REPORT ON ETHYLENE DIBROMIDE
TO THE SCIENTIFIC REVIEW PANEL

Prepared by the Staffs of the
Air Resources Board and
the Department of Health Services

April 1985

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CONTENTS

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OVERVIEW

I. INTRODUCTION

Under the provisions of Division 26, Chapter 3.5 of the Health and Safety Code, the Air Resources Board (ARB or the Board) is responsible for the identification and control of toxic air contaminants, except in their pesticidal use. The Department of Food and Agriculture is responsible for the regulation of toxic air contaminants in their pesticidal use (Health and Safety Code Sections 39650(g) and 39655; Food and Agriculture Code Section 14021 et seq.). Health and Safety Code Section 39650[1] et seq., and Food and Agriculture Code Section 14021 et seq., enacted in September 1983, (Assembly Bill 1807; Stats. 1983, ch. 1047) sets forth a procedure for the identification and control of toxic air contaminants (TAC) in California.

We are proposing, in accordance with these provisions, that ethylene dibromide (EDB) be identified as a toxic air contaminant. This overview reviews briefly our report on the uses of, and the extent of emissions of and public exposure to EDB in California (Part A of this report), and the Department of Health Services' (DHS) evaluation of the health effects of EDB (Part B of this report). The findings in these reports comprise the rationale for the selection of EDB as a candidate substance for listing as a toxic air contaminant. Health and Safety Code Section 39655 defines a "toxic air contaminant" as an air pollutant which may cause or

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[1] All statutory references are to the Health and Safety Code unless otherwise indicated.

contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health."

Health and Safety Code Section 39650 sets forth the Legislature's findings with respect to substances which may be toxic air contaminants. The Legislature has declared:

> "That public health, safety, and welfare may be endangered by the emission into the ambient air of substances which are determined to be carcinogenic, teratogenic, mutagenic, or otherwise toxic or injurious to humans."

The findings also include directives with respect to the consideration of scientific evidence and the basis for regulatory action. With respect to the control of toxic air contaminants, the Legislature has declared:

> "That it is the public policy of this state that emissions of toxic air contaminants should be controlled to levels which prevent harm to the public health."

The Legislature has further declared that, "while absolute and undisputed scientific evidence may not be available to determine the exact nature and extent of risk from toxic air contaminants, it is necessary to take action to protect public health."

With respect to the evaluation of substances, the Legislature has declared that the best available scientific evidence, gathered from both public agencies and private sources, including industry, should be used. The Legislature has also determined that this information should be reviewed by a scientific review panel and by members of the public.

Under the procedures established in the Health and Safety Code to implement the Legislature's findings, the determination by the Board as to whether a substance is a toxic air contaminant includes several steps. First, we request the DHS to evaluate the health effects of a substance (Section 39660). The evaluation includes a comprehensive review of all available scientific data. Second, upon receipt and in consideration of the DHS evaluation and recommendation, we prepare and submit a health effects report to the Scientific Review Panel (SRP) for its review (Section 39661). The report is prepared in a form which may serve as the basis for future regulatory action by the Board. The report is also made available to the public, which may submit comments on the report to the SRP. After receiving the written findings of the SRP, concerning the report, the Board issues a public hearing notice and proposed regulation which includes the proposed determination as to whether the substance is a toxic air contaminant. The Board's determination, after a public hearing and other procedures to comply with applicable provisions of Government Code Section 11340 et seq., that a substance is a toxic air contaminant must be set forth in a regulation (Section 39662). The Health and Safety Code also includes procedures for the development and adoption of control measures for substances identified by regulation as toxic air contaminants (Sections 39665-39667).

II. EVALUATION OF ETHYLENE DIBROMIDE

Consistent with the provisions of Chapter 5, Division 26 of the Health and Safety Code, the ARB and the DHS first prioritized candidate substances for evaluation and regulation as "toxic air contaminants" pursuant to Section 39660(f). Briefly, the selection of a substance for the Board's evaluation and consideration as a toxic air contaminant is to be based on the risk to the public from exposure to the substance, amount or potential amount of emissions from use of the substance, manner of usage in California, atmospheric persistence, and ambient concentrations. After consulting with DHS, we selected EDB for the Board's consideration for listing as a TAC. We selected EDB because it is a known animal carcinogen, it is ubiquitously emitted from evaporation and burning of leaded gasoline, it is persistent in the atmosphere, and its presence in the atmosphere has been documented. Pertinent data for California are summarized below. The emissions estimates show pesticide applications represented 96 percent of statewide emissions in 1983. Since nearly all pesticidal uses of EDB are now prohibited, the marketing and use of leaded gasoline will be the primary EDB emission sources in California.

1983 Emissions	Statewide	South Coast Air Basin
Stationary sources		
Pesticides*	362 tons/year	4 tons/year
Gasoline evaporation	0.5 "	0.2 "
Vehicular	15 "	7 "
Atmospheric Half-Life		
(OH· attack, polluted atmosphere)	50 days	
Ambient Concentration		
Average (annual)	Unknown	.0074 part per billion
Range (24 hour)	Unknown	<.005-.18 part per billion

Pursuant to Health and Safety Code Section 39660, we requested that the DHS conduct a health effects evaluation of EDB. The DHS evaluation was conducted in accordance with the provisions of that section, which requires

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* Under Chapter 3.5, Division 26, of the Health and Safety Code, TACs which are pesticides are to be regulated in their pesticidal use by the Department of Food and Agriculture.

that the DHS consider all available scientific data, including, but not limited to, relevant data provided by the ARB, the Department of Industrial Relations, international and federal health agencies, private industry, academic researchers, and public health and environmental organizations. To facilitate the identification of all available data prior to formally requesting the DHS evaluation, we sent a letter to owners of potential sources of EDB emissions in California and other interested members of the public requesting that they submit any information they considered pertinent to the DHS evaluation. We also received a reference search on EDB health effects using the MEDLARS II and DIALOG Information Services and included a bibliography from that search in our request for information. The data compiled in the search were provided to the DHS. Also, the DHS report and our draft report were released to the public upon completion on December 14, 1984, providing additional time during our preparation of the report to the SRP for the public's preparation of comments. These reports were also provided to the SRP on that date.

Section 39660 specifies that the DHS evaluation shall assess the availability and quality of data on health effects, including potency, mode of action, and other relevant biological factors of the substance. Section 39660 also requires that the DHS evaluation contain an estimate of the levels of exposure which may cause or contribute to adverse health effects, and, in the case where there is no threshold of significant adverse health effects, the range of risk resulting from current or anticipated exposure.

Five major issues discussed in the DHS health effects evaluation of EDB are: 1) Are health effects other than cancer expected to occur at current ambient levels? 2) Is EDB an animal carcinogen? 3) Should EDB be considered a potential human carcinogen? 4) Does EDB have a threshold below which cancer does not occur? and 5) What is the range of added lifetime cancer risk for populations continuously exposed to California's urban air EDB concentrations? Based on its review of all available scientific data, the DHS evaluation concludes that: 1) health effects other than cancer are not expected to occur at current ambient levels; 2) the DHS staff agrees with the International Agency for Research on Cancer (IARC) that EDB is an animal carcinogen; 3) since EDB is a potent animal carcinogen, it should be considered a potential human carcinogen; 4) EDB should be treated as a carcinogen without a threshold; and 5) the added lifetime cancer risk from ambient air EDB exposure ranges from 1.02 to 5.53 cases per million per 10 ppt.

The DHS report finds that the adverse health effects indicative of systemic toxicity of EDB, and reproductive effects, occur at levels of exposure to EDB which are thousands of times higher than ambient levels likely to be found in California's urban air. Thus, the DHS concludes that health effects other than cancer are not expected to occur at current ambient levels.

According to the DHS report, studies on the mutagenic potential of EDB were reviewed by the Occupational Safety and Health Administration (OSHA). EDB was shown to have genotoxic activity in artificial environments outside of living organisms (in vitro), and within living organisms (in vivo). It can induce gene mutation in bacteria, fungi, plants, insects, and mammalian cells.

According to the DHS report, animal cancer bioassays show EDB is a potent carcinogen in both sexes in more than one animal species. When administered to animals, EDB caused malignancies both at the site of first contact (skin, forestomach, and nasal cavity), as well as remote sites (circulatory system, lung, and pituitary, among others). Thus, the DHS agrees with IARC's conclusion that EDB is a proven animal carcinogen.

The DHS evaluation indicates that the one published epidemiological study of 161 workers failed to show a statistically significant increase in cancer rates from exposure to EDB. However, the DHS agrees with the authors of the study that it can neither rule out nor establish EDB as a human carcinogen because of the small size of the population studied. Since the scant human data for carcinogenicity are inconclusive, and the animal data establish EDB as a potent animal.carcinogen, the DHS staff recommends that EDB be considered a potential human carcinogen.

To determine that a substance has a carcinogenic threshold, the DHS requires strong positive evidence that the substance acts only through mechanisms which ought to have a threshold. No positive evidence exists to suggest that the carcinogenicity of EDB has a threshold. The DHS report states that EDB should be treated as a carcinogen without a threshold in humans.

The DHS estimated the carcinogenic potency of EDB at 20 ppm and 10 ppt by applying the Weibull-Multistage model, the multistage model, and the Probit model to data from animal bioassays. Table A shows the 95 percent upper confidence limit (UCL) and the maximum likelihood risk estimates (MLE) for each model based on nasal malignancies in male rats, and circulatory system malignancies (hemangiosarcomas) in female mice. The risk estimates using these models are not grossly incompatible with the results from the one small epidemiological study.

Table A

Risk Assessment Estimates for EDB in Air

Species/Tumor	Model	UCL*/MLE**	20 ppm Occupational Exposure (PEL)***	10 ppt Community Exposure
Male Rats Nasal Malignancies	Weibull-Multistage	95% UCL	985/1000	5.53/million
		MLE	916/1000	2.85/million
	Multistage	95% UCL	708/1000	3.15/million
		MLE	627/1000	2.53/million
	Probit	95% UCL	721/1000	0[1]/million
		MLE	638/1000	0[1]/million
Female Mice Hemangiosarcomas	Weibull-Multistage	95% UCL	732/1000	3.23/million
		MLE	549/1000	2.03/million
	Multistage	95% UCL	406/1000	1.34/million
		MLE	328/1000	1.02/million
	Probit	95% UCL	438/1000	0[1]/million
		MLE	357/1000	0[1]/million

* UCL - Upper confidence limit
** MLE - Maximum likelihood estimate
*** PEL - Permissible Exposure Limit
[1] Predictions for the Probit model ranged from $0-10^{-31}$

The DHS recommends the MLE from the multistage model for hemangiosarcomas in female mice for calculating the lower bound of risk. The DHS recommends the 95 percent UCL estimate from the Weibull-Multistage model for nasal malignancies in male rats for calculating the upper bound of risk. The DHS staff suggests that we consider that risk estimates between these bounds constitute the most reasonable estimates of risk from ambient EDB exposure. While less conservative risk estimates can also be defended as reasonable, the

DHS staff does not feel that any can be clearly preferred, and the more conservative of equally reasonable elements should constitute the basis for regulation. Using these bounds for the range of risk, then, the added lifetime cancer risk from exposure to EDB in urban air ranges from 1.02 to 5.53 cases per million per 10 ppt.

Using the range of risk suggested by the DHS, we estimated the added lifetime cancer risk to a population exposed continuously for 70 years to EDB at the annual average concentration of 7.4 ppt estimated for the South Coast Air Basin. The added lifetime cancer risk is in the range of 1 to 4 cases per million persons exposed. To place this in context, the comparable baseline lifetime risk of all cancers combined (SEER program, 1981, Surveillance Epidemiology and End Results Incidence and Mortality Levels, 1973-77, NCI Monograph #57), can be estimated at 23.7 percent or 237,000 cases per million persons exposed.

III. ENVIRONMENTAL IMPACTS

The identification of EDB as a toxic air contaminant is not expected to result in any adverse environmental impacts. However, if the Board determines that EDB is a toxic air contaminant, the Board and air pollution control districts will be required to evaluate the need for, and appropriate degree of, airborne toxic control measures. Thereafter, based on this control measure evaluation, the Board and the districts may be required to adopt airborne toxic control measures. Hence, the identification of EDB as a toxic air contaminant may ultimately result in environmental benefits. Environmental impacts identified with respect to specific control measures, will be included in the consideration of such control measures pursuant to Sections 39665 and 39666.

IV. RECOMMENDATION

Since the evidence strongly suggests that EDB is a known animal carcinogen and potential human carcinogen, and since the evidence does not warrant the assumption that carcinogenicity is confined to the dose above any threshold, we consider available evidence sufficient to recommend listing EDB as a toxic air contaminant having no threshold level.

REPORT ON ETHYLENE DIBROMIDE
TO THE SCIENTIFIC REVIEW PANEL

PART A - A REVIEW OF ETHYLENE DIBROMIDE USES, EMISSIONS AND PUBLIC EXPOSURE

April 1985

(This report has been reviewed by the staffs of the California Air Resources Board and the California Department of Health Services and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board or the Department of Health Services, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.)

SUMMARY

Part A of the ethylene dibromide (EDB) report to the Scientific Review Panel includes information on 1) EDB sources and emissions in California; 2) atmospheric persistence of EDB; 3) EDB concentrations in ambient air; and 4) other routes of exposure to EDB. In 1983, about 360 tons of EDB were emitted from pesticide applications, representing 96 percent of total emissions. Since nearly all pesticidal uses of EDB are now prohibited, the marketing and use of leaded gasoline will be the primary sources of EDB emissions in California. EDB is persistent in the atmosphere, having an estimated half life of about 50 days. Recent ambient monitoring in the South Coast Air Basin identified a daily range between <.005 and .18 ppb with an annual average of .0074 ppb. Prior to the recent EPA ban on pesticidal use of EDB, about 32 percent of total EDB exposure in California was from air and about 57 percent was from foods. We estimate that 75 percent of current EDB exposure is from air. We have no recent ambient air data for other areas of California and therefore are unable to estimate such exposures. Such data would be obtained during the risk management phase as part of the development of control measures.

REPORT ON ETHYLENE DIBROMIDE
TO THE SCIENTIFIC REVIEW PANEL

Part A - A Review of Ethylene Dibromide (EDB) *Uses, Emissions, and Public Exposure*

TABLE OF CONTENTS

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* Former Appendices A and B are included in Part C - Public Input Requests, Comments, and Responses.

LIST OF TABLES AND FIGURES

TABLES

FIGURE

I. MANNER OF USAGE AND AMOUNT OR POTENTIAL AMOUNT OF EMISSIONS

A. PRODUCTION AND USAGE

Ethylene dibromide (EDB) is commercially produced by reacting bromine with ethylene gas.[1/] There are no known natural sources of EDB.

In 1982, about 85,000 tons of EDB were produced in the United States.[2,3/] This amount reflects a decrease of 31 percent from 1977, primarily due to the decrease in leaded gasoline production. EDB is used as a lead scavenging agent in leaded gasoline, as a solvent for resins, gums, and waxes, in the manufacture of dyes, pharmaceuticals and other organic compounds, and as a pesticide. EDB is not available as a consumer product.[2/]

EDB is not produced in California; it is imported from other states. The only known uses of EDB in California are for pesticidal purposes and as a lead scavenger in leaded gasoline. An ARB survey of EDB manufacturers shows pesticides containing 448 tons of EDB were shipped into California in 1983. In 1983, 362 tons of EDB were reported to the Department of Food and Agriculture (DFA) as used for fumigation. The fate of the remaining 86 tons of EDB is not known.

In 1983, about 2,100 tons of EDB were used in leaded gasoline in California.[9/] Appendix F shows the method used to estimate the amount of EDB used in leaded gasoline in California.

Prior to September 1983, the major agricultural and related uses of EDB included fumigation of soil, stored grains and fruits, grain mills and termite-infested areas. In September 1983, EPA announced the cancellation of nearly all major pesticidal uses of EDB. However, EDB fumigants in the possession of users could be used until September 1984.[5/] Consequently, nearly all of the agricultural uses of EDB in California have ceased, as of October 1984.

