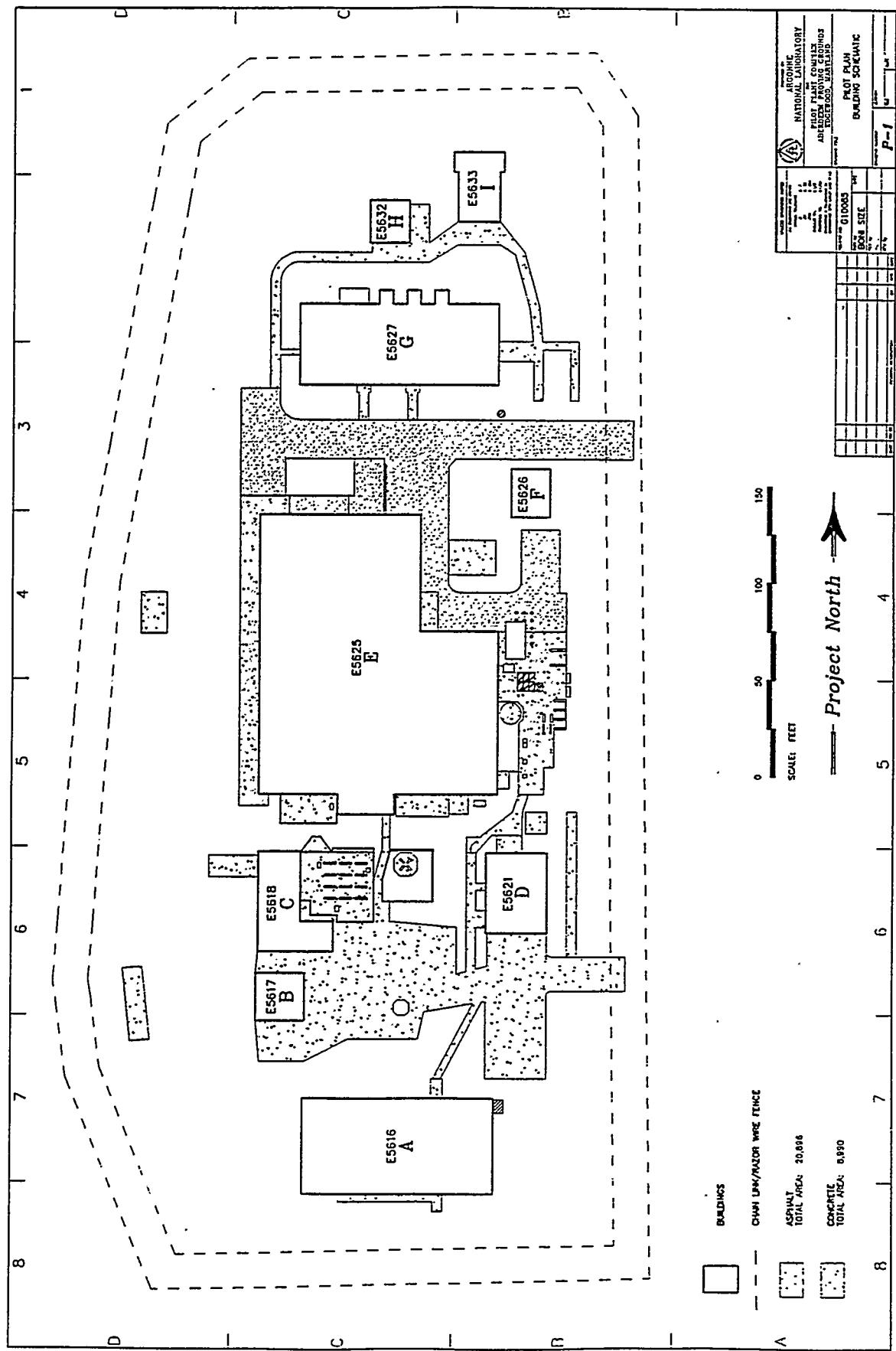


FIGURE 2 General Layout of the Pilot Plant Complex

2 Methods and Procedures

Preliminary ambient air monitoring of the PPC was performed in order to assess the relative degree of contamination present (Schneider et al. 1995). On the basis of the ambient air monitoring data, selected rooms in Building E5625 and all the rooms in Building E5618 were monitored for PCBs. A visual "walk-through" inspection yielded several locations that required sampling, on the basis of the presence of stains or spill marks on the floor that may represent PCB material. In each instance, the perimeter of the soil mark was outlined with a paint stripe to mark its location.

A standard operating procedure, SOP #103 (O'Neill et al. 1994), identifies the procedures followed by ANL for the measurement of PCBs. Generally, Environmental Protection Agency (EPA) guidelines were followed in collecting wipe samples. All samples were sent off-site to a commercial analytical laboratory for PCB analysis.

