Risk Assessment for Exposure to Ambient Air in the Vicinity of the BKK Landfill in West Covina, 1978-1985

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April 1986

R&S146084

1. Introduction

The BKK landfill in West Covina has been in operation as a repository for toxic waste since 1976. Some of the residents in the vicinity of the landfill have complained that substances in the landfill are causing them to suffer an increased risk of disease and have asked that the landfill be closed. In 1983, the California Department of Health Services (DHS) *et al.* (DHS 1983) issued a report which contained measurements of the ambient air concentrations of volatile organic compounds, which the Department considered to be potential human carcinogens, and also reported corresponding measurements at a control site located 9 miles away. These measurements were used as a basis for calculation of the excess cancer risk associated with residence near the BKK landfill (DHS 1983, attached as Appendix 1). A review of the DHS 1983 report indicated that it was not possible to reproduce this calculation since no information was given with regard to what animal cancer tests were used or how certain factors, such as meteorological conditions, were accounted for. We were therefore asked to perform our own calculation of the excess cancer risk that may be incurred by residence in the vicinity of the BKK landfill during a 7-year period between 1978 and 1985. Our analysis uses data from exposure monitoring and from animal experiments along with a variety of methods and assumptions that are used by the U.S. Environmental Protection Agency (EPA), plus several new methods that have been developed recently. Section 2 describes these methods, Section 3 reports the results of the calculations we made, and Section 4 discusses these results.

2. Methods

In order to predict increased lifetime cancer risk, it is necessary in this case to calculate both a dose and a carcinogenic potency for each of the compounds to which individuals are purportedly exposed around the BKK landfill.

Dose is, of course, calculated from the available exposure information. Carcinogenic potencies are derived from the selected animal bioassay data. Our assumptions and methods regarding the calculation of exposure and potency are described below.

2.1. Methods & Assumptions Regarding Exposure Assessment

In the absence of detailed information on exposure in the vicinity of the BKK landfill, a number of assumptions were made regarding how to interpret the concentration data available to us as well as how to estimate duration of exposure, dilution of ambient contaminant concentration, absorption of inhaled compounds and, finally, the impact of seasonal concentration variability. These assumptions are described below.

2.1.1. Concentration Data

It is assumed that the mean ambient air concentrations (i.e., the mean value of the 2 [1 in the case of benzene] compound-specific mean concentrations) reported in DHS (1983) equal the actual time-weighted average (TWA) concentrations for the seven compounds measured, over the 7-year period of interest. These data were collected at 4 monitoring stations (Stations A, B, D, and F) located on the perimeter of the BKK landfill, as well as at a control monitoring station located 9 miles away (Station C). It is also assumed that the relative ratios of the latter values accurately reflect the relative contribution of each compound to total exposure over this period, for each monitoring station.

For the purpose of our analysis, we have further assumed that the TWA concentrations at the stations on the perimeter of the BKK landfill and those at the control station are in fact different. That is, we assume that the DHS-reported differences between the mean concentrations for Stations A, B, D and F, on the one hand, and Station C, on the other, are not due purely to chance.

If a proper statistical analysis of the the actual concentration measurement data indicate that the latter differences are in fact due to chance, then the excess risk is of course 0 without reference to any further assumptions. Since the raw concentration data were unavailable to us, we are unable to evaluate the likelihood of this possibility.

Increased concentrations of the 7 contaminants measured by DHS in the BKK vicinity above the corresponding control station values were calculated for stations A, B, D and F in terms of mg/kg/day. These values are given in Appendix 2. Note that for Station F, the mean of the measured values is less than the corresponding control station value for benzene and chloroform.

2.1.2. Exposure Duration

Here we assume that exposed residents are present in the vicinity of the BKK landfill for an average of 15 hours per day, for 365 days per year over a 7-year period.

2.1.3. Concentration Dilution

We assume that concentrations reported on the perimeter of the landfill are dispersed in the ambient air to some degree before being inhaled by the average resident, and that this process reduces the average concentration to which residents are exposed by a factor of 2. We further assume that no additional dilution takes place (e.g., due to filtration by air conditioning).

2.1.4. Absorption

We assume residents' average respiratory intake rate is 20 m^3/day per 70 kg body weight (i.e., 0.2857 m^3/kg/day). In their analysis of cancer risk due to household exposure of chlorinated hydrocarbons, such as those considered here, Cothern *et al.* (1984) make the assumption that 50% of the amount of such compounds contained in inhaled air is absorbed into to blood and is distributed via circulation, and the balanced is exhaled back into the atmosphere. We follow the Cothern *et al.* assumption of 50% absorption (i.e., 50% retention) of contaminants contained in respired air.

2.1.5. Seasonal Variation in Concentration

It is possible that the release of volatile organic compounds, such as those considered here, from the surface of the BKK landfill may be enhanced with increasing temperature, resulting in increased ambient concentration during the warmer months of the year. We note that the DHS concentration measurements were made between July and October of 1982. Since these months are the warmest of the year in southern California, these measurements may overestimate TWA concentrations at other times of the year. In the absence of other measurements, however, we make the conservative assumption that the DHS measurements accurately reflect TWA concentrations over the multi-year period of interest without seasonal adjustment.

2.2. Methods & Assumptions Regarding Carcinogen Potency Assessment

Since the mid-1960s, the primary basis for judging both carcinogenicity (i.e., carcinogenic potential) *per se* and the carcinogenic potency of particular chemicals to humans, in the absence of adequate epidemiological data, has been data from long-term carcinogen bioassays using laboratory animals. By this means, an assessment of human carcinogenic potency of a compound at very low environmental dose levels begins with an assessment of tumorigenic potency at much higher experimental dose levels in the test species used. This is followed first by an extrapolation of expected response in that species from these experimental dose levels down to the environmental levels of interest, then by an extrapolation of the latter predicted response, in the test species used, to a response in a target human population.

The validity of risk predictions calculated in accordance with the above procedure, of course, is conditional on the validity of key assumptions or "inference bridges" that must be used to bridge fundamental gaps that currently exist in basic scientific knowledge concerning the mechanism of carcinogenesis, the extrapolation of high-dose observations to low-dose predictions for a given species, and the equivalence of tumorigenic doses between different species. Environmental cancer risk assessment cannot proceed without the use of these assumptions, so that much effort has gone into studying how they may standardized for use in a regulatory context (NAS 1983). But this does not mean that the uncertainty associated with these assumptions is in any way irrelevant or negligible, or even that their use will necessarily lead to risk predictions that are consistent with the "best guesses" of a majority of informed scientists/experts.

In certain components of our potency assessment we have made use of some of the assumptions and procedures that have become standard in the context of regulatory carcinogen risk assessment. But in other components of our analysis, we have made use of a range of plausible assumptions (rather than a single conservative assumption) in order to lend a greater degree of objectivity to the analysis. The validity of the final result, however, *remains* conditional on the validity of the residual set of inference bridges we have used for this analysis.

The following subsections discuss the specific methods and assumptions we use for carcinogen potency assessment in the present analysis.

2.2.1. Selection of Animal Data

The animal data we used for each compound were derived from EPA Health Assessment Documents when these were available. In the absence of such documents (for the cases of the 2 known human carcinogens vinyl chloride and benzene), data from the scientific literature were selected in general accordance with EPA's preferred selection criteria. The latter criteria are *conservative* in the sense that efforts are made to *err on the side of safety* by generally focusing on data obtained for the most sensitive species/strain/sex tested while ignoring the weight of evidence for non-carcinogenicity or for less potent carcinogenicity presented by any remaining data (EPA 1984a).

Below we describe the specific data sources we used in our potency assessment. The actual dose-response input data used and related information appears in Appendix 2.

We note that in the health assessment documents for the five compounds for which EPA has produced such documents to date, animal dose levels used to extrapolate tumorigenic response for given bioassay data sets represent lifetime TWA *metabolized* doses. In these cases, and in the case of vinyl chloride discussed below, dose levels were (linearly) transformed back into an applied dose level that corresponds with expected applied low-level dose, fully in accordance with the pharmacokinetic data relied on in each case for determining metabolized dose. The latter transformation obviates the need to readjust calculated potencies that are based directly on a metabolized dose, rather than on an applied dose such as that calculated for BKK-vicinity residents. (See, however, the discussion of vinylidene chloride bioassay data below.)

We note finally that in certain cases several animal bioassay data sets are discussed and analyzed in EPA health assessment documents, whereas only a subset of these are actually used to calculated potency values recommended for use (albeit, for use in a *regulatory* context) by EPA. We have made use of only data sets relied on by EPA for final potency assessment in these cases.

1. Vinyl Chloride (VCL). No EPA health assessment document exists for VCL at this time. For potency assessment, we used the data of Maltoni and LeFem-

ine (1975) on the induction of zymbal gland tumors, nephroblastomas and liver angiosarcomas in female Sprague-Dawly rats exposed to VCL by inhalation. The experimental exposures in this study (0, 50, 250, 500, 2500, 6000, and 10000 ppm) were converted to lifetime TWA exposures in mg/kg/day using standard assumptions employed by EPA (Anderson *et al.* 1983, EPA 1984a). In addition, the resulting animal TWA doses were adjusted to reflect non-linear metabolism of VCL by rats at these concentrations, in accordance with the pharmacokinetic analysis done by Gehring *et al.* (1978).

2. **Perchloroethylene (PCE).** Bioassay data on PCE liver carcinogenicity in B6C3F1 mice have been used by EPA to extrapolate carcinogenicity at low doses (EPA 1984b). More recent bioassay data have been produced by the National Toxicology Program which may also be used to evaluate the carcinogenic potential of PCE (NTP 1985). See discussion in Section 2.2.2 regarding our omission of PCE data.

3. **Trichloroethylene (TCE).** Bioassay data on TCE liver carcinogenicity in B6C3F1 mice have been used by EPA to extrapolate carcinogenicity at low doses (EPA 1985a). See discussion in Section 2.2.2 regarding our omission of TCE data.

4. **Vinylidene Chloride (VDCL).** We make use of bioassay data on VDCL's capacity to induce kidney adenocarcinomas in male Swiss mice reviewed in EPA (1985b). EPA's derivation of dose data for this bioassay relies on experimental information regarding VDCL metabolism in rats and mice. For potency assessment, EPA assumes 100% metabolism of VDCL, and so uses calculated metabolized dose directly in its potency assessment. However, the metabolic data relied on by EPA for VDCL potency assessment show that 0.035 kg mice and 0.25 kg rats exposed to 10 ppm VDCL for 6 hours metabolize 0.186 mg and 0.723 mg VDCL, respectively. But using EPA's recommended method to calculate mouse

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respiration rates in the context of cancer risk assessment (EPA 1984a), the corresponding inhaled amounts (which equal the respective applied doses only if 100% absorption is assumed—see discussion above) are

$$\textit{Mouse}: \left[10 \text{ ppm} \times \frac{97 \text{ g/M}}{24.45 \text{ L/M}}\right] \times \left[0.0345 \left(\frac{0.035}{0.025}\right)^{2/3} \text{m}^3/\text{day} \times \frac{6 \text{ hr}}{24 \text{ hr/day}}\right] = 0.428$$

$$\textit{Rat}: \left[10 \text{ ppm} \times \frac{97 \text{ g/M}}{24.45 \text{ L/M}}\right] \times \left[0.105 \left(\frac{0.25}{0.113}\right)^{2/3} \text{m}^3/\text{day} \times \frac{6 \text{ hr}}{24 \text{ hr/day}}\right] = 1.768$$

That is, 43% and 45% of applied dose is metabolized by mice and rats exposed to 10 ppm VDCL for 6 hours, respectively. Since metabolic saturation in these species occurs at a much greater dose level than 10 ppm, it may be argued that the appropriate applied dose data to use for mice in analyzing the VDCL bioassay data can be linearly extrapolated down to the ppb range of interest, i.e., that the dose data should be increased by a factor of $\frac{1}{0.43} = 2.3$ over the figures used by EPA. We did *not* correct for this source of potential conservatism in deriving appropriate dose data to use in the analysis of the VDCL bioassay data, but rather used EPA's dose data directly.

5. **1,2-Dichloroethane (DCE).** We make use of bioassay data on DCE's capacity to induce hemangiosarcomas in male Osborne-Mendel rats and hepatocellular carcinomas in male B6C3F1 mice reviewed in EPA (1985c).

6. **Chloroform (CLFM).** We make use of bioassay data on CLFM's capacity to induce hepatocellular carcinomas in male and female B6C3F1 mice reviewed in EPA (1985d).

7. **Benzene (BNZ).** No EPA health assessment document exists for BNZ at this time. For potency assessment, we used the data of Maltoni (1983) on zymbal gland tumor induction in female Sprague-Dawly rats exposed to BNZ by ingestion. Metabolism was not taken into account regarding the dose levels in

this data set.