The total amount of EDB used in California decreased 22 percent from 1982 to 1983 and 24 percent from 1983 to 1984.[4,9,12] Further reductions in use will occur in 1986 if a proposal by EPA to significantly reduce the lead content of gasoline is implemented. If EPA implements its proposed lead standard in 1986, EDB use will decrease about 70 percent from 1984 to 1986. If EPA does not implement this standard in 1986, EDB use will probably decrease 49 percent from 1984 to 1986 primarily due to the .8 gram lead/gallon California standard starting in October 1984, and the decrease in leaded gasoline consumption. The ban of pesticidal use starting in October 1984 accounts for 7 percent of this decrease.

B. CURRENT AND PROJECTED STATIONARY AND MOBILE SOURCE EMISSIONS

Preliminary emission estimates for 1983 show pesticide applications contributed about 95 percent of the estimable EDB emissions statewide and about 35 percent in the South Coast Air Basin (SCAB). The other stationary emission sources are gasoline marketing and gasoline blending facilities. These sources contributed less than one percent of the estimable EDB emissions statewide and about 4 percent in the SCAB. Motor vehicles contributed about 4 percent of the estimable EDB emissions statewide and about 61 percent in the SCAB. However, the motor vehicle emission estimate is uncertain; motor vehicles may contribute a substantially larger portion to the total emission inventory. The vehicle EDB emission test data base used for the inventory is very limited. Table I-1 summarizes the estimates of EDB emissions statewide and in the SCAB. Appendix F documents the methods used to estimate EDB emissions.

Table I-1 shows that the proportional contribution of stationary and mobile sources to total EDB emissions varies between the SCAB and other parts of California. Because the 1983 ambient EDB monitoring data are for the SCAB only, an estimate was made of the EDB emissions required in the SCAB to account for the observed ambient concentrations. Assuming that ARB monitoring data are reflective of the whole SCAB, this estimate predicts EDB emissions in the SCAB ranging from 41 to 67 tons per year (calculation included in Appendix G). Table I-1 shows only 11 tons per year EDB emissions in the SCAB. Three possible explanations for the discrepancy between estimated EDB emissions and observed ambient EDB concentrations in the SCAB are: 1) there are other sources of EDB emissions in the SCAB; 2) the EDB emissions from known sources in the SCAB are underestimated; or 3) uncertainties in the monitoring data.

Because the ambient EDB concentrations in the SCAB indicate EDB emissions larger than the estimated 11 tons per year, we looked for other possible sources of EDB emissions. Fumigated produce imported into the SCAB were evaluated as a possible source of EDB emissions. The method for calculating EDB emissions from this source (included in Appendix F) shows imported fumigated produce account for less than one ton per year of EDB emissions in the SCAB. Thus, the estimated EDB emissions in the SCAB do not account for the observed ambient EDB concentrations.

Excluding EDB pesticide emissions, all of the EDB emission estimates in Table I-1 are based on limited data. Additional testing of EDB emissions from stationary and mobile sources is planned prior to considering control measures for these sources.

Recent trends in EDB uses in California were evaluated to predict future stationary and mobile source EDB emissions. EDB emissions from pesticide use decreased almost 20 percent from 1982 to 1983.[4,12] Gasoline-related EDB emissions will decrease with decreasing leaded gasoline production. A lead content standard of 1.1 grams lead per gallon was in effect in 1983 and is the basis for the baseline emission estimates. A 0.8 gram lead per gallon standard went into effect October 1, 1984 and a 0.1 gram lead per gallon standard has been proposed by EPA to go into effect in 1986. EDB emissions from mobile sources will decrease with the phase-out of leaded gasoline.

Table I-1

Estimated Ethylene Dibromide Emissions in California

Source	Source Type	Emissions (tons/yr)		Inventory Year	Reference
		Statewide	SCAB		
Pesticide	Area	362*	4*	1983	4
Vehicular Exhaust	Area	8	4	1983	6, 7, 9
Vehicular Evaporative Emissions	Area	7	3	1983	7, 8
Gasoline Marketing**	Area	0.32	0.15	1983	10, 11
Gasoline Production	Area	0.19	0.09	1983	6, 11
Total		378	11		

* Assumes emission of all applied EDB.

** Includes bulk terminals, bulk plants, service station tanks and vehicle refueling operations.

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II. PERSISTENCE IN THE ATMOSPHERE

A. PHYSICAL AND CHEMICAL PROPERTIES

The chemical structure of ethylene dibromide (1,2-dibromoethane) is $BrH_2C\text{-}CH_2Br$. It is soluble in ethanol and acetone and is sparingly soluble in water. Ethylene dibromide is a non-polar, stable compound. Its properties are shown in Table II-1.

Table II-1

Property	Value	Reference
Boiling point, 1 atm	269°F	1
Density, liquid	2.18 g/cm^3	1
Heat capacity, 60°F	.173 cal/°C-gm	1
Heat of combustion (HHV), 25°C	1.48 kcal/gm	
Henry's Law Constant	.56 atm. m^3/mole	2
Heat of fusion	13.5 cal/gm	1
Heat of vaporization, 130°C	46.2 cal/gm	
Index of refraction	1.54	3
Molecular weight	187.9	
Octanol: water partition	∞	7
Solubility in water, 30°C	5.3 mg/cm^3	1
Vapor pressure, -16°F to 269°F	$\ln P$ (mmHg) $= -7975 \times 1/T(°K) + 17.56$	1

B. FORMATION AND FATE IN THE ATMOSPHERE

EDB reacts slowly in the atmosphere; it is slightly less reactive photochemically than ethane. The most important photochemical reaction, hydroxyl radical attack, occurs in polluted air. EDB's half-life under this reaction is 50 days or longer[4/] at the hydroxyl radical concentration 1 x 10^6 molecules/cm^3. This concentration was estimated by Calvert[5/] as the diurnal mean in Los Angeles. The other known removal reactions, attack by peroxides or ozone, are also very slow, having 100-day half-lives.[6/] Thus, EDB is a persistent pollutant that can be transported long distances and is apt to be present throughout an urban air shed.

The hydroxyl radical attack produces free bromine atoms or BrO radicals, which are reactive and thus short-lived. The ultimate fate of EDB and the derivatives is not certain. The derivatives may become part of aerosols that are removed by rainfall or by dry deposition.

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III. AMBIENT CONCENTRATIONS IN THE COMMUNITY

A. AMBIENT AIR DATA

The California Air Resources Board Haagen-Smit Laboratory (HSL) has been monitoring ambient EDB at four sites in the South Coast Air Basin (SCAB) since January 1983. These are in downtown Los Angeles (DOLA), Dominguez, El Monte, and Riverside. All samples are collected over 24-hour periods, beginning at 9 a.m., in Tedlar bags at constant flow rates. Analysis of the samples is by gas chromatography. Details of the sampling and analytical procedures are in Appendix D. Samples are collected five days per week at the El Monte site and about once every six days in DOLA, Dominguez, and Riverside.

Between January, 1983, and May, 1984, 511 samples were collected. Thirty percent of the samples had concentrations above 5 ppt (v), the minimum reporting level. Table III-1 summarizes the data. The mean concentrations during 1983 ranged among the sites from 5.0 to 9.3 ppt with the average for all sites at 7.4 ppt.

The average ambient EDB levels for 1983 exceeded the averages for January to May, 1984, because of strong peaks during the summer of 1983 at three stations. This phenomenon is inconsistent with the estimated inventory for known sources in the SCAB in 1983, which was heavily weighted to automotive emissions in the summer. Other pollutants that are predominantly from vehicles (CO and lead) are measured at their lower ambient concentrations during the summer in the SCAB and their higher concentrations in the winter because of the poor dispersion in the lower atmosphere during the winter. Preliminary data for 1984 (not included in this report), also indicate summertime peaks.

Table III-1

Summary of 24-Hour Monitoring Data In the SCAB (ppt)

	DOLA	El Monte	Dominguez	Riverside	Avg. Among Sites
Mean[a]					
Jan.- Dec. 1983	9.0	9.3	5.0	6.4	7.4
Jan.- May 1984[b]	3.0	3.4	4.2	3.6	3.6
All data	7.2	7.4	4.7	5.5	6.2
Highest 24-hour datum	180.0	130.0	37.0	51.0	--

[a] includes the value 2.5 for each sample with EDB below the reporting limit of 5.0 ppt

[b] data for later months not yet available; not representative of year-round means

A second unexpected aspect of the monitoring results is that if the monitoring data are used as an indicator of emissions, the emissions should be three to five times greater than estimated. If EDB, like carbon monoxide and lead, is emitted predominantly from vehicles in the SCAB, its ratio of ambient concentration to emission rate should equal those of the latter pollutants. However, as detailed in Appendix G, the ratio is four to six times higher than expected. This could result from any combination of three causes: (1) automotive emissions are greatly underestimated, (2) an as-yet-unknown type of EDB source emits large amounts around the basin, or (3) small unknown sources emit upwind and near the four monitors. The analysis in Appendix G suggests that hypothesis (1) is partly, but not solely, the cause of the discrepancy.

Attempts to correlate the EDB monitoring data among stations, or with ambient concentrations of CO and lead, or with various meteorological data were all unsuccessful (Appendix E). This leaves no means of extrapolating the data from these four sites to general ambient levels throughout the South Coast Air Basin. Therefore, the mean annual concentration for the four monitoring sites (7.4 ppt) is assumed to be the year-round exposure concentration in the basin.

The HSL monitoring program provides the only ambient EDB data gathered for more than a year in California. A few short-term data taken during 1976 to 1982 are available from other sources. They are shown in Appendix E. Mean concentrations at two remote sites were 0.0 and 5 ppt. At six urban sites, mean concentrations ranged from 10 to 34 ppt. These measurements probably reflect the higher concentrations of EDB in gasoline at that time.

B. OTHER ROUTES OF EXPOSURE TO EDB

Before the EPA banned EDB pesticide uses, the Department of Health Services (DHS) and the California Department of Food and Agriculture (CDFA) sampled for EDB in grain products, citrus fruits and well water in California. The DHS1/ found an average EDB concentration of 37 ppb in twenty-five percent of the grain products sampled. Seventy-five percent of the grain products sampled were not contaminated with EDB. The CDFA2,3/ found EDB concentrations ranging from 1.2 to 113 ppb in citrus fruits and from trace amounts to .38 ppb in well water.

To calculate the daily exposure to EDB from food, data on the average daily intake of grain and citrus fruits were obtained from two EPA studies.4,5/ These studies show an adult weighing 70 kilograms consumes 133 grams of grain per day and 16.8 grams of citrus fruit per day. ARB staff estimates daily air and water intake are 20 m^3 and two liters respectively.

The DHS and CDFA data on food and water exposure, and the ARB data on ambient air exposure were used to estimate total daily EDB exposure in

California. This estimate does not include occupational exposure to EDB and assumes the indoor air EDB concentration to be equivalent to the ambient level. Staff is not aware of any indoor air quality studies (excluding occupational) which tested for EDB contamination.

Table III-2 and Figure III-1 summarize the daily exposure to EDB in California. Table III-2 and Figure III-1 show that prior to EPA's ban on EDB pesticide uses, EDB exposure from air accounted for nearly one-third of the total EDB exposure in California. The estimated exposure from air exceeds the exposure from citrus fruit, and it was the citrus fruit exposure levels which led to EPA's ban on EDB citrus fumigation. With the phase-out of EDB pesticide uses, air will be the largest source of EDB exposure in California.

Table III-2

Summary of EDB Exposure in California*

	ug/day	Percent of Total
Grain1/	1.2	34
Citrus Fruit2/	.8	23
Water3/	.4	11
Air4/	1.1	32
Total	3.5 ug/day	100

* Before the EPA ban on EDB pesticidal uses.

1/ Assumes 25 percent of the grain consumed has an EDB concentration of 37 ppb.

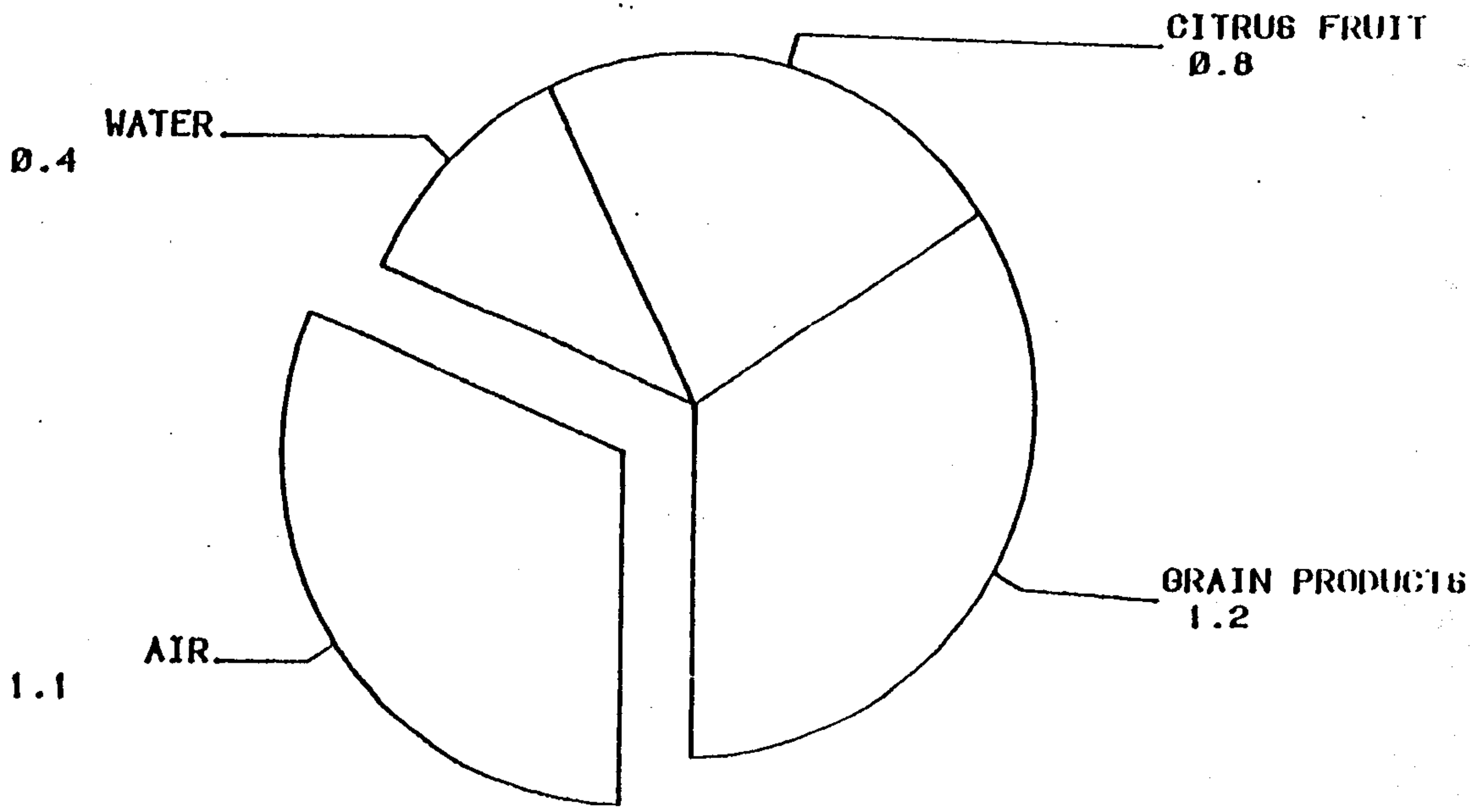
2/ Assumes all of the citrus fruit consumed has an EDB concentration of 45 ppb.

3/ Assumes all of the water consumed has an EDB concentration of .19 ppb.

4/ Assumes all of the air inhaled has an EDB concentration of 7.4 ppt.