In performing this survey of the buildings composing the PPC, any PCB contamination present was assumed to be due to the leakage or spillage of PCB-containing electrical equipment, compressors, hydraulic systems, or transformers and, consequently, to be located on the floors. The results of the preliminary ambient-air monitoring survey (Schneider et al. 1995) had indicated that levels of PCBs present in the air were elevated (compared to general outdoor background levels). In view of the possibility that PCB contamination may exist on the ceilings and walls of the buildings, the PPC was surveyed at night with a fluorescent lamp to determine whether additional PCB contamination could be identified. Time did not permit a survey of the entire PPC. However, a survey of the "high-risk" areas in Building E5618 did indicate the presence of a ~3-ft-diameter fluorescent spot on the wall (C05) in Room C-102. This large area of fluorescent contamination has not yet been identified, but its presence demonstrates that additional survey activity should be initiated at the PPC to clarify the nature of this material and to determine whether any other contaminated areas exist.

3 Results and Discussion

Analytical results are presented in Table 1. A discussion of each sampling location is given below. Refer to Figure 3 (page 14) for the sampling locations in Building E5618 and to Figures 4-8 (pages 14-16) for the sampling locations in Building E5625.

3.1 Building E5618

- *C101.* Wipe samples showed no detectable levels of PCBs.
- *C102.* Wipe samples indicated the presence of PCBs (Aroclors 1248, 1254, and 1260) on the floor at levels of 44 to 117 $\mu\text{g}/100 \text{ cm}^2$.
- *C103.* Wipe samples showed significant levels of PCBs (Aroclors 1248, 1254, and 1260), as high as 21,100 $\mu\text{g}/100 \text{ cm}^2$ on spill-stained floor surfaces. This area needs to be remediated.
- *C104.* Wipe samples showed significant levels of PCBs (Aroclors 1248, 1254, and 1260), as high as 16,000 $\mu\text{g}/100 \text{ cm}^2$ on the floor. This area needs to be remediated.

3.2 Building E5625

- *E123.* Wipe samples indicated the presence of PCBs (Aroclors 1248 and 1254), with a high reading of 56 $\mu\text{g}/100 \text{ cm}^2$.
- *E131.* Wipe samples indicated the presence of PCBs (Aroclors 1248, 1254, and 1260), with a high reading of 84 $\mu\text{g}/100 \text{ cm}^2$.
- *E207.* Wipe samples indicated the presence of PCBs (Aroclors 1248, 1254, and 1260), with a high reading of 80 $\mu\text{g}/100 \text{ cm}^2$.
- *E220.* Wipe samples indicated the presence of PCBs (Aroclors 1248, 1254, and 1260), with a high reading of 305 $\mu\text{g}/100 \text{ cm}^2$.
- *E305.* Wipe samples of a drain indicated relatively low levels of PCBs as Aroclor 1254 (27 $\mu\text{g}/100 \text{ cm}^2$ was the highest reading).

- *E314.* Wipe samples indicate the presence of PCBs (Aroclors 1248, 1254, and 1260), with a high reading of 350 $\mu\text{g}/100 \text{ cm}^2$.
- *E319.* Wipe samples indicate the presence of PCBs (Aroclors 1248, 1254, and 1260), with a high reading of 281 $\mu\text{g}/100 \text{ cm}^2$.
- *E416.* Wipe samples indicate the presence of PCBs (Aroclors 1248 and 1254), with a high reading of 127 $\mu\text{g}/100 \text{ cm}^2$.
- *E417.* Wipe samples indicate the presence of PCBs (Aroclors 1248 and 1254), with a high reading of 112 $\mu\text{g}/100 \text{ cm}^2$.
- *E504.* Wipe samples indicated the presence of PCBs (Aroclors 1248, 1254, and 1260), with a high reading of 124 $\mu\text{g}/100 \text{ cm}^2$.

3.3 Total PCB Content

The total amount of PCBs that would need to be present in the PPC in order to exceed the 50-ppm demolition-rubble concentration, as based on a total rubble value of 11,000 tons, amounts to approximately 1,230 lb (557,000 g). Considering the surface area of the floors in the PPC (~49,000,000 cm^2), the average floor surface would have to contain 1,136,000 $\mu\text{g}/100 \text{ cm}^2$ to obtain the 50-ppm concentration. The highest reading obtained in this investigation was 21,100 $\mu\text{g}/100 \text{ cm}^2$, and the average reading in areas targeted as being most likely to contain contamination was 530 $\mu\text{g}/100 \text{ cm}^2$. Therefore, on the basis of the results of this study, and assuming that no “pockets” of PCB contamination exist below surfaces of the PPC, the estimated total building burden is in the range of 50 ppb, which is three orders of magnitude below the allowable level.

