2.1

DEPARTMENT OF THE NAVY

NORTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
PHILADELPHIA, PENNSYLVANIA 19112-5094

IN REPLY REFER TO.
5090
Ser 1196/1423/RF
MAR 21 1991

Ms. Linda Wofford, Senior Engineer
Division of Air and Hazardous Materials
Department of Environmental management
291 Promenade Street
Providence, RI 02908

Dear Ms. Wofford:

In response to your letter of January 22, 1991, please find enclosed responses to your comments regarding the planned verification sampling activities for sites 12 and 14 of NCBC Davisville.

I would like to suggest the possibility of a conference call should you have additional comments or questions.

Please notify me after your review of the attached responses.

Sincerely,

Russell Fish
Remedial Project Manager
By Direction of the Commanding Officer

Copy to:
Mr. Lou Fayan NCBC Davisville, RI
Ms. Carol Keating EPA Region I

Internal Copy to wo/encl.:
Codes 1423,
1423/RF,
1422/FL,
1422/JS

RIDEM COMMENTS ON THE HEALTH AND SAFETY PLAN ADDENDUM

1. Comment:

   Page 3, Section 4.5: Decontamination Procedures. "The addendum should specify the method of disposal which will be utilized for the decontamination fluids."

   Reply:

   Decontamination fluids will not be generated in the field during the verification sampling. All decontamination of the sampling equipment will be completed in a laboratory. Dedicated sampling equipment will be used for each sample.

2. Comment:

   Page 4, Section 4.18.3 and Page 6, Section 4.19.3: Personal Protection.
   "The Department recommends that Level C personnel protection be utilized during the sampling procedures. Furthermore the Department recommends that air monitoring be conducted at the sites in order to detect the presence of any volatilized PCB carrier compound."

   Reply:

   The verification sampling will be conducted aft r all of the suspected contaminated materials have been removed from each site. Also given that the organic compounds potentially related to transformer fluids (e.g., trichlorobenzene, PCBs) are semivolatile compounds with very low vapor pressures , the inhalation risks associated with the verification sampling are believed to be minimal. However, TRC sampling personnel will maintain the ability to upgrade to Level C personnel protection if believed necessary by sampling personnel (based upon visual observations and odor).

RIDEM COMMENTS ON THE QUALITY ASSURANCE PROJECT PLAN (QAPP) ADDENDUM

1. Comment:

   Page 4, 1st Paragraph, Section 3.4: Project Scope. The soil sample results will be used to confirm that any subgrade materials contaminated by the spills is cleaned up to 25 mg/kg PCBs by dry weight.

   "The State of Rhode Island has a 1 ppm PCB cleanup level policy. RIDEM will require that this clean up level be met for all material above or below grade."

Reply:

According to th US EPA TSCA PCB Spill Cleanup Policy (40 CFR Subpart G, Section 761.125), the allowable level of PCBs which can remain in the soils at the locations of the subject PCB cleanup is 25 ppm. This allowable level is based on characterizing the spill cleanup area as a low-contact, indoor, industrial surface in a restricted access location. It is important to note that the 25 ppm level is also significantly below an applicable and appropriate EPA-developed advisory PCB cleanup soil level range of 800 to 3100 ppm (see Attachment A). This permissible PCB soil cleanup range is for the most applicable scenario consisting of short-term adult exposure to an area having PCB soil contamination with 10 inches of clean cover. Based on this guidance and the required RIDEM 1 ppm cleanup level, the findings of the verification sampling will be reviewed to determine the adequacy of the PCB spill cleanup at the sites. Attached for review is a copy of the EPA Project Summary titled "Development of Advisory Levels for Polychlorinated Biphenyls (PCBs) Cleanup" which presents the advisory EPA cleanup levels.

2. Comment:

Page 9, 5th Paragraph, Section 6.3.1: <u>Trip Blanks</u>. Trip blanks <u>will not</u> accompany the containers and the samples collected during this phase of the project.

"A trip blank should accompany the collected samples and be analyzed to detect the presence of any PCB carrier compound."