Figure III-1

SUMMARY OF EDB EXPOSURE IN CALIFORNIA (*)
Micrograms Per Day



(*) Before the EPA ban on EDB pesticidal uses.

Workers in gasoline blending facilities are exposed to additional quantities of EDB where they work. According to studies by the American Petroleum Institute (API)[6/] and Centaur Associates[7/], oil refineries have indoor EDB concentrations ranging from 0.4 to 40 ppb. A study by Rumsey and Tanita[8/] shows facilities that formulate and use fuel additives have indoor EDB concentrations ranging from 0.2 to 54 ppb.

REFERENCES FOR CHAPTER III

1. *"EDB Sample Results Summary to March 20, 1984," California Department of* Health Services.

2. California Department of Food and Agriculture; "Studies and Evaluation by the CDFA on EDB Used in Fumigation of Fruit," HS-956, Progress Reports 1 through 4, 1981.

3. California Department of Food and Agriculture; "A Survey of Well Water in Selected Counties of California for Contamination by EDB in 1983," HS-1123, September 12, 1983.

4. U.S. EPA, 1984. Ethylene Dibromide (EDB) - Scientific support and decision document for grain and grain milling fumigation uses. Washington, D.C., Office of Pesticide Programs, p. 118, Feb. 8, 1984.

5. U.S. EPA, 1984. Ethylene dibromide (EDB) - Technical support document for quarantine fumigation uses. Washington, D.C., Office of Pesticide Programs, p. 106, March 2, 1984.

6. American Petroleum Institute, 1982. Comments on OSHA advance notice of proposed rulemaking on occupational exposure to ethylene dibromide. Docket H-111. Comment No. 5-54. June 1, 1982.

7. Centaur Associates, Inc., 1983. Analysis of four industry segments which would be affected by proposed EDB standard. Prepared for the Occupational Safety and Health Administration. ps. 60-69.

8. Rumsey, D. W., and R. K. Tanita, 1978. An industrywide industrial hygiene study of ethylene dibromide. DHEW (NIOSH) Pub. No. 79-112. Prepared by Stanford Research Institute for the U.S. Department of Health, Education and Welfare under Contract No. 210-76-0162. Cincinnati, NIOSH, p. 36.

APPENDIX C

HEALTH EFFECTS REQUEST TO DHS AND LETTER OF RESPONSE

Memorandum

To : Peter Rank, Director
Department of Health Services
714 P Street
Sacramento, CA 95814

Date : May 18, 1984

Subject : Evaluation of
Ethylene Dibromide

James D. Boyd
Executive Officer
From : Air Resources Board

I am writing to formally request that the Department evaluate the health effects of ethylene dibromide as a candidate toxic air contaminant in accordance with Assembly Bill 1807 (Tanner). According to Health and Safety Code Sections 39660-62, your Department has ninety days to submit a written evaluation and recommendations on the health effects of ethylene dibromide to the Air Resources Board.

Attached for your staff's consideration in evaluating ethylene dibromide are: Attachment I - a list of references on ethylene dibromide health effects which were identified in an ARB letter of public inquiry and received in response to the inquiry letter; Attachment II - a suggested list of topics that we believe should be included in your ethylene dibromide evaluation and recommendations; and Attachment III - ambient ethylene dibromide concentration data which should be used to estimate the range of risk to California residents as required in Health and Safety Code Section 39660(c).

My staff is available for consultation in conducting this health effects evaluation. We look forward to continuing to work closely with you and your staff in carrying out this legislative mandate. If you have any further questions regarding this matter, please contact me at 445-4383 or have your staff contact Peter D. Venturini, Chief of the Stationary Source Division, at 445-0650.

Attachments

cc: G. Duffy
A. Kelter w/attachments
R. Neutra w/attachments
P. Venturini
Assemblywoman Tanner
C. Berryhill

AUG 27 1984

California

Department of Health Serv

Memorandum

To : James D. Boyd, Executive Officer
Air Resources Board
1102 Q Street
B-4

Date : August 27, 1984

Subject: Ethylene Dibromide

From : Office of the Director
714 P Street, Room 1253
5-1248

On May 18, 1984, you requested the Department of Health Services (DHS) to evaluate the health effects of ethylene dibromide as a candidate toxic air contaminant. According to Health and Safety Code Sections 39660-62, I have 90 days to submit a written evaluation and recommendations to you.

This memo constitutes a formal request for the 30-day extension described in Section 39660 (d). As you know, The Department delivered the document describing the health effects of benzene to you about three weeks ago. Since that time, staff has been devoted to several risk assessment reviews requested by various air pollution control districts, items considered a high priority by your staff.

The Department will be conducting civil service examinations in several classifications in the next four to eight weeks for the express purpose of hiring highly qualified candidates to fill the four professional positions dedicated to the toxic air contaminant program. I anticipate that hiring will begin by late September or early October and will be complete shortly after the first of the year. Until that time, it will be very difficult to maintain the level of effort necessary for the completion of these documents according to the timetable you have set.

If you have any questions, please contact me at the above number or Dr. Donald Lyman, Deputy Director (Acting), at 5-1102.

John W. Hagerty for

Peter Rank
Director

State of California

Department of Health Service

Memorandum

To : Gordon Duffy
Secretary of Environmental
Affairs
1102 Q Street
Sacramento, CA 95814

Date : OCT 17 1984

Subject : Request for Extensio
of Toxic Air Contaminant
Reports on EDB and EDC

From : Office of the Director
714 P Street, Room 1253
5-1248

As you know from previous discussions, the Department's Epidemiological Studies Section has experienced difficulty in meeting the deadlines for your requested toxic air contaminant risk assessments because of proble in acquiring the requisite specialized personnel and the demand for similar analyses from other sources. Given this, we ask that the deadlines for receipt of the EDB and EDC reports be extended until December 15, 1984, and February 28, 1985, respectively. My staff assure me that the reports can be completed by these dates, although such requires that we redirect our efforts from several other high priority projects.

In advance, thank you for this consideration.

Original signed by
Stanley Qubanski

Peter Rank
Director

cc: Kenneth W. Kizer, M.D.
Alex Kelter, M.D.

tate of California

RECEIVED
Department of Health Services
OCT 29 1984

Memorandum

o : Gordon Duffy
Secretary of Environmental Affairs
and Chairman of Air Resources
Board
1102 Q Street

Date : October 22, 1984

Subject : Toxic Air Contaminan
Reports on EDB and EDC

om : Office of the Director
714 P Street, Room 1253
5-1248

In follow-up to my memo of October 17, 1984, please be advised that I have instructed my staff to give top priority to the EDB and EDC toxic air contaminant reports and to proceed as rapidly as possible with them. I hope to be able to deliver them to you earlier than December 15, 1984 (EDB), and February 28, 1985, (EDC), although this will depend on some things not entirely within our control. Of note, I have spoken with Assemblywoman Sally Tanner about this.

I should also tell you that our experience so far with the Toxic Air Contaminant Program (i.e., with the benzene report and our work with the EDB and EDC reports to date) indicates that the reporting periods specified in AB 1807 need to be lengthened in order to produce the high quality reports that you need. This is a function of the multi-disciplinary approach needed to produce the requisite risk assessments, as well as the availability of the necessary scientific literature and other factors. Whatever, we plan to introduce legislation to extend these time lines in the next Legislative session.

Original signed by
Stanley Cubanski

Peter Rank
Director

cc: Kenneth W. Kizer, M.D., M.P.H.
Deputy Director
Preventive Health Services

David B. Swoap, Secretary
Health and Welfare Agency

James D. Boyd, Executive Officer
Air Resources Board

~~State of~~ California

Department of Health Services

Memorandum

To : James D. Boyd
Executive Officer
Air Resources Board
1102 Q Street
B-4

Date : 11/30/84

Subject: Health Effects
Ethylene Dibromide (EDB)

From : Office of the Director
714 P Street, Room 1253
B-1248

Attached is the document prepared in response to your memo requesting the assistance of the Department of Health Services in evaluating the health effects of ethylene dibromide (EDB).

Peter Rank
Director

Attachment

cc: C. Berryhill
G. Duffy
A. Kelter
R. Neutra
Assemblywoman Tanner
P. Venturini

APPENDIX D

SAMPLING AND ANALYSIS METHODS FOR ETHYLENE DIBROMIDE

APPENDIX D

SAMPLING AND ANALYSIS METHODS FOR ETHYLENE DIBROMIDE (EDB)

1. Sites

Toxic sampling by the ARB staff in the SCAB commenced in January, 1983 (see Figure 1 for relative locations). El Monte, the first operational site is 15 kilometers east of the Downtown Los Angeles (DOLA) North Main Street air monitoring station operated by the South Coast Air Quality Management District (SCAQMD). The DOLA site, already in use for criteria pollutants sampling, was the second site selected for toxic sampling. A third sampling site was established at the California State University Dominguez Hills facility in Carson, some 25 kilometers south of DOLA. A fourth sampling site was located at the SCAQMD Riverside station in Riverside, 125 kilometers east of DOLA. Table D-1 summarizes the activities around the four monitoring sites.

2. Principle of the Method

2.1 Ambient air is sampled into a polyvinyl fluoride (Tedlar) sample bag at a constant rate for a 24-hour time interval by means of an automatic sampler.

2.2 After sampling, the ambient air bag sample is returned to the laboratory and the contents are analyzed by gas chromatography (GC), using an electron capture detector (ECD).

3. Range and Detection Limit

3.1 The minimum measurable concentration of EDB has been determined to be 5 parts per trillion (ppt) using prescribed instrument conditions, 100 ml of sample, and a cryogenic trap.

3.2 The range of EDB measurement is 5 ppt to 100 ppb. The upper limit may be expanded by diluting the sample.

4. Confirmation of Chemical Identity

4.1 Any organic compound present in the sample having a retention time similar to that of EDB under the operating conditions described in this method may interfere with the analysis. Chemical identity for EDB is confirmed using a GC-Hall Electroconductivity Detector. Ten percent or more of the samples are reanalyzed using the same column and GC to check precision.

5. Calibration, Precision and Accuracy

5.1 The calibration procedure employs the principles set forth in Volume 1 of the "Quality Assurance Handbook for Air Pollution Measurement Systems" (U. S. Environmental Protection Agency, 1976).

5.2 Standards are used in the linearity check at concentrations which bracket the anticipated range of pollutant concentrations. The calibration data are fitted to a straight line, y=a + bx, by the method of least squares. The calibration is acceptable if the f-ratio is less than the 95 percent rejection limit.

5.3 The 95 percent confidence intervals are obtained by multiplying the square root of variance by the appropriate value of "t" from a "t" table.

5.4 References:

Bennett, C.A. and Franklin, N.L., "Statistical Analysis in Chemistry and Chemical Industry," p. 222-232. John Wiley & Sons, Inc., New York (1954).

Draper, N.R. and Smith, H., "Applied Regressing Analysis," p. 30, John Wiley & Sons, Inc., New York (1966).

Prunell, H., "Gas Chromatography," p. 301-302, John Wiley & Sons, Inc., New York (1962).

U. S. Environmental Protection Agency, "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I Principles." Research Triangle Park, North Carolina 27711 (1976).

6. Advantages and Disadvantages of the Sampling Method

6.1 The air sampling equipment is easily set up and involves no liquids. The ambient concentration of EDB is stable for at least 72 hours in the Tedlar sampling bags. Sampling bags are kept away from direct sunlight and are not exposed to temperatures greater than 30 degrees C.

6.2 A representative integrated sample is readily obtained because the equipment samples at a constant rate over a 24-hour period.

6.3 The accuracy of the analytical data is not dependent on the accuracy of the volume of air collected by the sampling apparatus.

6.4 The minimum detection limit of the analysis may be extended by freezing out a larger volume of the sample.

6.5 The maximum measurable limit of the analysis may also be extended by diluting the sample.

6.6 The polyvinyl fluoride (Tedlar) film sample bag is susceptible to leaks and permeation through the bag.

6.7 The sample is susceptible to contamination from the bag and the diaphragm pump.

7. Apparatus

7.1 The sampling system consists of a diaphragm pump, seven day timer, flow indicator, pressure regulator, flow controller, flow by-pass system and the sample bag (see Figure 2). The diaphragm pump (made of steel and Teflon or Viton construction) draws ambient air through the sample system at approximately 5 liters per minute. Thirty-five milliliters per minute of this air stream is sampled, the remaining flow is by-passed and vented. The sample flows through a diaphragm pump, a solenoid valve, a pressure regulator (set for 2-3 psig to prevent any accidental bursting of over-filled sample bags), a flow control needle valve, a flowmeter, and into the sample bag. A seven-day timer regulates the sampling period.

7.2 Tedlar bags, 2 mil thickness, 50 liter capacity, equipped with stainless steel quick disconnect fittings.

7.3 Rigid opaque containers for Tedlar bag samples are used to protect contents from sunlight and accidental puncture.

7.4 A gas chromatograph equipped with a cryogenic system and electron capture detector.

7.5 A freeze-out system consisting of a stainless steel loop, a liquid nitrogen Dewar and a hot water Dewar.

7.6 A glass column (6 ft x 1/4 inch), packed with 0.2 percent Carbowax 1500 on 80/100 mesh Carbopack C.

7.7 An analog recorder and an integrator to quantitate peak areas.

7.8 A ground glass syringe to transfer air samples from the Tedlar bag to the GC sample inlet.

7.9 Assorted gas cylinder regulator, flow meters, thermometers and a barometer.

7.10 A 145 cubic feet (4160 liters) glass lined tank to prepare standard calibration mixture.

8. Reagents

8.1 All chemicals are to reagent grade: 1,2-dibromoethane (ethylene dibromide, EDB), methyl chloride, methyl bromide, Freon-11, Freon-12, dichloromethane (methylene chloride), trans-dichloroethene, 1,2-dichloropropane, chloroform, 1,1,1-trichloroethane (methyl chrloroform), carbon tetrachloride, bromodichloromethane, trichloroethane (TCE), chlorodibromomethane, bromoform, Freon-113, and tetrachloroethene (PERC).

8.2 Helium, 99.995%

8.3 Zero nitrogen

9. Procedure

9.1 Preparation of the bags

9.1.1 Bags are constructed from 2 mil Tedlar sheeting (27 inches x 27 inches).

9.1.2 The seams are heat sealed to form an envelope which contains about 50 liters.

9.1.3 Swagelock, SS-QC4-D-400VT, stainless steel quick disconnect fittings are attached with a stainless steel adapter and buna O-ring, Cajon SS-4-TA-OR-ST.

9.1.4 All newly fabricated bags are leak and contamination tested. This involves three pressurization and evacuation cycles using zero air. After a final pressurization to a drum-head tightness, the bags are stored for 24 hours to test for leakage. If the bags do not remain taut, they are repaired or discarded. If the bags remain taut, the contents of the bags are analyzed for EDB by GC. The contents of the bag must not exceed the EDB content of the zero air by more than 1 ppt. If this criteria is met, the bags are evacuated for field use. If the bags exceed the EDB level, the pressurization/evacuation and analysis cycle is repeated.

9.1.5 Due to extensive handling, most bags are not suitable for recycling. Bags suitable for recycling are analyzed with a flame ionization detector, evacuated, refilled with zero air and evacuated for field use.

9.2 Preparation of sampling device for ambient sampling

9.2.1 The sample bag is attached to the sampler via the stainless steel quick disconnect.

9.2.2 The sample pump is turned on and the flow adjusted with a metering valve to 35 ml/min as determined on the rotameter.

9.2.3 The timer is set to start the sampler at 7 to 9 a.m. of the scheduled sampling day and set for a 24 hour duration.

9.2.4 Check the pressure regulator setting.

9.2.5 A label is attached to the sample bag noting the bag number, sampling day, sampling time, starting sample flow and sampling location.

9.2.6 After sampling is completed, the sampler is turned on manually and the final sample flow is noted on the bag label. The sampler is turned off and the sample bag is removed via the stainless steel quick disconnect.