TABLE 1 Results of PCB Screening of the Pilot Plant Complex

Sample No.	Wipe No.	Aroclor Concentration ^a (µg/100 cm ²)						Detection Limit (µg)	Spike Value (µg)
		1016	1221	1232	1242	1248	1254		
<i>Building E5618</i>									
C101	1	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.5
	2	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-
	3	BDL	BDL	BDL	BDL	BDL	BDL	BDL	2.5
	4	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-
C102	5	BDL	BDL	BDL	BDL	75.0	22.0	BDL	2.5
	6	BDL	BDL	BDL	BDL	56.0	23.0	BDL	-
	7	BDL	BDL	BDL	BDL	34.0	12.0	BDL	2.5
	8	BDL	BDL	BDL	BDL	51.0	50.0	BDL	-
	9	BDL	BDL	BDL	BDL	30.0	14.0	BDL	2.5
	10	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-
C103	11	BDL	BDL	BDL	BDL	BDL	8.7	BDL	2.5
	12	BDL	BDL	BDL	BDL	150.0	67.0	12.0	10 (1254)
	13	BDL	BDL	BDL	BDL	200.0	86.0	13.0	-
	14	BDL	BDL	BDL	BDL	160.0	64.0	37.0	-
	15	BDL	BDL	BDL	BDL	87.0	38.0	16.0	-
	16	BDL	BDL	BDL	BDL	3,100.0	3,300.0	1,200.0	-
	17	BDL	BDL	BDL	BDL	13,000.0	6,200.0	1,900.0	-
	18	BDL	BDL	BDL	BDL	130.0	77.0	100.0	-
	19	BDL	BDL	BDL	BDL	48.0	43.0	12.0	-
	20	BDL	BDL	BDL	BDL	67.0	48.0	56.0	-
	21	BDL	BDL	BDL	BDL	BDL	5.9	BDL	-
	22	BDL	BDL	BDL	BDL	BDL	BDL	BDL	-
C104	23	BDL	BDL	BDL	BDL	460.0	320.0	120.0	-
	24	BDL	BDL	BDL	BDL	380.0	350.0	100.0	-
	25	BDL	BDL	BDL	BDL	260.0	85.0	22.0	-
	26	BDL	BDL	BDL	BDL	430.0	72.0	BDL	-
	27	BDL	BDL	BDL	BDL	440.0	1,700.0	540.0	-
	28	BDL	BDL	BDL	BDL	2,800.0	9,400.0	3,800.0	-
	29	BDL	BDL	BDL	BDL	100.0	57.0	93.0	-

TABLE 1 (Cont.)

Sample No.	Wipe No.	Aroclor Concentration ^a (µg/100 cm ²)						Total	Detection Limit (µg)	Spike Value (µg)
		1016	1221	1232	1242	1248	1254			
<i>Building E5618 (Cont.)</i>										
	3.0	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0	2.5
	3.1	BDL	BDL	BDL	BDL	BDL	79.0	7.4	BDL	2.5
<i>Building E5625</i>	32	BDL	BDL	BDL	BDL	42.0	14.0	BDL	56	2.5
E123	33	BDL	BDL	BDL	BDL	14.0	BDL	BDL	14	2.5
	34	BDL	BDL	BDL	BDL	BDL	4.0	BDL	4	2.5
	35	BDL	BDL	BDL	BDL	15.0	12.0	BDL	27	2.5
	36	BDL	BDL	BDL	BDL	BDL	7.1	BDL	7	2.5
E131	37	BDL	BDL	BDL	BDL	BDL	3.4	BDL	3	2.5
	38	BDL	BDL	BDL	BDL	6.7	26.0	8.5	BDL	4.1
	39	BDL	BDL	BDL	BDL	BDL	26.0	16.0	BDL	4.2
	40	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0	2.5
	41	BDL	BDL	BDL	BDL	BDL	BDL	40.0	BDL	40
	42	BDL	BDL	BDL	BDL	42.0	29.0	BDL	71	2.5
	43	BDL	BDL	BDL	BDL	55.0	29.0	BDL	84	2.5
	44	BDL	BDL	BDL	BDL	24.0	34.0	BDL	58	2.5
	45	BDL	BDL	BDL	BDL	21.0	27.0	BDL	48	2.5
	46	BDL	BDL	BDL	BDL	4.1	BDL	BDL	4	2.5
E207	47	BDL	BDL	BDL	BDL	24.0	46.0	10.0	BDL	80
	48	BDL	BDL	BDL	BDL	26.0	45.0	BDL	71	2.5
	49	BDL	BDL	BDL	BDL	9.1	BDL	BDL	9	2.5
	50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0	2.5
	51	BDL	BDL	BDL	BDL	4.2	BDL	BDL	42	2.5
	52	BDL	BDL	BDL	BDL	BDL	9.3	BDL	9	2.5
	53	BDL	BDL	BDL	BDL	51.0	70.0	12.0	BDL	133
E220	54	BDL	BDL	BDL	BDL	BDL	21.0	BDL	21	2.5
	55	BDL	BDL	BDL	BDL	BDL	12.0	BDL	12	2.5
	56	BDL	BDL	BDL	BDL	BDL	9.3	BDL	9	2.5