2.2.2. Dose-Response Extrapolation

The extrapolation of observed response in animals at experimental doses to predicted response at low doses can be strongly influenced by the model used to carry out this extrapolation. This is clearly illustrated in Cothern *et al.* (1984). EPA uses the "linearized multistage" model to extrapolate lifetime human cancer risk at very low dose levels based on a given set of animal carcinogenicity bioassay data (Anderson *et al.* 1983, EPA 1984a). This method yields an upper (one-tailed) asymptotic 95% confidence limit of low-dose potency for a given input data set. The uncertainty referred to by this confidence limit is that due *only* to estimation error in fitting the multistage model, where this model is simply assumed to be correct for the purpose of doing a quantitative potency analysis. This dose-response model is such that risk is approximately equal to dose multiplied by potency at very low dose levels, such as the levels we consider here.

In addition, low-dose potency and risk extrapolations generated by the multistage model are conditional on the assumption that the compounds whose potencies are extrapolated are indeed human carcinogens at low doses. While in a regulatory context, a number of *conservative*, *safety-oriented* assumptions have been adopted to enable analysts to predict the cancer risks which may possibly be associated with exposure to certain compounds (NAS 1983, EPA 1984a), these assumptions do *not* necessarily provide the *most likely* or *most reasonable* estimate of risk given current scientific knowledge. Accordingly, we do not feel that the compounds PCE and TCE should be included in our assessment of the most *likely* risk associated with exposure to emissions from the BKK landfill. This is because both of these compounds are unlikely to be actual human carcinogens at the low doses considered in this analysis. Both compounds produce tumors in the livers of B6C3F1 mice and do not do so in the livers of rats. The B6C3F1 mouse is extraordinarily susceptible to liver cancer, possibly because of the presence of an oncogene in its liver cell DNA (Fox and Watantabe 1985). Therefore, any agency which produces toxicity in the livers of B6C3F1 mice is more than likely to produce liver tumors by stimulating cell proliferation rather than by causing genetic damage. Recent studies by Mirsalis *et al.* (1985) using both TCE and PCE support this proposition, i.e., that TCE and PCE produce liver cancer in B6C3F1 mice by an epigenetic toxic mechanism. Furthermore, mice do not metabolize TCE in the same manner as humans and do so at a much faster rate than either rats or humans. Since neither TCE nor PCE nor both will produce liver toxicity in humans at the low doses being considered here, they are extremely unlikely to produce liver cancer in the human population concerned.

When more than one data set is used to calculate carcinogenic potency, EPA uses the geometric mean of the calculated asymptotic upper confidence limits based on those data sets as an overall estimate of potency. The latter procedure, for instance, was used in EPA's recent calculation of TCE's carcinogenic potency based on 4 bioassay data sets (2 sexes in 2 different studies) (EPA 1984b).

For the purpose of deriving a lifetime tumorigenic potency assessment which takes a more objective approach to the uncertainties arising in dose-response extrapolation, we have used an alternative to EPA's method, called the Monte Carlo Potency Analysis (MCPA) method, to assess carcinogenic potency under different assumptions, such as regarding which data set to use (or how to do inter-species dose extrapolation, discussed below). The MCPA method uses the same multistage model used by the EPA method. However, the MCPA method relies on Monte Carlo simulation, rather than the more conservative

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and approximate asymptotic approach used in the EPA method, and it produces *complete distributions* for potency estimation error, rather than the single upper confidence value for potency produced by the EPA method (Bogen 1986). Our application of the MCPA method to the above-specified dose-response input data was carried out using a version of the program GLOBAL79 used for the analysis of dichotomous tumor response data (Crump and Watson 1979) which was modified to generate complete Monte Carlo distributions of site-specific as well as composite tumorigenic potency based on that data (Bogen 1986).

Time-to-tumor data were not used in our analysis of carcinogenic potency, although it would be possible to do so in the context of our analytical framework using a time-dependent multistage model (Crump and Howe 1984). EPA potency assessments have occasionally used time-to-tumor data with such a model when these data are available and when early mortality in a bioassay is prevalent to the extent that it may lead to distorted estimates of potency. Potency values thus derived tend to yield slightly greater values for potency than are derived using a multistage model that does not incorporate time-to-tumor information. For example, for compounds considered herein that are addressed by EPA health assessment documents, upper confidence limit potency values derived using time-to-tumor information are higher than those derived without this information by a factor of approximately 2 or less. However, the incorporation of time-to-tumor information into potency assessment requires several additional assumptions, such as the selection of an appropriate exponent of time (which corresponds to an assumed number of stages in the multistage carcinogenic process) to use in the more complicated time-to-tumor model (Crump and Howe 1984). This introduce yet additional sources of uncertainty into the analysis. Since the time-dependent and time-independent models yield similar potency estimates in the cases we consider for which a comparison was undertaken by EPA in its health assessment documents, we have relied only on the time-independent multistage model for our analysis.

Depending on the nature of a particular data set, the question may arise regarding how or whether to combine experimental incidence data for each significant tumor type observed in a given bioassay into data amenable to a quantitative assessment of increased *composite* risk, where here the term "composite" is used to refer to the potential or actual occurrence of *any one or more* types of tumor from among a prespecified set of types. EPA has used a tumor counting procedure that consequently has become widely applied in the context of environmental carcinogen risk assessment. According to EPA, if data exist for two or more significant tumor types in the same study, the number of animals with *at least one* of these types is used as incidence data for quantitative assessment of composite risk when bioassay data must be relied on for this purpose (Anderson *et al.* 1983, EPA 1984a). This procedure has been criticized in that it may lead to results which are inconsistent with the underlying tumor incidence data used for a given potency assessment, and an alternative procedure, "composite potency analysis," is available which always yields consistent potency estimates based on tumor incidence data segregated by tumor type (Bogen 1986). We have made use of composite potency analysis in the context of our assessment of VCL carcinogenic potency, in which case 3 different tumor types were observed to occur with significantly increased incidence in rats.

2.2.3. Inter-Species Dose-Equivalence Extrapolation

Equivalent doses between species may be calculated on the basis of dose per body weight or dose per body surface area. At present it is not known which inter-species dose extrapolation assumption better reflects reality in the context of extrapolating tumor response data in animals to anticipated response in humans, and existing data do not rule out either approach (Hogan and Hoel 1982). When data from a bioassay using mice, e.g., are used for dose-response extrapolation, the choice of which inter-species dose extrapolation method to use alters the resulting potency calculation by a factor of more than 10. To provide and objective approach to the issue of inter-species dose extrapolation, we used a Monte Carlo approach to combine the potency distributions based on the body weight and surface area methods, under the assumption that each method is equally likely to reflect reality.

2.3. Methods & Assumptions Regarding Risk Calculations

To calculate approximate increased low-dose risk to BKK-vicinity residents, calculated excess doses in mg/kg/day for each of the compounds VCL, VDCL, DCE, BNZ and CLFM at each station were multiplied by the factor

$$\frac{7}{70} \times \frac{15}{24} \times 0.50 \times 0.50 = 0.015625$$

in accordance with the assumptions we made regarding exposure duration, concentration dilution and absorption. These excess doses were then multiplied by the corresponding calculated MCPA potency distributions to yield approximate compound-specific risk distributions for each of the stations A, B, D, and F, in accordance with the approximate linearity of the multistage dose-response model at very low doses. The latter station-specific risk distributions were then summed, using a Monte Carlo procedure, to yield distributions of total increased risk due to all 5 compounds for each station, under the assumption that the carcinogenic potency of the mixture of compounds is in all cases equal to the simple sum of the individual compound-specific potencies. That is, we assumed that there is neither positive nor negative synergism among the carcinogenic potencies of the mixture of compounds considered.

An overall BKK-vicinity risk distribution was then derived by taking a weighted average of the 4 calculated station-specific risk distributions, again using a Monte Carlo procedure, where the station-specific weights were all assumed to be equal (i.e., all equal to 0.25, resulting in a simple average of the 4 distributions). Finally, from this average distribution of total increased risk, the median value (i.e., the 50th percentile value) was selected to represent a risk value which is as likely as not to overestimate the true level of average increased individual risk which BKK-vicinity residents have incurred over the 7-year period of interest, conditional on the set of assumptions we made in our risk analysis.

3. Risk Analysis Results

Our calculated MCPA potency distributions for each of the compounds VCL, VDCL, DCE, BNZ and CLFM (as well as for the compounds PCE and TCE) are given in Appendix 3. Application of the methods described above using these potency distributions yielded the station-specific distributions of increased risk given in Appendix 3, and the corresponding overall distribution of increased risk is also given in Appendix 3. From the latter distribution, we select the 50th percentile value equal to 1.5×10^{-6}, or approximately one chance in a million, as our best estimate of increased lifetime cancer risk for the average individual due to residence in the vicinity of the BKK landfill for the 7-year period of interest. Assuming a population of 7700 exposed individuals in the BKK landfill vicinity, this results in a corresponding predicted population risk of about 0.01 cases.

4. Discussion

Our calculation indicates that it is highly unlikely that even a single case of cancer would arise from the described BKK landfill exposure scenario. This result is consistent with the DHS report which suggested that 50×10^{-6} represents a "maximum risk" and that "the true excess risk of cancer is probably lower" (DHS 1983, p. 12).

Other various assumptions that could have led to a lower result were not included in our analysis. Such alternative assumptions include factors to take into account (1) seasonal adjustment of concentration data; (2) the possibility that the reported ambient concentration differences are due to chance such that the actual TWA concentrations at the landfill and at the comparison stations are equal and therefore the increased cancer risk is 0; (3) the possibility that the effective dilution factor due to atmospheric mixing might be much greater than the factor of 2 assumed for the average individual in the BKK residential population; or (4) the possibility that perhaps less than 50% of VDCL inhaled by humans will be metabolized even at low doses, in accordance with our analysis in Section 2.2.1.4 of data in EPA (1985b) relied on for VDCL potency assessment.

We did investigate, however, the effect of using alternative assumptions regarding (1) the carcinogenicity of PCE and TCE and (2) the relative population density in BKK-vicinity areas influenced by Stations A, B, D and F. The inclusion of PCE and TCE potencies into our risk analysis, corresponding with a presumption that these compounds are human carcinogens at low doses analogous to the other compounds VCL, VDCL, DCE, BNZ and CLFM, results in an increase in our "best" estimate of increased individual risk from 1.5×10^{-6} to 2.2×10^{-6}, that is, an increase by a factor of only 1.47. This result highlights the fact that increased risk in our analysis is primarily due to the impact of VDCL's carcinogenic potency, which was calculated to be greater than that of the other compounds. In the context of our calculation of overall increased risk using a weighted average of station-specific risks, the effect of changing the station weights from (.25,.25,.25,.25) to (.25,.40,.15,.20) for Stations A, B, D and F, respectively, was negligible.

To put these risks further into perspective it must be understood that a 1×10^{-6} lifetime mortality risk is roughly equivalent to 19 minutes of life expectancy, or put another way, equal to the added risk of death that is incurred by driving a car 100 miles, by riding a bicycle 10 miles, by traveling for 6 minutes by canoe or by smoking 1 or 2 cigarettes (cf. Crouch and Wilson 1982). The latter risk, smoking 1-2 cigarettes, is approximately equivalent in cancer risk to living for two weeks in Los Angeles as a result of air pollution (cf. Ames 1983). Residents living in the vicinity of the BKK landfill therefore experience only a negligible increased cancer risk, similar to that now being used by the U.S. Food and Drug Administration as a benchmark of insignificant health risk requiring no regulatory action (FDA 1985).

At very low doses, individual cancer risk becomes approximately equal to carcinogenic potency multiplied by dose, according to the cancer risk extrapolation model we have used in this analysis. Using the published EPA ("95% upper confidence limit") potency values, this relation allows us to make certain comparisons of estimated excess individual risk associated with different exposure situations. Note that such risk values are only estimates that contain a great deal of uncertainty, and only *a small part* of this uncertainty is meant to be addressed by EPA's use of "upper confidence limit" risk estimates; see, e.g., Anderson *et al.* (1983), Cothern *et al.* (1984) and Bogen (1986). Nevertheless, such risk estimates are useful for comparative purposes, as we have undertaken here.