9.3 The sample bags are transported to the laboratory in a rigid opaque container.

9.4 The bag samples received at the laboratory are logged in and analysis initiated.

9.5 Analysis of samples (freeze-out method)

9.5.1 Immerse the freeze-out loop in liquid nitrogen and allow the temperature to stabilize (approximately 5 minutes).

9.5.2 Flush the syringe with about 100 ml of the sample, discharge the sample into a hood and withdraw exactly 100 ml from the sample.

9.5.3 Transfer the sample into the precooled freeze-out loop through a Luerlock stopcock.

9.5.4 Back fill the syringe with 100 ml of helium and transfer it into the loop; then flush the loop with helium for 2 minutes.

9.5.5 Stop the helium flushing and remove the liquid nitrogen Dewar from the freeze-out loop.

9.5.6 Isolate the cryogenic loop with an "isolation valve."

9.5.7 Replace the liquid nitrogen Dewar with a Dewar containing hot water at about 80 degrees C.

9.5.8 Allow the loop to come to equilibrium with the hot water.

9.5.9 Introduce the sample into the carrier gas stream with an "injection valve."

9.6 Measure the areas of each of the GC peaks with an electronic integrator.

9.7 GC conditions:

9.7.1 Helium gas flow: 25 ml/min

9.7.2 Make up gas: 10% methane in argon: 40 ml/min

9.7.3 Heating bath temperature: 80 degrees C

9.7.4 Column temperature: 6 to 160 degrees C at 8 degrees C/min

9.7.5 Detector temperature: 300 degrees C

9.7.6 Column backflush: 23 min after injection

10. Calibration and Standards

10.1 Standard reference material for ethylene dibromide is not available from the National Bureau of Standards. The standard calibration mixture used by the CARB is prepared within the laboratory.

The standard calibration mixture is prepared by diluting pure gases and vaporizing pure liquids into a large chamber of zero air according to the following procedure:

10.1.1 Clean the 145 cubic foot (4160 liters) glass-lined steel tank by evacuating (to 6-10 torr) and then flushing it with zero air several times.

10.1.2 Pressurize the tank to 5 psia with zero air after the final evacuation.

10.1.3 Flush a 100 ml of 18.7 torr of methyl chloride, 8.7 torr of methyl bromide, 0.4 torr of Freon 11 and 0.4 torr of Freon 12 into the tank.

10.1.4 Inject 100 microliters of the mixture of liquid standards into the tank through a heated injector (150 deg. C) with a He carrier flow of 100 ml/min. The mixture of liquid standards was prepared by mixing 3.0 ml of methylene chloride, 500 ul of trans-dichloroethene, 500 ul 1,2-dichloroethane, 1 ml of 1,2-dichloropropane and 100 ul of each of the following: chloroform, 1,1,1-trichloroethane, carbon tetrachloride, bromodichloromethane, trichloroethene, chlorodibromomethane, bromoform, dibromoethane, Freon 113 and tetrachloroethene in 44 ml of methanol.

10.1.5 Humidify the tank by bubbling zero air through 40 ml of water (heated to boiling) into the tank till all the water is vaporized.

10.1.6 Pressurize the tank to 20 psia with zero air.

10.1.7 Record the temperature and pressure.

10.1.8 Stabilize the mixture for 24 hours (to be sure the equilibrium between the wall surface and the gas is established).

10.1.9 Check the new standard mixture against the previous standard mixture and the EPA quality assurance cylinders to validate the concentrations before the new standards mixture is used for calibration.

10.1.10 The standard calibration mixture thus prepared has the following concentrations:

water	0.96%
methanol	9.4 ppm
methyl chloride	430 ppb
methyl bromide	200 ppb
dichloromethane	400 ppb
chloroform	11 ppb
trans-1,2-dichloroethene	57 ppb
1,2-dichloroethane (EDC)	54 ppb
1,1,1-trichloroethane	8.6 ppb
carbon tetrachloride	8.9 ppb
bromodichloromethane	10 ppb
1,2-dichloropropane	88 ppb
trichloroethene (TCE)	9.6 ppb
dibromochloromethane	10 ppb
bromoform	9.8 ppb
dibromoethane (EDB)	10 ppb
Freon-113	7.2 ppb
Freon-11	9.3 ppb
Freon-12	9.3 ppb
Tetrachloroethene	8.4 ppb

10.2 Standards of lower concentrations are prepared by diluting the above mixture with zero nitrogen.

10.3 Calibration

10.3.1 Transfer various volumes (the volume used depends on the concentration of the sample normally 10, 30, 70 and 100 ml) of the standard mixture from the 4000 liter tank into the GC and analyze according to the procedure in 9.5.

10.3.2 Fit the data to a straight line by the method of least squares. If the calibration is less than the 95 percent rejection limit, it is accepted, otherwise the calibration is repeated.

10.3.3 A single calibration check is done by transferring 10 ml of the standard mixture from the tank into the GC and analyzing it according to the procedure in 9.5.

11. Quality Assurance

11.1 Bag material tests were performed to determine suitability of Tedlar used to construct sample bags.

11.1.1 Bag contamination test: A bag was filled with zero nitrogen and the contents analyzed. The EDB concentration was below the detection level of 1 ppt.

11.1.2 Bag stability test: Six bags were filled with 10 ppb of EDB in zero nitrogen and the contents were analyzed at various intervals. The recovery of EDB was better than 80% in 72 hours (Toxic Air Monitoring Technical Advisory Committee, April 1985).

11.1.3 Bag record: A log of each bag is kept to ensure that at no time has an ambient bag been used to sample high concentrations of (>100 ppb) any compound. The log contains date of fabrication, leak testing, sampling, sampling site/date, bag identification and bag destruction date.

11.2 Each sampler is tested for contamination before field use by pumping zero air into a sample bag. The contents of the bag are analyzed for EDB contamination. If the EDB concentration is found to be below the detection limit, the sampler system is then deemed ready for field use. If the system fails this test, it is dissassembled, decontaminated, reassembled and retested. This check is repeated every six months for each sampler system or more frequently if anomolies occur.

11.3 Analysis

11.3.1 Zero nitrogen is run every day to be sure the GC shows no signal for the blank, otherwise, the instrument is cleaned out and the blank rerun until the GC passes the blank test.

11.3.2 A standard calibration is run before any samples are analyzed. This is to ensure the calibration factor of the instrument has not changed. If the calibration factor is changed by more than 5 percent, the GC is checked for any malfunction. If there is malfunction, it is repaired and the GC recalibrated. If there is no malfunction, two more calibration runs are performed during the day. If the calibration runs are within 10 percent of each other, the analyses for that day are calculated based on the average of the new calibration factors. If the calibration runs are not within 10 percent, the GC has to be examined for any malfunctions. When the instrument is repaired the calibration is rerun.

11.3.3 Ten percent or more of the samples are reanalyzed to check precision.

11.4 Quality assurance audit: The standard mixtures prepared in the laboratory are checked annually with the EPA Quality Assurance Audit Cylinders. These Quality Assurance Cylinders are not available for all the compounds, but those that are available have agreed well with our standards.

12. Calculations

12.1 The EDB concentrations, in ppt are calculated by a data system using the external standard method.

Concentration = Area x Calibration Factor

Area = Integrated EDB Peak Area

12.2 The calibration factor (CF) is calculated during calibration by the equation:

CF = Concentration/Peak Area

Replicate calibrations are averaged and the arithmetic mean is stored as the CF to be used in subsequent analyses.

12.3 Concentrations may be converted from ppt to ng/m^3 by means of the following formula:

$$\text{ng/m}^3 = \frac{(P)\ (MW)\ (ppt)\ (10^3)}{(82)\ (T)}$$

P = Pressure in atmospheres

MW = Molecular weight of 1,2-dibromoethane (EDB)

82 = Gas constant in $(cm)^3$ (atm)/deg K mole

T = Absolute temperature (deg. K)

MONITORING SITES
SOUTH COAST AIR BASIN

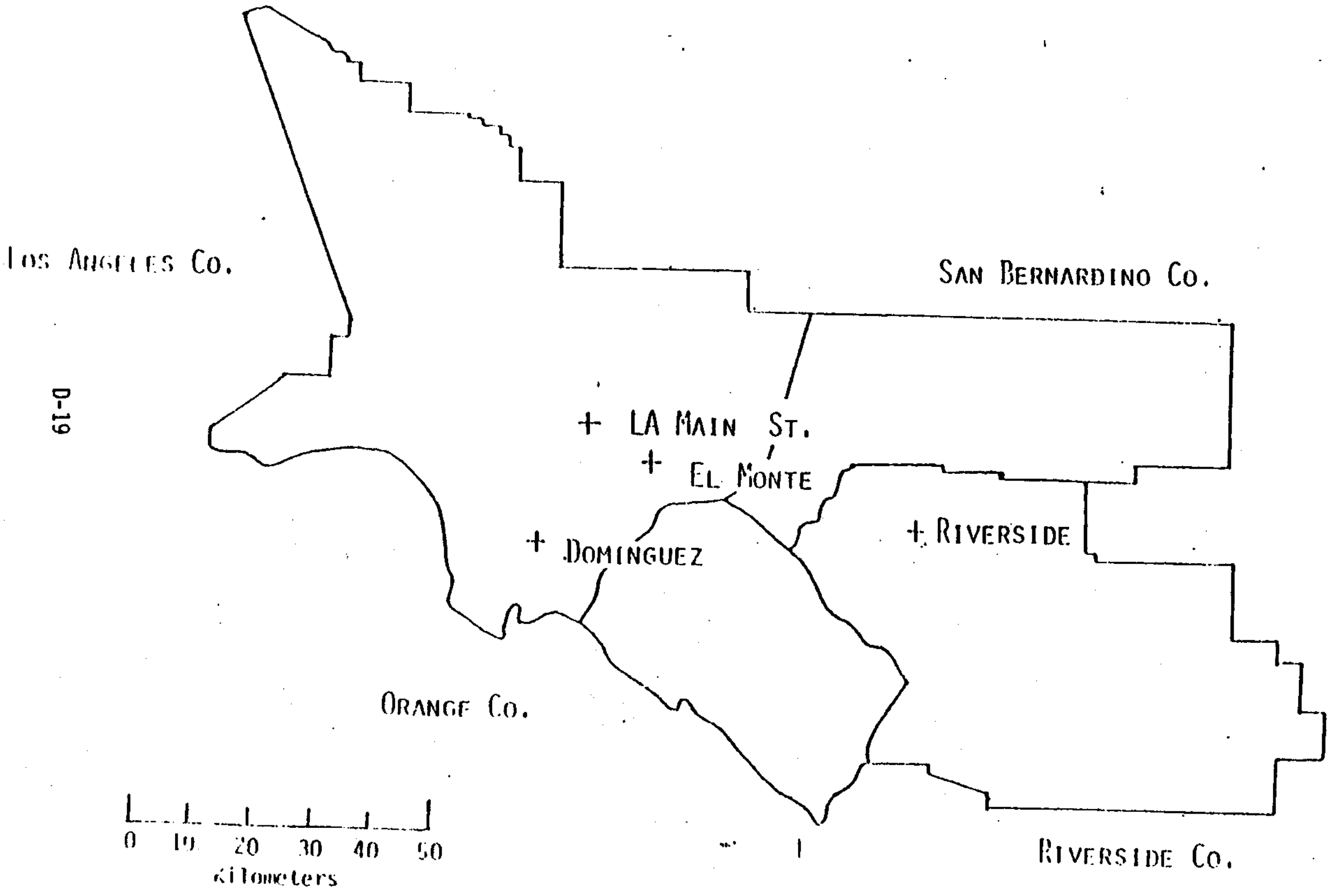
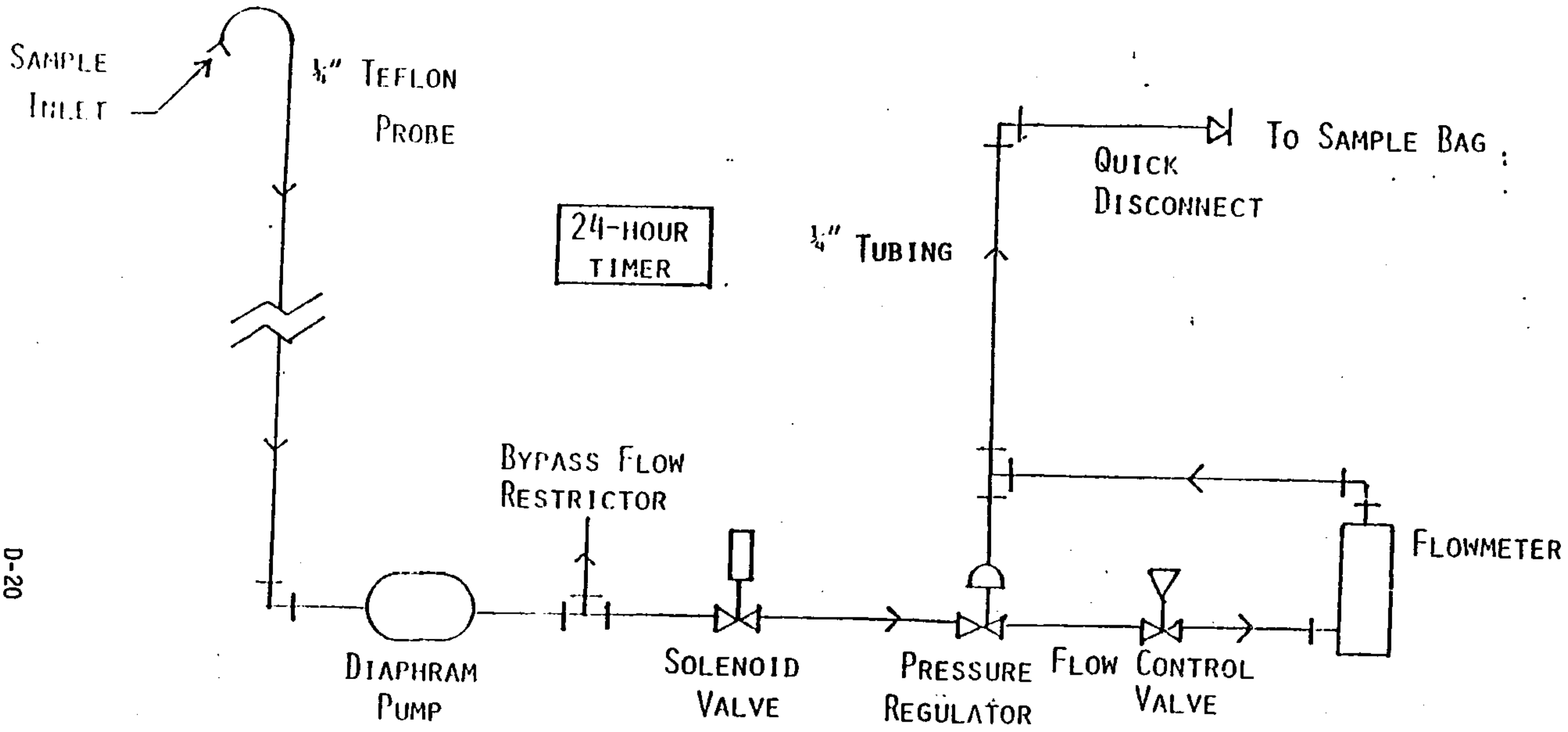


Figure 1



Typical Bag Sampler Flow System

Figure 2

Table D-

Description of ARB/HSLD Toxic Compound Monitoring Sites

-- Surrounding Activities	Downtown Los Angeles L.A. Dept. of Water and Power 1630 N. Main Street Los Angeles, CA[1]	Dominquez Hills CA State University Dominguez Hills 1000 E. Victoria St. Carson, CA[2]	El Monte ARB/Haagen-Smit Laboratory 9528 Telstar Ave. El Monte, CA[3]	Riverside 7002 Magnolia Avenue Riverside, CA[4]
Residential	West: Two-story apartment units, elementary school	North: Student housing, trailer park South: single family units	North: Low density residences South & West: Low density single family units	North: Low density single family units, convalescent home, several schools Southwest & West: Mixture of single and multiple family units, several schools South & East: Low density single family units
Traffic	Continuous gasoline and diesel powered light and heavy duty vehicles along North Main Street	Light-duty residential traffic	Freeway North of the monitor. On Telstar - gasoline and diesel vehicles with passenger cars dominant. Greatest volumes during commuting hours.	Heavy traffic along Arlington and Magnolia Avenues. Mainly light and medium duty gasoline and diesel-powered vehicles
Small Commercial/ Office use		Strip commercial	Business park area, commercial, light industrial, and office use	Office and strip commercial uses along Arlington and Magnolia Aves.
Light Industrial	North: Carnation processing plant, rubber products company, brass manufacturing and wholesaling. East: Milk processing, winery, railway transportation, concrete company, commercial trucking and shipping, paint company South: Railway transportation, trucking and shipping operations	-		
Heavy Industrial		North: Oil well pumping South: Oil refining and storage activities, chemical manufacturing East: Oil well pumping		
Agriculture		North and East: Commercial nursery crops		

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[1] Monitor in a 2nd story window of 2 1/2 story building. Annual predominant wind direction: southwest.

