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# HAZARDOUS AIR POLLUTANTS

In Maine:

## Emissions Inventory

AND

## Ranking System

Prepared by:

**Bureau of Air Quality Control**

Division of Technical Services

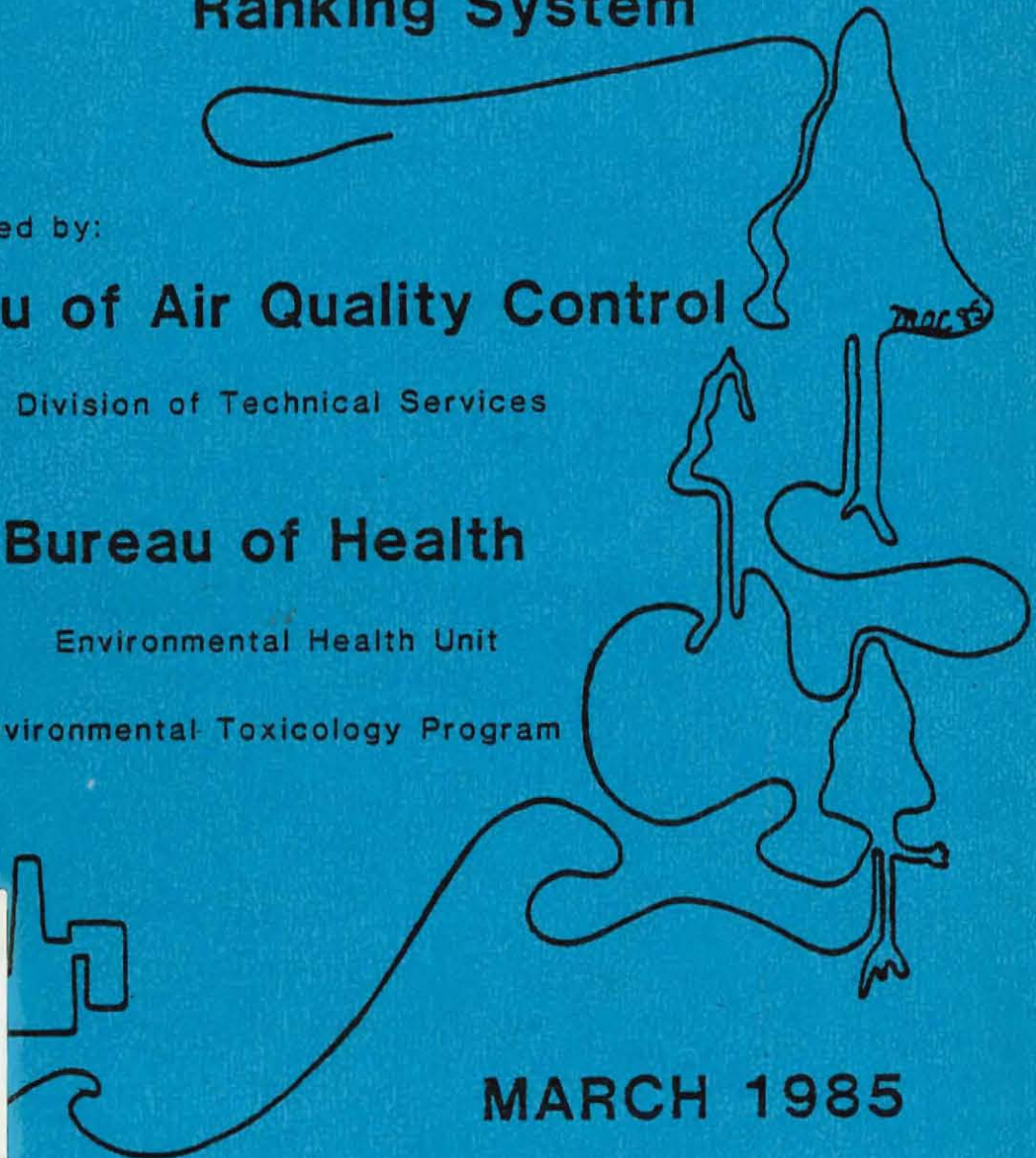
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Environmental Health Unit

Environmental Toxicology Program

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STATE OF MAINE

# Department of Environmental Protection

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JOSEPH E. BRENNAN  
GOVERNOR

HENRY E. WARREN  
COMMISSIONER

March 25, 1985

Senator Ronald E. Usher, Senate Chair  
Representative Michael H. Michaud, House Chair  
Joint Standing Committee on Energy and Natural Resources  
State House, Station 2  
Augusta, Maine 04333

Dear Senator Usher and Representative Michaud:


The Bureau of Air Quality Control of the Maine Department of Environmental Protection has completed the toxic air pollution inventory mandated in Chapter 835 of the Public Laws of 1984. With this report we respectfully submit the results of the inventory to the Committee on Energy and Natural Resources.

The report explains the process we followed in gathering data, what the collected information tells us and suggestions as to how the State of Maine should proceed to better control existing and future toxic emissions into the air. It is broken into three sections; the inventory, the air toxics ranking system and an appendix.

Throughout the inventory process the Maine Bureau of Health has been very helpful. In particular I want to thank Dr. Terry Shahata and Norman Anderson. In addition, credit should be given to David Dixon of the Bureau of Air Quality who organized and managed the inventory and data resolution processes. Finally, special thanks goes to the hundreds of businesses and industries that completed the questionnaires that form the basis of the data from which the inventory is drawn. Without their wholehearted help nothing could have been done.

In closing, as you use this report, questions and comments should be directed to Mr. Dixon. He will be most able and happy to help you. He can be reached at 289-2437.

Sincerely,

  
Henry E. Warren  
Commissioner

HEW/JLB/glk

cc: Richard Davies, Governor's Office

REGIONAL OFFICES

• Portland •

• Bangor •

• Presque Isle •



## EXECUTIVE SUMMARY

This report has been compiled by the Bureau of Air Quality Control and the Bureau of Health's Environmental Toxicology Program. Its purpose is to determine whether or not emissions of Hazardous Air Pollutants in Maine presents a serious environmental concern. The evaluation was carried out simultaneously with the Air Bureau collecting information on types and quantities of emissions while the Bureau of Health studied the relative toxicity or potential health hazard.

The report is divided into two sections: (1) the emission inventory and (2) the priority ranking system. Both sections are interdependent and must be evaluated collectively in order to determine the extent of environmental problems created by hazardous air pollutants. The hazard created is dependent on both factors, the toxicity or potency of the substance and the exposure.

The emissions inventory section includes a description of the procedures used to estimate emissions from point and area sources and discusses the findings. Based upon a list of 199 potential hazardous air pollutants selected to be inventoried and selected cutoffs for reporting, emissions of 6,143 tons per year were identified.

Of the 199 potentially hazardous air pollutants 58 were found to be emitted in Maine.

The Bureau of Health's toxicity ranking score is based upon four considerations: mutagenicity, carcinogenicity, reproductive effects and acute toxicity. The score in each of the four categories is a function of the evidence for each effect reported in the literature.

The toxicity score is combined with the exposure score to provide a numerical ranking of the inventoried hazardous air pollutants. The priority ranking system will be used by both Bureaus as a guide to systematically continue work on the hazardous air pollutant program .

The hazardous air pollutants which have been determined to undergo initial review are TOLUENE (present in gasoline and used as a solvent in paints and coatings), TETRACHLOROETHYLENE (used as a solvent principally for cleaning and extraction processes), FORMALDEHYDE (used in the manufacture of resins; as a preservative and hardening and reducing agent; in embalming fluids; as a corrosion inhibitor and sterilizing agent), BENZENE (present in gasoline and used as a raw material for organic chemicals), EPOXYPROPANE (used as a fumigant, and in the manufacture of urethane foams, surfactants and detergents, and synthetic lubricants), and CHLORINE (used as a bleaching and oxidizing agent).

Based upon the findings of the report, the following recommendations were developed. The recommendations presume that no single source of hazardous air pollutants is of such great public health concern that immediate pollutant abatement action is needed. The quantities emitted and potential health consequences of exposure to high concentrations or repeated exposures to lower concentrations, however, clearly demand continuing attention to sources emitting these potentially hazardous air pollutants. The entire process is systematic and procedures established by both Bureaus represent an appropriate level of effort.

The following recommendations are made based on the above conclusions:

Authorize the Commissioner to take immediate action when he finds imminent public health risk attributable to existing emissions of hazardous air pollutants.

Provide the Board of Environmental Protection the clear authority to require proper control of hazardous air pollutant emissions from any new source or new process of an existing source whenever the proposed emissions may pose an unacceptable health risk.

Require that existing air emission licensed sources undergo licensing review for hazardous air pollutants.

Authorize the Commissioner to collect additional source information for hazardous air pollutants.

## SECTION 1. EMISSIONS INVENTORY

### 1. INTRODUCTION

Chapter 835 of Public Laws of 1984 required that the Department of Environmental Protection carry out and maintain an inventory of sources in the State emitting any substance that may be a potential hazardous air pollutant. The inventory was specifically required to include the following:

- (1) the number of sources;
- (2) the location of each source or category of source;
- (3) the quantity emitted by each source or category of source;
- (4) the total emissions; and
- (5) the percentage of total emissions generated by sources with existing air licenses.

This section of the report describes the process utilized for data collection, emission calculations and quality assurance. Then it presents the findings of the inventory and our recommendations to the Committee.

### 2. PROCEDURE

The Department developed a comprehensive questionnaire based upon EPA guidelines and examples of data collected in other states. We solicited and received input from the Air Quality Research Coalition. The coalition is a group representing pulp & paper industries, tanneries, electronics manufacturers and other industries which showed a common interest in an air toxics program. As a result of discussions, we concluded that the short term objective of the inventory should be to develop a prioritization scheme for addressing specific air toxics. Based on that objective we developed a general questionnaire which asked only for the total use of a substance and total plant wide emissions, rather than production line by production line data. The scope of the inventory was further limited:

1. By establishing a list of 199 substances which were considered to be potential hazardous air pollutants by the Bureau of Air Quality Control and the Bureau of Health of the Department of Human Services, and;
2. By establishing a minimum use rate of 2000 pounds per year, below which no reporting was required.

The inventory questionnaire was designed to obtain information from 4 categories of sources:

- (1) process sources
- (2) incineration sources
- (3) storage facilities
- (4) loading, unloading, transfer operations.

In late July questionnaires were sent to approximately 700 sources based upon three factors:

- (1) facilities with existing air emission licenses,
- (2) Standard Industrial Classification (SIC) and employment level, using the Maine Marketing Guide,
- (3) hazardous waste manifest data of the Bureau of Oil and Hazardous Materials.

Questionnaires were due back October 31, 1985. At that time the response rate was between 60-65 percent. In looking through the early response data it was clear that 7 categories in the original sample would have little if any impact on the inventory. Because they would have such little impact we removed them from the sample. They were:

- (1) schools
- (2) hospitals
- (3) veterinarians
- (4) hotels
- (5) nursing homes
- (6) oil distribution companies
- (7) sewage treatment plants

Eliminating these categories resulted in a 75 percent response rate. All the remaining sources which had not reported were contacted individually via telephone during the first two weeks of November. Each was reminded of the inventory and its importance.

During the first week in November, all questionnaires were preliminarily reviewed. Based upon this evaluation 3 categories of sources were selected for on-site follow-up, as a verifying technique to assure that the data was accurate. The categories selected were:

- (1) Sources that reported significant emissions. Several were selected for an on-site inspection for quality assurance purposes and to verify methods used to calculate emissions,
- (2) Sources who responded and reported no emissions. We selected several for on-site inspections based upon their SIC code and employment level or similarity with sources that reported emissions,



(3) Sources who did not respond at all. We went to all those whom we expected may be significant sources based upon their SIC code and level of employment or similarity with sources that reported emissions.

During December and early January 1985, a total of 54 sources received on-site follow-up inspections to verify data. This represents a quality control check of 29 percent. Significant additional emissions were found during this process. By this point the inventory response rate was 518 out of 619 or 84 percent. Based upon the follow-up inspections, we believe that the sources inventoried in this report include the majority of significant emitters in Maine.

In order to deal with the volume of data reported during the inventory we developed an on-line computer data handling system. This system utilized the Department's Honeywell Level 6 mini-computer. Simply put, data could be entered directly to the computer and reports written using a generalized information retrieval system. Inherent in the design of the system was a method to maintain the confidentiality of the information reported to us.