Firstly, we calculated the excess individual risk due to exposures (15 hours per day) at an average BKK residence (see Tables 2.1 and 2.3). We then compared this risk value of 2.4×10^{-6} with that associated with other typical exposures to some of the compounds listed in Table 2.1 and exposure to other "everyday" carcinogens such as aflatoxin B_1, which is present in all peanut

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butter at an average of 2 ppb and which is regulated at 20 ppb (Table 2.4). One peanut butter sandwich per day works out to be at least 10 times worse than residence near BKK, which is similar in risk to drinking ordinary U.S. tap water and much less risky than taking a daily hot tub. This increased individual risk value of 2.4×10^{-6} is also absolutely minimal when compared to the risk incurred by someone working in a dry cleaning shop or in a plant manufacturing vinylidene chloride (Table 2.4). We therefore conclude that exposure of residents to the compounds and ambient concentrations listed in Table 2.1 poses a minimal, negligible cancer risk—a risk that is highly unlikely to result in even a single excess cancer case over the lifetime of the exposed BKK residential population.

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Table 2.1

Increased Exposure Above Measured Control Levels for Air Contaminants Measured at 4 BKK-Vicinity Monitoring Stations

	Increased Exposure in mg/kg/day (assuming 20 m^3/70 kg/day intake) At Monitoring Station:				
Compound	A	B	D	F	Mean
Vinyl Chloride	.0034	.0018	.0011	0.0	.0016
Perchloroethylene	.0019	.00087	.0015	.0011	.0013
Trichloroethylene	.0010	.0016	.0021	.0011	.0015
Vinylidene Chloride	.0011	.00074	.00062	.00017	.0007
1,2-Dichloroethane	.0019	.0014	.0014	.00023	.0012
Benzene	.0011	.00091	.00091	-.00055	.0006
Chloroform	0.0	.00007	.00056	-.00029	.00009

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TABLE 2.2

POTENCY ANALYSIS INPUT

KEY: LINE #1 = TITLE
LINE #2 = # ANIMALS PER DOSE GROUP (SURVIVING UNTIL AFTER THE OCCURRENCE OF THE 1ST TUMOR IN THE EXPERIMENT)
LINE #3 = # TUMOR-BEARING ANIMALS PER DOSE GROUP
LINE #4 = # EQUIVALENT APPLIED DOSES FOR EACH DOSE GROUP (IN MG/KG/DAY)

```
VCL MALTONI75 SPR-DAW RATS FEMALE .35KG HEAD MG/KG/D      ZYMBAL GLAND
58,59,59,59,59,60,61
0,0,0,4,2,7,16
0.0,4.225,13.92,19.52,28.76,30.90,31.57

VCL MALTONI75 SPR-DAW RATS FEMALE .35KG HEAD MG/KG/D      NEPHROBLASTOMAS
58,59,59,59,59,60,61
0,1,6,4,6,4,5
0.0,4.225,13.92,19.52,28.76,30.90,31.57

VCL MALTONI75 SPR-DAW RATS FEMALE .35KG HEAD MG/KG/D  LIVER ANGIOSARCOMAS
58,59,59,59,59,60,61
0,1,4,7,3,13,9
0.0,4.225,13.92,19.52,28.76,30.90,31.57

VCL MALTONI75 SPR-DAW RATS FEMALE .35KG HEAD MG/KG/D      COMPOSITE
58,59,59,59,59,60,61
6,10,16,22,32,31,38
0.0,4.225,13.92,19.52,28.76,30.90,31.57

BENZENE MALTONI83 S-D RATS FEMALE .30KG HEAD MG/KG/D      ZYMBAL GLAND
30,30,32
0,2,8
0.0,16.07,80.36

VINYLIDENE CL MALTONI85 SW MICE .035KG HEAD MG/KG/D KIDNEY ADENCSARC.
126,25,119
0,0,28
0.0,0.9827,2.457

DCE NCI78 O-M RATS MALE .5KG             HEAD MG/KG/D  HEMANGIOSARCOMAS
40,48,27
0,9,7
0.0,23.16,42.75

DCE NCI78 B6C3F1 MICE MALE .035KG        HEAD MG/KG/D  HEPATOCARCINOMAS
19,47,48
1,6,12
0.0,44.35,57.70
```

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CHLORDFORM NCI76 B6C3F1 MICE MALE.035KG HEAD MG/KG/D HEPATOCARCINOMAS
X 50,45
1..8,44
0.0,79.42,159.4

CHLORDFORM NCI76 B6C3F1 MICE FEMALE.028KG HEAD MG/KG/D HEPATOCARCINOMAS
20,45,41
0,36,39
0.0,137.0,274.5

PCE NCI77 B6C3F1 MICE, MALES HALD (MG/KG/DAY) VIA SAME LIVER
20,48,45
2,32,27
0.0,118.66,163.89

PCE NCI77 B6C3F1 MICE, FEMALES HALD (MG/KG/DAY) VIA SAME LIVER
20,48,45
0,19,19
0.0,97.718,142.76

PCE NTP85 B6C3F1 MICE: MALE HALD MG/KG/DAY VIA SAME,HEP AD/CARC
47,46,50
16,31,40
0.0,119.96,203.02

PCE NTP85 B6C3F1 MICE: FEMALE HALD MG/KG/DAY VIA SAME, HEP CARC
.9,40,46
.13,36
.124.79,209.89

TCE NTP82 B6C3F1 MICE: MALE HALD MG/KG/DAY VIA SAME HEP CARC
48,50
8,30
0.0,675.830

TCE NTP82 B6C3F1 MICE: FEMALE HALD MG/KG/DAY VIA SAME HEP CARC
48,49
2,13
0.0,680.409

TCE NCI76 B6C3F1 MICE: MALES HALD MG/KG/DAY VIA SAME HEP CARC
20,50,48
1,26,31
0.0,444.595,845.545

TCE NCI76 B6C3F1 MICE: FEMALES HALD MG/KG/DAY VIA SAME HEP CARC
20,50,47
0,4,11
0.0,337.779,655.510

APPENDIX THREE

RISK ANALYSIS OUTPUT

VCL MALTONI'75 S-D RATS FEMALE .33MG MG/KG/D ZYMBAL GLAND

Tumorigenic Potency Distribution Calculated
Assuming Equipotent Doses Can Be Extrapolated
Between Species on a (1) mg per Body Weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Percentile	Potency (1/[mg/kg/day]) Calculated Using Extrapolation Assumption: BW	SA	Percentile
0.4300	0.	0.	0.4300
1.0000	0.0005726795	0.0033490527	1.0000
2.0000	0.0012998717	0.0076017021	2.0000
3.0000	0.0018156692	0.0106181065	3.0000
4.0000	0.0021266260	0.0124365939	4.0000
5.0000	0.0023978178	0.0140225347	5.0000
6.0000	0.0026284026	0.0153710032	6.0000
7.0000	0.0028122789	0.0164463203	7.0000
8.0000	0.0029672480	0.0173525847	8.0000
9.0000	0.0031151413	0.0182174705	9.0000
10.0000	0.0032536136	0.0190272629	10.0000
11.0000	0.0033952545	0.0198555849	11.0000
12.0000	0.0035280201	0.0206320025	12.0000
13.0000	0.0036386538	0.0212789942	13.0000
14.0000	0.0037545366	0.0219566803	14.0000
15.0000	0.0038785900	0.0226821490	15.0000
16.0000	0.0039749783	0.0232458320	16.0000
17.0000	0.0040688273	0.0237946641	17.0000
18.0000	0.0041523678	0.0242832135	18.0000
19.0000	0.0042639095	0.0249355137	19.0000
20.0000	0.0043675330	0.0255418010	20.0000
21.0000	0.0044624414	0.0260965358	21.0000
22.0000	0.0045404690	0.0265528448	22.0000
23.0000	0.0046295142	0.0270735845	23.0000
24.0000	0.0047117588	0.0275545549	24.0000
25.0000	0.0047984691	0.0280616395	25.0000
26.0000	0.0048768963	0.0285202842	26.0000
27.0000	0.0049669673	0.0290470235	27.0000
28.0000	0.0050474182	0.0295175035	28.0000
29.0000	0.0051244469	0.0299679711	29.0000
30.0000	0.0051969453	0.0303919446	30.0000
31.0000	0.0052697374	0.0308176354	31.0000
32.0000	0.0053448598	0.0312569551	32.0000
33.0000	0.0054183519	0.0316867381	33.0000
34.0000	0.0054830536	0.0320651159	34.0000
35.0000	0.0055457177	0.0324315801	35.0000
36.0000	0.0056098541	0.0328066535	36.0000
37.0000	0.0056853541	0.0332481787	37.0000
38.0000	0.0057550259	0.0336556211	38.0000
39.0000	0.0058230604	0.0340534896	39.0000
40.0000	0.0058844727	0.0344126336	40.0000
41.0000	0.0059575381	0.0348402150	41.0000
42.0000	0.0060177930	0.0351922959	42.0000
43.0000	0.0060733837	0.0355203152	43.0000
44.0000	0.0061279945	0.0358367562	44.0000
45.0000	0.0061864941	0.0361768645	45.0000
46.0000	0.0062544325	0.0365764648	46.0000
47.0000	0.0063161105	0.0369368680	47.0000
48.0000	0.0063730385	0.0372697860	48.0000
49.0000	0.0064345961	0.0376297757	49.0000
50.0000	0.0064955465	0.0379862152	50.0000
51.0000	0.0065528918	0.0383215733	51.0000
52.0000	[illegible]	[illegible]	[illegible]

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[illegible]	[illegible]	[illegible]	[illegible]
55.0000	0.0067972252	0.0397504456	55.0000
56.0000	0.0068528769	0.0400758982	56.0000
57.0000	0.0069182469	0.0404581837	57.0000
58.0000	0.0069725960	0.0407760218	58.0000
59.0000	0.0070274523	0.0410968214	59.0000
60.0000	0.0070795454	0.0414014645	60.0000
61.0000	0.0071384124	0.0417457223	61.0000
62.0000	0.0071989144	0.0420995392	62.0000
63.0000	0.0072529400	0.0424154848	63.0000
64.0000	0.0073079383	0.0427371152	64.0000
65.0000	0.0073671667	0.0430834852	65.0000
66.0000	0.0074252975	0.0434234366	66.0000
67.0000	0.0074962992	0.0438386574	67.0000
68.0000	0.0075497241	0.0441510901	68.0000
69.0000	0.0076115336	0.0445125550	69.0000
70.0000	0.0076629536	0.0448132604	70.0000
71.0000	0.0077181831	0.0451362431	71.0000
72.0000	0.0077770394	0.0454604376	72.0000
73.0000	0.0078272959	0.0457743406	73.0000
74.0000	0.0078862319	0.0461190008	74.0000
75.0000	0.0079470677	0.0464747697	75.0000
76.0000	0.0080047920	0.0468123443	76.0000
77.0000	0.0080706635	0.0471975654	77.0000
78.0000	0.0081326142	0.0475598536	78.0000
79.0000	0.0082012340	0.0479611456	79.0000
80.0000	0.0082558179	0.0482803546	80.0000
81.0000	0.0083276853	0.0487006381	81.0000
82.0000	0.0083982218	0.0491131395	82.0000
83.0000	0.0084746592	0.0495601483	83.0000
84.0000	0.0085414629	0.0499508195	84.0000
85.0000	0.0086164356	0.0503895544	85.0000
86.0000	0.0086858262	0.0507950708	86.0000
87.0000	0.0087648258	0.0512570515	87.0000
88.0000	0.0088466890	0.0517357923	88.0000
89.0000	0.0089489324	0.0523337163	89.0000
90.0000	0.0090378392	0.0528536476	90.0000
91.0000	0.0091302823	0.0533942580	91.0000
92.0000	0.0092368033	0.0540171973	92.0000
93.0000	0.0093518551	0.0546900257	93.0000
94.0000	0.0094750915	0.0554107167	94.0000
95.0000	0.0096185394	0.0562496036	95.0000
96.0000	0.0097883055	0.0572424047	96.0000
97.0000	0.0099880612	0.0584105812	97.0000
98.0000	0.0102364104	0.0598629378	98.0000
99.0000	0.0106925238	0.0625303090	99.0000

[illegible] B6C3F1 MICE, FEMALES HALO (MG/KG/DAY) VIA SAME LIVER
PCE NTP85 B6C3 MICE: MALE HALO MG/KG/DAY VIA SAME,HEP AD/CARC
PCE NTP85 B6C3F1 MICE: FEMALE HALO MG/KG/DAY VIA SAME, HEP CARC