[2] Monitor in a van southeast of campus. Annual predominant wind direction: west.

[3] Monitor in a trailer in the southwest parking lot. Annual predominant wind direction: south.

[4] Monitor in a one-story building on the southeast side of the Arlington-Magnolia intersection. Annual predominant wind direction: west.

APPENDIX E

AMBIENT MONITORING DATA AND ANALYSIS

I. AMBIENT AIR CONCENTRATIONS

The ARB's Haagen-Smit Laboratory (HSL) monitors the ambient concentration of EDB at four sites in the South Coast Air Basin (SCAB): El Monte, Riverside, downtown Los Angeles (DOLA), and Dominguez Hills. Twenty-four hour samples are collected and analyzed by the methods presented in Appendix D. Each of the four sites has a different sampling schedule for EDB. Samples are collected at El Monte five days each week. At the other sites, samples are collected approximately once each week, but on different days at each site. (i.e., there are two samples collected each day, one of which is at El Monte.)

Seventy percent of all data taken between January 1983 and May 1984 are less than HSL's minimum reportable value, 5.0 parts per trillion, volume (ppt). For statistics, such data are assigned the value 2.5 ppt. Table E-1 shows the resulting average concentrations by station for 1983, for the first five months of 1984, and overall. It also shows the numbers of samples above and below the reporting limit. Figures E-1 through E-4 depict monthly averages over the period January 1983 to May 1984.

The 1983 averages for DOLA, El Monte, Riverside, and Dominguez Hills are, respectively, 9.0, 9.3, 6.4, and 5.0 ppt. The mean of these four averages is 7.4 ppt. At all stations, the EDB concentrations were highest during the summer of 1983, although the effect is rather weak at Riverside. Data from the summer of 1984 are not yet available.

Table E-2 shows the 15 highest 24-hour measurements among all sites. It also shows the same day measurements at whichever second station was also sampling.

Table E-1

Summary of Monitoring Results in the South Coast Air Basin (SCAB)

	DOLA	El Monte	Dominguez	Riverside	Total	Mean[b]
January to December, 1983						
Number of data						
< 5.0 ppt	40	117	39	32	228	
≥5.0 ppt	14	80	13	15	122	
Mean (ppt)						
>5.0 ppt	27.5	19.3	12.4	14.7		18.0
all data[a]	9.0	9.3	5.0	6.4		7.4
January to May, 1984[c]						
Number of data						
<5.0 ppt	20	76	14	18	128	
≥5.0 ppt	3	19	6	5	33	
Mean (ppt)						
>5.0 ppt	6.0	6.9	8.0	7.6		7.1
all data[a]	3.0	3.4	4.2	3.6		3.6
All Samples						
Number of data						
<5.0 ppt	60	193	53	50	356	
≥5.0 ppt	17	99	19	20	155	
Mean (ppt)						
>5.0 ppt	23.7	17.9	11.0	12.9		16.0
all data[a]	7.2	7.4	4.7	5.5		6.2

[a] data that were reported less than 5.0 ppt are assigned the value 2.5 ppt

[b] average of the four site means

[c] data for later months not yet available; does not represent year-round means

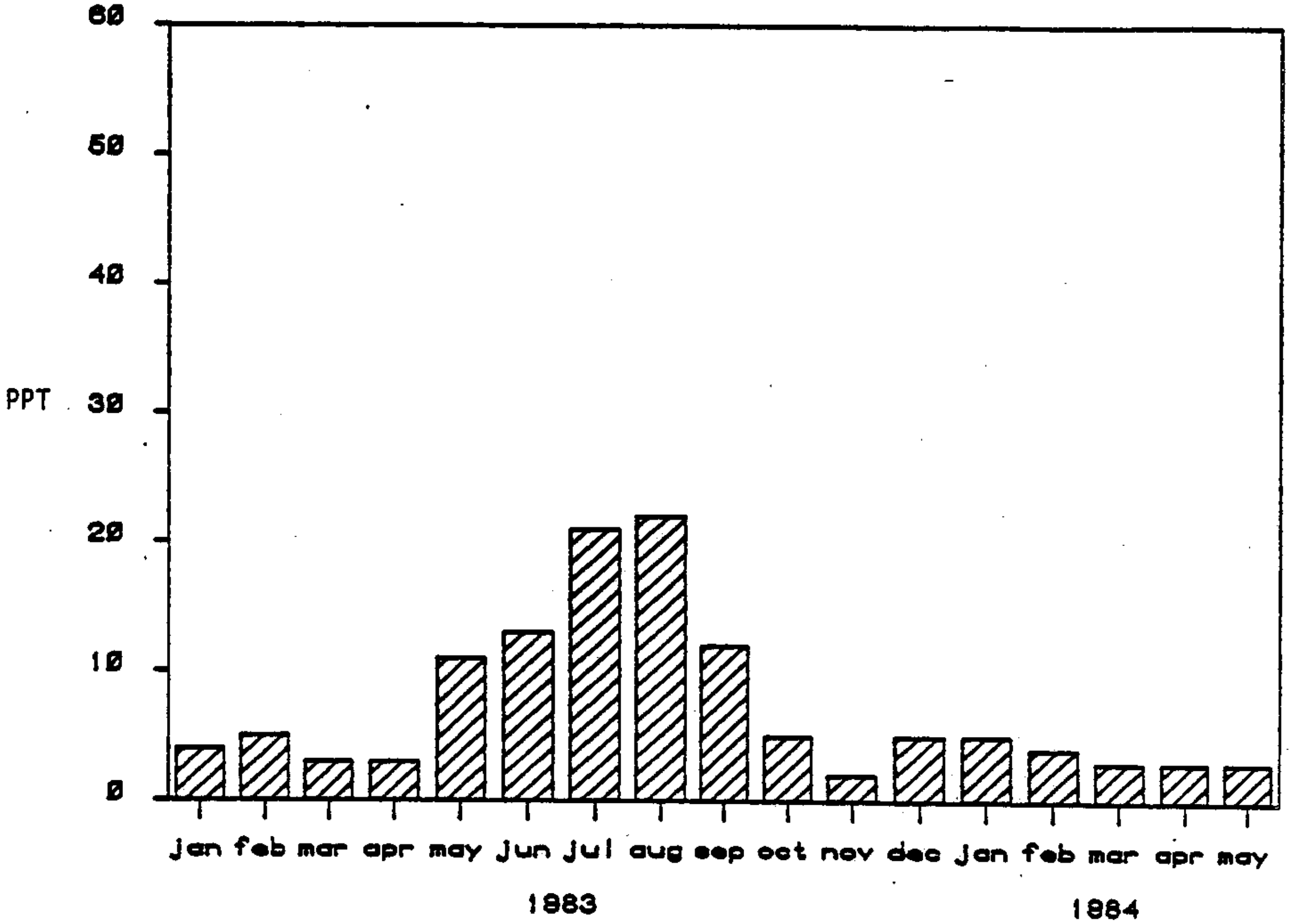

Figure E-1. Monthly Average EDB Concentrations at El Monte.

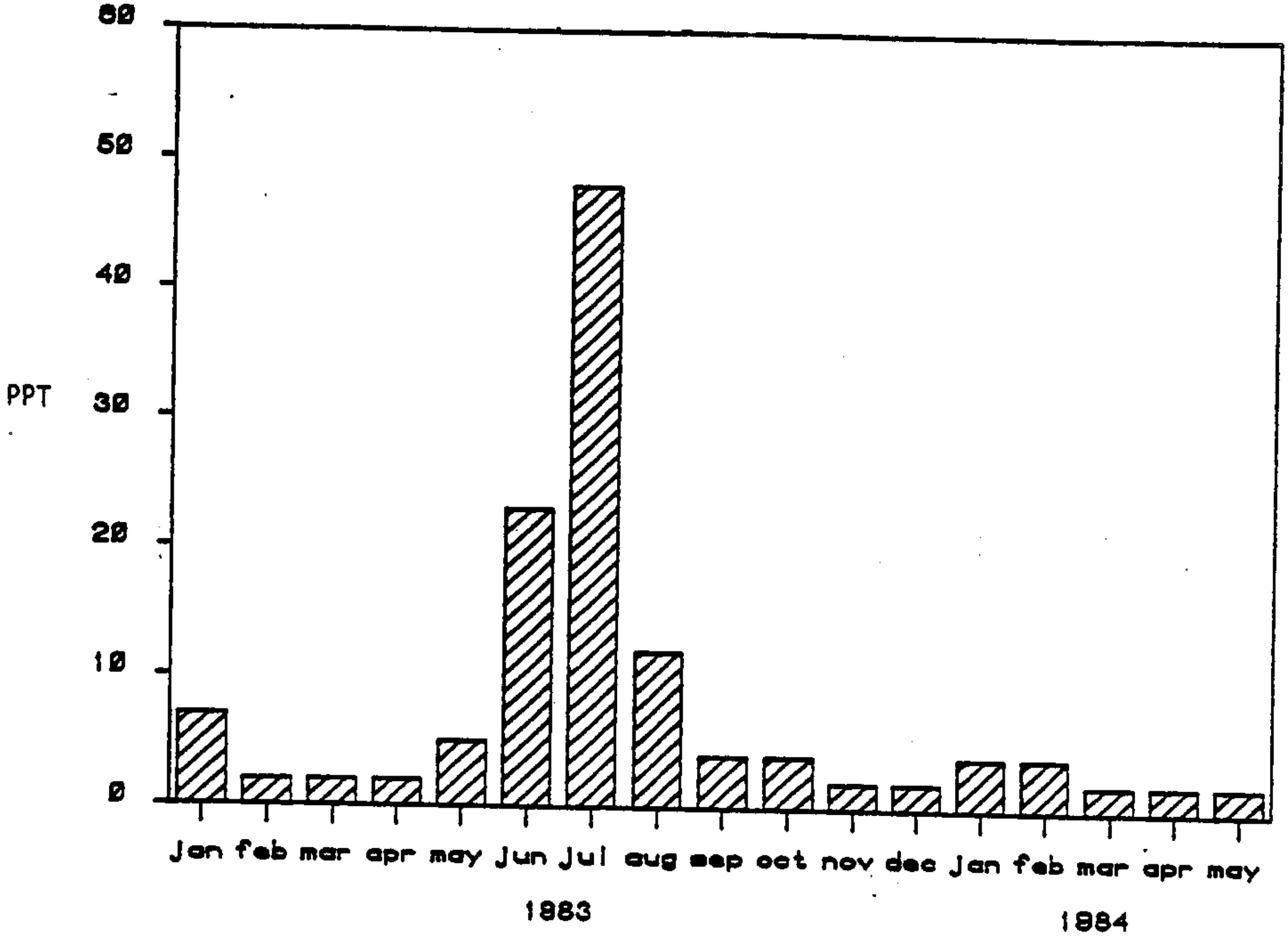

Figure E-2. Monthly Average EDB Concentrations at Downtown LA.

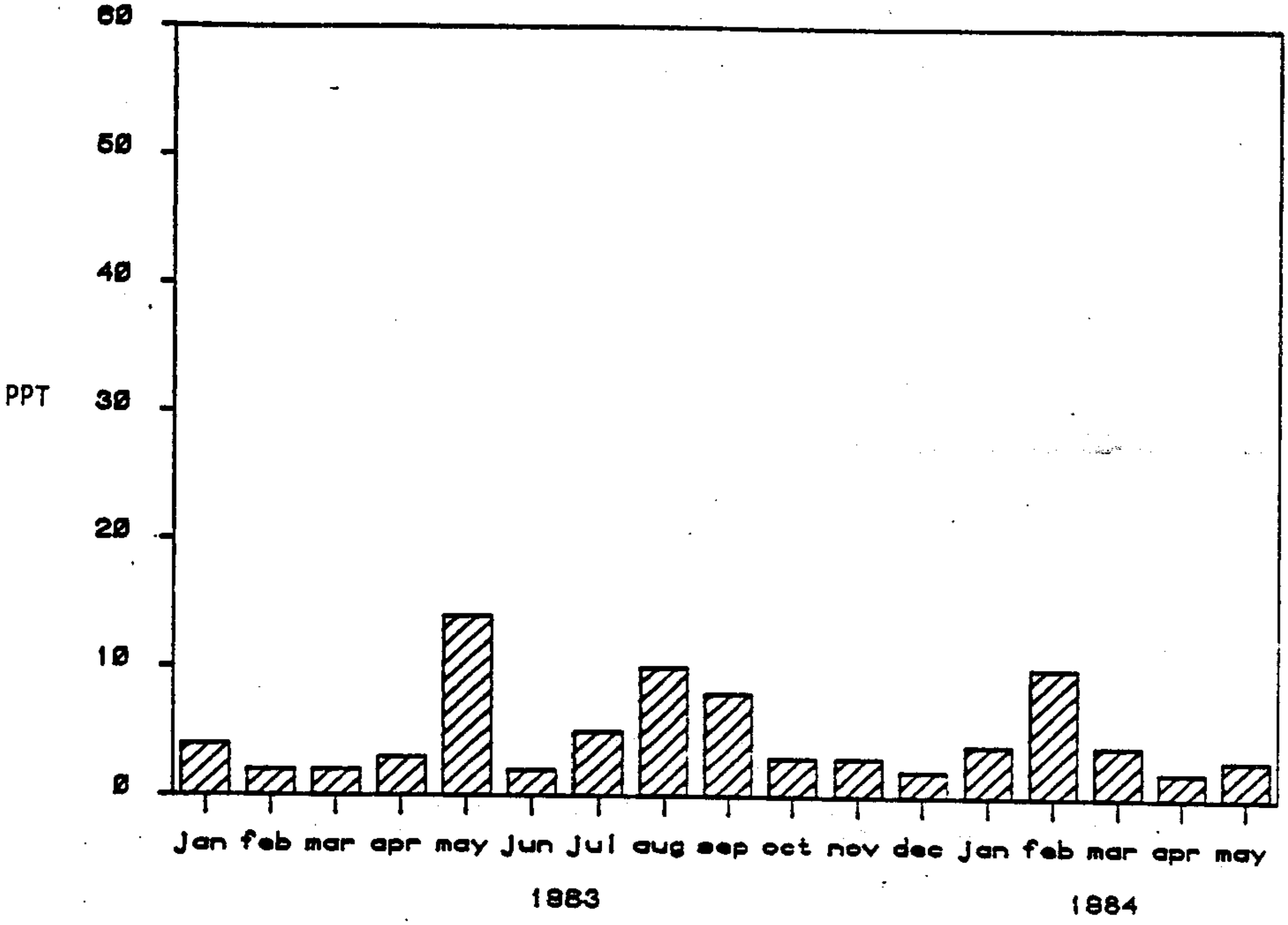

Figure E-3. Monthly Average EDB Concentrations at Dominguez Hills.