The quality of the responses to the questionnaire varied significantly. In some cases, it was evident that a great deal of time and effort had gone into the preparation of the reports. Documentation of calculations, detailed process descriptions, and control/emission assumptions were provided. The majority of submittals, however, simply reported only the amounts of chemicals used and left estimates of the emissions to the Department. In those cases, staff relied on talking with the particular plant operator, comparing between similar industrial sources and making the best estimate based on the chemical and its use. Because of the nature of this estimation process, we purposely made our assumptions conservative which means that the emissions may be somewhat overestimated.

More uncertainty is probably introduced by the methods used to calculate emissions. It was recognized that stack tests or engineering studies should not be required for collecting emission estimates for the purpose of this inventory. Two methods were commonly employed; emission factors and material balance calculations. Emission factors are a typical emission rate that would be expected from a type of source. The factor is then multiplied by the process rate to estimate emissions. Material balance calculations use the amount of product purchased minus what is sent out as a waste and what is tied up in the product. The quantity unaccounted for is assumed to be lost to the air. Much may initially be lost to the sewer system but even that will eventually evaporate. This method may, therefore, overestimate emissions at the source but is quite accurate for accounting for all that eventually reaches the ambient air.

It needs to be pointed out that time did not permit a thorough review of all questionnaires so in many cases estimates are based upon the source's

response. Those that were checked during on-site visits indicate the data are very reliable. Nevertheless, there were instances of misunderstanding and cases of unreasonable assumptions, so it is conceivable that reported values may in some cases inaccurately represent real emission rates.

On the other hand the minimum cut-off exclusion and the select nature of the list tend to make the process underestimate the total statewide emissions of hazardous air pollutants. The use of emission factors, and material balance calculations with conservative assumptions probably overstates emissions in many instances. The estimates therefore should be treated as estimates, not as absolute values. The data is valid for drawing comparisons and developing a prioritization ranking scheme which was the major goal of the project.

The inventory does not address two other situations which may be of concern. It neither provides qualitative and quantitative estimates of reaction products resulting from emissions of individual precursors, nor estimates hazardous air emissions from trace constituents of oil or coal burning. The latter would increase the total reported emissions of hazardous air pollutants so that more attention may be directed at the program; the regulatory significance is not great because control is, and should be, dictated by emissions of the major constituents.

The data collected is not intended to be used to assess local ambient air impacts because it did not include flow rates, densities, elevations and other similar characteristics of the emission that are necessary to quantify impact.

### 3. AREA SOURCES

Area source emission estimates are included for several categories of sources whose emissions are too small to catalogue individually but whose collective emissions are significant. Area sources are reported by category with a geographical breakdown by county and major urban areas. In most cases, the distribution is based upon population distributions or data on vehicle miles traveled in an area. Emissions for the area sources are based exclusively on emission factors. The source of the data used, emission factors and assumptions are all listed for each category in Appendix 3.

Table 1 contains each of the categories of sources included in the area source inventory:

TABLE 1  
AREA SOURCE CATEGORIES

Dry Cleaners  
Degreasers  
Open Burning Dumps  
Agricultural Open Burning  
Forest fires  
Architectural Surface Coating - (Painting)  
Highway Markings  
Printing  
Residential Wood Burning  
Waste Oil Burning  
Automotive Emissions - (Lead)  
Gasoline Stations Operation - (filling underground tanks, vehicular refueling  
and spillage)  
Gasoline Terminals

#### 4. FINDINGS

1. The study found 57 of the 199 inventoried hazardous air pollutants were emitted in Maine. Since this inventory was limited to sources using in excess of 2,000 pounds per year, it is not all inclusive. Some sources may use less than 2,000 pounds of a pollutant which the inventory would not detect.

2. The study indicated 187 sources of the reporting 619 had some reportable emissions. Given enough time and resources to follow-up on all inventoried sources, there is little doubt more emissions would have been found.

3. Of the 178 sources which reported emissions of potential hazardous air pollutants, 78 sources or approximately 44 percent have existing air emission licenses.

4. Area sources were found to be a significant source of hazardous air pollutants in a few cases. They are dry cleaners, gasoline marketing, residential wood burning, and waste oil burning.

5. Table 2 presents a statewide summary of the top 25 hazardous air pollutants for both point and area sources.

6. The total emissions of hazardous air pollutants reported is 6,143 tons (12,286,000 Lb.). Compared to a total emissions inventory of 106,000 tons (212,000,000 Lb.) of sulfur dioxide, the generic category of hazardous air

TABLE 2

## TOP 25 HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE

POLLUTANT	EMISSIONS (POUNDS)		
	POINT SOURCE	AREA SOURCE	TOTAL
1. Toluene	2,459,231	52,360	2,511,591
2. 1,1,1, Trichloroethane	1,496,539	0	1,496,539
3. Chlorine	1,337,003	0	1,337,003
4. Xylene	1,091,274	0	1,091,274
5. Acetone	804,521	0	804,521
6. Tetrachlorethylene	144,450	563,600	708,050
7. Methyl Cellosolve	632,248	0	632,248
8. Methyl Ethyl Ketone	512,611	0	512,611
9. Methyl Mercaptan	428,940	0	428,940
10. Chlorine Dioxide	296,787	0	296,787
11. Methylene Chloride	288,569	0	288,569
12. Ethylene Glycol Ethyl Ether	277,118	0	277,118
13. Hydrogen Sulfide	269,912	0	269,912
14. N-Butyl Acetate	253,563	0	253,563
15. Lead	630	202,800	203,430
16. Methyl Metharcylate	184,550	0	184,550
17. Butanol	149,490	0	149,490
18. Diphenylmethane 4,4-di- isocyanate	146,000	0	146,000
19. Hydrogen Chloride	44,731	96,000	140,731
20. 1,2 - Epoxypropane	124,600	0	124,600
21. Trichloroethylene	110,600	0	110,600
22. Formaldehyde	79,401	0	79,401
23. Turpentine	77,130	0	77,130
24. Ethyl Acetate	66,537	0	66,537
25. Benzene	0	52,392	52,392

pollutants is quite small. However, this is not a fair comparison due to the varying public health risk which hazardous air pollutants pose. This comparison is made to put the volume of hazardous air pollutants in perspective with a more familiar criteria air pollutant.

7. Of the 6,143 tons of inventoried hazardous air pollutants only 167 tons (2.7%) would have sufficient evidence to be classified as carcinogenic. This is not to suggest that carcinogens should receive special treatment but rather to confirm that most of what were identified as hazardous air pollutants were not carcinogenic.

## 5. DISCUSSION OF FINDINGS

The problem with a discussion of the results of the inventory is the age old one of comparing apples and oranges. The list of hazardous air pollutants is composed of chemicals with such varying public health risks that they should not be compared to each other. It is the role of the Bureau of Health and the Scientific Advisory Committee to perform this risk assessment.

The findings represent broad generalizations of the data reported. In many cases it is not the generalizations that are very useful but rather the specific data. That data is reported in a series of appendices:

1. Appendix 1 is the List of Hazardous Air Pollutants for which the Department inventoried. This list should be referred to in the following appendices as it identifies a six letter code for each pollutant. The code was used as part of the computer data handling system.

2. Appendix 2 reports the total process emissions for all inventoried point sources.

3. Appendix 3 reports the individual area source documentation sheets. The initial sheet describes the category, data collection, data assumptions, emission factor(s), emission factor source, calculation method, and annual emissions summary. The second sheet details the emissions by county and for a few major cities.

4. Appendix 4 reports a breakdown of hazardous air pollutants by county.

5. Appendix 5 reports a breakdown of hazardous air pollutants by Standard Industrial Classification (SIC).

## 6. RECOMMENDATIONS

The following recommendations for legislation are made with the understanding that while significant quantities of hazardous air pollutants are emitted into the air at present there is no single hazardous air pollutant or source that represents a clear threat to public health from these emissions. Nevertheless, it is prudent to limit or possibly regulate future sources of hazardous air pollutants that may pose a direct threat to public health and require the same level of control generally required for the criteria air pollutants. At the same time the Department should be authorized to gather the source specific information necessary to conduct ambient air quality impact assessments.

With this in mind, the Department's recommendations are:

### A. LEGISLATIVE

#### 1. Emergency Provision to Protect Public Health

The Commissioner should be given the clear authority to take immediate action to stop emissions of hazardous air pollutants when they pose an imminent threat to public health. The language should be similar to the existing emergency provisions found in Hazardous Waste Management law, Title 38, Section 1310.

#### 2. New Emission Sources

Legislation is needed to clarify and improve the capacity of the Board of Environmental Protection to regulate hazardous air pollutant emissions from any new source or new process or operation at an existing source when it finds that the proposed emissions pose an unacceptable public health risk.

#### 3. Existing Emission Sources

Existing law should be clarified to clearly indicate that hazardous air pollutants are treated similar to the criteria pollutants in the licensing of any existing air emission source. This may require existing sources of hazardous air pollutants to use Best Practical Treatment.

#### 4. Source Information

The Commissioner should be given the authority to solicit additional source information such as:

- a. process schedules and design specifications;



- b. stack or discharge vent operating parameters;
- c. control equipment specifications and design operating conditions;
- d. emission testing either periodically or using continuous emissions monitors.

B. DEPARTMENTAL

1. Emissions Inventory

The emissions inventory should be upgraded to include source specific emission data. Testing and documentation of emission estimates should be expanded to cover sources emitting less than 2000 lbs/year.

## SECTION II. RANKING HAZARDOUS AIR POLLUTANTS FOR FORMAL EVALUATION

### 1. INTRODUCTION

Section 585-C of 38 M.R.S.A. mandated the Maine Department of Environmental Protection (DEP) to establish an air emissions inventory for hazardous air pollutants. With the assistance of the Maine Bureau of Health and other state agencies, the DEP developed an initial list of two hundred air pollutants to be classified as "hazardous." It is the responsibility of the Bureau of Health (22 M.R.S.A. Section 1696) to assess the public health risk associated with these hazardous air pollutants. In conducting its assessments, the Bureau relies on the advice and constructive criticism of its Scientific Advisory Panel. This Panel, established concurrently with the hazardous air pollutant legislation, consists of expert health professionals from academia, industry, consulting firms, and private practice.

### 2. APPROACH

In order to know the sequence in which pollutants will be assessed, it is first necessary to develop a ranking system based on a preliminary evaluation of each pollutant's toxicity and the quantity that is emitted into the ambient air. Two components are assessed in the ranking system: toxicity and exposure. Combining these two components is necessary for a balanced perception of actual public health risk. The ranking measures all the pollutants against a standardized set of criteria, and assigns numerical scores based on these criteria. This method has inherent problems as it does not consider the particular toxicological or emission characteristics of a chemical. On the other hand, consideration of specific characteristics may undermine the purpose of the ranking system. Since it is only a scheme for setting priorities, its effectiveness can be diluted by introducing criteria which are not easily comparable among a wide variety of pollutants. Yet, while not directly translatable into a measure of public health risk, this ranking system should provide a relative index of the pollutants' potential health threats.

### 3. TOXICITY COMPONENT

The toxicity component of the ranking system provides a preliminary score based on the studies cited in the National Institute for Occupational Safety and Health's Registry of Toxic Effects of Chemical Substances (RTECS). The effects categories are based on the following health criteria: carcinogenicity, mutagenicity, reproductive effects, and acute effects. Values for each category range from zero, except acute toxicity, which ranges from one to four. The toxicity factor for a pollutant is determined first by adding the individual category scores, and then adding to this sum the standard deviation of the four values. The reason for adding the standard deviation will be explained below.

The mechanism by which the health effects are scored is outlined in Table 1. Though each category is evaluated by different parameters, the basic ordering reflects a hierarchy of concern regarding a pollutant's human health risk. A pollutant is scored as a carcinogen, mutagen, or a reproductive toxin according to its likelihood of acting as such in human beings. The acute toxicity category is scored according to potency criteria, since any substance

can be toxic to human beings if administered in large enough doses. With the exception of the acute toxicity category, no consideration is placed on route of exposure.

Carcinogenicity For carcinogenicity assessment, RTECS reflects the weight of evidence criteria used by the International Agency for Research on Cancer (IARC) and the National Toxicology Program. The evidence is considered with regard to whether it represents the results of human or animal studies, and whether the resulting associations are positive, suspected, indefinite, negative, or lacking data. Using the assumption that the compounds with the closest associations with human carcinogenesis warrant the most immediate attention, the following scoring scheme was developed.

Human: Positive/Suspected	4
Animal Positive	3
Animal Suspected	2
All Other Non-negative data	1
Adequate Negative data	0

Mutagenicity Though actual guidelines still need to be developed for interpreting mutagenicity data, there is the general recognition that those tests which more closely reflect human physiological responses to the suspected mutagen also provide the greatest weight of evidence. The following scheme was thus developed for interpreting RTECS mutagenicity data in light of this general premise.