Tumorigenic Potency Distribution Calculated
Assuming Equipotent Doses Can Be Extrapolated
Between Species on a (1) mg per Body Weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Percentile	Potency (1/[mg/kg/day]) Calculated Using Extrapolation Assumption: BW	SA	Percentile
23.5200	0.	0.	23.5200
24.0000	0.0000631399	0.0008419139	24.0000
25.0000	0.0002477595	0.0032905159	25.0000
26.0000	0.0004065095	0.0053327973	26.0000
27.0000	0.0005406287	0.0071042348	27.0000
28.0000	0.0006775836	0.0089232866	28.0000
29.0000	0.0008084442	0.0105216913	29.0000
30.0000	0.0009508039	0.0124029778	30.0000
31.0000	0.0010622996	0.0140911490	31.0000
32.0000	0.0012121021	0.0157920271	32.0000
33.0000	0.0013783769	0.0182200354	33.0000
34.0000	0.0015607907	0.0207534954	34.0000
35.0000	0.0017147622	0.0223614797	35.0000
36.0000	0.0018365651	0.0239088777	36.0000
37.0000	0.0019815555	0.0262096580	37.0000
38.0000	0.0021057397	0.0275176186	38.0000
39.0000	0.0022612270	0.0296708345	39.0000
40.0000	0.0023447108	0.0310381241	40.0000
41.0000	0.0024843295	0.0326073281	41.0000
42.0000	0.0026001076	0.0346569722	42.0000
43.0000	0.0026962133	0.0360331982	43.0000
44.0000	0.0028273263	0.0368654616	44.0000
45.0000	0.0029609974	0.0390260671	45.0000
46.0000	0.0030838503	0.0408094414	46.0000
47.0000	0.0032178843	0.0419077836	47.0000
48.0000	0.0033038284	0.0438546464	48.0000
49.0000	0.0033742981	0.0451851636	49.0000
50.0000	0.0034405054	0.0462058075	50.0000
51.0000	0.0035401534	0.0471385531	51.0000
52.0000	0.0036381371	0.0481932089	52.0000
53.0000	0.0036876083	0.0497919470	53.0000
54.0000	0.0037836900	0.0509260669	54.0000
55.0000	0.0038175124	0.0517350100	55.0000
56.0000	0.0039036532	0.0527276520	56.0000
57.0000	0.0039779469	0.0537138171	57.0000
58.0000	0.0040559196	0.0543200411	58.0000
59.0000	0.0041189343	0.0555971563	59.0000
60.0000	0.0041798120	0.0560675710	60.0000
61.0000	0.0042497516	0.0569670014	61.0000
62.0000	0.0043027191	0.0578635931	62.0000
63.0000	0.0043729548	0.0585039258	63.0000
64.0000	0.0044210218	0.0596585087	64.0000
65.0000	0.0044639823	0.0602021478	65.0000
66.0000	0.0045630080	0.0613929220	66.0000
67.0000	0.0046134321	0.0620164797	67.0000
68.0000	0.0047130641	0.0625100061	68.0000
69.0000	0.0047519626	0.0634471178	69.0000
70.0000	0.0048404224	0.0644137189	70.0000
71.0000	0.0049026082	0.0649361536	71.0000
72.0000	0.0049709054	0.0663178042	72.0000
73.0000	0.0050370945	0.06680[illegible]	73.0000

[illegible]	[illegible]	[illegible]	[illegible]
76.0000	0.00522[illegible]3550	0.0689715445	76.00[illegible]
77.0000	0.0053[illegible]083	0.0696585774	77.0[illegible]
78.0000	0.0053876548	0.0707354471	78.0000
79.0000	0.0054476908	0.0713223070	79.0000
80.0000	0.0055350373	0.0723741651	80.0000
81.0000	0.0056042066	0.0732380450	81.0000
82.0000	0.0056812912	0.0739837438	82.0000
83.0000	0.0057923449	0.0750207230	83.0000
84.0000	0.0058550616	0.0761620775	84.0000
65.0000	0.0059278943	0.0772702247	85.0000
86.0000	0.0060320524	0.0783423260	86.0000
87.0000	0.0061395695	0.0797456056	87.0000
88.0000	0.0062557189	0.0812087208	88.0000
89.0000	0.0063808989	0.0824906453	89.0000
90.0000	0.0064814021	0.0840217695	90.0000
91.0000	0.0066168713	0.0853406787	91.0000
92.0000	0.0067779957	0.0867500380	92.0000
93.0000	0.0068894438	0.0888896659	93.0000
94.0000	0.0070212791	0.0911299139	94.0000
95.0000	0.0072206082	0.0928635597	95.0000
96.0000	0.0073681385	0.0958132222	96.0000
97.0000	0.0075680926	0.0984796148	97.0000
98.0000	0.0078990255	0.1026449278	98.0000
99.0000	0.0084332814	0.1077851206	99.0000

[illegible] B6C3F1 MICE: FEMALE HALD MG/KG/DAY VIA SAME HEP CARC
TCE NCI76 B6C3F1 MICE: MALES HALD MG/KG/DAY VIA SAME HEP CARC
TCE NCI76 B6C3F1 MICE: FEMALES HALD MG/KG/DAY VIA SAME HEP CARC

Tumorigenic Potency Distribution Calculated
Assuming Equipotent Doses Can Be Extrapolated
Between Species on a (1) mg per Body Weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Potency (1/[mg/kg/day])
Calculated Using
Extrapolation Assumption:

Percentile	BW	SA	Percentile
11.6000	0.	0.	11.6000
12.0000	0.0000288718	0.0004010805	12.0000
13.0000	0.0000331952	0.0004617967	13.0000
14.0000	0.0000735215	0.0010205493	14.0000
15.0000	0.0000768560	0.0010693242	15.0000
16.0000	0.0001185921	0.0016247210	16.0000
17.0000	0.0001299646	0.0016874871	17.0000
18.0000	0.0001623041	0.0021598854	18.0000
19.0000	0.0001717535	0.0022996233	19.0000
20.0000	0.0001994221	0.0025248800	20.0000
21.0000	0.0002066782	0.0027376411	21.0000
22.0000	0.0002111395	0.0028802075	22.0000
23.0000	0.0002317257	0.0029799310	23.0000
24.0000	0.0002410785	0.0030773962	24.0000
25.0000	0.0002555447	0.0033821820	25.0000
26.0000	0.0002674929	0.0034916122	26.0000
27.0000	0.0002729225	0.0035558483	27.0000
28.0000	0.0002864209	0.0037451424	28.0000
29.0000	0.0002987948	0.0038907297	29.0000
30.0000	0.0003045304	0.0040064328	30.0000
31.0000	0.0003124588	0.0040976494	31.0000
32.0000	0.0003182912	0.0041765687	32.0000
33.0000	0.0003278030	0.0043178336	33.0000
34.0000	0.0003427067	0.0044134185	34.0000
35.0000	0.0003502932	0.0044350801	35.0000
36.0000	0.0003569786	0.0046192929	36.0000
37.0000	0.0003671742	0.0048116501	37.0000
38.0000	0.0003819009	0.0048415521	38.0000
39.0000	0.0003870664	0.0049207699	39.0000
40.0000	0.0003929799	0.0050728549	40.0000
41.0000	0.0004038969	0.0052447678	41.0000
42.0000	0.0004203070	0.0054401890	42.0000
43.0000	0.0004319644	0.0055211429	43.0000
44.0000	0.0004422651	0.0057088500	44.0000
45.0000	0.0004531117	0.0058406456	45.0000
46.0000	0.0004652110	0.0059791761	46.0000
47.0000	0.0004817551	0.0061627184	47.0000
48.0000	0.0005044929	0.0063774111	48.0000
49.0000	0.0005184426	0.0065426948	49.0000
50.0000	0.0005371177	0.0067672594	50.0000
51.0000	0.0005564941	0.0070168427	51.0000
52.0000	0.0005792555	0.0073040705	52.0000
53.0000	0.0006026781	0.0075932685	53.0000
54.0000	0.0006419369	0.0080280732	54.0000
55.0000	0.0006660301	0.0083375992	55.0000
56.0000	0.0006980940	0.0086673899	56.0000
57.0000	0.0007303558	0.0089960033	57.0000
58.0000	0.0007553491	0.0093287015	58.0000
59.0000	0.0007789282	0.0096417508	59.0000
60.0000	0.0008099292	0.0099793402	60.0000
61.0000	[illegible]	[illegible]	[illegible]

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62.0000	0.0008[illegible]4004	0.0105952965	62.0[illegible]
63.0000	0.0008792258	0.0109503596	63.0000
64.0000	0.0009100983	0.0111167086	64.0000
65.0000	0.0009266917	0.0113879135	65.0000
66.0000	0.0009449993	0.0116341598	66.0000
67.0000	0.0009639515	0.0118264370	67.0000
68.0000	0.0009767214	0.0120875696	68.0000
69.0000	0.0009926786	0.0122434404	69.0000
70.0000	0.0010138333	0.0126162264	70.0000
71.0000	0.0010469393	0.0126998471	71.0000
72.0000	0.0010547247	0.0130873881	72.0000
73.0000	0.0010860262	0.0132064130	73.0000
74.0000	0.0010860262	0.0135276821	74.0000
75.0000	0.0011097921	0.0136578409	75.0000
76.0000	0.0011233548	0.0139594963	76.0000
77.0000	0.0011408036	0.0140514816	77.0000
78.0000	0.0011601131	0.0143212499	78.0000
79.0000	0.0011717480	0.0144456886	79.0000
80.0000	0.0011930985	0.0146767264	80.0000
81.0000	0.0012043820	0.0149525125	81.0000
82.0000	0.0012199676	0.0152541241	82.0000
83.0000	0.0012353265	0.0155025935	83.0000
84.0000	0.0012502574	0.0156882275	84.0000
85.0000	0.0012755778	0.0159120834	85.0000
86.0000	0.0012912479	0.0160874929	86.0000
87.0000	0.0013026590	0.0163902510	87.0000
88.0000	0.0013261532	0.0166165289	88.0000
89.0000	0.0013389988	0.0167716797	89.0000
90.0000	0.0013619312	0.0170479119	90.0000
91.0000	0.0013789770	0.0172818143	91.0000
92.0000	0.0013983441	0.0176176969	92.0000
93.0000	0.0014159299	0.0179115827	93.0000
94.0000	0.0014415535	0.0181849767	94.0000
95.0000	0.0014810615	0.0185676906	95.0000
96.0000	0.0015181559	0.0190831878	96.0000
97.0000	0.0015631353	0.0197035875	97.0000
98.0000	0.0016321145	0.0204428229	98.0000
99.0000	0.0017534167	0.0217868433	99.0000

VINYLIDENE CL MALTONI 5 SW MICE .035KG MG/KG/D KID Y ADENOCARCINOMAS

Tumorigenic Potency Distribution Calculated
Assuming Equipotent Doses Can Be Extrapolated
Between Species on a (1) mg per Body Weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Percentile	Potency (1/[mg/kg/day]) Calculated Using Extrapolation Assumption: BW	SA	Percentile
57.4000	0.	0.	57.4000
58.0000	0.0023508139	0.0296183750	58.0000
59.0000	0.0023508139	0.0296183750	59.0000
60.0000	0.0023508139	0.0296183750	60.0000
61.0000	0.0023508139	0.0296183750	61.0000
62.0000	0.0052523129	0.0661749393	62.0000
63.0000	0.0052523129	0.0661749393	63.0000
64.0000	0.0052523129	0.0661749393	64.0000
65.0000	0.0081231073	0.1023446545	65.0000
66.0000	0.0081231073	0.1023446545	66.0000
67.0000	0.0109638385	0.1381355971	67.0000
68.0000	0.0109638385	0.1381355971	68.0000
69.0000	0.0137751363	0.1735557020	69.0000
70.0000	0.0137751363	0.1735557020	70.0000
71.0000	0.0165575966	0.2086124718	71.0000
72.0000	0.0193118080	0.2433133423	72.0000
73.0000	0.0247377418	0.3116757572	73.0000
74.0000	0.0403775983	0.5087254643	74.0000
75.0000	0.0501255058	0.6315413117	75.0000
76.0000	0.0532984957	0.6715184450	76.0000
77.0000	0.0595352550	0.7500967383	77.0000
78.0000	0.0626006722	0.7887184024	78.0000
79.0000	0.0626006722	0.7887184024	79.0000
80.0000	0.0656318665	0.8269090056	80.0000
81.0000	0.0656318665	0.8269090056	81.0000
82.0000	0.0686295033	0.8646768332	82.0000
83.0000	0.0715944767	0.9020331502	83.0000
84.0000	0.0715944767	0.9020331502	84.0000
85.0000	0.0745273232	0.9389846921	85.0000
86.0000	0.0745273232	0.9389846921	86.0000
87.0000	0.0774288177	0.9755411744	87.0000
88.0000	0.0774288177	0.9755411744	88.0000
89.0000	0.0794975162	1.0016051531	89.0000
90.0000	0.0802996159	1.0117108822	90.0000
91.0000	0.0831080675	1.0470951796	91.0000
92.0000	0.0833316445	1.0499120951	92.0000
93.0000	0.0833316445	1.0499120951	93.0000
94.0000	0.0908618569	1.1447867155	94.0000
95.0000	0.0984939337	1.2409447432	95.0000
96.0000	0.1068254709	1.3459155560	96.0000
97.0000	0.1109157301	1.3974500895	97.0000
98.0000	0.1188809372	1.4978053570	98.0000
99.0000	0.1234383583	1.5552245378	99.0000