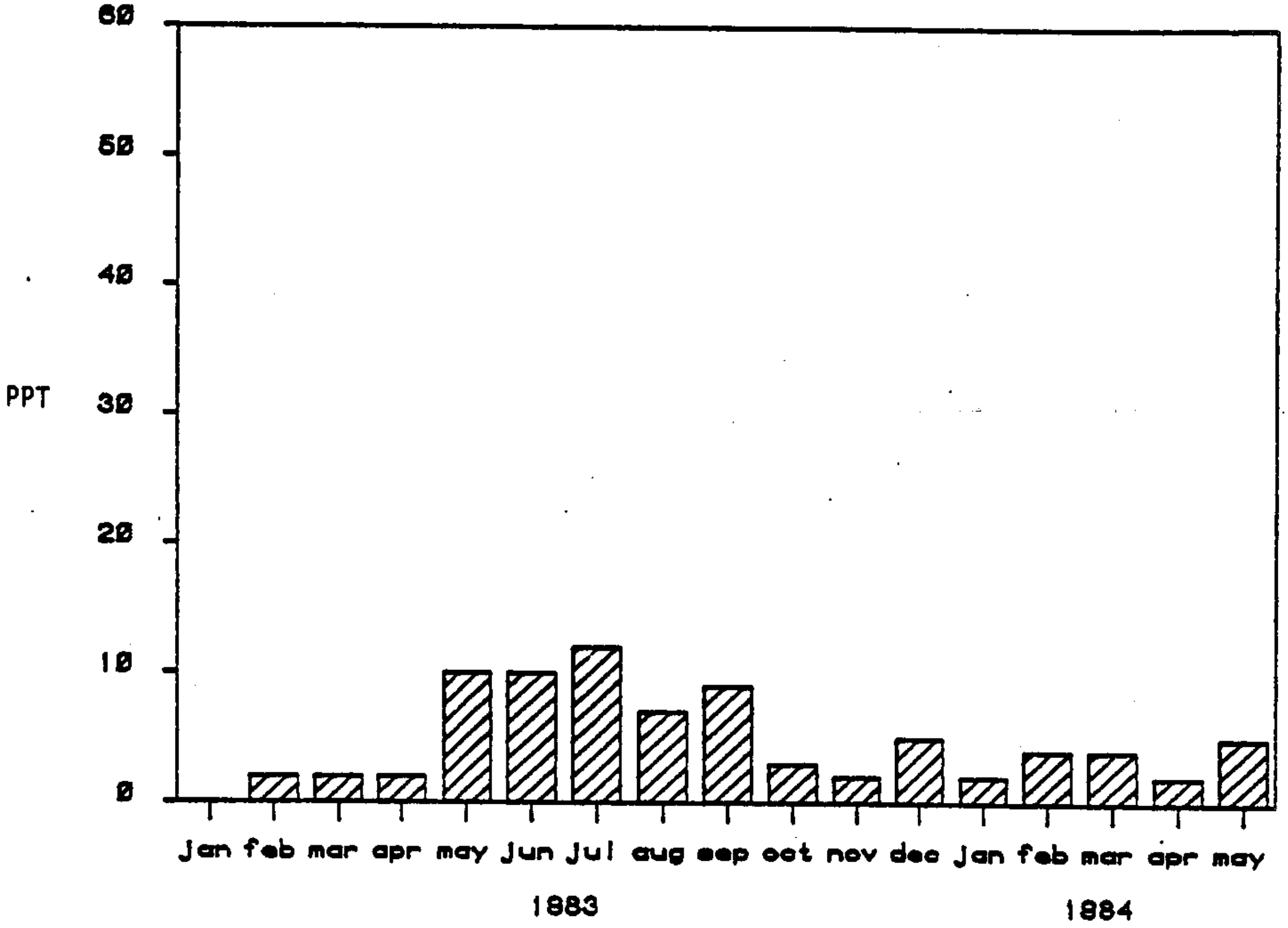

Figure E-4. Monthly Average EDB Concentrations at Riverside.

Table E-2

Fifteen Highest EDB Concentrations and Same-Day Concentrations at Other Sites

	Highest Concentration			Same-Day Concentrations	
Rank	Date	Site	Ppt	Site	Ppt
1	7/25/83	DOLA	180	El M.	43
2	7/31/83	El M.	130	DOLA	6
3	9/14/83	El M.	130	R'side	16
4	8/10/83	El M.	84	DOLA	16
5	7/27/83	El M.	73	Dom.	11
6	8/ 3/83	El M.	69	(None)	
7	6/14/83	DOLA	65	El M.	10
8	5/15/83	El M.	59	R'side	8
9	7/26/83	R'side	51	El M.	27
10	8/ 9/83	El M.	46	(None)	
11	7/25/83	El M.	43	DOLA	180
12	8/11/83	El M.	41	R'side	9
13	6/20/83	El M.	39	(None)	
14	5/22/83	Dom.	37	El M.	8
15	8/ 4/83	El M.	36	DOLA	7

II. ANALYSIS AND CONCLUSIONS

The data from El Monte were examined for statistical correlation with those taken on the same days at each of the other stations. No station's data yielded a correlation coefficient (ρ) above 0.35 versus El Monte. This result suggests that each station is predominantly affected by different sources (relative to El Monte), possibly with different temporal variations. Also, the ratio of highest 24-hour measurement to annual average is unusually high - 20 and 14 - at DOLA and El Monte, respectively. This indicates that these sites are affected by nearby localized sources rather than by emissions that are spatially uniform over a large area.

Therefore, the data point to an emission pattern dominated by isolated sources with strengths varying in time. It is also possible that inconsistent meteorology, especially wind direction, could have caused or contributed to the above statisical patterns. However, this is unlikely because regressions of EDB measurements station-by-station against daily resultant wind directions and speeds yielded no correlations.

Table E-3 shows the other variables we used in linear and multiple linear regressions against each station's EDB data. It indicates the effect which each independent variable was intended to represent. None of the regressions yielded correlation coefficients greater than 0.4. This suggests that the dominant emission source(s) - at least during the periods of high ambient concentrations - was not auto exhausts or gasoline. However, because 69 percent of the dependent variable (EDB) data were arbitrarily fixed at a constant value (1/2 the reporting limit), the lack of correlation cannot be used to make sound conclusions.

Table E-3

Independent Regression Variables

Variable	Represented Effect
CO (ppm)	Automotive exhaust emissions
EDC (ppm)[a]	Gasoline composition
Maximum daily temp.	
Minimum daily temp.	Evaporation of gasoline
Daily temp. change	
Resultant winds	Plume direction and dispersion
Temp. at 850 millibar[b]	
Inversion height	Mixing in atmosphere

[a] 1,2-dichloroethane; present in a fixed ratio to EDB in leaded gasoline

[b] temperature at the altitude where atmospheric pressure is 850 millibars

The lack of a correlating variable leaves no means to extrapolate the measurements at the monitoring sites to the rest of the SCAB, other than to assume that the entire population is exposed to the inter-site mean, 7.4 ppt, as the annual average.

III. ADDITIONAL DATA

The only other data on EDB concentrations in California are short-term data from 1976 to 1982. They are summarized in Table E-4.

Table E-4

Miscellaneous Data on EDB Concentrations

Place	Month/ Year	Duration	Number	Mean (ppt)	Ref.
Los Angeles	3/76	14-19 hrs	2	15.4	1
Los Angeles	4/79	24 hrs	8[a]	33.7	1,4,6
Los Angeles	11/81 to 4/82	3 hrs	156	23.4	2
El Monte	11/81 to 5/82	--	106	28.5	2
Oakland	7/79	24 hrs	8[b]	16.5	1,3,4,6
Riverside	4/77	10 days	1	23.0	1
Riverside	7/80	24 hrs	10[c]	23.2	1,3,5
Mill Valley	1/77	26 days	1	10.0	1
Badger Pass	5/77	8 days	1	0.0	1
Point Arena	5/77	7 days	1	5.0	1

[a] plus one at 14 hours
[b] plus one at 10 hours
[c] plus one at 12 hours

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APPENDIX F

SUPPORTING INFORMATION ON ETHYLENE DIBROMIDE EMISSION ESTIMATES

APPENDIX F

Supporting Information on EDB Emission Estimates

CALCULATION OF EDB TO LEAD RATIO

Atomic ratio -- 1 atom Pb: 1 atom Br (Roberts, 1980, pg 3-82)

molecular weight -- 1 mole EDB: 2(CH_2Br) = 2 (12.01 + 2 (1.01) + 79.91) = 187.88

1 mole Pb: 207.19

A mole of EDB has 2 atoms Br, therefore 0.5 mole EDB is required per mole Pb.

0.5 mole EDB/mole Pb = 0.5 (187.88)/(207.19) = 0.453 lb EDB/lb Pb

CALCULATION OF EDB CONSUMPTION IN 1983

Total lead used in 1983: 4,228,879 kg (Morgester, 1984)

(4,228,879 kg Pb)(2.205 lb/kg)(ton/2000 lb) = 4662 tons Pb

(4662 tons Pb/yr)(0.453 lb EDB/lb Pb) = 2112 tons EDB/yr in leaded fuel

CALCULATION OF MOTOR VEHICLE EXHAUST EMISSIONS

Survival rate of EDB -- wt in exhaust/wt in fuel = 0.37% = 0.0037 (Sigsby, et. al., 1982, pg 12 -- This is based on limited test data).

(2112 tons EDB/yr in fuel)(0.0037 exh. EDB/fuel EDB) = 7.8 tons EDB/yr statewide

Since the South Coast Air Basin (SCAB) has 47 percent of California's population, assume it accounts for 47 percent of the EDB consumed in fuel

(2112 tons EDB/yr in fuel) (.47) (0.0037 exhaust EDB/fuel EDB) = 3.7 tons EDB/yr in the SCAB.

If the test results for the Mazda automobile are excluded from Sigsby's paper, because the Mazda was registered for unleaded fuel and many of the tests indicated zero EDB emissions (from telephone conversation with Mr. Sigsby on 8/14/84), the survival rate of EDB is 0.45% which gives an estimated emissions of 9.5 tons EDB statewide and 4.5 tons EDB in the SCAB.

CALCULATION OF MOTOR VEHICLE EVAPORATIVE EMISSIONS

evaporative EDB = 9×10^{-5} lb EDB/lb HC

(Sigsby, et al., 1982, pg 6 - NOTE: only data for TEL fuel were used and this is a rough value based on limited test data. However, the weight fraction of EDB to THC is 1.03×10^{-5} in the vapor phase based on Raoult's law. So this number appears reasonable.)

Evap. emissions from non-catalyst on-road vehicles in 1983 = 77,771 tons HC/yr (CARB, 1983a)

(77,771 tons HC/yr)(9×10^{-5} lb EDB/lb HC) = 7 tons EDB/yr statewide

Applying the .47 population factor for the SCAB:

(77,771 tons HC/yr)(.47)(9×10^{-5} lb EDB/lb HC) = 3.3 tons EDB/yr in the SCAB

CALCULATION OF GASOLINE MARKETING EMISSIONS

In an EPA report, the mass fraction of EDB in saturated gasoline vapor for 0.015 Vol % EDB at 70°F is 5.2×10^{-5} (EPA, 1984, pg 2-7). EDB in California gasoline is estimated as 0.00604 Vol %, based on the weight ratio 1.000:0.294 of tetraethyl lead to EDB, respectively and 1.1 g. Pb per gallon of leaded gasoline. An EDB emission factor for gasoline marketing based on these data is therefore:

$$(5.2 \times 10^{-5}\ \text{lb.EDB/lb.THC})(0.00604/0.015) = 2.1 \times 10^{-5}\ \text{lb.EDB/lb.THC}$$

The TOG emissions from gasoline marketing, including emissions from point sources are forecasted as 36,800 tons in 1983. Assuming TOG emissions from leaded gasoline are proportional to the amount of leaded gasoline produced at the refineries, 41.2 percent of the estimated TOG emissions are from leaded gasoline (calculated by the percentage of leaded gasoline to total gasoline output from refineries - CEC, 1984, pg 30,31).

For gasoline evaporation, a ton of TOG is equivalent to a ton of THC (CARB, 1983b, pg H-17). The EDB emissions from gasoline marketing are thus:

EDB Ems = (36,800 tons THC/yr)(0.412) (2.1 x 10^{-5} lb.EDB/lb.THC)

= 0.32 tons/yr., statewide

Applying the .47 population factor for the SCAB:

EDB Ems in the SCAB = (0.32 ton/yr. x .47)

= .15 ton /yr.

CALCULATION OF GASOLINE PRODUCTION EMISSIONS

The estimated THC release from gasoline mixing, transfer and storage operation at Douglas refinery in 1979 was 38 lb/hr (Roberts, 1980, pg 3-92).

Gasoline production capacity at Douglas refinery in 1979 was 8,500 bbl/day (Roberts, 1980, pg 3-84). Assuming production at 70% capacity, 5,950 bbl/day of gasoline would have been produced at the Douglas refinery. An emission factor for gasoline production calculated from these data is thus:

Emission Factor = (38 lb.THC/hr) (2.1 x 10^{-5} lb.EDB/lb.THC (24hr./day) $(5950 \text{ bbl/day})^{-1}$

= 3.22 x 10^{-6} lb. EDB/bbl gasoline

The total leaded gasoline production in 1983 was 119,472,000 bbls (CEC, 1984, pg 31). Using these data, EDB emissions for gasoline production are estimated to be:

EDB Emissions = (119,472,000 bbl/yr)(3.22×10^{-6} lb. EDB/bbl)

(ton/2,000 lb.)

= 0.19 ton/yr., statewide

Applying the .47 population factor for the SCAB:

EDB Emissions in the SCAB = 0.19 ton/year x .47

= 0.09 ton EDB/year

EDB Emissions in the SCAB from Produce Fumigated Outside California

It is possible that in 1983, fruits and grains fumigated outside of California released EDB in the South Coast Air Basin when cooked, processed or simply let stand exposed. Appropriate data are too few for an accurate estimate of such emissions. This appendix presents the calculation of an upper bound of plausible emissions. Data from years other than 1983 must be used.

Emissions of EDB could occur at many steps in the history of an out-of-state shipment of produce after it has crossed into California. However, if we assume that all EDB entering California is released here (that is, neither eaten, borne in exported products, nor borne in returned cargo containers), the total emissions equal the import rate of fumigated produce times its mean EDB concentration plus the total EDB in the void volumes of shipping containers.

Upper Bound Concentrations

The California Department of Food and Agriculture (CDFA) reported[10,11,12] the results of several studies analyzing the EDB content of the pulp of fumigated citrus fruit, mangoes, and papayas arriving in California. Table F-1 summarizes the data.

Table F-1

EDB in Fumigated Fruit from Outside California
(CDFA, Ref. 10)

Fruit	Origin of Sample	EDB in Pulp, ppb
Papaya	Shipping container	20
Papaya	Shipping container	31
Oranges	Wholesaler	113
Limes	Wholesaler	1.2
Grapefruit	Wholesaler	82
Papaya	Wholesaler	14
Mangoes	Wholesaler	52

To be conservative (bias errors high), we used 100 ppb for fumigated fruit pulp in subsequent calculations.

CDFA also presents[10,11] a few data, summarized in Table F-2, for the ratio of EDB in skins to EDB in pulp.

Table F-2

Ratio of Skin and Pulp Concentration of EDB
(CDFA, Ref, 10,11)

Fruit	EDB_{Skin}/EDB_{Pulp}
Papaya	.03 to .33
Oranges	1 to 24
Oranges	11 to 22

To be conservative, we assumed that the papaya and mango pulp concentrations in Table F-1 apply to the entire fruits and that the citrus fruits' overall concentration is given by:

$$
\begin{aligned}
C_{\text{total}} &= C_{\text{pulp}} \times (90\% \text{ of weight as pulp}) \\
&\quad + 20 \times C_{\text{pulp}} \times (10\% \text{ of weight as skin}) \\
&= 2.9 \times C_{\text{pulp}} = 290 \text{ ppb}
\end{aligned}
$$

The Department of Health Services (DHS) analyzed 171 samples of whole grain from late 1983 to spring, 1984, and detected EDB in 17 of them.[13/] They report only that the maximum was 650 ppb. If that figure is used as a high estimate of the average, the overall average was 65 ppb. This agrees with monitoring by Pillsbury of grains arriving in Los Angeles.[14/] A few shipments had EDB concentrations exceeding 100 ppb, but most had concentrations below 10 ppb.