In vitro or in vivo human, in vivo mammalian	4
In vitro mammalian	3
Non-mammalian	2
No Data	1
Adequate Negative data	0

The study (or studies) which have the highest ranking determine the pollutant's score for this health effect.

Reproductive Effects Scoring for reproductive effects follows basically the weight of evidence ranking used by IARC in its evaluation of potential carcinogens. This approach differs from IARC's in that the triggering studies have not necessarily been peer reviewed. Because of the generally limited data base for this category, however, less demanding criteria have been employed.

Human data, or	4
2 species and 2 routes in 1 species	
2 species or 2 routes in 1 species	3
1 species tests	2
No data	1
Adequate Negative data	0

Acute Toxicity As shown in the Table 2, numerous regulatory agencies categorize acute toxicity into roughly four levels. This categorization forms the basis of the scoring assignments for this effect. To reflect the importance of actual human data, pollutant scoring gives priority to any human lethal dose studies cited. For those pollutants which lack human data, priority is given to the LC50\* (4-hour exposure period) in any animal species, since this is a measure of toxicity via inhalation. Pollutants with neither human lethal dose data nor lethal dose animal inhalation data are scored according to the LD50. For the sake of consistency, the rat has been used as the reference species for the LD50. When rat data are not available for a pollutant, toxicity data from any rodent is used.

Level 4	LC (human) or LC50 (animal): less than 0.2 mg/liter, less than 200 ppm; or LD (human) or LD50 (animal): less than 50 mg/kg	4
Level 3	LC (human) or LC50 (animal): 0.2 - 2.0 mg/liter, 200 - 2000 ppm; or LD (human) or LD50 (animal) 50 - 500 mg/kg	3
Level 2	LC (human) or LC50 (animal): 2 - 20 mg/liter, 2000 - 20,000 ppm; or LD (human) or LD50 (animal): 500 - 5000 mg/kg	2
Level 1	LC (human) or LC50 (animal): greater than 20 mg/liter, greater than 20,000 ppm; or LD (human) or LD50 (animal): greater than 5,000 mg/kg; or No Data	1

Deviation. There are several difficulties involved with the derivation of a general toxicity value for a wide variety of pollutants. In this scheme, there is the concern that pollutants with wide deviations in their health effect scores (particularly in the carcinogenicity, mutagenicity, and reproductive effects scores) may be underestimated in their rankings because of inadequate data. To compensate for this, the standard deviation of the four health effects scores was added to the sum.

#### 4. EXPOSURE COMPONENT

Emissions estimates for all hazardous air pollutants have been provided by the Department of Environmental Protection's Bureau of Air Quality Control. These estimates are in the form of statewide summations in pounds per year from industrial, commercial, residential, and mobile sources.

\* For explanation of terms, see GLOSSARY

## 5. RANKING ALGORITHM

The DEP inventory, because of the wide range in the emissions estimates, is not easily comparable to the toxicity scale. A variety of methods can be used, each given varying degrees of weight to each component. It is unknown at this time how different modifications of the exposure component affect its weight in the final scoring. Given the uncertainties involved with the weighting process, a non-parametric approach is used. In this approach, the toxicity and exposure components for each pollutant are ranked in order of decreasing toxicity and decreasing emissions. The toxicity and exposure ranks are then added to produce the total score. Pollutants decrease in priority, therefore as their total scores increase. The results of this algorithm are presented in Table 3.

## 6. DISCUSSION

Despite the efforts of the National Institute for Occupational Safety and Health to list all journal sources, it is entirely possible that some important studies have not been included. Also, with the exception of carcinogenicity, the health effects scoring is drawn from sources that have not been peer reviewed. Finally, "negative data" cannot be distinguished in RTECS from "no data." A provision has been made in the ranking system to score a health category as zero if findings of a negative effect have been demonstrated.

The health effects categories were given equivalent scoring ranges to minimize the biases involved in weighing the different health effects. This procedure, however, does not eliminate the biases inherent in the criteria themselves. Both carcinogenicity and reproductive toxicity are highly correlated with mutagenicity. In other words, a compound having a high score for either carcinogenicity or reproductive effects most likely has a high score for mutagenicity as well. Ranking, therefore, may be disproportionately weighted against pollutants which may be very toxic, but not mutagenic. On the other hand, this unequal emphasis may also more closely reflect the public health threat. Compounds present in sufficient concentrations to produce acute effects are generally more easily detected and controlled than compounds which can produce effects through long-term, low level exposures. Nevertheless, this concern can of unequal weighting be mitigated to a certain extent by prior consideration of "supertoxics," or compounds whose acute toxicity doses are less than the most toxic dose levels described in Table 2. These compounds are listed in Table 4. Before the formal risk assessments are conducted, assessments will be done on these pollutants to determine whether a potential public health problem exists due to acute exposures.

Important facets of a compound's potential toxicity, such as chronic toxicity and synergistic effects, have not been explicitly considered in this process. People are rarely exposed in the ambient environment to only one pollutant. There are several examples to illustrate the possibility that exposures to mixtures of pollutants can create unforeseen effects. There are also many ways in which pollutants can promote disease development through interactions with lifestyle or genetic factors. This shortcoming may be alleviated to a certain extent through the unequal weighting. As a class, mutagenic compounds may be more likely to produce interactive effects than non-mutagenic compounds.

By generally scoring mutagenic compounds higher than non-mutagenic compounds, this system may indirectly consider these effects. Unfortunately, there is currently no systematic method to assess these concerns. They will be assessed in the formal risk assessments, however, and attempts will be made to include these criteria in future ranking systems.

In many instances, the basis for a pollutant's statewide emissions estimate has questionable credibility. Actual emissions test for hazardous air pollutants have rarely been done in Maine. Much information has been obtained through emission factors, material balances, or purchase records. Estimates of hazardous air pollutants emitted from combustion processes are, for the most part, unavailable. Pollutant exposures resulting from consumer or small commercial usage are also difficult to estimate. These limitations, however, have been recognized at the outset. Also recognized was the fact that the hazardous air pollutant program could not wait for these limitations to be overcome. Rather, the intention is to more rigorously address exposure criteria as the public health concerns related to hazardous air pollutants become more clearly understood.

For all of these reasons, the ranking system should be kept flexible so that it can easily respond to additional information or more critical review of the literature. It would be counterproductive for the Bureau of Health to verify the data used in the system, since the purpose of the ranking process is to order pollutants without becoming involved in specifics. On the other hand, assistance from outside sources is appreciated and is encouraged during this and all ensuing steps of the pollutant assessment process.



## GLOSSARY

LC: lethal concentration

LD: lethal dose

LC50: lethal concentration for 50% of the animals in the study

LD50: lethal dose for 50% of the animals in the study

mg/liter: milligrams of compound per liter of air

ppm: parts per million (volume)

mg/kg: milligrams of compound administered per kilogram body weight

TABLE 1  
TOXICITY RANKING SYSTEM

	Score
A. Carcinogenicity (C)	
Human: Positive/Suspected	4
Animal Positive	3
Animal Suspected	2
All Other Non-negative data	1
Adequate Negative data	0
B. Mutagenicity (M)	
In vitro or in vivo human, in vivo mammalian	4
In vitro mammalian	3
Non-mammalian	2
No Data	1
Adequate Negative data	0
C. Reproductive Effects (R)	
Human data, or 2 species and 2 routes in 1 species	4
2 species or 2 tests in 1 species	3
1 species	2
No data	1
Adequate Negative data	0
D. Acute Toxicity (A)	
Level 4 LC (human) or LC50 (animal): less than 0.2 mg/liter, less than 200 ppm; or LD (human) or LD50 (animal): less than 50 mg/kg	4
Level 3 LC (human) or LC50 (animal): 0.2 - 2.0 mg/liter, 200 - 2000 ppm; or LD (human) or LD50 (animal) 50 - 500 mg/kg	3
Level 2 LC (human) or LC50 (animal): 2 - 20 mg/liter, 2000 - 20,000 ppm; or LD (human) or LD50 (animal): 500 - 5000 mg/kg	2
Level 1 LC (human) or LC50 (animal): greater than 20 mg/liter, greater than 20,000 ppm; or LD (human) or LD50 (animal): greater than 5,000 mg/kg; or No Data	1

Sum = Sum of Individual Health Effects Scores  
S = Standard Deviation of a pollutant's effects scores

Toxicity Score = Sum + S

TABLE 2

ACUTE TOXICITY TESTS  
FOR SELECTED FEDERAL REGULATORY PROGRAMS

## CATEGORY A: Mists, Dusts, and Fumes

OSHA	Highly Toxic		Toxic		
HMTA	Poison A or B				
FHSA	Highly Toxic		Toxic		
FIFRA	I	II	III	IV	
RCRA	Acutely Hazardous				
	.02	.2	2	20	200

LC<sub>50</sub>(mg/L)

## CATEGORY B: Vapors and Gases

OSHA	Highly Toxic		Toxic		
FHSA	Highly Toxic		Toxic		
CWA	Hazardous				
	20	200	2000	20,000	200,000

LC<sub>50</sub>(ppm)

## CATEGORY C: Oral Toxicity

OSHA	Highly Toxic		Toxic		
HMTA	Poison A or B				
FIFRA	I	II	III	IV	
CWA	Hazardous				
RCRA	Acutely Hazardous				
	5	50	500	5000	50,000

LD<sub>50</sub> (mg/kg)

OSHA Occupational Safety and Health Act  
 HMTA Hazardous Materials Transportation Act  
 FHSA Federal Hazardous Substances Act  
 FIFRA Federal Insecticide, Fungicide, and Rodenticide Act  
 CWA Clean Water Act  
 RCRA Resource Conservation and Recovery Act

Source: U.S. Environmental Protection Agency, Chemical Substances Designation, Vol. I: Overview and Analysis, Washington, D.C., 1981.  
 EPA-560/TIIS-82-003.

TABLE 3  
RANKINGS FOR HAZARDOUS AIR POLLUTANTS

Pollutant	Toxicity Score	Emissions (lbs/yr)	Toxicity Rank	Emissions Rank	Total
Toluene	12.5	2,511,623	18	1	19
Tetrachloroethylene	13.2	708,050	15	6	21
Formaldehyde	15.5	79,401	2	21	23
Benzene	15.5	52,392	2	24	26
Epoxypropane	13.5	124,600	10	19	29
Chlorine	11.7	1,433,003	27	3	30
Methylene Chloride	12.5	288,569	18	13	31
1,1,1-Trichloroethane	11.0	1,496,539	30	2	32
Lead	12.5	178,630	18	16	34
Styrene	15.5	13,001	2	32	34
Trichloroethylene	13.2	110,865	15	20	35
Benzo-a-Pyrene	14.6	15,180	7	30	37
Xylene	10.3	1,091,274	34	4	38
Methyl Mercaptan	10.5	428,940	31	9	40
1,2 Dichloroethane	13.2	32,400	15	28	43
Methyl Cellosolve	9.4	632,248	36	7	43
Methyl Methacrylate	11.3	184,550	28	15	43
Hydrogen Chloride	12.5	44,731	18	26	44
Bis 2-ethylhexyl phthalate	13.4	10,190	11	34	45
Chlorine Dioxide	9.4	296,787	36	10	46
Ethylene Glycol Ethyl Ether	9.4	277,118	36	11	47
Napthalene	12.5	11,799	18	33	51
Acetone	7.5	804,521	46	5	51
Methyl Ethyl Ketone	8.0	512,611	43	8	51
Arsenic	16.0	430	1	50	51
Hydrogen Sulfide	8.5	269,912	41	12	53
Hydrazine	14.6	740	7	49	56
Ethylene Oxide	13.4	1,535	11	45	56
Formic Acid	10.5	50,433	31	25	56
Chromium	15.5	184	2	54	56
Methyl Chloride	11.3	16,800	28	29	57
Zinc	13.4	946	11	47	58
Cadmium	14.6	238	7	52	59
Epichlorhydrin	15.5	12	2	58	60
Phenol	12.3	5,180	24	37	61
n-Butyl Acetate	6.6	253,563	49	14	63
Diethyl Sulfate	12.0	5,424	26	38	64
Butanol	6.6	149,490	49	17	66
Copper	13.4	107	11	55	66
Diphenyl Methyl 4,4-Diisocyanate	5.5	146,000	51	18	69
Manganese	10.0	9,320	35	35	70
Turpentine	5.5	77,130	51	22	73
Nitric Acid	7.0	41,450	47	27	74
Ethyl Acetate	5.5	66,537	51	23	74

RANKING FOR HAZARDOUS AIR POLLUTANTS (cont.)