Reply:

None of the samples were planned for analysis of any so-called "PCB carrier compounds". We are not aware of any chemicals known to be "PCB carrier compounds". Although since the use of PCBs became regulated in the late 1970's, trichlorobenzene (TCB), a semivolatile compound, has been used in electrical transformer dielectric fluid. A copy of a material safety data sheet (MSDS) for TCB fluid is attached in Attachment B. The MSDS shows that TCB fluid is primarily made up of 1,2,4-TCB and contains no volatile organic compounds. Given that the TCB dielectric fluid has typically been used in place of the PCB fluid, one would <u>not</u> expect to find both compounds present in a transformer. Also it is believed that PCBs are the contaminant of concern in determining a proper cleanup based on the greater known health risks associated with

PCBs. However, soil samples will also be collected for 1,2,4-TCB analysis as discussed below in response to comment #3. Trip blanks will not be submitted with the samples since none of the samples are being analyzed for volatile organic compounds.

3. Comment:

Page 12, 1st paragraph, Section 9.0: Analytical Procedures. The sample analyses will be performed in accordance with EPA Method 8080 for PCBs analysis (SW-846 Third Edition).

"Sample analyses should also be conducted for the PCB carrier compound."

Reply:

As presented above, we are not aware of any so-called "PCB carrier compounds". Although given the potential for the presence of TCB in a transformer spill area, soil samples will also be analyzed for 1,2,4-TCB (EPA Method 8270, SW-846 3rd Edition). Another change in the sampling plan is the collection of only three (not five) wipe samples from each of the sites. This change will allow for available funds to be used in the most effective manner in the verification sampling effort.

4. Comment:

Figure A-2: Site 14, Building 316 Sample Locations and Figure A-3: Site 14, Building 38 Sample Locations.

"The figures should indicate the location of the PCB wipe results."

Reply:

The actual locations of the wipe samples will be selected in the field by sampling personnel. Wipe samples will be collected from locations adjacent to the spill cleanup area. Wipe samples will be collected from adjacent floors, walls, and/or columns.

EPA COMMENTS ON THE HEALTH AND SAFETY PLAN ADDENDUM

1. General Comments

"Therefore, since the generation of PCB-contaminated dust during the drilling is a potential concern, will TRC be monitoring for airborne dust levels during drilling? Given the possibility that PCB contamination is present, how did TRC arrive at Level D Protection requir ments and is there a contingency plan in place for upgrading to Level C based on an established action level?

Reply:

TRC will not be monitoring for airborne dust levels during the hand drilling associated with the chip sampling. It is believed that insignificant levels of dust will be generated and become airborne during the drilling operations (especially from the asphalt) which will be of very short duration. If significant airborne dust is generated during the drilling, TRC sampling personnel will wear Level C protection. The level of protection selected (a modified Level D) is based upon the very low potential for exposure to contamination during the sampling. Given the nature of the spill and the extent of the spill cleanup beyond the observed spill area, it is believed that the planned level of protection (which includes protective gloves and boot covers) is sufficient to protect the sampling personnel from any potential contaminant exposure routes. No air monitoring will be conducted during the sampling and thus no action level has been established for upgrading to Level C. Any upgrade to Level C will be based upon visual (e.g., dust) and olfactory observations by sampling personnel.

EPA COMMENTS ON THE QUALITY ASSURANCE PROJECT PLAN ADDENDUM

1. Comment:

Section 3.4, Project Scope: The PCB cleanup level of 25 mg/kg specified in the plan "is inconsistent with the project specification. More specifically, Section 2.6 of the Navy's specification states that the PCB concentrations shall not exceed 1 ppm in the concrete and soil."

Reply:

See response to RIDEM QAPP comment #1 above.

2. Comment:

Section 6.1, Selection of Sampling Locations. "Figure A-3 identifies the soil sample locations in Building 38. Given the high levels of PCB-contamination identified in samples collected during the Confirmation Study activities, soil sample locations (S-2 and S-4) should coincide with those areas of highest contamination (CW-14:2, CW-14:3, CW-14:4, and CW-14:8)."

Reply:

The locations of soil samples S-2 and S-4 will be moved to the former sample locations of CW-14:8 and CW-14:2, respectively.

3. Comment:

Section 6.2, Sample Collection, Handling, and Shipping.

"It is recommended that the holes to aid in collected chip samples be drilled to a minimum of two inches, not 1/8 inch as outlined in the project specifications and amended QAPP. Although PCBs are not very mobile, after further analysis of the time period elapsed since the spills occurred (nearly ten years ago) and the pervious nature of the floor material, a near surface sample may not be sufficient to adequately verify the absence of any PCB contamination."