[illegible] MALE [illegible] HEPATOCARCINOMAS

Tumorigenic Potency Distribution Calculated
Assuming Equipotent Doses Can Be Extrapolated
Between Species on a (1) mg per Body Weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Percentile	Potency (1/(mg/kg/day)) Calculated Using Extrapolation Assumption: BW	SA	Percentile
32.0550	0.	0.	32.0550
33.0000	0.0001038053	0.0010927507	33.0000
34.0000	0.0004158972	0.0034300131	34.0000
35.0000	0.0006223086	0.0052099419	35.0000
36.0000	0.0008052544	0.0067426893	36.0000
37.0000	0.0010680376	0.0078208055	37.0000
38.0000	0.0012650864	0.0101002697	38.0000
39.0000	0.0013524315	0.0106902849	39.0000
40.0000	0.0014808926	0.0128090139	40.0000
41.0000	0.0016244322	0.0142214093	41.0000
42.0000	0.0016513089	0.0148719465	42.0000
43.0000	0.0020176996	0.0160176922	43.0000
44.0000	0.0020587973	0.0172541905	44.0000
45.0000	0.0022687374	0.0183555558	45.0000
46.0000	0.0023956372	0.0192078575	46.0000
47.0000	0.0025417092	0.0205113776	47.0000
48.0000	0.0026377053	0.0220622046	48.0000
49.0000	0.0027363470	0.0222374797	49.0000
50.0000	0.0028409075	0.0227661040	50.0000
51.0000	0.0028641261	0.0244304445	51.0000
52.0000	0.0030001164	0.0251968689	52.0000
53.0000	0.0031688850	0.0264859851	53.0000
54.0000	0.0033263485	0.0266618878	54.0000
55.0000	0.0034470086	0.0272008087	55.0000
56.0000	0.0035790491	0.0280365832	56.0000
57.0000	0.0036291692	0.0291268602	57.0000
58.0000	0.0037549126	0.0296260286	58.0000
59.0000	0.0039007415	0.0300076716	59.0000
60.0000	0.0041051777	0.0307655465	60.0000
61.0000	0.0041463748	0.0314085409	61.0000
62.0000	0.0042734761	0.0326598287	62.0000
63.0000	0.0042826235	0.0329465419	63.0000
64.0000	0.0043652970	0.0335101448	64.0000
65.0000	0.0045969049	0.0340721458	65.0000
66.0000	0.0047065211	0.0351862982	66.0000
67.0000	0.0048733628	0.0355613306	67.0000
68.0000	0.0050965096	0.0356993228	68.0000
69.0000	0.0051347017	0.0363942012	69.0000
70.0000	0.0052294573	0.0382859968	70.0000
71.0000	0.0052772732	0.0386370271	71.0000
72.0000	0.0056311530	0.0387365334	72.0000
73.0000	0.0057518049	0.0390550457	73.0000
74.0000	0.0057926576	0.0395760536	74.0000
75.0000	0.0059661344	0.0404470563	75.0000
76.0000	0.0063385554	0.0413730331	76.0000
77.0000	0.0064840131	0.0415324606	77.0000
78.0000	0.0067303958	0.0428625122	78.0000
79.0000	0.0068540093	0.0434967284	79.0000
80.0000	0.0068751834	0.0443399996	80.0000
81.0000	0.0073733404	0.0445330963	81.0000
82.0000	0.0074477480	0.0450259484	82.0000
83.0000	0.0074609537	0.0455429740	83.0000
[illegible]	[illegible]	[illegible]	[illegible]

85.0000	0.[illegible]79178447	0.0476443917	[illegible].0000
86.0000	0.0079985633	0.0484076105	86.0000
87.0000	0.0081310456	0.0498319604	87.0000
88.0000	0.0084179109	0.0504848696	88.0000
89.0000	0.0085530840	0.0508543812	89.0000
90.0000	0.0085997619	0.0517573170	90.0000
91.0000	0.0090888273	0.0522902869	91.0000
92.0000	0.0091861417	0.0535886660	92.0000
93.0000	0.0096188542	0.0543918086	93.0000
94.0000	0.0097569674	0.0557134598	94.0000
95.0000	0.0098993611	0.0570824519	95.0000
96.0000	0.0103204176	0.0582462363	96.0000
97.0000	0.0105662909	0.0606013387	97.0000
98.0000	0.0109909372	0.0631922334	98.0000
99.0000	0.0117450356	0.0666660815	99.0000

Tumorigenic P[illegible]ncy Distribution Calculated
Assuming Equipotent Doses Can B Extrapolated
Between Species on a (1) mg per Body weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Percentile	Potency (1/[mg/kg/day]) Calculated Using Extrapolation Assumption: BW	SA	Percentile
17.8000	0.	0.	17.8000
18.0000	0.0005611179	0.0035775830	18.0000
19.0000	0.0010148041	0.0062475200	19.0000
20.0000	0.0010154368	0.0062514152	20.0000
21.0000	0.0011749854	0.0072336569	21.0000
22.0000	0.0013267462	0.0081679663	22.0000
23.0000	0.0013267462	0.0081679663	23.0000
24.0000	0.0013685476	0.0084252991	24.0000
25.0000	0.0014714494	0.0090588015	25.0000
26.0000	0.0014714494	0.0090588015	26.0000
27.0000	0.0014714494	0.0090588015	27.0000
28.0000	0.0014714494	0.0090588015	28.0000
29.0000	0.0016097173	0.0099100312	29.0000
30.0000	0.0016097173	0.0099100312	30.0000
31.0000	0.0016097173	0.0099100312	31.0000
32.0000	0.0016097173	0.0099100312	32.0000
33.0000	0.0016097173	0.0099100312	33.0000
34.0000	0.0017354523	0.0106841046	34.0000
35.0000	0.0017420996	0.0107250279	35.0000
36.0000	0.0017420996	0.0107250279	36.0000
37.0000	0.0017420996	0.0107250279	37.0000
38.0000	0.0017420996	0.0107250279	38.0000
39.0000	0.0017420996	0.0107250279	39.0000
40.0000	0.0017420996	0.0107250279	40.0000
41.0000	0.0018690773	0.0115067502	41.0000
42.0000	0.0018690773	0.0115067502	42.0000
43.0000	0.0018690773	0.0115067502	43.0000
44.0000	0.0018690773	0.0115067502	44.0000
45.0000	0.0018690773	0.0115067502	45.0000
46.0000	0.0019910738	0.0122578079	46.0000
47.0000	0.0019910738	0.0122578079	47.0000
48.0000	0.0019910738	0.0122578079	48.0000
49.0000	0.0020652630	0.0127145443	49.0000
50.0000	0.0021053632	0.0129614165	50.0000
51.0000	0.0021084659	0.0129805179	51.0000
52.0000	0.0021084659	0.0129805179	52.0000
53.0000	0.0024735923	0.0152283749	53.0000
54.0000	0.0024735923	0.0152283749	54.0000
55.0000	0.0024735923	0.0152283749	55.0000
56.0000	0.0025360672	0.0174599085	56.0000
57.0000	0.0028703806	0.0176711548	57.0000
58.0000	0.0028703806	0.0176711548	58.0000
59.0000	0.0028703806	0.0176711548	59.0000
60.0000	0.0028703806	0.0176711548	60.0000
61.0000	0.0032219272	0.0198354068	61.0000
62.0000	0.0032400019	0.0199466832	62.0000
63.0000	0.0032801141	0.0201936290	63.0000
64.0000	0.0032801141	0.0201936290	64.0000
65.0000	0.0032801141	0.0201936290	65.0000
66.0000	0.0034188544	0.0210477673	66.0000
67.0000	0.0036572944	0.0225156955	67.0000
68.0000	0.0036572944	0.0225156955	68.0000
69.0000	0.0036572944	0.0225156955	69.0000
70.0000	[illegible]	[illegible]	[illegible]

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71.0000	0.00370[illegible]634	0.0228011589	71.0[illegible]
72.0000	0.0037036634	0.0228011589	72.0000
73.0000	0.0037036634	0.0228011589	73.0000
74.0000	0.0037036634	0.0228011589	74.0000
75.0000	0.0037449196	0.0230551492	75.0000
76.0000	0.0037449196	0.0230551492	76.0000
77.0000	0.0040362515	0.0248486977	77.0000
78.0000	0.0040562302	0.0249716956	78.0000
79.0000	0.0040562302	0.0249716956	79.0000
80.0000	0.0040888526	0.0251725316	80.0000
81.0000	0.0040888526	0.0251725316	81.0000
82.0000	0.0040888526	0.0251725316	82.0000
83.0000	0.0041419901	0.0254996661	83.0000
84.0000	0.0041419901	0.0254996661	84.0000
85.0000	0.0041419901	0.0254996661	85.0000
86.0000	0.0042009316	0.0258625317	86.0000
87.0000	0.0042009316	0.0258625317	87.0000
88.0000	0.0042009316	0.0258625317	88.0000
89.0000	0.0044769049	0.0275615286	89.0000
90.0000	0.0045356899	0.0279234312	90.0000
91.0000	0.0045356399	0.0279234312	91.0000
92.0000	0.0049324445	0.0303660035	92.0000
93.0000	0.0049989149	0.0307752211	93.0000
94.0000	0.0049989149	0.0307752211	94.0000
95.0000	0.0054797754	0.0337355807	95.0000
96.0000	0.0054797754	0.0337355807	96.0000
97.0000	0.0058957078	0.0362962186	97.0000
98.0000	0.0059796646	0.0368130878	98.0000
99.0000	0.0064061992	0.0394389965	99.0000

Tumorigenic Potency Distribution Calculated
Assuming Equipotent Doses Can Be Extrapolated
Between Species on a (1) mg per Body Weight (BW)
Basis or (2) mg per Surface Area (SA) Basis

Percentile	Potency (1/[mg/kg/day]) Calculated Using Extrapolation Assumption: BW	SA	Percentile
26.7750	0.	0.	26.7750
27.0000	0.0000507622	0.0006275531	27.0000
28.0000	0.0002096018	0.0026408150	28.0000
29.0000	0.0004298591	0.0054194015	29.0000
30.0000	0.0005620106	0.0071251397	30.0000
31.0000	0.0009720490	0.0122466604	31.0000
32.0000	0.0012379130	0.0155967139	32.0000
33.0000	0.0014613902	0.0185654219	33.0000
34.0000	0.0016829012	0.0212158430	34.0000
35.0000	0.0021019625	0.0264530219	35.0000
36.0000	0.0023729971	0.0303103067	36.0000
37.0000	0.0026725268	0.0338076092	37.0000
38.0000	0.0029567736	0.0390348600	38.0000
39.0000	0.0035185416	0.0452052057	39.0000
40.0000	0.0036764252	0.0477245301	40.0000
41.0000	0.0038315980	0.0483890921	41.0000
42.0000	0.0042651291	0.0553291105	42.0000
43.0000	0.0046149381	0.0594883114	43.0000
44.0000	0.0047179731	0.0605977401	44.0000
45.0000	0.0047961711	0.0626344010	45.0000
46.0000	0.0050184107	0.0639160499	46.0000
47.0000	0.0054832995	0.0698217377	47.0000
48.0000	0.0057254005	0.0735943988	48.0000
49.0000	0.0058275308	0.0775177330	49.0000
50.0000	0.0060069738	0.0797523020	50.0000
51.0000	0.0063974769	0.0837744325	51.0000
52.0000	0.0067358073	0.0864733309	52.0000
53.0000	0.0068979263	0.0904720202	53.0000
54.0000	0.0070492476	0.0956730917	54.0000
55.0000	0.0070492476	0.0956730917	55.0000
56.0000	0.0071712560	0.0965001956	56.0000
57.0000	0.0073190155	0.0978169367	57.0000
58.0000	0.0076582120	0.1016124487	58.0000
59.0000	0.0080866031	0.1065208686	59.0000
60.0000	0.0082255788	0.1116383746	60.0000
61.0000	0.0082972546	0.1121719629	61.0000
62.0000	0.0083875768	0.1126113012	62.0000
63.0000	0.0084381104	0.1145228744	63.0000
64.0000	0.0084381104	0.1145228744	64.0000
65.0000	0.0086628031	0.1151535809	65.0000
66.0000	0.0088179633	0.1190914735	66.0000
67.0000	0.0091513284	0.1221939400	67.0000
68.0000	0.0094719964	0.1278152466	68.0000
69.0000	0.0094792508	0.1286533326	69.0000
70.0000	0.0095687062	0.1298197508	70.0000
71.0000	0.0095945485	0.1302181631	71.0000
72.0000	0.0099126194	0.1332768547	72.0000
73.0000	0.0099640759	0.1349835545	73.0000
74.0000	0.0099734217	0.1353602707	74.0000
75.0000	0.0099734217	0.1353602707	75.0000
76.0000	0.0101132747	0.1363334507	76.0000
77.0000	0.0102331033	0.1388839483	77.0000
78.0000	[illegible]	[illegible]	[illegible]