TABLE 1 (Cont.)

Sample No.	Wipe No.	Aroclor Concentration ^a (µg/100 cm ²)						Detection Limit (µg)	Spike Value (µg)
		1016	1221	1232	1242	1248	1254		
<i>Building E5625 (Cont.)</i>									
E220	57	BDL	BDL	BDL	BDL	BDL	13.0	BDL	2.5
	58	BDL	BDL	BDL	BDL	48.0	41.0	BDL	2.5
	59	BDL	BDL	BDL	BDL	36.0	57.0	BDL	2.5
	60	BDL	BDL	BDL	BDL	BDL	BDL	0	Blank
	61	BDL	BDL	BDL	BDL	BDL	85.0	BDL	100 (1254)
	62	BDL	BDL	BDL	BDL	40.0	71.0	BDL	2.5
	63	BDL	BDL	BDL	BDL	BDL	25.0	BDL	2.5
	64	BDL	BDL	BDL	BDL	52.0	95.0	27.0	BDL
	65	BDL	BDL	BDL	BDL	30.0	37.0	13.0	BDL
	66	BDL	BDL	BDL	BDL	40.0	59.0	BDL	2.5
	67	BDL	BDL	BDL	BDL	95.0	130.0	BDL	2.5
	68	BDL	BDL	BDL	BDL	16.0	58.0	4.8	BDL
	69	BDL	BDL	BDL	BDL	36.0	78.0	BDL	2.5
	70	BDL	BDL	BDL	BDL	BDL	BDL	BDL	Blank
	71	BDL	BDL	BDL	7.3	BDL	BDL	41.0	BDL
	72	BDL	BDL	BDL	BDL	27.0	64.0	BDL	91
	73	BDL	BDL	BDL	BDL	BDL	38.0	BDL	2.5
	74	BDL	BDL	BDL	BDL	BDL	48.0	BDL	2.5
	75	BDL	BDL	BDL	BDL	BDL	78.0	23.0	BDL
	76	BDL	BDL	BDL	BDL	46.0	240.0	19.0	BDL
	77	BDL	BDL	BDL	BDL	17.0	41.0	13.0	BDL
	78	BDL	BDL	BDL	BDL	BDL	4.3	BDL	4
	79	BDL	BDL	BDL	BDL	BDL	5.8	3.1	BDL
	80	BDL	BDL	BDL	42	BDL	BDL	4.2	2.5
	81	BDL	BDL	BDL	BDL	25.0	BDL	BDL	50 (1016)
									5 (1260)

TABLE 1 (Cont.)