Pollutant	Toxicity Score	Emissions (lbs/yr)	Toxicity Rank	Emissions Rank	Total Rank
Ethyl Benzene	12.5	80	18	56	74
Furfural	9.2	7,110	40	36	76
Barium	9.4	2,156	36	44	80
Mercury	12.3	16	24	57	81
Biphenyl	8.0	4,510	43	40	83
Cyanide	8.5	2,955	41	42	83
p-Nitrophenol	10.5	228	31	53	84
Methyl Isobutyl Ketone	4.0	14,045	57	31	88
Ethanolamine	5.5	3,318	51	41	92
1,2 Dichlorobenzene	5.5	2,400	51	43	94
Tetrahydrofuran	8.0	400	43	51	94
Oxalic Acid	7.0	868	47	48	95
Titanium Oxide	4.0	5,240	57	39	96
Acetic Anhydride	5.5	1,403	51	46	97

TABLE 4

SUPERTOXICS

Acrolein  
Beryllium  
Arsine  
Benzotrichloride  
Aldicarb  
Cadmium  
Bis (chloromethyl) ether  
Arsenic Trioxide

Cyanide  
Hydrogen Cyanide  
Dioxin  
Methyl Isocyanate  
Nitrogen Mustard  
Phosphorus  
Tetrachlordibenzofuran  
Thallium



\*\* APPENDICES A \*\*

APPENDIX A  
HAZARDOUS AIR POLLUTANT CODES

<u>MNEUMONIC</u>	<u>SUBSTANCE</u>	<u>CAS #</u>
ACETAL	Acetaldehyde	75-07-0
ACETAM	Acetamide	60-35-5
ACETIC	Acetic anhydride	108-24-7
ACETON	Acetone	67-64-1
ACETYL	2-Acetylaminofluorene	53-96-3
ACROLE	Acrolein	107-02-8
ACRYLA	Acrylamide	79-06-1
ACACID	Acrylic acid	79-10-7
AETHYL	Acrylic acid, Ethyl ester	140-88-5
ACRYLO	Acrylonitrile	107-13-1
ALDICA	Aldicarb	116-06-3
ALLYLC	Allyl chloride	107-05-1
ALPHAB	Alpha benzene hexachloride	319-84-6
AMINOD	p-Aminodiphenyl	92-67-1
ANILIN	Aniline and salts	62-53-3
ANISID	p-Anisidine	104-94-9
ANTIMO	Antimony (dust and salts) as Sb	7440-36-0
ARSINE	Arsine	7784-42-1
ARSENI	Arsenic (dust and salts) as As	7440-38-2
ASBEST	Asbestos	1332-21-4
AURAMI	Auramine (technical grade)	2465-27-2
BARIUM	Barium (dust and salts) as Ba	7440-39-3
BENZEN	Benzene	71-43-2
BENZID	Benzidine	92-87-5
BENZOZ	Benzo(a)pyrene	50-32-8
BENZOT	Benzotrichloride	98-07-07
BENZYL	Benzyl chloride	100-44-7
BERYLL	Beryllium (dust and salts) as Be	7440-41-7
BETAPR	Beta-Propiolactone	57-57-8
BIPHEN	Biphenyl	92-52-4
BETHER	Bis(chloromethyl) ether	542-88-1
BPHTHA	Bis(2-ethylhexyl) phthalate	117-81-7
BROMIN	Bromine	7726-95-6
BUTADI	1,3,-Butadiene	106-99-0
BUTANE	Butanethiol	109-79-5
BUTANO	Butanol (n-Butyl Alcohol)	71-36-3
BACETA	n-Butyl acetate	123-86-4
BAMINE	n-Butylamine	109-73-9
CADMIU	Cadmium (dust and salts) as Cd	7440-43-9
CTETRA	Carbon Tetrachloride	56-23-5
CDISUL	Carbon disulfide	75-15-0
CHLORI	Chlorine	7782-50-5
CDIOXI	Chlorine dioxide	10049-04-4
CACETO	2-Chloroacetophenone (Phenacylchloride)	532-27-4
CANILI	p-Chloroaniline	106-47-8
CHFORM	Chloroform	67-66-3
CMETHY	Chloromethyl methyl ether	107-30-2
CNITRO	p-Chloronitrobenzene	100-00-5
CPRENE	Chloroprene	126-99-8
CHROMI	Chromium (VI) insoluble compounds	7440-47-3
CHRYSE	Chrysene	218-01-9
COBALT	Cobalt (dust and salts) as Co	7440-48-4
COPPER	Copper (fumes, dusts & mists) as Cu	7440-50-8
CRESOL	Cresol (all isomers)	1319-77-3
CYANIM	Cyanamide	420-04-2

CYANIK	Cyanic acid (K salt)	590-28-3
CYANIN	Cyanic acid (Na salt)	917-61-3
CYANID	Cyanides (as Cn)	57-12-5
CYANOA	Cyanoacetamide	107-91-5
CYANOG	Cyanogen	460-19-5
CYCLOH	Cyclohexane	110-82-7
DIAMIN	2,5-Diaminotoluene	95-70-5
DIAZOM	Diazomethane	334-88-3
DETHAN	1,2-Dichlorethane	107-06-2
DBENZE	1,2-Dichlorobenzene	95-50-1
DPROPA	1,2-Dichloropropane	78-87-5
DBENZI	3,3-Dichlorobenzidine	91-94-1
DPHTHA	Diethyl phthalate	84-66-2
DSULFA	Diethyl sulfate	64-67-5
DIISOC	Diisooctyl phthalate	27554-26-3
DIISOD	Diisodecyl phthalate	26761-40-0
DBENDI	3,3-Dimethoxybenzidine (o-dianisidine)	119-90-4
DIMHYD	1,1-Dimethyl hydrazine	57-14-7
DSULFT	Dimethyl sulfate	77-78-1
DAMINO	Dimethylaminoazobenzene	60-11-7
DCARBA	Dimethylcarbonyl chloride	79-44-7
DINITR	m-Dinitrobenzene	99-65-0
DIOXAN	1,4-Dioxane	123-91-1
TDIOXI	Total Dioxins	1746-01-6
DIPHVD	Diphenylhydrazine	122-66-7
DMETHA	Diphenylmethane 4,4-di-isocyanate (MDI)	101-68-8
EPICHL	Epichlorohydrin	106-89-8
EPOXYP	Epoxypropane (Propylene oxide)	75-56-9
ETHANE	Ethanethiol	75-08-1
ETHANO	Ethanolamine	141-43-5
EACETA	Ethyl acetate	141-78-6
EBENZE	Ethyl benzene	100-41-4
ECHLOR	Ethyl chloride	75-00-3
EETHER	Ethyl ether	60-29-7
ETHYLE	Ethylene	74-85-1
EGLYCO	Ethylene glycol ethyl ether	110-80-5
EOXIDE	Ethylene oxide	75-21-8
EIMINE	Ethyleneimine (Aziridine)	151-56-4
FLUORI	Fluorine	7782-41-4
FORMAL	Formaldehyde (gas)	50-00-0
FORMAM	Formamide	75-12-7
FORMIC	Formic acid	64-18-6
FURFUR	Furfural	98-01-1
FALCOH	Furfuryl alcohol	98-00-0
GLYCID	Glycidaldehyde	765-34-4
HBUTAD	Hexachlorobutadiene	87-68-3
HPENTA	Hexachlorocyclopentadiene	77-47-4
HNAPHT	Hexachloronaphthalene	1335-87-1
HPHOSP	Hexamethylphosphoramide	680-31-9
HYDRAZ	Hydrazine (and acid salts)	302-01-2
HBROMI	Hydrogen bromide	10035-10-6
HCHLOR	Hydrogen chloride	7647-01-0
HCYANI	Hydrogen cyanide	74-90-8
HSULFI	Hydrogen sulfide	7783-06-4
HYDROQ	Hydroquinone (dihydroxy benzene)	123-31-9
IMINOD	2,2-Iminodiethanol	111-42-2
IODINE	Iodine	7553-56-2
IACETA	Isoamyl acetate	123-92-2
IALCOH	Isoamyl alcohol	123-51-3

ISOPHO	Isophorone	78-59-1
ISOPRO	Isopropylamine	75-31-0
KETENE	Ketene (unsaturated ketone)	463-51-4
LEADPB	Lead (dust and salts) as Pb	7439-92-1
MALEIC	Maleic anhydride	108-31-6
MANGAN	Manganese	7439-96-5
MELAMI	Melamine	108-78-1
MERCUR	Mercury (metal and salts) as Hg	7439-97-6
MCELLO	Methyl cellosolve	109-86-4
MCHLOR	Methyl chloride	74-87-3
MEKETO	Methyl ethyl ketone (MEK)	78-93-3
MIODIN	Methyl iodine	74-88-4
MISOCY	Methyl isocyanate	624-83-9
MMERCA	Methyl mercaptan	74-93-1
MMETHA	Methyl methacrylate	80-62-6
MISOBU	Methyl-iso-butylketone	108-10-1
MMETHY	Methylchloromethylether	107-30-2
MECHLO	Methylene Chloride	75-09-2
MEDIAN	4,4-Methylene-dianiline	101-77-9
MHYDRA	Methylhydrazine	60-34-4
MONOCH	Monochlorobenzene (chlorobenzene)	108-90-7
NNAPHT	n-phenyl-beta-naphthylamine	135-88-6
NALINE	Napthalene	91-20-3
NAMINA	Napthylamine(alpha)	134-32-7
NAMINB	Napthylamine(beta)	91-59-8
NICKEL	Nickel (dust and salts) as Ni	7440-02-0
NITRIC	Nitric acid	7697-37-2
NITROA	p-Nitroaniline	100-01-6
NBENZE	Nitrobenzene	98-95-3
NBIPHE	4-Nitrobiphenyl	92-93-3
NMUSTA	Nitrogen mustard	51-75-2
NGLYCE	Nitroglycerine	55-63-0
NPHENO	p-Nitrophenol	100-02-7
NPROPA	1-Nitropropane	108-03-2
NSOMET	Nitroso-n-methylurea	684-93-5
NSODIM	n-Nitrosodimethylamine	62-75-9
NSOMOR	n-Nitrosomorpholine	59-89-2
NSOPHE	p-Nitrosophenol	104-91-6
NTOLUM	m-Nitrotoluene	99-08-1
NTOLUP	p-Nitrotoluene	99-99-0
OCTACH	Octachloronaphthalene	2234-13-1
OXALIC	Oxalic acid	144-62-7
PCPHEN	Pentachlorophenol (PCP)	87-86-5
PHENOL	Phenol	108-95-2
PDIAMI	p-Phenylenediamine	106-50-3
PHYDRA	Phenylhydrazine	100-63-0
PHOSGE	Phosgene	75-44-5
PHOSPH	Phosphorus	7723-14-0
PICRIC	Picric acid	88-89-1
PCBIPH	Polychlorinated byphenyls (PCBs)	11097-69-1
PROPAN	1,3-Propane sultone	1120-71-4
PROPYL	Propyleneimine	75-55-8
PYRIDI	Pyridine	110-86-1
QUINOL	Quinoline	91-22-5
QUINON	Quinone	106-51-4
RESORC	Resorcinol	108-46-3
ROTENO	Rotenone	83-79-4
SELENI	Selenium (dust and salts) as Se	7782-49-2
SOXIDE	Styrene oxide	96-09-3

STYREN	Styrene, monomer	100-42-5
TEREPH	Terephthalic acid	100-21-0
TETHYL	Tetrachlorethylene (perchlorethylene)	127-18-4
TDIBEN	2,3,7,8-Tetrachlorodibenzofuran	51207-31-9
TETHAN	1,1,2,2-Tetrachloroethane	79-34-5
TFURAN	Tetrahydrofuran	109-99-9
THALLI	Thallium (dust and salts) as Tl	7440-28-0
TITANI	Titanium oxide	13463-67-7
TOLUEN	Toluene	108-88-3
TDIAMI	2,4-Toluene-diamine	95-80-7
TDIISO	2,4-Toluene-di-isocyanate	584-84-9
TOLUID	o-Toluidine	95-53-4
TBENZE	1,2,4-Trichlorobenzene	120-82-1
TETHAL	1,1,1-Trichloroethane, methyl chloroform	71-55-6
TETHA2	1,1,2-Trichloroethane	79-00-5
TRICHL	Trichloroethylene	79-01-6
TURPEN	Turpentine	8006-64-2
URETHA	Urethane	51-79-6
VBROMI	Vinyl Bromide	593-60-2
VCHLOR	Vinyl chloride	75-01-4
VCYCLO	Vinyl cyclohexene dioxide	106-87-6
VFLUOR	Vinyl fluoride	75-02-5
VIDENE	Vinylidene chloride (1-1-Dichloroethene)	75-35-4
XYLENE	Xylene (all isomers)	1330-20-7
XYLIDI	Xylidine	1300-73-8
ZINCZN	Zinc (dust and salts) as Zn	7440-66-6