Reply:

All of the chip sampling will be conducted outsid of the spill areas which were visually evident at each site. The chip samples are not being collected so much as to determine the extent of the actual spill area, but rather to provide an indication of the presence of any near surface contamination related to the tracking of any of the spill material before and during the spill cleanup. However, the chip samples will be collected down to a depth of 1 cm, as is recommended on page 42 of the EPA guidance document "Verification of PCB Spill Cleanup by Sampling and Analysis".

4. Comment:

Section 6.4, Field Decontamination Procedures.

"There is a discrepancy between the QAPP and the project specification decontamination procedures. TRC states that a hexane (pesticide grade) rinse will follow a tap water rinse, whereas the project specification call for the use of an Acetone (pesticide grade) rinse."

Reply:

A pesticide grade hexane will be used as the decontamination solvent. PCBs are more soluble in h xane than acetone, and therefore this change was made to ensure better decontamination of the sampling equipment.

ATTACHMENT A

United States
Environmental Protection
Agency

Office of Health and
Environmental Assessment
Washington DC 20460

Research and Development

EPA/600/S6-86/002 June 1987

EPA

Project Summary

Development of Advisory Levels for Polychlorinated Biphenyls (PCBs) Cleanup

Polychlorinated biphenyls (PCBs), commercially known as Aroclors, consist of mixtures of chlorinated biphenyl compounds. Many sites contaminated by PCBs remain contaminated because of PCB persistence in the environment. Although commercial PCB production in the United States has been banned by the Toxic Substances Control Act, continued use in previously existing commercial equipment can result in spills which require cleanup. The Environmental Protection Agency (EPA) has become increasingly involved in the discovery, assessment, and cleanup of these sites.

The purpose of this study is to provide advisory levels for PCB cleanup, and to describe the technical and scientific rationale and methods used in developing these advisory levels for PCBs in contaminated soil. This required the development of exposure and risk assessment methodology related to hazardous waste and spill sites, and analyses of health effects data.

The currently available modeling techniques considered most appropriate are used to estimate exposures. PCBs advisory levels are presented as ranges of values to reflect the difference in soil-air partition coefficients depending on soil type, different types of commercial Aroclors, and variations in the soil ingestion rate.

This Project Summary was developed by EPA's Office of Health and Environmental Assessment, Washington, D.C., 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

The full report of this project summary was prepared in response to a request from the Office of Emergency and Remedial Response (OERR), that the Office of Health and Environmental Assessment (OHEA) develop advisory levels for polychlorinated biphenyls (PCBs) which can be used as guidelines for initiating removal action for sites contaminated with PCBs. Interested offices within EPA, including OERR, have advised OHEA that these advisory levels for PCBs cleanup should be developed based on considerations of public health protection from short-term and long-term exposures. The advisories presented include permissible levels of PCBs in soil corresponding to 10-day and lifetime acceptable intakes.

Exposure routes considered in developing these advisory levels include drinking water, ingestion of PCB-contaminated soil by children and adults, and inhalation of ambient air contaminated with PCBs. Other exposure routes, such as dermal exposure, food intake, and ingestion of fish which have bioaccumulated PCBs, are considered in relation to their importance and their relevance to this project. In view of the high bioaccumulation factor for PCBs, the consideration of bioaccumulation is important in setting PCB levels in surface water in which aquatic animals live. If one of these routes is a controlling factor in relation to the exposure route or human intake considered, the advisories need to be reevaluated.

Chemical Composition

Commercial-grade PCBs, consisting of mixtures of different composition, are sold under the trade name Aroclors. Impurities such as chlorinated dibenzofurans and chlorinated naphthalenes are known to exist in commercial PCBs. The sole producer of Aroclors in the United States for the period 1957 to 1972 was the Monsanto Chemical Company. Their products are characterized by four-digit numbers. The first numbers represent the type of molecule (12 = biphenyl-based; 54 = terphenyl-based; 25 or 44 = blends of PCBs and chlorinated terphenyls): and the last two digits refer to the percentage of chlorine by weight. PCB products are also manufactured in other countries, including Germany, France, Japan and the U.S.S.R.

Although one might expect some 140 to 150 separate congeners in an Aroclor, the actual analysis of Aroclor 1248, for example, identified less than 50 peaks using high-resolution gas chromatography. No compounds which can be formed by addition of chlorine rather than substitution were found in a detailed study of PCBs published in 1976. It is suspected that the conditions prevailing during industrial manufacturing of PCBs do not favor the formation of addition compounds, or that these latter compounds might have been destroyed in the step used to purify the Aroclor. The literature data show that even for the same type of Aroclor, the compositions of individual biphenyls vary slightly.