Sample No.	Wipe No.	1016	1221	1232	1242	1248	1254	1260	1262	Total	Detection Limit (µg)	Spike Value (µg)
<i>Building E5625 (Cont.)</i>												
E305	82	BDL	BDL	BDL	BDL	BDL	BDL	26.0	BDL	26	2.5	-
	83	BDL	BDL	BDL	BDL	BDL	BDL	18.0	BDL	18	2.5	-
	87	BDL	BDL	BDL	BDL	BDL	BDL	21.0	BDL	21	2.5	-
	88	BDL	BDL	BDL	BDL	BDL	BDL	27.0	BDL	27	2.5	-
	89	BDL	BDL	BDL	BDL	BDL	BDL	2.8	BDL	3	2.5	-
E314	90	BDL	BDL	BDL	BDL	BDL	BDL	3.2	BDL	3	2.5	-
	91	BDL	BDL	BDL	BDL	BDL	BDL	4.8	BDL	5	2.5	-
	92	BDL	BDL	BDL	BDL	BDL	BDL	5.3	BDL	5	2.5	-
	93	BDL	BDL	BDL	BDL	BDL	BDL	350.0	BDL	350	10	-
	94	BDL	BDL	BDL	BDL	BDL	BDL	20.0	BDL	160	2.5	-
	95	BDL	BDL	BDL	BDL	BDL	BDL	58.0	BDL	58	2.5	-
	96	BDL	BDL	BDL	BDL	BDL	BDL	32.0	210.0	23.0	2.5	-
	97	BDL	BDL	BDL	BDL	BDL	BDL	170.0	16.0	BDL	186	2.5
	98	BDL	BDL	BDL	BDL	BDL	BDL	37.0	82.0	BDL	119	2.5
	99	BDL	BDL	BDL	BDL	BDL	BDL	54.0	69.0	BDL	123	2.5
	100	BDL	BDL	BDL	BDL	BDL	BDL	26.0	59.0	BDL	85	2.5
E319	101	BDL	BDL	BDL	BDL	BDL	BDL	110.0	160.0	11.0	BDL	281
	102	BDL	BDL	BDL	BDL	BDL	BDL	39.0	42.0	4.2	BDL	85
	103	BDL	BDL	BDL	BDL	BDL	BDL	55.0	140.0	13.0	BDL	208
E416	114	BDL	BDL	BDL	BDL	BDL	BDL	87.0	39.0	BDL	BDL	126
	115	BDL	BDL	BDL	BDL	BDL	BDL	49.0	49.0	BDL	BDL	98
	116	BDL	BDL	BDL	BDL	BDL	BDL	60.0	67.0	BDL	BDL	127
	117	BDL	BDL	BDL	BDL	BDL	BDL	50.0	27.0	BDL	BDL	77
	118	BDL	BDL	BDL	BDL	BDL	BDL	35.0	23.0	BDL	BDL	58
E417	104	BDL	BDL	BDL	BDL	BDL	BDL	25.0	44.0	BDL	BDL	69
	105	BDL	BDL	BDL	BDL	BDL	BDL	38.0	48.0	BDL	BDL	86
	106	BDL	BDL	BDL	BDL	BDL	BDL	1.0	18.0	BDL	BDL	28
	107	BDL	BDL	BDL	BDL	BDL	BDL	11.0	28.0	BDL	BDL	39
	108	BDL	BDL	BDL	BDL	BDL	BDL	17.0	57.0	BDL	BDL	74
	109	BDL	BDL	BDL	BDL	BDL	BDL	7.2	26.0	BDL	BDL	33

TABLE 1 (Cont.)

Sample No.	Wipe No.	Aroclor Concentration ^a (µg/100 cm ²)						Detection Limit (µg)	Spike Value (µg)
		1016	1221	1232	1242	1248	1254		
<i>Building E5625 (Cont.)</i>									
E504	110	BDL	BDL	BDL	BDL	BDL	18.0	BDL	1.8
	111	BDL	BDL	BDL	BDL	4.8	18.0	BDL	2.3
	112	BDL	BDL	BDL	BDL	53.0	59.0	BDL	11.2
	113	BDL	BDL	BDL	BDL	16.0	75.0	BDL	0
	119	BDL	BDL	BDL	BDL	18.0	90.0	16.0	10.2
	120	BDL	BDL	BDL	BDL	BDL	18.0	BDL	12.4
	121	BDL	BDL	BDL	BDL	BDL	18.0	BDL	1.8
	122	BDL	BDL	BDL	BDL	BDL	16.0	BDL	1.6
	123	BDL	BDL	BDL	BDL	BDL	18.0	BDL	1.8

^a BDL = below detection limit.