\*\* APPENDIX B \*\*

APPENDIX B

SUMMARY OF HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE

POLLUTANT	EMISSIONS (POUNDS)		
	POINT SOURCE	AREA SOURCE	TOTAL
1. Toluene	2,459,231	52,360	2,511,591
2. 1,1,1, Trichloroethane	1,496,539	0	1,496,539
3. Chlorine	1,337,003	0	1,337,003
4. Xylene	1,091,274	0	1,091,274
5. Acetone	804,521	0	804,521
6. Tetrachlorethylene	144,450	563,600	708,050
7. Methyl Cellosolve	632,248	0	632,248
8. Methyl Ethyl Ketone	512,611	0	512,611
9. Methyl Mercaptan	428,940	0	428,940
10. Chlorine Dioxide	296,787	0	296,787
11. Methylene Chloride	288,569	0	288,569
12. Ethylene Glycol Ethyl Ether	277,118	0	277,118
13. Hydrogen Sulfide	269,912	0	269,912
14. N-Butyl Acetate	253,563	0	253,563
15. Lead	630	202,800	203,430
16. Methyl Methacrylate	184,550	0	184,550
17. Butanol	149,490	0	149,490
18. Diphenyl methane 4,4-di- isocyanate	146,000	0	146,000
19. Hydrogen Chloride	44,731	96,000	140,731
20. 1,2 - Epoxypropane	124,600	0	124,600
21. Trichloroethylene	110,600	0	110,600
22. Formaldehyde	79,401	0	79,401
23. Turpentine	77,130	0	77,130
24. Ethyl Acetate	66,537	0	66,537
25. Benzene	0	52,392	52,392
26. Formic Acid	50,433	0	50,433
27. Nitric Acid	41,450	0	41,450
28. 1, 2 - Dichloroethane	32,400	0	32,400
29. Methyl Chloride	16,800	0	16,800
30. Benzo (a) Pyrene	0	15,000	15,000

## APPENDIX B (CONTINUED)

## SUMMARY OF HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE

POLLUTANT	EMISSIONS (POUNDS)		TOTAL
	POINT SOURCE	AREA SOURCE	
31. Methyl Isobutyl Ketone	14,045	0	14,045
32. Styrene	13,001	0	13,001
33. Napthalene	11,799	0	11,799
34. Bis Phthalate	10,190	0	10,190
35. Manganese	9,320	0	9,320
36. Furfural	7,110	0	7,110
37. Phenol	5,810	0	5,810
38. Diethyl Sulfate	5,424	0	5,424
39. Titanium Oxide	5,240	0	5,240
40. Biphenyl	4,510	0	4,510
41. Ethanol Amine	3,318	0	3,318
42. Cyanimide	2,955	0	2,955
43. 1,2 Dichlorobenzene	2,400	0	2,400
44. Barium	2,156	0	2,156
45. Ethylene Oxide	1,535	0	1,535
46. Acetic Anhydride	1,403	0	1,403
47. Chromium	184	820	1,004
48. Zinc	946	0	946
49. Oxalic Acid	868	0	868
50. Hydrazine	740	0	740
51. Tetrahydrofuran	400	0	400
52. P-nitrophenol	228	0	228
53. Cadmium	0	200	200
54. Copper	107	0	107
55. Ethyl Benzene	80	0	80
56. Mercury	16	0	16
57. Epichlorohydrin	12	0	12



\*\* APPENDIX C \*\*

APPENDIX C

AREA SOURCE EMISSIONS DATA

CATEGORY:  
DRY CLEANERS

DATA COLLECTION:  
Maine DEP statewide emissions inventory survey of dry cleaning establishments.  
72% of respondents used a cleaning solvent of which 82% was perc. 16.9% was stoddard, and .5% was freon 113. Each respondent on the avg. used 423.7 gal of perc., 86.5 gal of stoddard, and .5 gal freon 113.

- DATA ASSUMPTIONS:
1. Respondents and non-respondents of survey total 100% of ME dry cleaners.
  2. Amount of solvent purchased equals amount of solvent consumed.
  3. Amounts used by units not responding corresponds to state avg of responding units.
  4. Perchloroethylene weighs 13.6 lb/gal; stoddard ~6.1 lb/gal.
  5. Use of freon 113 assumed to be normal.

EMISSION FACTOR(S):

Perchloroethylene----	2000 lb/ton consumed
Stoddard solvent-----	2000 lb/ton consumed

CALCULATIONS:

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Estimated use	
Perc. and stod.	#non-resp. x 72.6% x avg.use of responds
Emissions VOC	#gal x wt/gal /2000 x EMF

TOTAL EMISSIONS:

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Perchloroethylene	
VOC's	281.8 tons
Stoddard solvent	
VOC's	25.84 tons

EMISSION FACTOR SOURCE:  
NEDS Source Classification Codes and Emission Factor Listing, EPA,  
Dec. 1984.

AREA SOURCE EMISSIONS DATA

DRY CLEANERS

COUNTY	USE OF RESPONDING UNITS (GALS)		EMISSIONS OF RESPONDENTS VOC (TONS)		#UNITS IN COUNTY NOT RESPONDING OR UNKNOWN	ESTIMATED USE OF NON-RESPONDS. (GAL)		EMISSIONS OF NON-RESPONDS VOC (TONS)		TOTAL PERC.VOC EMITTED (TONS)	TOTAL STOD.VOC EMITTED (TONS)
	PERC.	STOD.	PERC.	STOD.		PERC.	STOD.	PERC.	STOD.		
ANDROSCOGGIN	1189		8.0		7	2153.3		14.6		22.7	
AROOSTOOK	1525		10.3			0	440.7	.0	1.3	10.3	1.3
CUMBERLAND	8007	1760	54.4	5.3	11	3383.8	.0	23.0	.0	77.4	5.3
FRANKLIN	1976		13.4			0	692.6	.0	2.1	13.4	2.1
HANCOCK	585	702	3.9	2.1	3	922.8	.0	6.2	.0	10.2	2.1
KENNEBEC	2453		16.6		8	2461.0	188.8	16.7	.5	33.4	.5
KNOX	450		3.0		4	1230.5	503.7	8.3	1.5	11.4	1.5
LINCOLN			.0		1	307.6	251.8	2.0	.7	2.0	.7
OXFORD	805		5.4		1	307.6	62.9	2.0	.1	7.5	.1
PENOBSCOT	2063	972	14.0	2.9	7	2153.3	62.9	14.6	.1	28.6	3.1
PISQUATAQUIS	245	1325	1.6	4.0	1	307.6	440.7	2.0	1.3	3.7	5.3
SAGadahoc			.0		2	615.2	62.9	4.1	.1	4.1	.1
SOMERSET	600		4.0		2	615.2	125.9	4.1	.3	8.2	.3
WALDO	600		4.0			0	125.9	.0	.3	4.0	.3
WASHINGTON	650		4.4		3	922.8	.0	6.2	.0	10.6	.0
YORK	2157		14.6		9	2768.6	188.8	18.8	.5	33.4	.5
						566.6			1.7		1.7
TOTALS	23305	4759	158.4	14.5	59.0	18149.9	3714.8	123.4	11.3	281.8	25.8

AREA SOURCE EMISSIONS  
DATA

CATEGORY:

Degreasers - Area source

DATA COLLECTION:

Population data obtained from the Maine Dept. of Human Services bulletin: "Population projections of Main counties and minor civil divisions for total population - July 1 (1982-1991)."

DATA ASSUMPTIONS:

1. Population projections for 1983 are representative of 1984.
2. All area source degreasers are of the cold cleaning variety.

Note: A major source of cold cleaning degreasing chemicals in ME is the Safety Kleen Corp. who supplies and recycles these chemicals, of which petroleum naphtha represents nearly 100%. Rich Baker of the Oil and Hazardous Waste Materials Bureau, confirms this information.

EMISSION FACTOR(S):

All VOC emissions-----	4 lb/cap-yr
All reactive VOC emissions---	3 lb/cap-yr

CALCULATIONS

<u>POLLUTANT</u>	<u>FÓRMULA</u>
Total VOC	Pop. x emf / 2000
Total reactive VOC	Pop. x emf / 2000

TOTAL EMISSIONS

VOC emissions	2297.4 tons
Reactive VOC emiss.	1723.0 tons

EMISSION FACTOR SOURCE:

EPA-450/2-77-028, Sec.4.3.2.2, Cold Cleaning Degreasing

AREA SOURCE EMISSIONS

DEGREASERS

COUNTIES AND SELECTED CITIES	POPULATION	VOC	REACTIVE										
		tons	VOC tons										
ANDROSCOGGIN	100900	201.8	151.3										
Auburn	22300	44.6	33.4										
Lewiston	40650	81.3	60.9										
AROSTOOK	90400	180.8	135.6										
Presque Isle	10850	21.7	16.2										
CUMBERLAND	220100	440.2	330.1										
Brunswick	17550	35.1	26.3										
Portland	61100	122.2	91.6										
S. Portland	23000	46.0	34.5										
Westbrook	15250	30.5	22.8										
FRANKLIN	28500	57.0	42.7										
HANCOCK	42700	85.4	64.0										
KENNEBEC	112850	225.7	169.2										
Augusta	22050	44.1	33.0										
Waterville	17050	34.1	25.5										
KNOX	34050	68.1	51.0										
LINCOLN	26150	52.3	39.2										
OXFORD	48800	97.6	73.2										
PENOBSCOT	141150	282.3	211.7										
Bangor	33350	66.7	50.0										
Brewer	8600	17.2	12.9										
PISQUATAQUIS	17850	35.7	26.7										
SAGadahoc	28050	56.1	42.0										
Bath	9950	19.9	14.9										
SOMERSET	47050	94.1	70.5										
WALDO	28500	57.0	42.7										
WASHINGTON	33550	67.1	50.3										
YORK	148100	296.2	222.1										
Biddeford	20400	40.8	30.6										
Saco	12650	25.3	18.9										
Sanford	19450	38.9	29.1										
TOTALS	1148700	2297.4	1723.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

AREA SOURCE EMISSIONS  
DATA

CATEGORY:

Residential Open Burning (Dumps)

DATA COLLECTION:

Data concerning which towns employ open burning of solid waste and the town's population obtained from the Maine Dept. of Env't'l-Protection's Bureau of Land Quality Control (based on 1984 inspection reports on all Maine dumps).

DATA ASSUMPTIONS:

1. Assumed solid waste disposal of 6.66 tons/thous people per week.
2. Assumed 60% burning of solid waste disposed.
3. Assumed brush burning is insignificant at Maine dumps.
4. Assumed 1984 dump conditions are representative for 1983.

CALCULATIONS

Pollutants	Pop. x 6.66t/1000 per wk x 52 wk/yr x 60% x EMF ton/2000lb
B(a)P	Amt. Part. x .00012

EMISSION FACTOR(S):

Particulates-----	16 lb/ton
Sulfur oxides-----	1 lb/ton
Carbon monoxide-----	85 lb/ton
VOC methane-----	13 lb/ton
VOC non-methane-----	30 lb/ton
Nitrogen oxides-----	6 lb/ton
Benzo(a)pyrene-----	.00012 lb/ton

TOTAL EMISSIONS

Particulates	210.2 tons
Sulfur oxides	13.1 tons
Carbon monoxide	1117.0 tons
VOC methane	170.8 tons
VOC non-methane	394.2 tons
Nitrogen oxides	78.8 tons
Benzo(a)pyrene	.0252 tons

EMISSION FACTOR SOURCE:

AP-42, Sec.2.4: Open Burning, Table 2.4-1. Maine DEP, Bureau of Land Quality Control and conversation with DHS toxicologist Norm Anderson Jan.30, 1985.