80.0000	0.0107[illegible]270	0.14547[illegible]020	80.0[illegible]
81.0000	0.0108 [illegible]3984	0.1472061574	81.0[illegible]
82.0000	0.0109540522	0.1486694813	82.0000
83.0000	0.0110216215	0.1493060440	83.0000
84.0000	0.0111465789	0.1512824744	84.0000
85.0000	0.0111928107	0.1512824744	85.0000
86.0000	0.0114462450	0.1553495824	86.0000
87.0000	0.0114462450	0.1553495824	87.0000
88.0000	0.0116167953	0.1573326141	88.0000
89.0000	0.0116897561	0.1586545408	89.0000
90.0000	0.0117840376	0.1595713943	90.0000
91.0000	0.0119430088	0.1620917022	91.0000
92.0000	0.0121220453	0.1640242189	92.0000
93.0000	0.0124753751	0.1689127088	93.0000
94.0000	0.0124858618	0.1694593579	94.0000
95.0000	0.0130839720	0.1775769740	95.0000
96.0000	0.0134910503	0.1830649078	96.0000
97.0000	0.0136579064	0.1858780384	97.0000
98.0000	0.0140798213	0.1910927445	98.0000
99.0000	0.0144791398	0.1965127140	99.0000

R&S146119

Bogen/Smith 2/10-13/86

COMPOUNDS: VCL, VDCL, DCE, BNZ, CLFM

Calculated Distributions of Individual Risk

Percentile	STATION A	STATION B	STATION C	STATION
0.0000	0.	0.	0.	-0.000060
1.0000	0.0000117884	0.0000074320	0.0000068312	-0.000057
2.0000	0.0000149576	0.0000093885	0.0000084504	-0.000054
3.0000	0.0000171173	0.0000105254	0.0000094657	-0.000051
4.0000	0.0000186231	0.0000114856	0.0000101038	-0.000049
5.0000	0.0000202142	0.0000123879	0.0000108344	-0.000046
6.0000	0.0000215941	0.0000130836	0.0000115001	-0.000045
7.0000	0.0000228705	0.0000137458	0.0000121013	-0.000043
8.0000	0.0000238056	0.0000143756	0.0000126325	-0.000041
9.0000	0.0000247567	0.0000149180	0.0000131480	-0.000039
10.0000	0.0000257650	0.0000155280	0.0000136969	-0.000038
11.0000	0.0000265681	0.0000159862	0.0000142634	-0.000035
12.0000	0.0000274636	0.0000165288	0.0000148324	-0.000034
13.0000	0.0000282500	0.0000169985	0.0000153391	-0.000032
14.0000	0.0000290385	0.0000175196	0.0000158206	-0.000030
15.0000	0.0000297792	0.0000180047	0.0000162584	-0.000028
16.0000	0.0000304257	0.0000183946	0.0000166756	-0.000025
17.0000	0.0000310246	0.0000188916	0.0000171831	-0.000023
18.0000	0.0000318354	0.0000193605	0.0000176232	-0.000021
19.0000	0.0000325451	0.0000198277	0.0000180155	-0.000019
20.0000	0.0000332134	0.0000203269	0.0000184686	-0.000016
21.0000	0.0000338986	0.0000208272	0.0000189382	-0.000014
22.0000	0.0000346417	0.0000213097	0.0000194253	-0.000012
23.0000	0.0000354209	0.0000218615	0.0000199231	-0.000011
24.0000	0.0000363165	0.0000224705	0.0000205214	-0.00000
25.0000	0.0000371377	0.0000228946	0.0000210565	-0.000007
26.0000	0.0000381047	0.0000235390	0.0000217583	-0.00000
27.0000	0.0000390199	0.0000242334	0.0000223537	-0.000005
28.0000	0.0000400237	0.0000250638	0.0000230269	-0.000005
29.0000	0.0000412684	0.0000258034	0.0000236835	-0.00000
30.0000	0.0000423530	0.0000264956	0.0000244092	-0.00000
31.0000	0.0000437418	0.0000274218	0.0000252453	-0.00000
32.0000	0.0000451495	0.0000284245	0.0000261823	-0.00000
33.0000	0.0000470129	0.0000294835	0.0000271878	-0.00000
34.0000	0.0000486159	0.0000305580	0.0000283033	-0.00000
35.0000	0.0000510023	0.0000324262	0.0000297674	-0.00000
36.0000	0.0000544181	0.0000349360	0.0000318742	-0.00000
37.0000	0.0000617547	0.0000406851	0.0000359688	-0.00000
38.0000	0.0000730774	0.0000476779	0.0000423996	-0.00000
39.0000	0.0000830700	0.0000540435	0.0000480227	-0.00000
40.0000	0.0000901469	0.0000588070	0.0000517504	-0.00000
41.0000	0.0000953110	0.0000622014	0.0000541636	-0.00000
42.0000	0.0000991074	0.0000645162	0.0000563568	-0.00000
43.0000	0.0001029710	0.0000670357	0.0000585840	-0.00000
44.0000	0.0001060591	0.0000690905	0.0000604468	-0.00000
45.0000	0.0001090590	0.0000709690	0.0000620078	-0.00000
46.0000	0.0001120632	0.0000727919	0.0000637651	-0.00000
47.0000	0.0001152433	0.0000746921	0.0000657357	-0.00000
48.0000	0.0001181696	0.0000765475	0.0000679010	-0.00000
49.0000	0.0001212229	0.0000785003	0.0000697566	-0.00000
50.0000	0.0001242888	0.0000803130	0.0000721697	-0.00000
51.0000	0.0001279027	0.0000823139	0.0000744212	-0.00000
52.0000	0.0001312018	0.0000845594	0.0000767982	-0.00000
53.0000	0.0001352057	0.0000868614	0.0000795114	-0.00000

54.0000	0.0001392111	0.0000868723	0.0000828613	-0.0000010
55.0000	0.0001431934	0.0000908279	.0000865959	-0.000000
56.0000	0.0001475864	0.0000935064	0.0000896391	-0.000000
57.0000	0.0001520836	0.0000959528	0.0000931007	-0.000000
58.0000	0.0001556557	0.0000984862	0.0000967255	-0.000000
59.0000	0.0001599696	0.0001009645	0.0001006619	-0.000000
60.0000	0.0001636242	0.0001036360	0.0001055916	-0.000000
61.0000	0.0001674493	0.0001063234	0.0001093911	-0.000000
62.0000	0.0001712926	0.0001089515	0.0001139939	0.000000
63.0000	0.0001759144	0.0001116251	0.0001184010	0.000000
64.0000	0.0001804812	0.0001139389	0.0001228280	0.000000
65.0000	0.0001854171	0.0001168312	0.0001273081	0.000000
66.0000	0.0001897237	0.0001198681	0.0001305438	0.000000
67.0000	0.0001943767	0.0001236307	0.0001347541	0.000001
68.0000	0.0001991257	0.0001266384	0.0001385609	0.000001
69.0000	0.0002042394	0.0001302695	0.0001423528	0.000002
70.0000	0.0002096224	0.0001335675	0.0001464086	0.000003
71.0000	0.0002152158	0.0001377795	0.0001513642	0.000004
72.0000	0.0002201937	0.0001406788	0.0001556020	0.000005
73.0000	0.0002254053	0.0001440686	0.0001594995	0.000006
74.0000	0.0002316638	0.0001486598	0.0001646039	0.000007
75.0000	0.0002371676	0.0001524146	0.0001689261	0.000006
76.0000	0.0002431331	0.0001556880	0.0001732660	0.000008
77.0000	0.0002497201	0.0001599423	0.0001781289	0.000009
78.0000	0.0002564164	0.0001643577	0.0001834165	0.000010
79.0000	0.0002632263	0.0001691098	0.0001890660	0.000010
80.0000	0.0002728368	0.0001749128	0.0001963395	0.000011
81.0000	0.0002826490	0.0001810220	0.0002033284	0.000012
82.0000	0.0002964873	0.0001911310	0.0002111578	0.000012
83.0000	0.0003144502	0.0002033676	0.0002199315	0.000013
84.0000	0.0003390945	0.0002190669	0.0002306007	0.000015
85.0000	0.0003764977	0.0002450238	0.0002500737	0.000016
86.0000	0.0004330993	0.0002829960	0.0002807505	0.000018
87.0000	0.0006022413	0.0003958867	0.0003704334	0.000022
88.0000	0.0009746531	0.0005829828	0.0005154652	0.000040
89.0000	0.0010024015	0.0006668878	0.0005838092	0.000075
90.0000	0.0010721035	0.0007140977	0.0006263086	0.000094
91.0000	0.0011265214	0.0007506026	0.0006576739	0.000106
92.0000	0.0011778153	0.0007856230	0.0006861812	0.000116
93.0000	0.0012234695	0.0008155349	0.0007110817	0.000125
94.0000	0.0012607755	0.0008414289	0.0007358133	0.000132
95.0000	0.0013030332	0.0008704795	0.0007671033	0.000140
96.0000	0.0013433116	0.0008952050	0.0007932837	0.000150
97.0000	0.0014258666	0.0009515447	0.0008353190	0.000160
98.0000	0.0015840221	0.0010589150	0.0009172775	0.000172
99.0000	0.0013085926	0.0012068250	0.0010382556	0.000225

[illegible] ANALYSIS

Bogen/Smith Feb. 1986

COMPOUNDS: VCL, VDCL, DCE, BNZ, CLFM

STATIONS A,B,D, and F: Weighted Average Individual Risk

Weights:	A	.25	A	.25
	B	.25	B	.40
	D	.25	D	.15
	F	.25	F	.20

Percentile			Percentile
0.	0.	0.	0.0000
1.0000	0.0000119460	0.0000132463	1.0000
2.0000	0.0000156075	0.0000164325	2.0000
3.0000	0.0000179668	0.0000188821	3.0000
4.0000	0.0000207219	0.0000208173	4.0000
5.0000	0.0000223633	0.0000233367	5.0000
6.0000	0.0000254948	0.0000257504	6.0000
7.0000	0.0000278966	0.0000282544	7.0000
8.0000	0.0000300740	0.0000308486	8.0000
9.0000	0.0000322668	0.0000336372	9.0000
10.0000	0.0000337775	0.0000356674	10.0000
11.0000	0.0000359101	0.0000379173	11.0000
12.0000	0.0000375922	0.0000397931	12.0000
13.0000	0.0000396047	0.0000413343	13.0000
14.0000	0.0000412700	0.0000429528	14.0000
15.0000	0.0000427910	0.0000444416	15.0000
16.0000	0.0000443832	0.0000459243	16.0000
17.0000	0.0000459137	0.0000477869	17.0000
18.0000	0.0000475331	0.0000492397	18.0000
19.0000	0.0000491222	0.0000507661	19.0000
20.0000	0.0000505528	0.0000523307	20.0000
21.0000	0.0000521641	0.0000538351	21.0000
22.0000	0.0000534101	0.0000553665	22.0000
23.0000	0.0000551213	0.0000570069	23.0000
24.0000	0.0000567850	0.0000584052	24.0000
25.0000	0.0000583104	0.0000600574	25.0000
26.0000	0.0000595291	0.0000615865	26.0000
27.0000	0.0000609398	0.0000632521	27.0000
28.0000	0.0000624920	0.0000647120	28.0000
29.0000	0.0000639084	0.0000663750	29.0000
30.0000	0.0000652984	0.0000677963	30.0000
31.0000	0.0000666952	0.0000690913	31.0000
32.0000	0.0000681751	0.0000706720	32.0000
33.0000	0.0000695121	0.0000717976	33.0000
34.0000	0.0000708344	0.0000733306	34.0000
35.0000	0.0000721014	0.0000748485	35.0000
36.0000	0.0000733940	0.0000763210	36.0000
37.0000	0.0000746910	0.0000778514	37.0000
38.0000	0.0000763045	0.0000793699	38.0000
39.0000	0.0000777944	0.0000809702	39.0000
40.0000	0.0000792022	0.0000826075	40.0000
41.0000	0.0000809779	0.0000841434	41.0000
42.0000	0.0000826669	0.0000856116	42.0000
43.0000	0.0000843548	0.0000874245	43.0000
44.0000	0.0000860280	0.0000892629	44.0000
45.0000	0.0000875945	0.0000909096	45.0000
46.0000	0.0000892188	0.0000927660	46.0000
47.0000	0.0000912793	0.0000945362	47.0000
48.0000	0.0000933251	0.0000963741	48.0000