Major PCB components in foreign products bearing the names of Kanechlor and Phenoclor for Japanese and Franch products, respectively, have been identified. The number of the major components separated from Kanechlor 400 is five, and that from Phenoclor DP6 is seven.

Exposure Assessment

It is likely that not all of the PCBs ingested or inhaled by humans are absorbed. Proper calculations of absorption rate and hence exposure should be based on realistic pharmacokinetics-type models to determine intake. Lack of experimental data with which to estimate the parameters needed in the pharmacokinetics models has prevented their applications to the analysis for PCB absorptions through human exchange boundaries. Future work should consider these models. Although most animal studies (in rats and mice) on the extent of absorption in the gastrointestinal tract show absorption in excess of 90%, there are two experiments on monkeys reporting less than 88% absorption in one case and less than 13% and 40% absorption for a specific congener in another case, based on the analysis of feces and urine. Vehicles used in administering PCBs were not specified. It is likely that the high adsorption characteristics of PCBs on soil could retard the absorption rate in the human intestinal tract. In the risk analysis performed in the present study, the absorption rate for humans after ingestion of PCB-contaminated soil is considered to be 30%.

Absorption from dermal exposure has been reported to be as significant as from other routes of exposure, but little information is available for the quantitative evaluation of dermal absorption rates. Five percent dermal absorption is assumed for soil contaminants in contact with human skin.

Inhalation studies using PCB aerosols show that the absorption of PCBs from inhalation exposure readily occurs. In the present analysis, an absorption factor of 50% is assumed for absorption of PCB vapors after inhalation into human lungs.

The circumstances under which human exposure occurs are divided into three classes depending on population distribution: (1) Exposure occurs onsite. This can be further subdivided into: (a) sites that are readily accessible to children, and, hence, the soil from which will be subject to ingestion, dermal contact, and inhalation, and (b) sites for which there is no possibility of soil ingestion, and, hence, exposure is only through inhalation; (2) sites which no population is assumed to enter within a radius of 0.1 km from the site; and (3) sites which no population is assumed to enter within a radius of 1 km from the site.

The soil ingestion rates used for Class (1)(a) evaluations are 3 and 0.6 g/day. The former is a value based on data from a study of an adult person with pica, while the latter represents a long-term average value for soil ingestion. If sites are not accessible to populations at distances of 0.1 km or 1 km from the site, as in Classes (2) and (3) above, it is assumed that no ingestion of contaminated soil occurs and the exposure route is that of inhalation.

Emission Evaluation

The emission rate of volatilized PCBs can be considerably reduced by covering the contaminated soil by low-porosity uncontaminated soil or clay material. The reduction in the emission rate will result in a decrease in ambient air concentrations of PCBs by the action of blowing winds. When PCB-contaminated material is directly exposed to the atmosphere, the PCB levels in soil required to maintain the same level of exposure will be les than those expected when the PCB-con taminated material is covered with low permeability material of appropriate thick ness. The cover would also serve as : deterrent to soil ingestion and direc dermal contact.

The depletion of PCBs from soil causei by volatilization is accounted for in th exposure analysis by solving a partia differential equation simulating PCB vapo diffusion through the soil air-phase pores and the distribution of PCBs between ai and soil phases. Boundary condition assume that the air-phase resistance i relatively small compared to the dif fusional resistance in the soil air-phase pores. The available experimental data reasonably follow the time-emission rate relationship predicted from the models based on this assumption. Since the depletion rate varies over time, it is averaged over the exposure period. Depletion averaged over a period of time should lead to a lesser inhalation exposure than that based on the model, assuming that depletion does not occur.

The worst-case emissions would occur when the contaminated soil is initially exposed to the atmosphere and the soil is contaminated up to the conditions exhibiting saturation vapor pressure. A constant emission rate can be assumed if the vapor-phase concentration maintains a constant value at the surface of soil contamination for time-varying emission rates. Calculations corresponding to Classes (1), (2), and (3) for exposure possibilities with surface contamination are repeated at an assumed 25-cm thickness of a soil cover initially free from PCB contamination. Among many factors affecting the emission rate (including vapor pressure, soil-air partition coefficient, Henry's Law constant, etc.), the value of the soil-air partition coefficient shows the most wide-ranging variation, because of the variation of the experimental soil-water partition coefficient available in the literature for soil textures ranging from 40 to 1,000 cm^3/g.