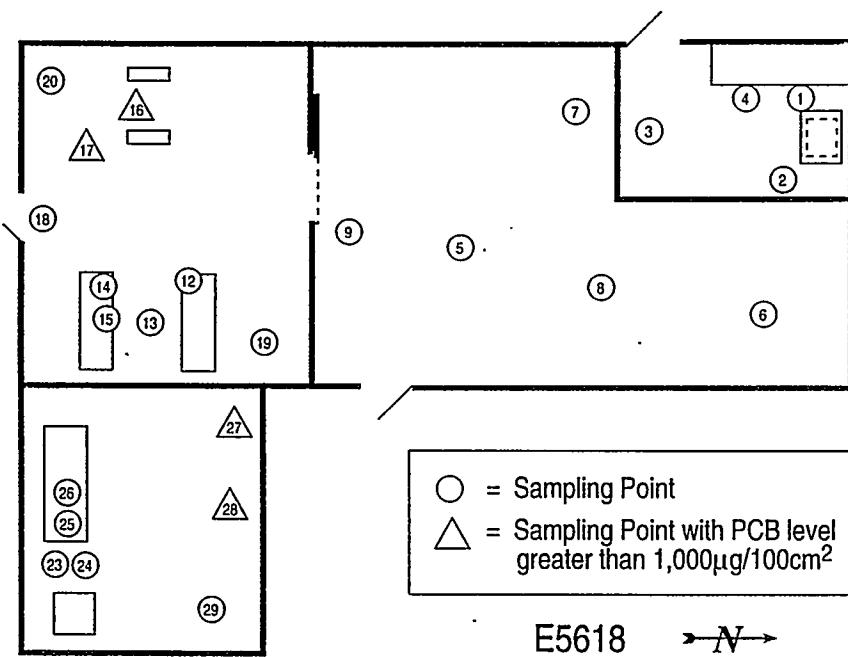


FIGURE 3 Layout of Building E5618, Showing Sampling Points

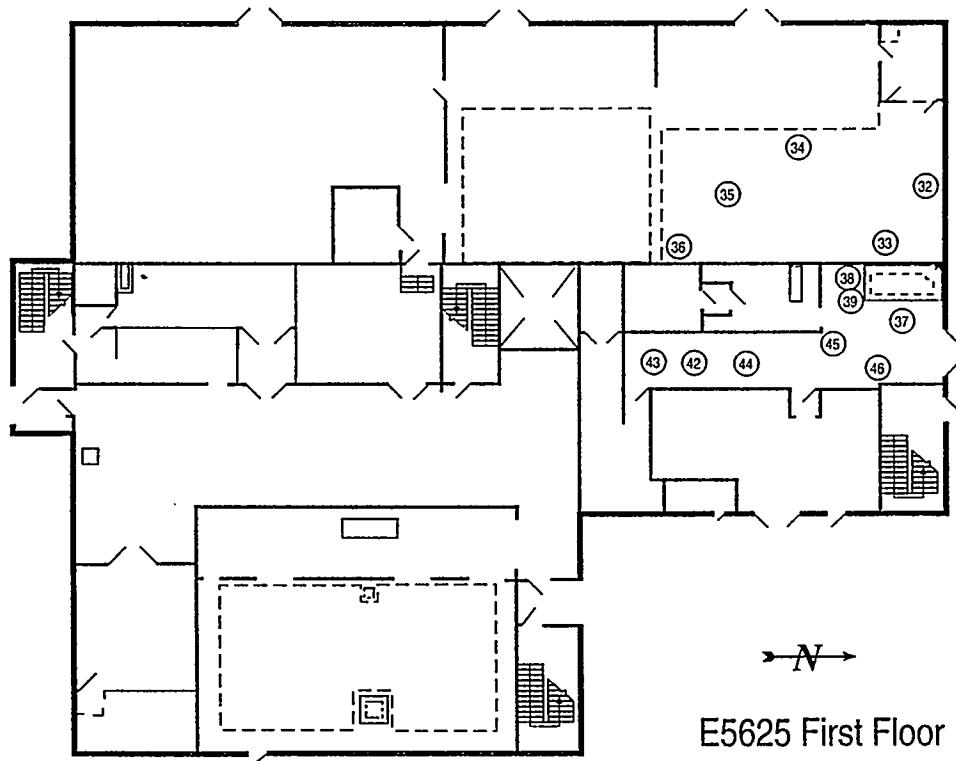


FIGURE 4 Layout of the First Floor of Building E5625, Showing Sampling Points