DHS also analyzed 1,291 samples of products derived from grains and nuts. Three hundred twenty were positive, with 56 above DHS's "action level" of 150 ppb. If 150 ppb is used as a high estimate of the average of the positive samples, the overall mean is 37 ppb.

Finally, CDFA[10,12/] measured the ambient concentration of EDB in closed shipping containers and trucks arriving with fumigated produce. Table F-3 summarizes the data.

Table F-3

Ambient EDB in Arriving Containers
(CDFA, refs. 10,12)

Enclosure	Fruit	Ambient EDB, ppb
Sea van	payapas	88 to 261
Air cargo container (cold)	papayas	34 to 91
Truck	papayas	364
Truck	lemons	25 to 1,523

To be conservative, we used 1,000 ppb as the high estimate of ambient concentrations in cargo containers.

Import Rates

Data for imports of whole grains and fruit to Los Angeles are shown in Table F-4.

Table F-4

Imports of Fruit and Grain to Los Angeles

Item	Reference	Year	Tons
Total grains	15	1982	3.01×10^6**
Citrus	16	1983	2.2×10^4
Mango	16	1983	4,250
Papaya*	16	1983	200

* "fruits, other, Mexico" in ref. 16

** total to state divided by 2

There are no data available for the amount of grain products imported to California. To be conservative (estimate high), we assumed the import rate is one pound per day per person, or about 1.8×10^6 tons per year in the South Coast Air Basin.

We assume that cargo containers enclose 67% empty space when loaded and that the produce density is 60 pounds per cubic foot. The enclosed air volume per ton of produce is thus:

$$(1/60)\ \text{ft}^3/\text{lb} \times 2{,}000\ \text{lb/ton} \times \frac{.67\ \text{ft}^3\ \text{air}}{.33\ \text{ft}^3\ \text{prod.}} = 67\ \text{ft}^3/\text{ton}$$

<u>EDB Emissions</u>

The high estimate of EDB emissions in the SCAB in 1983 from produce (assuming <u>all</u> produce arrived fumigated) is:

Items	Tons/yr	x	Fraction	=	Emissions
Whole grains:	3×10^6		65×10^{-9}		.20
Grain products:	1.8×10^6		37×10^{-9}		.07
Mangoes, papayas:	4450		100×10^{-9}		.0004
Citrus:	2.2×10^4		290×10^{-9}		.006
	4.8×10^6				.27 tons/year

The high estimate of emissions from cargo air is:

$$67\ \text{ft}^3/\text{ton} \times 4.8 \times 10^6\ \text{tons/yr} \times 1000 \times 10^{-9}\ \text{ft}^3\text{EDB}/\text{ft}^3$$

$$\times \frac{188\ \text{lb EDB}}{380\ \text{ft}^3\ \text{EDB}} \times \text{ton}/2{,}000\ \text{lb}$$

$$= .08\ \text{tons/year}$$

Therefore, the maximum plausible emission rate of EDB from imported fumigated produce is minor compared to the known inventory for the South Coast Air Basin.

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11. Maddy, Keith T., et al.; "Analyses for Residues of EDB in Selected Fruit Which Had Been Fumigated Prior to Entry into California," CDFA, February 8, 1980.

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17. U.S. Environmental Protection Agency; <u>Evaluation of Air Pollution Control Strategies for the Gasoline Marketing Industry</u>, EPA-450/3-84-012a.

APPENDIX G

ESTIMATE OF EDB EMISSIONS REQUIRED FOR OBSERVED AMBIENT CONCENTRATIONS

APPENDIX G

ESTIMATION OF EDB EMISSIONS REQUIRED TO ACCOUNT FOR OBSERVED AMBIENT CONCENTRATIONS

The means of all ambient EDB monitoring data taken during 1983 at DOLA, Dominquez, El Monte, and Riverside are 9.0 ppt, 5.0 ppt, 9.3 ppt and 6.4 ppt, respectively.* The mean of these four values is 7.4 ppt, or .057 ug/m^3. We assume that this figure typifies the annual mean concentration of the entire SCAB.

One can estimate the emission rate of EDB needed to account for the mean observed ambient concentration. Carbon monoxide, lead, and EDB are all emitted by road vehicles**, and all have negligible photo-reactivities. Therefore, if EDB, like CO and lead, is predominantly from vehicles, the ratio of ambient concentration to emission rate should be approximately equal among all three compounds.

Table G-1 shows the 1983 mean concentrations of CO and lead at the four stations nearest the EDB monitors.

Table G-1

1983 Mean Ambient Concentration (ug/m^3)
(Source: ARB Aerometric Data Division)

	Pico Rivera (El Monte)b/	DOLA	Lynwood (Dom. Hills)b/	Riversidea/	Average
CO	2460	2890	3260	2650	2820
Pb	.667	.638	.635	.483	.606

a/ Magnolia Street
b/ Parentheses indicate the EDB monitors for which Pico Rivera and Lynwood serve as the nearest CO monitoring sites.

---

* These means were calculated using 2.5 ppt for data reported as less than 5.0 ppt.

** In the South Coast Air Basin, 92 percent of estimated CO emissions and 98 percent of estimated lead emissions are vehicular (ARB Technical Support Division).

CO emissions in 1983 in the SCAB were 2.05 x 10^6 tons.[1/] The amount of lead used in gasoline in California in 1983 was 4,031,000 kg (8,870,000 lb).[2/] Roughly half of the lead was in fuel burned in the SCAB, and roughly 32% of the lead introduced into vehicles becomes available for ambient sampling as vapor or small aerosol.[3/] Thus, the effective lead emissions in the SCAB were 710 tons in 1983.

Table G-2 shows the ratio of emissions to mean annual ambient concentration for CO and for lead and the respective estimates of EDB emissions.

Table G-2

EDB Emission Estimates, SCAB, 1983

Surrogate	$\frac{\text{Emissions}}{\text{Concentration}}$[a/]	EDB Emissions[b/] (tons/year)
CO	727	41
Pb	1170	67

[a/] from last column of Table G-1

[b/] based on the ambient concentration .057 ug/m^3

These results are four to six times the known emission inventory of EDB in the SCAB. It thus appears that either vehicular emissions of EDB have been underestimated or that an as-yet-unknown type(s) of source affects the monitoring sites. Such a source type could either be large but spread over the basin or minor but unfortunately near the monitoring sites.

The ambient monitoring data in 1983 show strong peaks in June through August at three of the four sites. The mean concentration among the stations for the other nine months is 4.7 ppt. If this figure is hypothesized as a "vehicular background" upon which short-term unknown sources added the June to August peaks, the above methodology yields 4.7/7.4 x (41 or 67) = 26 or 43 tons per year, or two to three times the known inventory. So, it appears that in addition to some seasonal source, a year-round correction to the emission inventory may be needed.

REFERENCES

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APPENDIX H

ASSEMBLY BILL 1807

Assembly Bill No. 1807

Passed the Assembly September 15, 1983

Chief Clerk of the Assembly

Passed the Senate September 15, 1983

Secretary of the Senate

This bill was received by the Governor this ________

day of ________________, 1983, at ______ o'clock ___M.

Private Secretary of the Governor

H-1

CHAPTER ____

An act to add Article 1.5 (commencing with Section 14021) to Chapter 3 of Division 7 of the Food and Agricultural Code, and to add Chapter 3.5 (commencing with Section 39650) to Part 2 of Division 26 of the Health and Safety Code, relating to air pollution.

LEGISLATIVE COUNSEL'S DIGEST

AB 1807, Tanner. Air pollution: toxic air contaminants.

(1) Under existing law, the State Air Resources Board is required to adopt ambient air quality standards for each air basin in the state. Standards relating to health effects are required to be based upon the recommendations of the State Department of Health Services. Air pollution control districts and air quality management districts are required to adopt and enforce rules and regulations which assure that reasonable provision is made to achieve and maintain ambient air quality standards. The Department of Food and Agriculture has general authority to regulate pesticides.

This bill would require, upon request of the state board, the State Department of Health Services, in consultation with and with the participation of the state board, to evaluate and prepare recommendations on the health effects of substances, other than pesticides in their pesticidal use, emitted into the ambient air which may be determined to be toxic air contaminants; and would require the state board, in consultation with and with the participation of, the State Department of Health Services, to prepare a report which would serve as the basis for regulatory action and to determine, by regulation, whether a substance is a toxic air contaminant. The Director of Food and Agriculture, in consultation with the State Department of Health Services and the state board, would be required to evaluate health effects of pesticides which may be or are emitted into the ambient air and may be hazardous to human health. It would define the terms "toxic air contaminant," "airborne toxic control measure," and "pesticide." The state board would be required to adopt airborne toxic control measures to reduce emissions of toxic air contaminants from nonvehicular sources below the threshold exposure level, if any, at which no significant adverse health effects are anticipated.

The Director of Food and Agriculture would be required to determine which pesticides are toxic air contaminants and to determine, in consultation with the State Department of Health Services, the state board, and districts, the appropriate degree of control measures needed for pesticides identified as toxic air contaminants. The director, in consultation with county agricultural commissioners and districts in the affected counties, would be required to develop and adopt control measures designed to reduce emissions from those pesticide sources.

The bill would require the state board, based on its determination of toxic air contaminants, to determine whether revisions are needed in vehicular emission standards and motor vehicle fuel additives standards to prevent harm to the public health from vehicular emissions.

The bill would impose a state-mandated local program by requiring districts to propose regulations enacting airborne toxic control measures on nonvehicular sources not later than 120 days after their adoption by the state board, except that districts would be authorized to adopt and enforce equally effective or more stringent control measures. A district would be required to adopt regulations implementing airborne toxic control measures on nonvehicular sources within 6 months after adoption by the state board. District new source review rules and regulations would be required to control emissions of toxic air contaminants, except that processors of food and fiber operating 6 months or less in any calendar year would be exempt until January 1, 1987.

The bill would require the appointment of a 9-member Scientific Review Panel on Toxic Air Contaminants to advise the state board in its evaluation of the health effects toxicity of substances.

The bill would make any person who violates any rule or regulation, emission limitation, or permit condition adopted to control a toxic air contaminant liable for a civil penalty not exceeding $10,000 per day.

(2) The bill would declare legislative intent that the state board, the State Department of Health Services, and the Department of Food and Agriculture perform functions required by the bill in the 1983–84 fiscal year within their existing resources and budgetary authorizations.

(3) Article XIII B of the California Constitution and Sections 2231 and 2234 of the Revenue and Taxation Code require the state to reimburse local agencies and school districts for certain costs mandated by the state. Other provisions require the Department of Finance to review statutes disclaiming these costs and provide, in certain cases, for making claims to the State Board of Control for reimbursement.

However, this bill would provide that no appropriation is made and no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Chapter 3.5 (commencing with Section 39650) is added to Part 2 of Division 26 of the Health and Safety Code, to read:

CHAPTER 3.5. TOXIC AIR CONTAMINANTS

Article 1. Findings, Declarations and Intent

39650. The Legislature finds and declares the following:

(a) That public health, safety, and welfare may be endangered by the emission into the ambient air of substances which are determined to be carcinogenic, teratogenic, mutagenic, or otherwise toxic or injurious to humans.

(b) That persons residing in California may be exposed to a multiplicity of toxic air contaminants from numerous sources which may act cumulatively to produce adverse effects, and that this phenomenon should be taken into account when evaluating the health effects of individual compounds.

(c) That it is the public policy of the state that emissions of toxic air contaminants should be controlled to levels which prevent harm to the public health.

(d) That the identification and regulation of toxic air contaminants should utilize the best available scientific evidence gathered from the public, private industry, the scientific community, and federal, state, and local agencies, and that the scientific research on which decisions related to health effects are based should be reviewed by a scientific review panel and members of the public.

(e) That, while absolute and undisputed scientific evidence may not be available to determine the exact nature and extent of risk from toxic air contaminants, it is necessary to take action to protect public health.

(f) That the state board has adopted regulations regarding the identification and control of toxic air contaminants, but that the statutory authority of the state board, the relationship of its proposed program to the activities of other agencies, and the role of scientific and public review of the regulations should be clarified by the Legislature.

(g) That the Department of Food and Agriculture has jurisdiction over pesticides to protect the public from environmentally harmful pesticides by regulating the registration and uses of pesticides.

(h) That while there is a statewide program to control levels of air contaminants subject to state and national ambient air quality standards, there is no specific statutory framework in this division for the evaluation and control of substances which may be toxic air contaminants.

(i) That the purpose of this chapter is to create a program which specifically addresses the evaluation and control of substances which may be toxic air contaminants and which complements existing authority to establish, achieve, and maintain ambient air quality standards.

(j) That this chapter is limited to toxic air contaminants and nothing in the chapter is to be construed as expanding or limiting the authority of any agency or district concerning pesticides which are not identified as toxic air contaminants.

(k) That a statewide program to control toxic air contaminants is necessary and desirable in order to provide technical and scientific assistance to the districts, to achieve the earliest practicable control of toxic air contaminants, to promote the development and use of advanced control technologies and alternative processes and materials, to identify the toxic air contaminants of concern and determine the priorities of their control, and to minimize inconsistencies in protecting the public health in various areas of the state.

Article 2. Definitions

39655. For purposes of this chapter, "toxic air contaminant" means an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health. Substances which have been identified as hazardous air pollutants pursuant to Section 7412 of Title 42 of the United States Code shall be identified by the state board as toxic air contaminants. Toxic air contaminants which are pesticides shall be regulated in their pesticidal use by the Department of Food and Agriculture pursuant to Article 1.5 (commencing with Section 14021) of Chapter 3 of Division 7 of the Food and Agricultural Code.

39656. For purposes of this chapter, "airborne toxic control measure" means recommended methods, and where appropriate a range of methods, of reducing the emissions of a toxic air contaminant, including, but not limited to, emission limitations, control technologies, the use of operational and maintenance conditions and closed system engineering.

39657. For purposes of this chapter, "pesticide" means any economic poison as defined by Section 12753 of the Food and Agricultural Code.

Article 3. Identification of Toxic Air Contaminants

39660. (a) Upon the request of the state board, the State Department of Health Services, in consultation with and with the participation of the state board, shall evaluate the health effects of and prepare recommendations regarding substances, other than pesticides in their pesticidal use, which may be or are emitted into the ambient air of California which may be determined to be toxic air contaminants.

(b) In conducting this evaluation, the State Department of Health Services shall consider all available scientific data, including, but not limited to, relevant data provided by the state board, the Occupational Safety and Health Division of the Department of Industrial Relations, international and federal health agencies, private industry, academic researchers, and public health and environmental organizations.

(c) The evaluation shall assess the availability and quality of data on health effects, including potency, mode of action, and other relevant biological factors, of the substance.

The evaluation shall also contain an estimate of the levels of exposure which may cause or contribute to adverse health effects and, in the case where there is no threshold of significant adverse health effects, the range of risk to humans resulting from current or anticipated exposure.

(d) The State Department of Health Services shall submit its written evaluation and recommendations to the state board within 90 days after receiving the request of the state board pursuant to subdivision (a). The State Department of Health Services may, however, petition the state board for an extension of the deadline, not to exceed 30 days, setting forth its statement of the reasons which prevent the department from completing its evaluation and recommendations within 90 days. Upon receipt of a request for extension of, or noncompliance with, the deadline contained in this section, the state board shall immediately transmit to the Assembly Committee on Rules and the Senate Committee on Rules, for transmittal to the appropriate standing, select, or joint committee of the Legislature, a statement of reasons for extension of the deadline, along with copies of the department's statement of reasons which prevent it from completing its evaluation and recommendations in a timely manner.