AREA SOURCE EMISSIONS

RESIDENTIAL OPEN BURNING (DUMPS)

COUNTIES AND SELECTED CITIES	POPULATION	POP. AREAS OPEN BURN SOL. WASTE	PARTICULAT tons	SULFUR OXIDES tons	CARBON MONOXIDE tons	VOC METHANE tons	VOC NON-METHAN tons	NITROGEN OXIDES tons	B(a)P tons	tons
ANDROSCOGGIN	100900	7427	12.3	.77	65.5	10.0	23.1	4.6	.0014	
Auburn	22300		.0	.00	.0	.0	.0	.0	.0000	
Lewiston	40650		.0	.00	.0	.0	.0	.0	.0000	
AROOSTOOK	90400	13749	22.8	1.42	121.4	18.5	42.8	8.5	.0027	
Presque Isle	10850		.0	.00	.0	.0	.0	.0	.0000	
CUMBERLAND	220100	4968	8.2	.51	43.8	6.7	15.4	3.0	.0009	
Brunswick	17550		.0	.00	.0	.0	.0	.0	.0000	
Portland	61100		.0	.00	.0	.0	.0	.0	.0000	
S.Portland	23000		.0	.00	.0	.0	.0	.0	.0000	
Westbrook	15250		.0	.00	.0	.0	.0	.0	.0000	
FRANKLIN	28500	6133	10.1	.63	54.1	8.2	19.1	3.8	.0012	
HANCOCK	42700	5974	9.9	.62	52.7	8.0	18.6	3.7	.0011	
KENNEBEC	112850	5537	9.2	.57	48.8	7.4	17.2	3.4	.0011	
Augusta	22050		.0	.00	.0	.0	.0	.0	.0000	
Waterville	17050		.0	.00	.0	.0	.0	.0	.0000	
KNOX	34050	1002	1.6	.10	8.8	1.3	3.1	.6	.0001	
LINCOLN	26150	6090	10.1	.63	53.7	8.2	18.9	3.7	.0012	
OXFORD	48800	15560	25.8	1.61	137.4	21.0	48.4	9.6	.0031	
PENOBSCOT	141150	19155	31.8	1.99	169.1	25.8	59.7	11.9	.0038	
Bangor	33350		.0	.00	.0	.0	.0	.0	.0000	
Brewer	8600		.0	.00	.0	.0	.0	.0	.0000	
PISQUATAQUIS	17850	9324	15.4	.96	82.3	12.5	29.0	5.8	.0018	
SAGadahoc	28050	735	1.2	.07	6.4	.9	2.2	.4	.0001	
Bath	9950		.0	.00	.0	.0	.0	.0	.0000	
SOMERSET	47050	8399	13.9	.87	74.1	11.3	26.1	5.2	.0016	
WALDO	28500	7787	12.9	.80	68.7	10.5	24.2	4.8	.0015	
WASHINGTON	33550	5434	9.0	.56	47.9	7.3	16.9	3.3	.0010	
YORK	148100	9213	15.3	.95	81.3	12.4	28.7	5.7	.0018	
Biddeford	20400		.0	.00	.0	.0	.0	.0	.0000	
Saco	12650		.0	.00	.0	.0	.0	.0	.0000	
Sanford	19450		.0	.00	.0	.0	.0	.0	.0000	
TOTALS	1148700	126487.0	210.2	13.14	1117.0	170.8	394.2	78.84	.0252	.0

Total VOC 565.0

Individual city data not available.

AREA SOURCE EMISSIONS  
DATA

CATEGORY:

Agricultural burning - Blueberries

DATA COLLECTION:

Contact was made with Ed McLaughlin and David Yarborough, both asst. scientists with the University of Maine Plant and Soil Dept.

DATA ASSUMPTIONS:

1. It was determined that the only significant agricultural field burning in Maine during 1983 occurred from blueberry field prep.
2. Assumed that in any year 1/2 of the blueberry acreage is burned. The USAGE column represents this 1/2.
3. Assumed that of Washington County's burnable acreage, 25% was pruned.
4. The ratio of BaP/particulates of woodsmoke emissions is .00012.

EMISSION FACTOR(S):

Particulates-----	21 lb/ton
Carbon monoxide-----	117 lb/ton
VOC methane-----	5.4 lb/ton
VOC non-methane-----	18 lb/ton
Benzo(a)pyrene-----	.00012 x part. emiss.
Fuel Loading Factor-----	2 tons/acre

EMISSION FACTOR SOURCE:

AP-42: Open Burning of Agricultural materials: field crops unspecified (Sec.2.4) and conservation with DHS toxicologist Norm Anderson Jan.30, 1985. Acres of land in blueberry production supplied by David Yarborough.

CALCULATIONS

-----  
Pollutants                      Ac x flf x emf / 2000  
  
B(a)P                              Part.emiss. x .00012

TOTAL EMISSIONS

-----  
Particulates                      523.9 tons  
Carbon monoxide                  2919.0 tons  
VOC methane                      134.7 tons  
VOC non-methane                  449.0 tons  
Benzo(a)pyrene                    .0628 tons



AREA SOURCE EMISSIONS

AGRICULTURAL BURNING -BLUEBERRY

COUNTIES AND SELECTED CITIES	POPULATION	USAGE 1/2 tot ac burned/yr	PARTICULAT tons	CARBON MONOXIDE tons	VOC METHANE tons	VOC NON-METHAN tons	B(a)P tons
ANDROSCOGGIN	100900	N/A					
Auburn	22300	"					
Lewiston	40650	"					
ARCOSTOOK	90400	16	.33	1.87	.08	.28	.00004
Presque Isle	10850	N/A					
CUMBERLAND	220100	482	10.12	56.39	2.60	8.67	.00121
Brunswick	17550	N/A					
Portland	61100	"					
S.Portland	23000	"					
Westbrook	15250	"					
FRANKLIN	28500	"					
HANCOCK	42700	5021	105.44	587.45	27.11	90.37	.01265
KENNEBEC	112850	180	3.78	21.06	.97	3.24	.00045
Augusta	22050	N/A					
Waterville	17050	"					
KNOX	34050	2555	53.65	298.93	13.79	45.99	.00643
LINCOLN	26150	554	11.63	64.81	2.99	9.97	.00139
OXFORD	48800	N/A					
PENOBSCOT	141150	65	1.36	7.60	.35	1.17	.00016
Bangor	33350	N/A					
Brewer	8600	"					
PISQUATAQUIS	17850	"					
SAGadahoc	28050	"					
Bath	9950	"					
SOMERSET	47050	"					
WALDO	28500	1893	39.75	221.48	10.22	34.07	.00477
WASHINGTON	33550	14063	295.32	1645.37	75.94	253.13	.03543
YORK	148100	120	2.52	14.04	.64	2.16	.00030
Biddeford	20400	N/A					
Saco	12650	"					
Sanford	19450	"					
TOTALS	1148700	24949.0	523.9	2919.0	134.7	449.0	.0628
					Total VOC	583.8	

Individual city data not available.

AREA SOURCE EMISSIONS  
DATA

CATEGORY:  
Forest Wildfire

DATA COLLECTION:  
Forest acres burned by county in 1983 obtained from Maine Forest Service (Dept. of Conservation).

DATA ASSUMPTIONS:  
Fuel loading assumed to be 11 tons/acre (source: AP-42 sec.11.1).  
The ratio of BaP/part. of wood smoke emissions is .00012. This figure x the amt of particulates from forest wildfire emissions = the amt of BaP.

EMISSION FACTOR(S):

Particulates-----	17 lbs/ton
Carbon monoxide-----	140 lbs/ton
Total hydrocarbons---	24 lbs/ton
Nitrogen oxides-----	4 lbs/ton
Benzo (a) pyrene-----	.00012 x amt of part. lbs/ton

CALCULATIONS

<u>POLLUTANT</u>	<u>FORMULA</u>
Particulates	Use x 11t/ac x EME/2000
Carbon monoxide	Use x 11t/ac x EME/2000
Total hydrocarbon	Use x 11t/ac x EME/2000
Nitrogen oxides	Use x 11t/ac x EME/2000
Benzo (a) pyrene	Amt part x EME

TOTAL EMISSIONS

Particulates	83.4 tons
Carbon monoxide	687.4 tons
Total hydrocarbons	117.8 tons
Nitrogen oxides	19.6 tons
Benzo (a) pyrene	.01 tons

EMISSION FACTOR SOURCE:  
AP-42 Forest Wildfires (Sec.11.1) and conversation with DHS toxicologist Norm Anderson, Jan.30, 1985, (for BaP).

AREA SOURCE EMISSIONS		FOREST WILDFIRE					
COUNTIES AND SELECTED CITIES	POPULATION	USAGE (1983 acre burned)	PARTICULAT tons	CARBON MONOXIDE tons	TOTAL HYDROCARB. tons	NITROGEN OXIDES tons	B(a)P tons
ANDROSCOGGIN	100900	21.5	2.0	16.5	2.8	.47	.0002
Auburn	22300						
Lewiston	40650						
AROOSTOOK	90400	79.2	7.4	60.9	10.4	1.74	.0008
Presque Isle	10850						
CUMBERLAND	220100	34.6	3.2	26.6	4.5	.76	.0003
Brunswick	17550						
Portland	61100						
S. Portland	23000						
Westbrook	15250						
FRANKLIN	28500	9.9	.9	7.6	1.3	.21	.0001
HANCOCK	42700	53.2	4.9	40.9	7.0	1.17	.0005
KENNEBEC	112850	28.9	2.7	22.2	3.8	.63	.0003
Augusta	22050						
Waterville	17050						
KNOX	34050	69.1	6.4	53.2	9.1	1.52	.0007
LINCOLN	26150	21.0	1.9	16.1	2.7	.46	.0002
OXFORD	48800	28.1	2.6	21.6	3.7	.61	.0003
PENOBSCOT	141150	108.9	10.1	83.8	14.3	2.39	.0012
Bangor	33350						
Brewer	8600						
PISQUATAQUIS	17850	32.4	3.0	24.9	4.2	.71	.0003
SAGADAHOC	28050	22.8	2.1	17.5	3.0	.50	.0002
Bath	9950						
SOMERSET	47050	28.1	2.6	21.6	3.7	.61	.0003
WALDO	28500	16.6	1.5	12.7	2.1	.36	.0001
WASHINGTON	33550	290.0	27.1	223.3	38.2	6.38	.0032
YORK	148100	48.5	4.5	37.3	6.4	1.06	.0005
Biddeford	20400						
Saco	12650						
Sanford	19450						
TOTALS	1148700	892.8	83.4	687.4	117.8	19.64	.0100

Individual city data not available.

AREA SOURCE EMISSIONS DATA

CATEGORY:

Architectural Surface Coating

DATA COLLECTION:

Population figures obtained from "Population projection of Maine counties and minor civil divisions for total populations, 1982-1991" by the ME Dept. of Human Services.

CALCULATIONS:

-----  
-----  
Total VOC's                      Population x EME/2000

DATA ASSUMPTIONS:

1. Population projections for 1983 were representative for the year 1983.
2. Usage of architectural surface coatings is proportional to the population.

EMISSION FACTOR(S):

VOC's-----                      4.6 lb/cap-yr

TOTAL EMISSIONS:

-----  
-----  
Total VOC's                      2642.01 tons

EMISSION FACTOR SOURCE:

AP-42, 4.2.1 Nonindustrial surface coating.

AREA SOURCE EMISSIONS DATAARCHITECTURAL SURFACE COATING

COUNTY	POPULATION	VOC EMISSIONS (TONS/YR)
ANDROSCOGGIN	100900	232.0
AROOSTOOK	90400	207.9
CUMBERLAND	220100	506.2
FRANKLIN	28500	65.5
HANCOCK	42700	98.2
KENNEBEC	112850	259.5
KNOX	34050	78.3
LINCOLN	26150	60.1
OXFORD	48800	112.2
PENOBSCOT	141150	324.6
PISQUATAQUIS	17850	41.0
SAGadahoc	28050	64.5
SOMERSET	47050	108.2
WALDO	28500	65.5
WASHINGTON	33550	77.1
YORK	148100	340.6
TOTALS	1148700	2642.0

AREA SOURCE EMISSIONS  
DATA

CATEGORY:

Highway line and bridge painting

DATA COLLECTION:

All data obtained from the Maine Dept. of Transportation by personal communication. Line paint data was obtained from Dick Weeks of Division of Traffic Engineering, Jan.30,1985. Data for bridge painting obtained from John Butts and Ron Cyr of the Design Division and Bridge Maintenance Division respectively, Jan.31, 1985.

DATA ASSUMPTIONS:

1. One gallon of solvent-based paint contains 5.6 lbs of VOC.
2. 100% of the solvent applied to the highway or bridge surface is emitted.

Note: Highway paint solvent primarily consist of toluene with small amounts of methylene chloride, xylene, hexane, vm+p naphtha, and 1,1,1, trichloroethane. Bridge paint primarily utilizes mineral spirits.

EMISSION FACTOR(S):

Total VOC	5.6 lb/gal
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CALCULATIONS

<u>POLLUTANT</u>	<u>FORMULA</u>
VOC	Usage x 5.6 / 2000

TOTAL EMISSIONS

VOC--road paint	422.3 tons
VOC--bridge paint	38.3 tons
Total VOC	460.8 tons

EMISSION FACTOR SOURCE:

EPA--NEDS Source Classification Codes and Emission Factor Listing--  
Surface Coating Operations,p96-97.