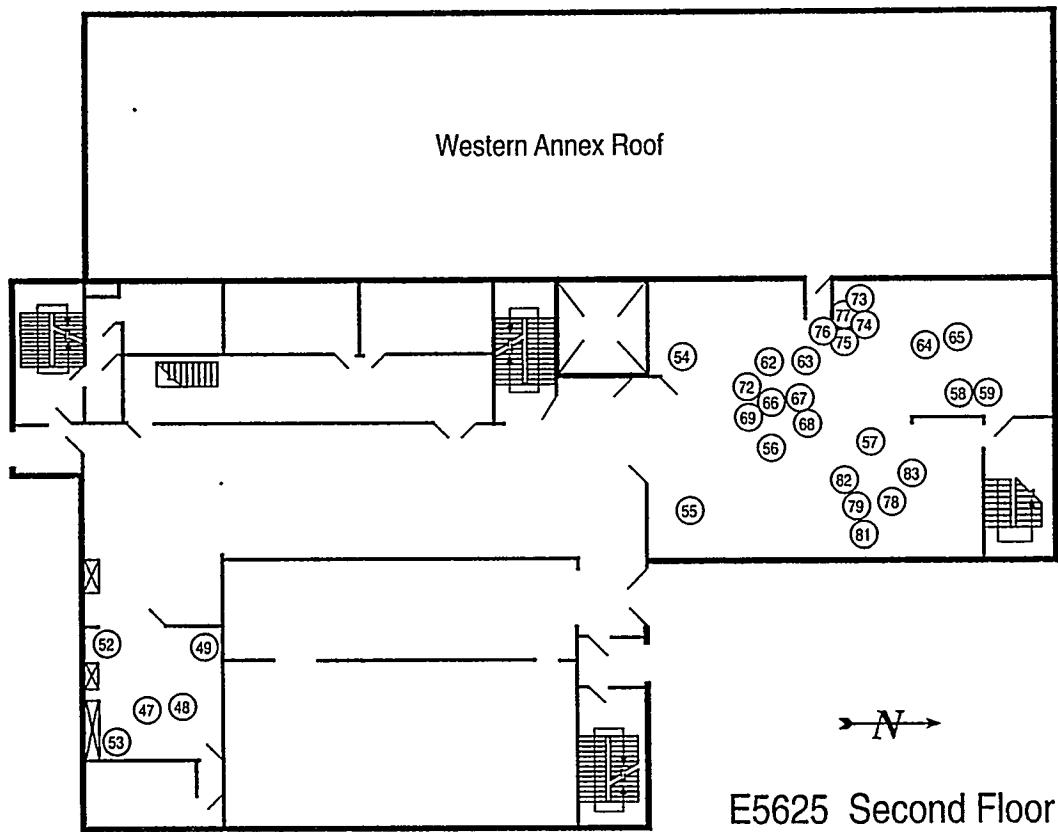


FIGURE 5 Layout of the Second Floor of Building E5625, Showing Sampling Points

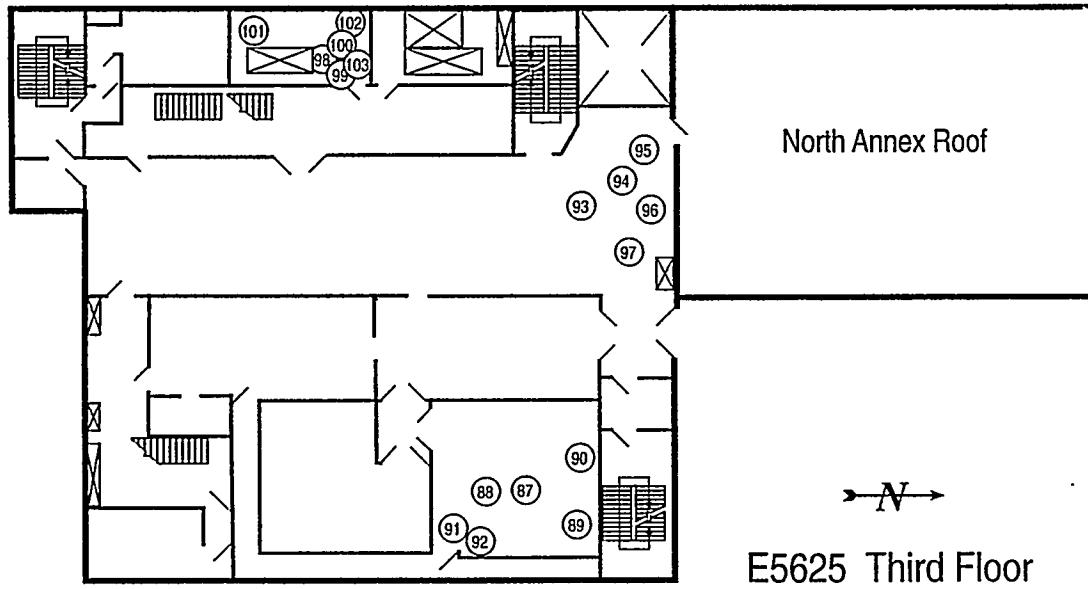
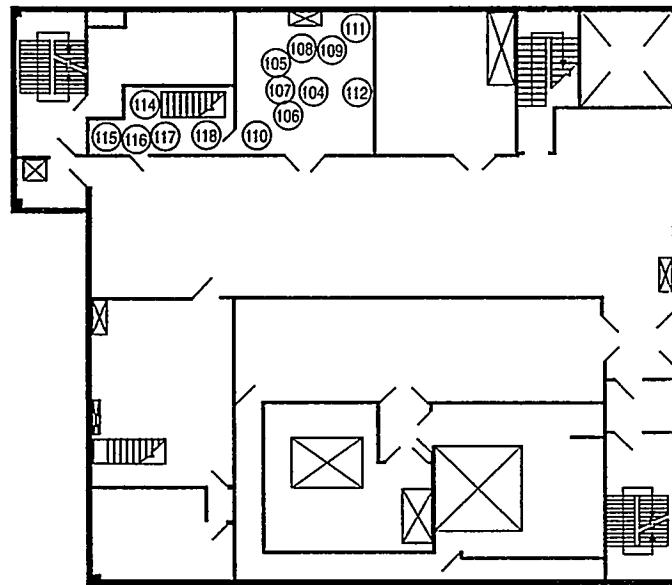
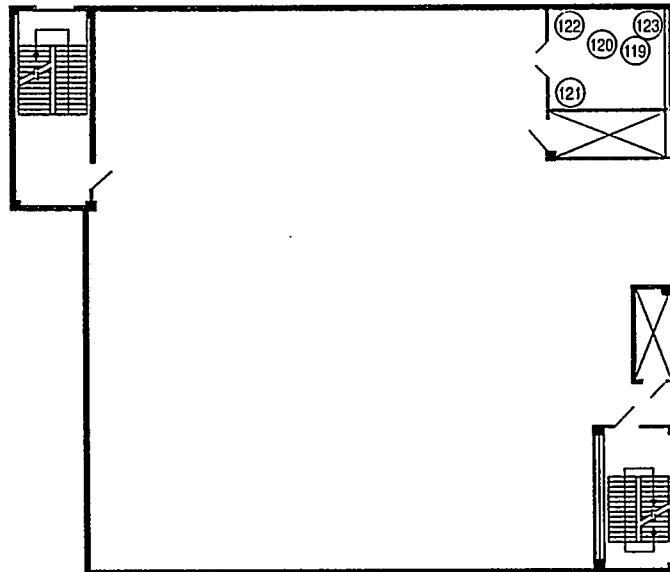