(e) The state board or a district may request, and any person shall provide, information on any substance which is or may be under evaluation and which is manufactured, distributed, emitted, or used by the person of whom the request is made, in order to carry out its responsibilities pursuant to this chapter. To the extent practical, the state board or a district may collect the information in aggregate form or in any other manner designed to protect trade secrets.

Any person providing information pursuant to this subdivision may, at the time of submission, identify a portion of the information submitted to the state board or a district as a trade secret and shall support the claim of a trade secret, upon the written request of the state board or district board. Information supplied which is a trade secret, as specified in Section 6254.7 of the Government Code, and which is so marked at the time of submission, shall not be released to any member of the public. This section shall not be construed to prohibit the exchange of properly designated trade secrets between public agencies when those trade secrets are relevant and necessary to the exercise of their jurisdiction provided that the public agencies exchanging those trade secrets shall preserve the protections afforded that information by this paragraph.

Any information not identified as a trade secret shall be available to the public unless exempted from disclosure by other provisions of law. The fact that information is claimed to be a trade secret is public information. Upon receipt of a request for the release of information which has been claimed to be a trade secret, the state board or district shall immediately notify the person who submitted the information, and shall determine whether or not the information claimed to be a trade secret is to be released to the public. The state board or district board, as the case may be, shall make its determination within 60 days after receiving the request for disclosure, but not before 30 days following the notification of the person who submitted the information. If the state board or district decides to make the information public, it shall provide the person who submitted the information 10 days' notice prior to public disclosure of the information.

(f) The State Department of Health Services and the state board shall give priority to the evaluation and regulation of substances based on factors related to the risk of harm to public health, amount or potential amount of emissions, manner of usage of the substance in California, persistence in the atmosphere, and ambient concentrations in the community.

39661. (a) Upon receipt of the evaluation and recommendations prepared pursuant to Section 39660, the state board, in consultation with and with the participation of the State Department of Health Services, shall prepare a report in a form which may serve as the basis for regulatory action regarding a particular substance pursuant to subdivisions (b) and (c) of Section 39662.

The report shall include and be developed in consideration of the evaluation and recommendations of the State Department of Health Services.

(b) The report, together with the scientific data on which the report is based, shall, with the exception of trade secrets, be made available to the public and shall be formally reviewed by the scientific review panel established pursuant to Section 39670. The panel shall review the scientific procedures and methods used to support the data, the data itself, and the conclusions and assessments on which the report is based. Any person may submit any information for consideration by the panel which may, at its discretion, receive oral testimony. The panel shall submit its written findings to the state board within 45 days after receiving the report. The panel may, however, petition the state board for an extension of the deadline, which may not exceed 15 working days.

(c) If the scientific review panel determines that the health effects report is seriously deficient, the report shall be returned to the state board, and the state board, in consultation with and with the participation of the State Department of Health Services, shall prepare revisions to the report which shall be resubmitted, within 30 days following receipt of the panel's determination, to the scientific review panel which shall review the report in conformance with subdivision (b) prior to a formal proposal by the state board pursuant to Section 39662.

39662. (a) Within 10 working days following receipt of the findings of the scientific review panel pursuant to subdivision (c) of Section 39661, the state board shall prepare a hearing notice and a proposed regulation which shall include the proposed determination as to whether a substance is a toxic air contaminant.

(b) After conducting a public hearing pursuant to Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code, the state board shall list, by regulation, substances determined to be toxic air contaminants.

(c) If a substance is determined to be a toxic air contaminant, the regulation shall specify a threshold exposure level, if any, below which no significant adverse health effects are anticipated.

(d) In evaluating the nature of the adverse health effect and the range of risk to humans from exposure to a substance, the state board shall utilize scientific criteria which are protective of public health, consistent with current scientific data.

(e) Any person may petition the state board to review a determination made pursuant to this section. The petition shall specify the additional scientific evidence regarding the health effects of a substance which was not available at the time the original determination was made and any other evidence which would justify a revised determination.

Article 4. Control of Toxic Air Contaminants

39665. (a) Following adoption of the determinations pursuant to Section 39662, the executive officer of the state board shall, with the participation of the districts, and in consultation with affected sources and the interested public, prepare a report on the need and appropriate degree of regulation for each substance which the state board has determined to be a toxic air contaminant.

(b) The report shall address all of the following issues, to the extent data can reasonably be made available:

(1) The rate and extent of present and anticipated future emissions and estimated levels of human exposure.

(2) The stability, persistence, transformation products, dispersion potential, and other physical and chemical characteristics of the substance when present in the ambient air.

(3) The categories, numbers, and relative contribution of present or anticipated sources of the substance, including mobile, industrial, agricultural, and natural sources.

(4) The availability and technological feasibility of airborne toxic control measures to reduce or eliminate emissions, and the anticipated effect of airborne toxic control measures on levels of exposure.

(5) The approximate cost of each airborne toxic control measure and the magnitude of risks posed by the substances as reflected by the amount of emissions from the source or category of sources.

(6) The availability, suitability, and relative efficacy of substitute compounds of a less hazardous nature.

(7) The potential adverse health, safety, or environmental impacts that may occur as a result of implementation of an airborne toxic control measure.

(c) The staff report, and relevant comments received during consultation with the districts, affected sources, and the public, shall be made available for public review and comment at least 45 days prior to the public hearing required by Section 39666.

39666. (a) Following a noticed public hearing, the state board shall adopt airborne toxic control measures to reduce emissions of toxic air contaminants from nonvehicular sources.

(b) For toxic air contaminants for which the state board has determined, pursuant to Section 39662, that there is a threshold exposure level below which no significant adverse health effects are anticipated, the airborne toxic control measure shall be designed, in consideration of the factors specified in subdivision (b) of Section 39665, to reduce emissions sufficiently so that the source will not result or contribute to ambient levels at or in excess of the threshold exposure.

(c) For toxic air contaminants for which the state board has not specified a threshold exposure level pursuant to Section 39662, the airborne toxic control measure shall be designed, in consideration of the factors specified in subdivision (b) of Section 39665, to reduce emissions to the lowest level achievable through application of best available control technology or a more effective control method, unless the state board or a district board determines, based on an assessment of risk, that an alternative level of emission reduction is adequate or necessary to prevent an endangerment of public health.

(d) Not later than 120 days after the adoption by the state board of an airborne toxic control measure pursuant to this section, the districts shall propose regulations enacting control measures on nonvehicular sources within their jurisdiction which meet the requirements of subdivisions (b), (c), and (e), except that a district may, at its option, adopt and enforce equally effective or more stringent control measures than the airborne toxic control measures adopted by the state board. A district shall adopt rules and regulations implementing airborne toxic control measures on nonvehicular sources within its jurisdiction in conformance with the requirements of subdivisions (b), (c), and (e), not later than six months following the adoption of airborne toxic control measures by the state board.

(e) District new source review rules and regulations shall require new or modified sources to control emissions of toxic air contaminants consistent with subdivisions (b), (c), and (d) except for processors of food and fiber that operate for six months or less in any calendar year. The exception for processors of food and fiber shall become inoperative on January 1, 1957. On or before January 1, 1986, the state board, in consultation and with the participation of the Department of Food and Agriculture, shall report to the Legislature on the feasibility of implementation and the economic impact of this section on processors of food and fiber.

39667. Based on its determinations pursuant to Section 39662, the state board shall determine if revisions are needed in the emission standards for vehicular sources, or in the standards for motor vehicle fuel additives, adopted pursuant to Part 5 (commencing with Section 43000), in order to prevent harm to the public health from vehicular emissions.

Article 5. Scientific Review Panel

39670. (a) A nine-member Scientific Review Panel on Toxic Air Contaminants shall be appointed to advise the state board and the Department of Food and Agriculture in their evaluation of the health effects toxicity of substances pursuant to Article 3 (commencing with Section 39660) of this chapter and Article 1.5 (commencing with Section 14021) of Chapter 3 of Division 7 of the Food and Agricultural Code.

(b) The members of the panel shall be highly qualified and professionally active or engaged in the conduct of scientific research, and shall be appointed as follows for a term of three years:

(1) Five members shall be appointed by the Secretary of the Environmental Affairs Agency, one of whom shall be qualified as a pathologist, one of whom shall be qualified as an oncologist, one of whom shall be qualified as an epidemiologist, one of whom shall be qualified as an atmospheric scientist, and one who shall have relevant scientific experience and shall be experienced in the operation of scientific review or advisory bodies.

(2) Two members shall be appointed by the Senate

Committee on Rules, one of whom shall be qualified as a biostatistician and one of whom shall be a physician or scientist specializing in occupational medicine.

(3) Two members shall be appointed by the Speaker of the Assembly, one of whom shall be qualified as a toxicologist and one of whom shall be qualified as a biochemist.

(4) Members of the panel shall be appointed from a pool of nominees submitted to each appointing body by the President of the University of California. The pool shall include, at a minimum, three nominees for each discipline represented on the panel, and shall include only individuals who hold, or have held, academic or equivalent appointments at universities and their affiliates in California.

(c) The panel may establish ad hoc committees, which may include other scientists, to assist it in performing its functions.

(d) Members of the panel, and any ad hoc committee established by the panel, shall submit annually a financial disclosure statement that includes a listing of income received within the preceding three years, including investments, grants, and consulting fees derived from individuals or businesses which might be affected by regulatory actions undertaken by the state board or districts pursuant to this chapter. The financial disclosure statements submitted pursuant to this subdivision are public information. Members of the panel shall be subject to the disqualification requirements of Section 87100 of the Government Code.

(e) Members of the panel shall receive one hundred dollars ($100) per day for attending panel meetings, and shall be reimbursed for reasonable and necessary travel and other expenses incurred in the performance of their duties.

(f) The state board and the State Department of Health Services, and, in the case of pesticides, the Department of Food and Agriculture shall provide technical and clerical staff support to the panel.

Article 6. Penalties

39674. (a) Any person who violates any rule or regulation, emission limitation, or permit condition adopted pursuant to Article 4 (commencing with Section 39665) is liable for a civil penalty not to exceed ten thousand dollars ($10,000) for each day in which the violation occurs.

(b) There is no liability under subdivision (a) if the person accused of the violation alleges by affirmative defense and establishes that the violation is caused by an act which was not the result of intentional or negligent conduct.

SEC. 2. Article 1.5 (commencing with Section 14021) is added to Chapter 3 of Division 7 of the Food and Agricultural Code, to read:

Article 1.5. Pesticides

14021. (a) As used in this article, "pesticide" means any economic poison as defined in Section 12753.

(b) For purposes of this article, "toxic air contaminant" means an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health. Pesticides which have been identified as hazardous air pollutants pursuant to Section 7412 of Title 42 of the United States Code shall be identified by the director as toxic air contaminants.

14022. (a) In consultation with the State Department of Health Services and the State Air Resources Board, the director shall evaluate the health effects of pesticides which may be or are emitted into the ambient air of California and which may be determined to be a toxic air contaminant which poses a present or potential hazard to human health. Upon request of the State Air Resources Board, the director shall include a pesticide for evaluation.

(b) In conducting this evaluation, the director shall consider all available scientific data, including, but not limited to, relevant data provided by the State

Department of Health Services, the Occupational Safety and Health Division of the Department of Industrial Relations, international and federal health agencies, private industry, academic researchers, and public health and environmental organizations. At the request of the director, the State Air Resources Board shall document the level of airborne emissions and the State Department of Health Services shall provide an assessment of related health effects of pesticides which may be determined to pose a present or potential hazard and each agency shall provide technical assistance to the department as it conducts its evaluation.

(c) The director may request, and any person shall provide, information on any substance which is or may be under evaluation and which is manufactured, distributed, or used by the person to whom the request is made, in order to carry out his or her responsibilities pursuant to this chapter. Any person providing information pursuant to this subdivision shall, at the request of the director, identify that portion of the information submitted to the department which is a trade secret and, upon the request of the director, shall provide documentation to support the claim of the trade secret. Information supplied which is trade secret, as specified in Section 6254.7 of the Government Code, and which is so marked at the time of submission shall not be released to the public by the director, except in accordance with Section 1060 of the Evidence Code and Section 21160 of the Public Resources Code.

(d) The director shall give priority to the evaluation and regulation of substances based on factors related to the risk of harm to public health, amount or potential amount of emissions, manner of usage of the pesticide in California, persistence in the atmosphere, and ambient concentrations in the community.

14023. (a) Upon completion of the evaluation conducted pursuant to Section 14022, the director shall, in consultation and with the participation of the State Department of Health Services, prepare a report on the health effects of the pesticide which may be determined to be a toxic air contaminant which poses a present or potential hazard to human health due to airborne emission from its use. The report shall assess the availability and quality of data on health effects, including potency, mode of action, and other relevant biological factors, of the substance. The report shall also contain an estimate of the levels of exposure which may cause or contribute to adverse health effects and, in the case where there is no threshold of significant adverse health effects, the range of risk to humans, resulting from current or anticipated exposure. The report shall include the findings of the State Department of Health Services. The report shall be made available to the public, subject to subdivision (c) of Section 14022.

(b) The report prepared pursuant to subdivision (a) shall be formally reviewed by the scientific review panel established according to Section 39670 of the Health and Safety Code. The director shall also make available the data deemed necessary to the scientific review panel, according to departmental procedures established to ensure confidentiality of proprietary information. The panel shall review, as appropriate, the scientific data on which the report is based, the scientific procedures and methods used to support the data, and the conclusions and assessments on which the report is based.

(c) If the scientific review panel determines that the health effects report is seriously deficient, the report shall be returned to the director who shall revise and resubmit the report to the panel prior to development of emission control measures.

(d) The director shall determine which pesticides are toxic air contaminants.

(e) The director shall determine, in consultation with the State Department of Health Services, the State Air Resources Board, and the air pollution control districts or air quality management districts in the affected counties, the need for and appropriate degree of control measures for each pesticide identified as a toxic air contaminant in subdivision (d). Any person may submit written information for consideration by the director in making his determinations pursuant to subdivisions (d) and (e).

14024. (a) For those pesticides for which a need for control measures has been determined pursuant to subdivision (e) of Section 14023 and pursuant to provisions of this code, the director, in consultation with the agricultural commissioners and air pollution control districts and air quality management districts in the affected counties, shall develop and adopt control measures designed to reduce emissions sufficiently so that the source will not expose the public to the levels of exposure which may cause or contribute to significant adverse health effects. Where no demonstrable safe level or threshold of significant adverse health effects has been established by the director, the control measures shall be designed to adequately prevent an endangerment of public health through the application of best practicable control techniques.

(b) Best practicable control techniques may include, but are not limited to, the following:

(1) Label amendments.
(2) Applicator training.
(3) Restrictions on use patterns or locations.
(4) Changes in application procedures.
(5) Reclassification as a restricted material.
(6) Cancellation.

14025. Any person may petition the department to review a determination made pursuant to this article. The petition shall specify the additional scientific evidence regarding the health effects of a pesticide which was not available at the time the original determination was made and any other evidence which would justify a revised determination.

14026. Nothing in this article shall be construed to limit or expand the department's authority regarding pesticides which are not determined to be toxic air contaminants.

SEC. 3. It is the intention of the Legislature, in the enactment of this act, that the State Air Resources Board, the State Department of Health Services, and the Department of Food and Agriculture shall perform the functions required by this act within their respective existing resources and budgetary authorizations during the 1983–84 fiscal year, by appropriating sufficient funds in items 3400-001-001, 3400-001-044, 4260-001-001, 4260-001-044, 4260-001-455, 8570-001-001, 8570-001-111, 8570-001-890, 8570-101-001 and 8570-101-111 of the Budget Act of 1983 (Ch. 324, Stats. 1983).

SEC. 4. No appropriation is made and no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution or Section 2231 or 2234 of the Revenue and Taxation Code because the local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act.