AREA SOURCE EMISSIONS

HIGHWAY LINE AND BRIDGE PAINTING

COUNTIES	POPULATION	LINE PAINT USAGE gals	LINE PAINT VOC tons	BRIDGE PNT USAGE gals	BRIDGE PNT VOC tons	TOTAL VOC tons
ANDROSCOGGIN	100900	4570	12.7	16	.04	12.8
AROOSTOOK	90400	19806	55.4		.00	55.4
CUMBERLAND	220100	10665	29.8	8360	23.40	53.2
FRANKLIN	28500	9141	25.5		.00	25.5
HANCOCK	42700	12188	34.1		.00	34.1
KENNEBEC	112850	9141	25.5	5040	14.11	39.7
KNOX	34050	4570	12.7		.00	12.7
LINCOLN	26150	6094	17.0		.00	17.0
OXFORD	48800	12188	34.1		.00	34.1
PENOBSCOT	141150	15236	42.6	240	.67	43.3
PISQUATAQUIS	17850	4570	12.7	24	.06	12.8
SAGADAHOC	28050	3047	8.5		.00	8.5
SOMERSET	47050	12188	34.1		.00	34.1
WALDO	28500	6094	17.0		.00	17.1
WASHINGTON	33550	10665	29.8		.00	29.9
YORK	148100	10665	29.8		.00	29.9
COUNTY OF USE UNAVAILABLE*----				2965	8.30	.0
TOTALS	1148700	150828.0	422.3	13680.0	38.3	460.8

Individual city data not available.

\*County breakdown of bridge paint used for maintenance is not available.

AREA SOURCE EMISSIONS  
DATA

CATEGORY:

Printing Industry

DATA COLLECTION:

Population data obtained from the Maine Dept. of Human Services Bulletin, "Population projections of Maine counties and minor civil division for total population - July (1982-1991)."

CALCULATIONS

<u>POLLUTANT</u>	<u>FORMULA</u>
VOC non-methane	EMF * Population

DATA ASSUMPTIONS:

1. Population projections for 1983 were representative for the year 1983.

EMISSION FACTOR(S):

Non-Methane VOC ----- .8 lb/yr/capita

TOTAL EMISSIONS

VOC non-methane 918960 lb/yr

EMISSION FACTOR SOURCE:

AP-42, Sec. 4.9, table 4.9-2



AREA SOURCE EMISSIONS DATA

PRINTING INDUSTRY

COUNTIES AND SELECTED CITIES	POPULATION	FACTOR lb/yr/cap	TOTAL VOC non-meth. lbs	POLLUTANTS					
ANDROSCOGGIN	100900	.8	80720						
Auburn	22300	.8	17840						
Lewiston	40650	.8	32520						
AROOSTOOK	90400	.8	72320						
Presque Isle	10850	.8	8680						
CUMBERLAND	220100	.8	176080						
Brunswick	17550	.8	14040						
Portland	61100	.8	48880						
S.Portland	23000	.8	18400						
Westbrook	15250	.8	12200						
FRANKLIN	28500	.8	22800						
HANCOCK	42700	.8	34160						
KENNEBEC	112850	.8	90280						
Augusta	22050	.8	17640						
Waterville	17050	.8	13640						
KNOX	34050	.8	27240						
LINCOLN	26150	.8	20920						
OXFORD	48800	.8	39040						
PENOBSCOT	141150	.8	112920						
Bangor	33350	.8	26680						
Brewer	8600	.8	6880						
PISQUATAQUIS	17850	.8	14280						
SAGadahoc	28050	.8	22440						
Bath	9950	.8	7960						
SOMERSET	47050	.8	37640						
WALDO	28500	.8	22800						
WASHINGTON	33550	.8	26840						
YORK	148100	.8	118480						
Biddeford	20400	.8	16320						
Saco	12650	.8	10120						
Sanford	19450	.8	15560						
TOTALS	1148700		918960	0	0	0	0	0	0

AREA SOURCE EMISSIONS  
DATA

CATEGORY:

Residential Wood Combustion

DATA COLLECTION:

State consumption of wood for Maine for 1982 was obtained from the Maine Office of Energy Resources 'Comprehensive Energy Plan (1983).' Population figures obtained from "Population Projections of Maine counties and minor civil divisions for total population, 1982-1991," by the Maine Dept. of Human Services.

DATA ASSUMPTIONS:

1. 2.5 tons/cord of wood.
2. State consumption of wood apportioned to the county level on the basis of county population as a % of the state population total.
3. 1982 wood usage data is representative of 1983 wood usage.
4. All wood burned in wood stoves.

EMISSION FACTOR(S):

Particulates -----	42 lb/ton
SOx -----	.4 lb/ton
NOx -----	2.8 lb/ton
CO -----	260 lb/ton
P.O.M. -----	.3 gm/kg
B(a)P -----	.0025 gm/kg
VOC methane -----	1 lb/ton
VOC non-methane -----	100 lb/ton

EMISSION FACTOR SOURCE:

AP-42, Particulates, SOx, NOx, CO, VOC: meth. & non-meth (res.wood stoves)  
J.A.Cooper, JAPCA, Avg'80 "Environmental impact of Res. Wood Combustion and its implications- POM and BaP, Res. Wood Stoves.

CALCULATIONS

Usage =  
State Usage \* 1193000 cds  
Tons per Cord 2.5 ton/cd

Pollutants  
(In lbs) Usage \* EMF / 2000 lb/t  
  
(In kg) Usage \* EMF / 1000 g/kg

TOTAL EMISSIONS

Particulates	62632.4 tons
SOx	596.4 tons
NOx	4175.4 tons
CO	387724.9 tons
P.O.M.	894.7 tons
B(a)P	7.4 tons
VOC methane	1491.2 tons
VOC non-methane	149124.9 tons

AREA SOURCE EMISSIONS

RESIDENTIAL WOOD COMBUSTION

COUNTIES AND SELECTED CITIES	POPULATION	USAGE tons	PARTICULAT tons	SOx tons	NOx tons	CO tons	P.O.M. tons	B(a)P tons	VOC methane tons	VOC non-meth. tons
ANDROSCOGGIN	100900	261978.1	5501.5	52.3	366.7	34057.1	78.5	.65	130.9	13098.9
Auburn	22300	57900.0	1215.9	11.5	81.0	7527.0	17.3	.14	28.9	2895.0
Lewiston	40650	105544.2	2216.4	21.1	147.7	13720.7	31.6	.26	52.7	5277.2
AROSTOOK	90400	234715.7	4929.0	46.9	328.6	30513.0	70.4	.58	117.3	11735.7
Presque Isle	10850	28171.0	591.5	5.6	39.4	3662.2	8.4	.07	14.0	1408.5
CUMBERLAND	220100	571470.5	12000.8	114.2	800.0	74291.1	171.4	1.42	285.7	28573.5
Brunswick	17550	45567.0	956.9	9.1	63.7	5923.7	13.6	.11	22.7	2278.3
Portland	61100	158640.8	3331.4	31.7	222.0	20623.3	47.5	.39	79.3	7932.0
S.Portland	23000	59717.5	1254.0	11.9	83.6	7763.2	17.9	.14	29.8	2985.8
Westbrook	15250	39595.3	831.5	7.9	55.4	5147.3	11.8	.09	19.7	1979.7
FRANKLIN	28500	73997.7	1553.9	14.7	103.5	9619.7	22.1	.18	36.9	3699.8
HANCOCK	42700	110866.8	2328.2	22.1	155.2	14412.6	33.2	.27	55.4	5543.3
KENNEBEC	112850	293005.2	6153.1	58.6	410.2	38090.6	87.9	.73	146.5	14650.2
Augusta	22050	57250.9	1202.2	11.4	80.1	7442.6	17.1	.14	28.6	2862.5
Waterville	17050	44268.8	929.6	8.8	61.9	5754.9	13.2	.11	22.1	2213.4
KNOX	34050	88407.8	1856.5	17.6	123.7	11493.0	26.5	.22	44.2	4420.3
LINCOLN	26150	67896.2	1425.8	13.5	95.0	8826.5	20.3	.16	33.9	3394.8
OXFORD	48800	126704.9	2660.8	25.3	177.3	16471.6	38.0	.31	63.3	6335.2
PENOBSCOT	141150	366483.7	7696.1	73.2	513.0	47642.8	109.9	.91	183.2	18324.1
Bangor	33350	86590.3	1818.3	17.3	121.2	11256.7	25.9	.21	43.2	4329.5
Brewer	8600	22329.1	468.9	4.4	31.2	2902.7	6.6	.05	11.1	1116.4
PISQUATAQUIS	17850	46345.9	973.2	9.2	64.8	6024.9	13.9	.11	23.1	2317.2
SAGadahoc	28050	72829.3	1529.4	14.5	101.9	9467.8	21.8	.18	36.4	3641.4
Bath	9950	25834.3	542.5	5.1	36.1	3358.4	7.7	.06	12.9	1291.7
SOMERSET	47050	122161.2	2565.3	24.4	171.0	15880.9	36.6	.30	61.0	6108.0
WALDO	28500	73997.7	1553.9	14.7	103.5	9619.7	22.1	.18	36.9	3699.8
WASHINGTON	33550	87109.6	1829.3	17.4	121.9	11324.2	26.1	.21	43.5	4355.4
YORK	148100	384528.8	8075.1	76.9	538.3	49988.7	115.3	.96	192.2	19226.4
Biddeford	20400	52966.8	1112.3	10.5	74.1	6885.6	15.8	.13	26.4	2648.3
Saco	12650	32844.6	689.7	6.5	45.9	4269.8	9.8	.08	16.4	1642.2
Sanford	19450	50500.2	1060.5	10.1	70.7	6565.0	15.1	.12	25.2	2525.0
TOTALS	1148700	2401086.2	62632.4	596.4	4175.4	387724.9	894.7	7.45	1491.2	149124.9

AREA SOURCE EMISSIONS DATA

CATEGORY:

Waste oil

DATA COLLECTION:

Note: PCB 5-7 ppm in fuel resulted in no detectable

DATA ASSUMPTIONS:

1. Assume waste oil weighs 8lb/gal.
2. Assume even distribution by population.

EMISSION FACTOR(S):

Lead-----	.001000 % Waste oil
Chlorine-----	.004000 % Waste oil
Arsenic-----	.000018 % Waste oil
Cadmium-----	.000010 % Waste oil
Chromium-----	.000035 % Waste oil

EMISSION FACTOR SOURCE:

A.D.Little, Waste Oil Combustion at a Bituminous Concrete Batching Plant, August 1984.

CALCULATIONS:

Chlorine  $Tot.pop/cty.pop \times use$   
 $\times 8 \times EMF \times .01/2000$

All other pollutants  $Tot.pop/cty.pop \times use$   
 $\times 8 \times EMF / 2000$

TOTAL EMISSIONS:

Lead	11.99 tons
Chlorine	47.99 tons
Arsenic	.21 tons
Cadmium	.11 tons
Chromium	.41 tons

AREA SOURCE EMISSIONS DATA

WASTE OIL

COUNTY	POPULATION	USAGE gal	LEAD tons	CHLORINE tons	ARSENIC tons	CADMIUM tons	CHROMIUM tons
ANDROSCOGGIN	100900	263515.2	1.05	4.21	.018	.010	.036
AROOSTOOK	90400	236092.9	.94	3.77	.016	.009	.033
CUMBERLAND	220100	574823.7	2.29	9.19	.041	.022	.080
FRANKLIN	28500	74431.9	.29	1.19	.005	.002	.010
HANCOCK	42700	111517.3	.44	1.78	.008	.004	.015
KENNEBEC	112850	294724.4	1.17	4.71	.021	.011	.041
KNOX	34050	88926.6	.35	1.42	.006	.003	.012
LINCOLN	26150	68294.5	.27	1.09	.004	.002	.009
OXFORD	48800	127448.4	.50	2.03	.009	.005	.017
PENOBSCOT	141150	368634.1	1.47	5.89	.026	.014	.051
PISQUATAQUIS	17850	46617.9	.18	.74	.003	.001	.006
SAGadahoc	28050	73256.7	.29	1.17	.005	.002	.010
SOMERSET	47050	122878.0	.49	1.96	.008	.004	.017
WALDO	28500	74431.9	.29	1.19	.005	.002	.010
WASHINGTON	33550	87620.7	.35	1.40	.006	.003	.012
YORK	148100	386785.0	1.54	6.18	.027	.015	.054
TOTALS	1148700	3000000	11.99	47.99	.215	.119	.419

AREA SOURCE EMISSIONS DATA

CATEGORY:

Automotive lead emissions

DATA COLLECTION:

Lead emissions by county from Maine State Implementation Plan data  
Table 2.5.1 (3) "Area source automotive lead emissions by counties."