FIGURE 6 Layout of the Third Floor of Building E5625, Showing Sampling Points



E5625 Fourth Floor 

FIGURE 7 Layout of the Fourth Floor of Building E5625, Showing Sampling Points



E5625 Roof 

FIGURE 8 Layout of the Roof of Building E5625, Showing Sampling Points

4 Quality Assurance/Quality Control

Field blanks and spiked samples were analyzed as a quality assurance check. The spiked samples (Table 2) were prepared by the Analytical Chemistry Laboratory of ANL. Results indicate that the commercial analytical laboratory did an adequate job identifying and quantitating the PCBs. Aroclor 1016 was misidentified as Aroclor 1242, but the fingerprints of these two Aroclors are very similar. Aroclor 1260 was missed in duplicate samples spiked with 5 µg, indicating that the limit of detection for Aroclor 1260 is actually higher than the 2.5 µg estimated by the commercial analytical laboratory. Field blanks (Table 3) showed no evidence of cross contamination in the field or the laboratory.

TABLE 2 Spiked Sample Results

Sample No.	Actual Concentration	Analytical Result
011	10 µg 1254	8.7 µg 1254
021	10 µg 1254	5.9 µg 1254
031	100 µg 1254	79 µg 1254
	0 µg 1260	7.4 µg 1260
061	100 µg 1254	85 µg 1254
041	10 µg 1016	BDL ^a 1016
	50 µg 1260	40 µg 1260
071	10 µg 1016	7.3 µg 1242
	50 µg 1260	41 µg 1260
051	50 µg 1016	42 µg 1242
	5 µg 1260	BDL 1260
080	50 µg 1016	42 µg 1242
	5 µg 1260	BDL 1260

TABLE 3 Field Blank Results

Sample	Result (µg PCB)
010	<2.5
022	<2.5
030	<2.5
040	<2.5
050	<2.5
060	<2.5
070	<2.5
113	<2.5

^a BDL = below detection limit.

5 Conclusions

The results of the ambient air monitoring indicate that PCBs in the air of the PPC are well below acceptable levels. The wipe-sampling results suggest that the total PCB burden of the PPC appears to be below the 50-ppm regulatory level. However, we have identified contaminated floor surfaces that exceed the approved level of 10 $\mu\text{g}/100\text{ cm}^2$ for a workplace. Areas in Building E5618 exceed 1,000 $\mu\text{g}/100\text{ cm}^2$, with a high reading of 21,100 $\mu\text{g}/100\text{ cm}^2$ in room C103. Building E5625 has several areas where PCBs exceed 100 $\mu\text{g}/\text{cm}^2$.

6 References

Lattin, F.G., 1994, unpublished information, Edgewood Research and Development Engineering Center, Aberdeen Proving Ground, Md.

O'Neill, H.J., K. Brubaker, and K. Muir-Ploense, 1994, unpublished information, Argonne National Laboratory, Argonne, Ill.

Schneider, J.F., et al., 1995, *Air Monitoring for Volatile Organic Compounds at the Pilot Plant Complex, Aberdeen Proving Ground*, ANL/ESD/TM-94, Argonne National Laboratory, Argonne, Ill.