PCB Levels In Soil

The method for determining the permissible PCB levels in soil, which combines the routes of soil ingestion, inhalation, and dermal exposure, has been computerized to avoid the necessity for hand calculations.

The results of these computer calculations are summarized in Tables 1 and 2, which have been prepared using different combinations of the following variables:

Table 1. Permissible PCB Soil Contamination Levels (Uncovered Surface Contamination)

Location and Route of Human Exposure	Permissible Levels (μg PCB/g soil) Corresponding to: Noncancer Short-Term[a] Acceptable Intake (μg/day)[b]		Cancer Risk Specific Doses (μg/day)			
	100 for Child	700 for Adult	0.00175 (10^{-7} Risk)	0.0175 (10^{-6} Risk)	0.175 (10^{-5} Risk)	1.75 (10^{-4} Risk)
On the contaminated site						
–Soil ingestion[c], inhalation[e]	25-100[f]	510-730	0.008-0.01	.08-0.1	0.8-2	8-17
–Soil ingestion[d], inhalation[e]	42-420	2100-3000	0.01-0.06	0.1-0.6	1-6	36-61
–Inhalation only[e],	47-vs[g]	vs	0.01-0.2	0.1-2.0	1-20	77-470
0.1 km from contaminated site –Inhalation only[e]	vs	vs	2.0-220	$90\text{-}2.2\times10^4$	7.7×10^3-vs	8.7×10^6-vs
1 km from contaminated site –Inhalation only[e]	vs[g]	vs	$220\text{-}1.3\times10^3$	$2.2\times10^4\text{-}1.3\times10^5$	vs	vs

[a]Short-term ≅ 10-day intake.
[b]Based on average weights of 10 and 70 kg for a child and an adult, respectively.
[c]Children ages 1-5, with pica (consuming 3 g soil/day).
[d]Children ages 1-5, without pica (consuming 0.6 g soil/day).
[e]Inhalation rates are assumed to be 20 m^3/day for the short-term and longer-term noncancer exposures; all other (more chronic) exposui assumed to be 10 m^3/day as a result of 182 days' exposure per year.
[f]Ranges result in each case because (1) four PCBs (1242, 1248, 1254, 1260) are considered, each with a different vapor pressure, and i high and low values for soil-air partition coefficient are used in the calculations.
[g]vs denotes no theoretical upper-bound limit. Practical reasons require no free-flowing PCB liquids for the limit.

(1) Surface contamination representing a situation where the contaminated soil surface has been left uncovered after removal action.
(2) 25-cm (10-inch) clean cover applied, representing a situation in which clean soil material is used on top of the contaminated soil surface.
(3) Two different soil ingestion rates (3 and 0.6 g/day) for Class (1) (a), corresponding to sites accessible to children.
(4) Different acceptable intake (AI) levels (short-term AI, and AIs at different cancer risk levels).
(5) Four Aroclors (Aroclor 1242, 1248, 1254, and 1260).
(6) Two selected values of the soil-air partition coefficient, representing the high and low values.
(7) Exposures for 10 days after cleanup or spill of contaminants for short-term advisories.

Table 1 shows the range of values for permissible PCB concentrations in soil when the soil is contaminated up to the surface in contact with the atmosphere and is left uncovered. Table 2 represents the case where the contaminated soil left at the site, or after remediation, is covered with a 25-cm (10-inch) clean soil layer. The ranges in both tables result from the use of four Aroclors and the use of high and low values for the soil-air partition coefficient. Other factors reflected in the ranges are differences in vapor pressures and Henry's Law constants for each Aroclor.

Results

The symbol "vs" in Tables 1 and 2 indicates that no upper-bound limit for PCB concentrations in soil can be derived from the exposure evaluation, because the PCB concentration in soil is above the vapor saturation concentration. There ar two reasons for such a result. First, th emission rate cannot exceed the upper bound value which can be expected whe the air-phase concentration of PCBs a the contaminated soil surface is main tained at the vapor saturation point. Th concentration at the vapor saturatio point corresponds to the vapor pressur concentration. Second, when the cover i applied, not only is the emission rat retarded, but also the concentration o PCBs in soil being ingested is controlle by the amount of PCBs adsorbed on soi in equilibrium with the air phase being emitted. Therefore, the concentration o PCBs in the initially clean soil material cannot exceed the concentration in equilibrium with saturated vapor.