49.0000	0.000[illegible]4158	0.0000960939	49.0000
50.0000	0.0000975545	0.0000999289	50.0000
51.0000	0.0000996262	0.0001021408	51.0000
52.0000	0.0001016491	0.0001046748	52.0000
53.0000	0.0001039926	0.0001071460	53.0000
54.0000	0.0001064349	0.0001097920	54.0000
55.0000	0.0001096245	0.0001126752	55.0000
56.0000	0.0001122482	0.0001150656	56.0000
57.0000	0.0001157567	0.0001176408	57.0000
58.0000	0.0001188060	0.0001207582	58.0000
59.0000	0.0001227197	0.0001234717	59.0000
60.0000	0.0001267467	0.0001271274	60.0000
61.0000	0.0001316333	0.0001309652	61.0000
62.0000	0.0001369030	0.0001349603	62.0000
63.0000	0.0001434428	0.0001390285	63.0000
64.0000	0.0001501922	0.0001438627	64.0000
65.0000	0.0001591538	0.0001485198	65.0000
66.0000	0.0001710379	0.0001543214	66.0000
67.0000	0.0001816358	0.0001592774	67.0000
68.0000	0.0001896090	0.0001641432	68.0000
69.0000	0.0001989381	0.0001704458	69.0000
70.0000	0.0002064036	0.0001776602	70.0000
71.0000	0.0002137381	0.0001852956	71.0000
72.0000	0.0002190300	0.0001941856	72.0000
73.0000	0.0002266648	0.0002053501	73.0000
74.0000	0.0002326950	0.0002179657	74.0000
75.0000	0.0002394111	0.0002308161	75.0000
76.0000	0.0002450625	0.0002499023	76.0000
77.0000	0.0002520022	0.0002697587	77.0000
78.0000	0.0002596123	0.0002859498	78.0000
79.0000	0.0002673615	0.0002999518	79.0000
80.0000	0.0002743790	0.0003112532	80.0000
81.0000	0.0002819232	0.0003220499	81.0000
82.0000	0.0002903360	0.0003327035	82.0000
83.0000	0.0002976524	0.0003409899	83.0000
84.0000	0.0003068053	0.0003483519	84.0000
85.0000	0.0003149464	0.0003574431	85.0000
86.0000	0.0003249839	0.0003657447	86.0000
87.0000	0.0003346745	0.0003751234	87.0000
88.0000	0.0003439268	0.0003841729	88.0000
89.0000	0.0003536567	0.0003944876	89.0000
90.0000	0.0003653216	0.0004060516	90.0000
91.0000	0.0003775376	0.0004157684	91.0000
92.0000	0.0003887416	0.0004345696	92.0000
93.0000	0.0004076859	0.0004516836	93.0000
94.0000	0.0004268342	0.0004724605	94.0000
95.0000	0.0004508652	0.0004960444	95.0000
96.0000	0.0004789169	0.0005232969	96.0000
97.0000	0.0005128299	0.0005591788	97.0000
98.0000	0.0005533487	0.0006160105	98.0000
99.0000	0.0006155258	0.0006927988	99.0000

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Bogen/Smith 2/10-13/88

COMPOUNDS: VCL, PCE, TCE, VDCL, CCE, BNZ, CLFM

Calculated Distributions of Individual Risk

Percentile	STATION A	STATION B	STATION C	STATION F
0.	0.	0.	0.	-0.000044100
1.0000	0.0000167416	0.0000104513	0.0000105567	-0.000038111
2.0000	0.0000201954	0.0000125581	0.0000124066	-0.000032112
3.0000	0.0000225259	0.0000139631	0.0000137900	-0.000026818
4.0000	0.0000242155	0.0000148549	0.0000147735	-0.000021879
5.0000	0.0000258961	0.0000156690	0.0000156949	-0.000017248
6.0000	0.0000271932	0.0000164566	0.0000165174	-0.000013116
7.0000	0.0000283096	0.0000171433	0.0000172849	-0.000008616
8.0000	0.0000295966	0.0000178361	0.0000180432	-0.000004945
9.0000	0.0000307031	0.0000184297	0.0000187433	-0.000003746
10.0000	0.0000316542	0.0000190747	0.0000193151	-0.000003176
11.0000	0.0000326966	0.0000197551	0.0000199449	-0.000002666
12.0000	0.0000338039	0.0000202387	0.0000205676	-0.000002277
13.0000	0.0000346373	0.0000207854	0.0000210972	-0.000001956
14.0000	0.0000355356	0.0000213115	0.0000217091	-0.000001626
15.0000	0.0000363311	0.0000218004	0.0000223280	-0.00000134
16.0000	0.0000370161	0.0000222389	0.0000227976	-0.00000105
17.0000	0.0000378112	0.0000227703	0.0000233639	-0.00000072
18.0000	0.0000385936	0.0000232621	0.0000238953	-0.00000043
19.0000	0.0000393749	0.0000236722	0.0000244075	-0.00000016
20.0000	0.0000401131	0.0000241711	0.0000249112	0.00000010
21.0000	0.0000409161	0.0000246785	0.0000253937	0.00000037
22.0000	0.0000418316	0.0000252247	0.0000258708	0.00000065
23.0000	0.0000428108	0.0000258257	0.0000265080	0.00000091
24.0000	0.0000438087	0.0000265473	0.0000272412	0.00000116
25.0000	0.0000445363	0.0000270885	0.0000278962	0.00000140
26.0000	0.0000454770	0.0000277467	0.0000285023	0.00000163
27.0000	0.0000464649	0.0000284356	0.0000291974	0.00000187
28.0000	0.0000475088	0.0000291322	0.0000298928	0.00000210
29.0000	0.0000486140	0.0000298595	0.0000305489	0.00000236
30.0000	0.0000497405	0.0000305784	0.0000313912	0.00000259
31.0000	0.0000513301	0.0000315582	0.0000323318	0.00000282
32.0000	0.0000527962	0.0000326300	0.0000333016	0.00000310
33.0000	0.0000545322	0.0000338427	0.0000345954	0.00000331
34.0000	0.0000565647	0.0000351800	0.0000357623	0.00000361
35.0000	0.0000596773	0.0000368202	0.0000375966	0.00000384
36.0000	0.0000643914	0.0000397141	0.0000402446	0.00000409
37.0000	0.0000760322	0.0000464039	0.0000447861	0.00000439
38.0000	0.0000915892	0.0000579888	0.0000522974	0.00000463
39.0000	0.0000990680	0.0000643281	0.0000578410	0.00000494
40.0000	0.0001044989	0.0000684469	0.0000613447	0.00000520
41.0000	0.0001090098	0.0000715235	0.0000643256	0.00000553
42.0000	0.0001135631	0.0000741705	0.0000670281	0.00000582
43.0000	0.0001166602	0.0000767352	0.0000691188	0.00000615
44.0000	0.0001206058	0.0000792412	0.0000715299	0.00000657
45.0000	0.0001241229	0.0000816281	0.0000741565	0.00000688
46.0000	0.0001284115	0.0000844175	0.0000769191	0.00000734
47.0000	0.0001323431	0.0000875623	0.0000802985	0.00000778
48.0000	0.0001368215	0.0000903983	0.0000835524	0.00000840
49.0000	0.0001420118	0.0000937007	0.0000878839	0.00000901
50.0000	0.0001484406	0.0000980230	0.0000929224	0.00000989
51.0000	0.0001554685	0.0001027172	0.0000987470	0.00001068
52.0000	0.0001631518	0.0001068566	0.0001058147	0.00001141
53.0000	0.0001714261	0.0001112505	0.0001153716	0.0000123[illegible]

54.0000	0.0001[illegible]3800	0.0001151393	0.0[illegible]1254001	0.0000131966
55.0000	0.0001881400	0.0001193971	0.0001351193	0.0000140539
56.0000	0.0001967505	0.0001240139	0.0001430866	0.0000148532
57.0000	0.0002053009	0.0001291605	0.0001507263	0.0000155704
58.0000	0.0002127309	0.0001334420	0.0001572401	0.0000163812
59.0000	0.0002211341	0.0001382014	0.0001637301	0.0000170979
60.0000	0.0002291074	0.0001430089	0.0001705682	0.0000179092
61.0000	0.0002374263	0.0001474257	0.0001769954	0.0000186926
62.0000	0.0002460355	0.0001521993	0.0001830809	0.0000196838
63.0000	0.0002532971	0.0001565996	0.0001893462	0.0000207714
64.0000	0.0002604108	0.0001605321	0.0001961033	0.0000220924
65.0000	0.0002685594	0.0001647855	0.0002022566	0.0000238881
66.0000	0.0002754990	0.0001685263	0.0002082651	0.0000258823
67.0000	0.0002823051	0.0001726795	0.0002145035	0.0000282531
68.0000	0.0002890742	0.0001766196	0.0002196703	0.0000313247
69.0000	0.0002954087	0.0001810707	0.0002253651	0.0000354304
70.0000	0.0003035968	0.0001850113	0.0002309116	0.0000386657
71.0000	0.0003120290	0.0001894472	0.0002371761	0.0000421539
72.0000	0.0003188752	0.0001930911	0.0002419357	0.0000454371
73.0000	0.0003255634	0.0001975205	0.0002471573	0.0000487792
74.0000	0.0003337023	0.0002025943	0.0002538896	0.0000523578
75.0000	0.0003422117	0.0002076196	0.0002599254	0.0000554247
76.0000	0.0003491150	0.0002118553	0.0002654939	0.0000586852
77.0000	0.0003587085	0.0002168571	0.0002716460	0.0000620299
78.0000	0.0003672591	0.0002220305	0.0002784427	0.0000655260
79.0000	0.0003757695	0.0002278990	0.0002854810	0.0000689765
80.0000	0.0003869332	0.0002345239	0.0002941267	0.0000731710
81.0000	0.0003968601	0.0002425033	0.0003031442	0.0000773982
82.0000	0.0004160306	0.0002519356	0.0003141768	0.0000823501
83.0000	0.0004327652	0.0002636519	0.0003244769	0.0000861481
84.0000	0.0004527254	0.0002782673	0.0003377407	0.0000905731
85.0000	0.0004891809	0.0003004160	0.0003560954	0.0000960447
86.0000	0.0005543724	0.0003393321	0.0003845051	0.0001031195
87.0000	0.0007449347	0.0004478697	0.0004589469	0.0001117394
88.0000	0.0009877429	0.0006302872	0.0005836126	0.0001230128
89.0000	0.0010927630	0.0007125543	0.0006540236	0.0001365960
90.0000	0.0011622346	0.0007621924	0.0007014063	0.0001511233
91.0000	0.0012161805	0.0008010886	0.0007320404	0.0001658916
92.0000	0.0012656278	0.0008343418	0.0007656841	0.0001797781
93.0000	0.0013107589	0.0008637734	0.0007958769	0.0001928594
94.0000	0.0013481090	0.0008919118	0.0008216055	0.0002043543
95.0000	0.0013977059	0.0009262862	0.0008550131	0.0002171679
96.0000	0.0014431083	0.0009553584	0.0008847672	0.0002277545
97.0000	0.0015204839	0.0010077254	0.0009340050	0.0002429122
98.0000	0.0016660416	0.0011076273	0.0010001422	0.0002586257
99.0000	0.0018914242	0.0012574432	0.0011262981	0.0002881467