In actuality, the "no upper limit," or the level above vapor saturation, designated by vs, should be interpreted with great care. The assumptions used in the ex-

Table 2. Permissible PCB Soil Contamination Levels (25-cm-Thick Clean Cover)

Location and Route of Human Exposure	Permissible Levels (μg PCB/g soil) Corresponding to: Noncancer Short-Term[a] Acceptable Intake (μg/day)[b] — 100 for Child	700 for Adult	Cancer Risk Specific Doses (μg/day) — 0.00175 (10^{-7} Risk)	0.0175 (10^{-6} Risk)	0.175 (10^{-5} Risk)	1.75 (10^{-4} Risk)
On the contaminated site						
-Soil ingestion[c], inhalation[e]	110-200[f]	800-1400	0.01-0.2	0.1-2.0	1-17	22-vs
-Soil ingestion[d], inhalation[e]	450-vs[g]	3100-vs	0.02-0.6	0.2-6.0	10-48	93-vs
-Inhalation only[e]	vs	vs	0.02-1.0	0.2-vs	2.0-vs	770-vs
0.1 km from contaminated site -Inhalation only[e]	vs	vs	1-vs	620-vs	vs	vs
1 km from contaminated site -Inhalation only[e]	vs	vs	vs	vs	vs	vs

[a]Short-term ≅ 10-day intake.
[b]Based on average weights of 10 and 70 kg for a child and an adult, respectively.
[c]Children ages 1-5, with pica (consuming 3 g soil/day).
[d]Children ages 1-5, without pica (consuming 0.6 g soil/day).
[e]Inhalation rates are assumed to be 20 m^3/day for the short-term and longer-term noncancer exposures, all other (more chronic) exposures assumed to be 10 m^3/day as a result of 182 days' exposure per year.
[f]Ranges result in each case because (1) four PCBs (1242, 1248, 1254, 1260) are considered each with a different vapor pressure, and (2) high and low values for soil-air partition coefficient are used in the calculations.
[g]vs denotes no theoretical upper-bound limit. Practical reasons require no free-flowing PCB liquids for the limit.

posure evaluation are critical. They include but are not limited to: (1) no soaking of clean cover by liquid PCBs for the thickness of 25 cm; (2) no disturbance of cover material by construction activities or children digging the ground; (3) no exposure to initial spills when 25 cm of clean cover (Table 2) is assumed; (4) no population enters the area within the respective radius of distances from the site; and (5) the cover material is at least equivalent to soil material.

From a practical point of view, the first assumption is tantamount to requiring the presence of no free liquids in the soil, which may otherwise result in the phenomenon of "wicking." Since the ranges shown in Tables 1 and 2 are dependent upon the type of Aroclors and the values of the soil-air partition coefficient, site-specific or Aroclor-specific information should be used to establish an appropriate level of PCBs for that particular condition. Computer outputs for the selected Aroclors under the ranges and conditions of common environmental concern can be used to find the permissible concentrations in soil suitable to particular situations.

Table 1, for example, can be interpreted as follows:

(1) When the site is amenable to access by children with possibilities of ingesting the contaminated soil exposed to the atmosphere, and when exposure occurring to the children by inhalation and dermal contact is accounted for, the permissible PCB levels in soil should range from 25 to 100 μg/g and 42 to 420 μg/g for prevention of noncancer effects from 10-day exposure for a child with an average weight of 10 kg ingesting soil at the rates of 3 and 0.6 g/day, respectively. For cancer effects, permissible levels in soil for a lifetime exposure to PCBs resulting from ingestion of and dermal contact with contaminated soil and inhalation of contaminated air should range from 0.08 to 0.1 μg/g and 0.1 to 0.6 μg/g, corresponding to an upper-bound risk estimate of 10^{-6} at assumed soil ingestion rates of 3 and 0.6 g/day, respectively. The specific level will depend on the types of Aroclor present, the likely ingestion rate, and the extent of soil-air partitioning. For sites in which there is no possibility of soil ingestion, PCB levels in soil, based on the inhalation route only, should range from 47 μg/g to no limit value for a 10-day exposure for a child with an average weight of 10 kg, and correspond to no limit value for an adult with an average weight of 70 kg. The permissible levels of PCBs in soil, based on the inhalation pathway only, range from 0.1 to 2 μg/g, corresponding to a lifetime AI at a risk factor of 10^{-6}. Again, the level will be dictated by the types of Aroclor present and the specific characteristics of the site involved.

(2) If there is no possibility of a population entering the contaminated site within

a radius of 0.1 km from the site, the PCB levels in soil can remain at no limit value and 90 to 2.2×10^4 μg/g, without exceeding 10-day AI and lifetime AI at 10^{-6} risk, respectively.

Similar interpretations can be made for the results applicable to sites without affected population up to 1 km from the site, and to the carcinogenic risks listed at 10^{-4}, 10^{-5} and 10^{-7}.

Conclusion

The short-term AI levels (100 μg/g day for a child and 700 μg/g day for an adult) used to develop 10-day advisories based on noncancer effects are derived from animal studies, which collectively indicate that the experimental threshold for adverse effects of Aroclor 1254 is at or near a dose of 1.0 μg/kg body weight. Using this dose as a No Observed Adverse Effect Level and a safety factor of 100, the 10-day AI levels for noncancer effects described above (100 and 700 μg/day) were computed. The permissible concentrations of PCBs in soil are calculated from multimedia exposure assessments by requiring that the total PCBs intake rate from pertinent exposure pathways do not exceed these AIs. Advisory levels for 1-day and lifetime noncancer effects cannot be derived at this time because of the insufficiency of available data. However, in view of the experimental duration, the 10-day advisories may well be used for the 1-day advisories.

*The EPA authors **Seong T. Hwang** (also the EPA Project Officer, see below), **James W. Falco**, and **Charles H. Nauman** are with the Office of Health and Environmental Assessment, Washington, DC 20460.*

The complete report, entitled "Development of Advisory Levels for Polychlorinated Biphenyls (PCBs) Cleanup," (Order No. PB 86-232 774/AS; Cost: $22.95, 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:

Office of Health and Environmental Assessment (RD-689)
U.S. Environmental Protection Agency
Washington, DC 20460

ATTACHMENT B

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

NO. 365

TRICHLOROBENZENE, DIELECTRIC GRADE

REVISION A

Date December 1979

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: TRICHLOROBENZENE, DIELECTRIC GRADE
DESIGNATION: This material is a specific technical mixture (see Sec. II), based mainly on 1,2,4-trichlorobenzene and its isomers.
OTHER DESIGNATIONS: GE Material D5B76
MANUFACTURER: Standard Chlorine Chemical Co., Inc.
1035 Belleville Turnpike
Kearny, NJ 07032
Telephone: (201) 997-1700

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Trichlorobenzenes:	> 97	
1,2,4-Trichlorobenzene, >70% (CAS # 000 120 821)		8-hr TWA 5 ppm* or 40 mg/m3
1,2,3-Trichlorobenzene, >20% (CAS # 000 087 616)		No TLV established**
1,3,5-Trichlorobenzene		No TLV established
Other Chlorinated Benzenes:	<4	
Dichlorobenzenes, ca 1%		8-hr TWA 50 ppm (C)*** (o-isomer)
Tetrachlorobenzenes, ca 1%		No TLV established
Pentachlorobenzene, Trace		No TLV established

*ACGIH (1979) TLV; no OSHA TLV.
**USSR (Russian) TLV 1.3 ppm (1971).
***ACGIH and OSHA ceiling level TLV.

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg F ----	ca 415*	Specific gravity (H_2O=1) -----	1.46*
Vapor pressure at 104 F, mm Hg -	1	Volatiles, % (when heated) -----	ca 100
Vapor density (Air=1) ----------	6+	Melting point, deg F ----------	<50*
Solubility in water, 25 C,% ----	0.003	Molecular weight, approx -----	182

Appearance & Odor: A clear, nearly colorless liquid with a characteristic aromatic odor.

*Exact properties depend on the mixture used.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	LOWER	UPPER
ca 230 F (CC)	Unknown	Unknown		

Extinguishing Media: CO_2, dry chemical, foam or water spray.
When this material is in a fire situation, it can thermally and oxidatively decompose to yield phosgene, hydrogen chloride, carbon monoxide and other toxic gases and vapors. Firefighters should use self-contained breathing apparatus to fight this kind of fire.
This material is a slight fire hazard when heated.

SECTION V. REACTIVITY DATA

This is a stable material under normal storage conditions. It does not polymerize. It will thermally decompose above 575 F. Contact with an open flame or an electric arc can yield phosgene and hydrogen chloride.
Avoid contact with oxidizing agents.