R&S146126

Bogen/Smith Feb. 1986

COMPOUNDS: VCL, PCE, TCE, VDCL, DCE, BNZ, CLFM

STATIONS A,B,D, and F: Weighted Average Individual Risk

Weights:	A .25 B .25 D .25 F .25	A .25 B .40 D .15 F .20	(test) A .1 B .1 D .1 F .7	(test) A .05 B .05 D .05 F .85
Percentile				
0.	0.	0.	0.	-0.00001644
1.0000	0.0000204584	0.0000211545	0.0000048512	-0.00000903
2.0000	0.0000242386	0.0000246190	0.0000087678	-0.00000162
3.0000	0.0000279106	0.0000275176	0.0000110357	0.00000274
4.0000	0.0000311852	0.0000304999	0.0000132008	0.00000490
5.0000	0.0000349727	0.0000341969	0.0000155844	0.00000684
6.0000	0.0000378378	0.0000381523	0.0000176491	0.00000808
7.0000	0.0000408607	0.0000413655	0.0000194145	0.00000919
8.0000	0.0000437934	0.0000443506	0.0000211199	0.00001024
9.0000	0.0000467885	0.0000468923	0.0000225700	0.00001138
10.0000	0.0000497234	0.0000495340	0.0000239289	0.00001237
11.0000	0.0000524977	0.0000524410	0.0000255765	0.00001336
12.0000	0.0000551247	0.0000551983	0.0000267758	0.00001417
13.0000	0.0000582948	0.0000582593	0.0000279610	0.00001504
14.0000	0.0000605146	0.0000606122	0.0000293068	0.00001593
15.0000	0.0000633737	0.0000628670	0.0000304310	0.00001675
16.0000	0.0000656121	0.0000653010	0.0000318560	0.00001769
17.0000	0.0000674726	0.0000678034	0.0000330773	0.00001836
18.0000	0.0000695475	0.0000700922	0.0000343715	0.00001916
19.0000	0.0000719375	0.0000719697	0.0000355260	0.00001989
20.0000	0.0000744188	0.0000741635	0.0000368745	0.00002057
21.0000	0.0000770200	0.0000766476	0.0000379063	0.00002149
22.0000	0.0000794324	0.0000792382	0.0000390427	0.00002208
23.0000	0.0000816143	0.0000815102	0.0000401178	0.00002284
24.0000	0.0000837869	0.0000834925	0.0000414410	0.00002355
25.0000	0.0000857691	0.0000855734	0.0000426145	0.00002423
26.0000	0.0000876149	0.0000875942	0.0000436528	0.00002514
27.0000	0.0000894127	0.0000897765	0.0000448584	0.00002593
28.0000	0.0000914198	0.0000918467	0.0000458641	0.00002657
29.0000	0.0000935049	0.0000943213	0.0000472987	0.00002741
30.0000	0.0000953721	0.0000962963	0.0000487736	0.00002813
31.0000	0.0000977037	0.0000983643	0.0000498835	0.00002886
32.0000	0.0000997645	0.0001003667	0.0000510056	0.00002971
33.0000	0.0001019075	0.0001026966	0.0000522020	0.00003064
34.0000	0.0001037152	0.0001043956	0.0000536194	0.00003158
35.0000	0.0001058274	0.0001065292	0.0000548920	0.00003240
36.0000	0.0001078090	0.0001084594	0.0000560758	0.00003342
37.0000	0.0001097040	0.0001106679	0.0000575096	0.00003456
38.0000	0.0001117766	0.0001126516	0.0000590906	0.00003549
39.0000	0.0001138784	0.0001145845	0.0000606580	0.00003664
40.0000	0.0001158186	0.0001168656	0.0000620599	0.00003771
41.0000	0.0001180233	0.0001190925	0.0000636321	0.00003915
42.0000	0.0001203513	0.0001209054	0.0000654171	0.00004039
43.0000	0.0001228854	0.0001229395	0.0000671986	0.00004159
44.0000	0.0001252108	0.0001252725	0.0000689713	0.00004284
45.0000	0.0001275451	0.0001272665	0.0000707890	0.00004437
46.0000	0.0001297198	0.0001298882	0.0000727128	0.0000455
47.0000	0.0001325839	0.0001324883	0.0000751161	0.0000473
48.0000	0.0001353098	0.0001351530	0.0000773350	0.0000489

49.0000	0.[illegible]1378552	0.0001377227	.0000793015	0.00005048
50.0000	0.0001407559	0.0001400774	0.0000813439	0.0000520
51.0000	0.0001435693	0.0001427931	0.0000835467	0.0000536
52.0000	0.0001464524	0.0001452163	0.0000854501	0.0000550
53.0000	0.0001493753	0.0001483283	0.0000880061	0.0000565
54.0000	0.0001523748	0.0001506127	0.0000907375	0.0000583
55.0000	0.0001555732	0.0001540627	0.0000928356	0.0000597
56.0000	0.0001598615	0.0001575702	0.0000951295	0.0000612
57.0000	0.0001643265	0.0001612872	0.0000975491	0.0000628
58.0000	0.0001680505	0.0001644625	0.0001002750	0.0000644
59.0000	0.0001730946	0.0001684695	0.0001028761	0.0000662
60.0000	0.0001776716	0.0001723213	0.0001053664	0.0000679
61.0000	0.0001836000	0.0001764688	0.0001076213	0.0000695
62.0000	0.0001892681	0.0001806079	0.0001102704	0.0000711
63.0000	0.0001947449	0.0001853479	0.0001130905	0.0000729
64.0000	0.0002017037	0.0001895807	0.0001158360	0.0000745
65.0000	0.0002095510	0.0001941297	0.0001186579	0.0000766
66.0000	0.0002160812	0.0001996267	0.0001215133	0.0000783
67.0000	0.0002247096	0.0002056536	0.0001243998	0.0000800
68.0000	0.0002307941	0.0002109161	0.0001274853	0.0000816
69.0000	0.0002384554	0.0002172988	0.0001306388	0.0000836
70.0000	0.0002457089	0.0002248247	0.0001334368	0.0000856
71.0000	0.0002528513	0.0002332646	0.0001363476	0.0000877
72.0000	0.0002599996	0.0002420739	0.0001394772	0.0000895
73.0000	0.0002673251	0.0002552182	0.0001428066	0.0000925
74.0000	0.0002743479	0.0002667731	0.0001464428	0.0000947
75.0000	0.0002805328	0.0002807976	0.0001499200	0.0000973
76.0000	0.0002883072	0.0002967754	0.0001533030	0.0001000
77.0000	0.0002968641	0.0003118931	0.0001564810	0.0001031
78.0000	0.0003052506	0.0003275154	0.0001593584	0.0001058
79.0000	0.0003129182	0.0003374013	0.0001628595	0.0001089
80.0000	0.0003204447	0.0003499175	0.0001660865	0.0001124
81.0000	0.0003272209	0.0003627074	0.0001695919	0.0001165
82.0000	0.0003350463	0.0003710674	0.0001732141	0.0001206
83.0000	0.0003432883	0.0003807869	0.0001781006	0.0001247
84.0000	0.0003520433	0.0003905885	0.0001830363	0.0001301
85.0000	0.0003614785	0.0004001783	0.0001869070	0.0001355
86.0000	0.0003710391	0.0004096882	0.0001923460	0.0001415
87.0000	0.0003811896	0.0004183790	0.0001960053	0.0001476
88.0000	0.0003913370	0.0004295794	0.0002011726	0.0001543
89.0000	0.0004007554	0.0004421347	0.0002060741	0.0001609
90.0000	0.0004137709	0.0004544519	0.0002132248	0.0001692
91.0000	0.0004266316	0.0004664131	0.0002214344	0.0001782
92.0000	0.0004428630	0.0004832953	0.0002286343	0.0001865
93.0000	0.0004584003	0.0004998501	0.0002368908	0.0001962
94.0000	0.0004791230	0.0005183414	0.0002455478	0.0002070
95.0000	0.0005015589	0.0005425868	0.0002553466	0.0002181
96.0000	0.0005291854	0.0005745288	0.0002656395	0.0002313
97.0000	0.0005669994	0.0006124660	0.0002801838	0.0002461
98.0000	0.0006076190	0.0006667769	0.0003014875	0.0002643
99.0000	0.0005669510	0.0007551034	0.0003365391	0.0002970

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Table 2.3

Calculation of Increased Annual Carcinogenic Risk to Individuals for Comparative Purposes

Compound	EPA 95% UCL Potency[a] $(mg/kg/day)^{-1}$	Individual Dose[b] (mg/kg/day)	Annual Risk[c] ($\times 10^{6}$)
Vinyl Chloride	.0175	2.5×10^{-4}	.062
Perchloroethylene	.051	2.0×10^{-4}	.15
Trichloroethylene	.011	2.3×10^{-4}	.036
Vinylidene Chloride	1.16	1.1×10^{-4}	1.8
1,2-Dichloroethane	.091	1.9×10^{-4}	.25
Benzene	.029	9.4×10^{-5}	.039
Chloroform	.007	1.4×10^{-5}	.014
Total =			2.4

[a] EPA potency values are for lifetime exposure and are taken from the EPA's. Health Assessment Document for Trichloroethylene (EPA 600/8-82/006F, July 1985) p. 8-133.

[b] Doses derived from "Mean" values presented in Table 2.1, multiplied by the factor (15/24)x(0.5)x(0.5) = 0.15625 to account for partial daily exposure, dilution and partial absorption, as explained in the text.

[c] Annual risk calculated using 70 years as human lifespan.

Table 2.4

Table of Comparative Cancer Risks

Daily Exposure Situation	Person at Risk[a]	Dose (mg/kg/day)	Individual Annual Risk ($\times 10^6$)
BKK Resident	Adult Youth	See Table 2.3 See Table 2.3	2.4 3.4
Drinking 2 liters of average U.S. tap water containing 86 ppb chloroform	Adult	2.45×10^{-3}	2.5
Swimming for 1 hr in a pool	Child	0.01	10
Eating a peanut butter sandwich containing 2 teaspoons of p. buttter @ 2 ppb aflatoxin B_1	Adult Child	0.914×10^{-6} 2.133×10^{-6}	38 88
Worker exposed to 50 ppm perchloroethylene for 8 hr. e.g., in a dry cleaning shop, for 5 days/week	Adult	32.3	~ 810,000
Worker exposed to 5 ppm vinylidene chloride for 8 hr, e.g., in an adhesive manufacturing plant, for 5 days/week	Adult	1.90	~ 890,000

[a] Exposure Assumptions: Adult weighs 70 kg and inhales 20 m^3 of air per day; Youth are aged 0-15 breathing a time-weighted average of 0.4143 m^3/kg/day (equivalent to 29 m^3 per 70 kg per day); and Child weighs 30 kg.

APPENDIX E

ANALYSIS OF VARIANCE OF THE DATA IN EPA AND DHS' 1984 EXTENDED MONITORING PROGRAM

Analysis of variance (ANOVA) is a statistical technique that isolates and assesses the contribution of one or more factors to an outcome of interest. Independent categorical variables (factors) are investigated for their influence on the dependent continuous random variable (outcome). Assumptions underlying ANOVA are: independence of the values, normality of the errors of the values, and equal variance for all observations. Two types of models used with ANOVA are the fixed effects model and the mixed effects model. In the fixed effects model there is one level of effect for each group of observations, and the assumption is that the difference is due to the fixed effect. In the random effects model, the effects are drawn from a prior distribution in which it is not possible to estimate the magnitude of the effects for one group of observations, but it is possible to estimate the overall variance. The mixed effects model contains both fixed and random effects.

For the data in EPA and DHS' 1984 Extended Monitoring Program (CH2MHill, 1988), the independent categorical variables were: "type" (Priority I homes/control home), "agent" (chemicals detected in the Priority I homes), and "sample date/calendar period"; the dependent random variable was "concentrations detected".

Three-way ANOVA was performed on the data in the program for the primary factor of interest, "type" (that is, whether or not there was a difference between the concentrations detected in the Priority I homes and the concentrations detected in the control home). The two other factors investigated to ensure that the difference was not due to their influence were "agent" (vinyl chloride, 1,1-dichloroethylene, 1,2-dichloroethane, 1,1,1-trichloroethane, perchloroethylene, trichloroethylene, and benzene) and "sample date". A mixed effects model was used, with agent and date as random effects. Analysis required log transformation of the values recorded in Volume 5 Appendix H-2. The table below shows that, in 3-way ANOVA, concentrations detected in the Priority I homes were significantly higher than concentrations detected in the control home ($p < 0.039$).

3-WAY MIXED EFFECTS ANALYSIS OF VARIANCE

PARAMETER	ESTIMATE	STANDARD DEVIATION	P VALUE
Error Variance	0.049	0.003	-
Constant	0.354	0.106	0.001
Type	0.053	0.026	0.039
Agent	0.072	0.039	-
Date	0.009	0.004	-

A 2-way fixed effects model ANOVA was also done to verify that the sample date did not affect the primary factor of interest, "type". The analysis was done separately for the early part of the month (calendar period October 1-14) and the later part of the month (calendar period October 15-29). The second factor in the analysis was "agent" (the six compounds detected in the Priority I h mes). Benzene was omitted in the 2-way ANOVA because too few data points in the control home precluded its inclusion in the analysis. Values recorded in Volume 5 Appendix H-2 were log transformed for the analysis. The table below shows that, in 2-way ANOVA, concentrations detected in the Priority I homes were significantly higher than concentrations detected in the control home ($p < 0.006$).

2-WAY FIXED EFFECTS ANALYSIS OF VARIANCE
FOR ALL DATES COMBINED

SOURCE	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F VALUE	P VALUE
Agent	4.6203	5	0.9241	15.13	0.0000
Type	0.4713	1	0.4713	7.72	0.0057
Interaction	0.5490	5	0.1098	1.80	0.1117
Error	28.2087	462	0.0611		