CALCULATIONS:

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DATA ASSUMPTIONS:

EMISSION FACTOR(S):

TOTAL EMISSIONS:

-----  
Lead emissions 89.4 tons

EMISSION FACTOR SOURCE:

AREA SOURCE EMISSIONS DATAAUTOMOTIVE LEAD EMISSIONS

COUNTY	POPULATION	LEAD EMISSIONS (tons/yr)
ANDROSCOGGIN	100900	6.5
AROOSTOOK	90400	6.4
CUMBERLAND	220100	18.3
FRANKLIN	28500	2.1
HANCOCK	42700	4.4
KENNEBEC	112850	8.6
KNOX	34050	2.2
LINCOLN	26150	2.4
OXFORD	48800	3.6
PENOBSCOT	141150	10.6
PISQUATAQUIS	17850	1.3
SAGADAHOC	28050	2.3
SOMERSET	47050	4.3
WALDO	28500	2.3
WASHINGTON	33550	2.8
YORK	148100	11.3
TOTALS	1148700	89.4

AREA SOURCE EMISSIONS DATA

CATEGORY:

Gasoline Service Station Operations

DATA COLLECTION:

Gasoline usage obtained from Maine gasoline sales information, provided by the Maine Office of Energy Resources. Total gas sold was apportioned to the county level by % vehicle miles traveled (VMT). VMT data was obtained from the Maine Dept. of Transportation.

DATA ASSUMPTIONS:

1. VMT is proportional to amount of gasoline used.
2. 1982 VMT data is representative of 1983 conditions.
3. Gasoline applies only to leaded, unleaded, and regular gasoline.
4. All service stations operations utilize no emission controls.
5. % benzene and toluene emissions from fuel tanks similar to all other gasoline station operations.

EMISSION FACTOR(S):

Splash filling-----	11.5 lb/thous gal
Underground tank breathing + emptying-----	1.0 lb/thous gal
Refueling loss-----	9.0 lb/thous gal
Spillage-----	.7 lb/thous gal
Benzene-----	.004 x VOC(tons)
Toluene-----	.004 x VOC(tons)

EMISSION FACTOR SOURCE:

AP-42, (Table 4.4-4): Hydrocarbons and Vapor Phase Organic Pollutants Table 2-6, page 13, "Benzene and toluene emissions from gas tanks," Jackson and Everett.

CALCULATIONS:

TOTAL EMISSIONS:

VOC	5955.63 tons
Benzene	23.82 tons
Toluene	23.82 tons
Underground tanks	
Splash filling*	3109.80 tons
Breathing + emptying*	270.41 tons
Refueling loss*	2433.76 tons
Spillage*	189.29 tons

\*All pollutants



AREA SOURCE EMISSIONS

GASOLINE SERVICE STATION OPERATIONS

	USAGE THRU-PUT THOUS GALS	POLLUTANTS EMITTED	UNDERGROUND TANKS		REFUELING LOSS tons	SPILLAGE tons	TOTAL VOC tons	TOTAL BENZENE tons	TOTAL TOLUENE tons
			SPLASH FILLING tons	BREATHING +EMPTYING tons					
ANDROSCOGGIN	41667.0	VOC	239.58	20.83	187.50	14.58	462.50		
		Benzene	.95	.08	.75	.05		1.85	
		Toluene	.95	.08	.75	.05			1.85
AROOSTOOK	41096.2	VOC	236.30	20.54	184.93	14.38	456.16		
		Benzene	.94	.08	.73	.05		1.82	
		Toluene	.94	.08	.73	.05			1.82
CUMBERLAND	114727.0	VOC	659.68	57.36	516.27	40.15	1273.46		
		Benzene	2.63	.22	2.06	.16		5.09	
		Toluene	2.63	.22	2.06	.16			5.09
FRANKLIN	14840.0	VOC	85.33	7.42	66.78	5.19	164.72		
		Benzene	.34	.02	.26	.02		.65	
		Toluene	.34	.02	.26	.02			.65
HANCOCK	28539.0	VOC	164.09	14.26	128.42	9.98	316.78		
		Benzene	.65	.05	.51	.03		1.26	
		Toluene	.65	.05	.51	.03			1.26
KENNEBEC	55365.8	VOC	318.35	27.68	249.14	19.37	614.56		
		Benzene	1.27	.11	.99	.07		2.45	
		Toluene	1.27	.11	.99	.07			2.45
KNOX	14269.5	VOC	82.04	7.13	64.21	4.99	158.39		
		Benzene	.32	.02	.25	.01		.63	
		Toluene	.32	.02	.25	.01			.63
LINCOLN	15411.0	VOC	88.61	7.70	69.34	5.39	171.06		
		Benzene	.35	.03	.27	.02		.68	
		Toluene	.35	.03	.27	.02			.68
OXFORD	23402.0	VOC	134.56	11.70	105.30	8.19	259.76		
		Benzene	.53	.04	.42	.03		1.03	
		Toluene	.53	.04	.42	.03			1.03
PENOBSCOT	34246.9	VOC	196.91	17.12	154.11	11.98	380.14		
		Benzene	.78	.06	.61	.04		1.52	
		Toluene	.78	.06	.61	.04			1.52

TOTALS ON NEXT PAGE

AREA SOURCE EMISSIONS (CONT.)

GASOLINE SERVICE STATION OPERATIONS

	USAGE THRU-PUT THOUS GALS	POLLUTANTS EMITTED	UNDERGROUND TANKS		REFUELING LOSS tons	SPILLAGE tons	TOTAL VOC tons	TOTAL BENZENE tons	TOTAL TOLUENE tons
			SPLASH FILLING tons	BREATHING +EMPTYING tons					
PISQUATAQUIS	8561.7	VOC	49.22	4.28	38.52	2.99	95.03		
		Benzene	.19	.01	.15	.01		.38	
		Toluene	.19	.01	.15	.01			.38
SAGADAHOC	13698.7	VOC	78.76	6.84	61.64	4.79	152.05		
		Benzene	.31	.02	.24	.01		.60	
		Toluene	.31	.02	.24	.01			.60
SOMERSET	25695.1	VOC	147.74	12.84	115.62	8.99	285.21		
		Benzene	.59	.05	.46	.03		1.14	
		Toluene	.59	.05	.46	.03			1.14
WALDO	15411.1	VOC	88.61	7.70	69.34	5.39	171.06		
		Benzene	.35	.03	.27	.02		.68	
		Toluene	.35	.03	.27	.02			.68
WASHINGTON	18265.0	VOC	105.02	9.13	82.19	6.39	202.74		
		Benzene	.42	.03	.32	.02		.81	
		Toluene	.42	.03	.32	.02			.81
YORK	71347.6	VOC	410.24	35.67	321.06	24.97	791.95		
		Benzene	1.64	.14	1.28	.09		3.16	
		Toluene	1.64	.14	1.28	.09			3.16
TOTALS	536543.6		3109.8	270.4	2433.7	189.2	5955.63	23.82	23.82

AREA SOURCE EMISSIONS FROM GASOLINE TERMINAL

	BENEZENE	TOLENE	VOC
Texaco	.04 Tons	.04 Tons	10.6 Tons
Gulf	.15	.15	38.7
Mobil	.23	.23	57.5
Chevron	.23	.23	57.1
Koch	.004	.004	1.0
Getty	.09	.09	22.4
B.P.	.29	.29	71.3
Exxon	.09	.09	21.9
Mobil (Bangor)	.60	.60	150.3
Texaco (Bangor)	.65	.65	161.9
Mobil (Hall)	<u>.002</u>	<u>.002</u>	<u>.38</u>
TOTAL	2.376	2.376	630.7

\*\* APPENDIX D \*\*

APPENDIX D

COUNTY CODES

<u>CODE</u>	<u>COUNTY</u>
01	ANDROSCOGGIN
03	AROOSTOCK
05	CUMBERLAND
07	FRANKLIN
09	HANCOCK
11	KENNEBEC
13	KNOX
15	LINCOLN
17	OXFORD
19	PENOBSCOT
21	PISCATAQUIS
23	SAGADAHOC
25	SOMERSET
27	WALDO
29	WASHINGTON
31	YORK

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 HAZARDOUS AIR POLLUTANT SYSTEM  
 PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
01	ACETON	645.1	206,310.0
	ACRYLO	57.5	0.0
	ACETA	6.3	4,930.0
	BUTANO	2.2	0.0
	CHLORI	75.1	100.0
	COPPER	125.0	100.0
	CRESOL	2.5	0.0
	OBENZE	2.5	0.0
	DMETHA	440.5	56,000.0
	EACETA	12.5	22,231.0
	EOXIDE	3.6	966.0
	EPICHL	31.0	12.0
	ETHANO	21.4	0.0
	FALCOH	2.0	0.0
	FORMAL	3,375.0	25,003.0
	FORMIC	7.5	1.0
	HCHLOR	89.3	512.0
	HSULFI	0.0	0.0
	IMINOD	8.5	0.0
	LEADPB	2.0	0.0
	MALEIC	143.0	0.0
	MCELLO	10.5	0.0
	MECHLO	218.6	190,145.0
	MEKETO	265.0	103,174.8
	MELAMI	2,321.0	0.0
	NITRIC	52.1	2,500.0
	OXALIC	6.0	0.0
	PHENOL	3,524.0	3,247.0
	STYREN	86.0	21.0
	TDIOXI	1.6	0.0
	TETHA1	878.9	655,298.0
TETHYL	218.7	19.0	
TITANI	48.7	0.0	
TOLUEN	159.3	75,301.0	
TRICHL	8.8	0.0	
VCHLOR	501.4	0.0	
XYLENE	284.9	22,378.8	
03	ACETIC	77.5	1,402.6
	CDIOXI	6.0	0.0
	CHLORI	59.1	22,800.0
	EACETA	1.3	2,600.0
	EPOXYP	401.0	124,600.0
	HCHLOR	36.5	600.0
	MEKETO	4.3	3,200.0
	PCBIPH	42.8	0.0
05	TETHA1	7.3	14,600.0
	TETHYL	9.5	14,860.0
	XYLENE	58.9	117,800.0
	ACETON	144.9	125,311.0
	ANTIMU	6.7	0.0

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 HAZARDOUS AIR POLLUTANT SYSTEM  
 PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	ASBEST	5.6	0.0
	BACETA	21.9	34,203.0
	BARIIUM	41.7	374.0
	BUTANO	84.8	116,340.0
	COIOXI	370.0	4,000.0
	CHLORI	17,810.0	85,000.0
	CHROMI	1.2	0.0
	COPPER	2.7	6.6
	DBENZE	2.5	0.0
	DETHAN	68.1	32,400.0
	EACETA	3.1	6,208.0
	EGLYCO	32.0	7,461.0
	EOXIDE	2.0	569.0
	FORMAL	20.6	41,000.0
	FORMIC	166.9	4,892.0
	HCHLOR	82.5	6,160.0
	HSULFI	14.8	22,000.0
	LEADPB	20.2	550.0
	MANGAN	6.2	9,320.0
	MCELLO	52.9	7,708.0
	MCHLOR	1.8	3,600.0
	MECHLO	63.9	41,081.0
	MEKETO	44.7	13,167.9
	MELAMI	50.0	0.0
	MISOBU	1.0	0.0
	MMERCA	34.9	30,700.0
	VITRIC	107.8	1,620.0
	OXALIC	1.3	0.0
	PCBIPH	40.5	0.0
	PHENOL	2.6	0.7
	STYREN	47.4	6,775.0
	TETHA1	194.1	168,290.0
	TETHYL	16.8	9,060.0
	TFURAN	0.2	400.0
	TITANI	2,669.2	1,800.0
	TOLUEN	2,656.9	606,635.0
	TRICHL	104.4	53,977.0
	TURPEN	186.0	12,000.0
	XYLENE	171.9	36,854.7
	ZINCZN	92.0	946.0
07	ACETON	24.6	42,363.0
	BACETA	1.2	2,400.0
	COIOXI	3,364.0	34,000.0
	CHLORI	19,406.5	300,000.0
	EACETA	1.8	3,600.0
	FORMIC	14.3	572.0
	HSULFI	530.0	100,000.0
	MECHLO	9.8	16,265.0
	MEKETO	40.7	76,958.0
	MMERCA	374.0	180,000.0

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 HAZARDOUS AIR POLLUTANT SYSTEM  
 PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	NITRIC	4.5	9,000.0
	TITANI	1,000.0	0.0
	TOLUEN	23.0	43,676.0
	TRICHL	1.2	2,420.0
	TURPEN	9,000.0	30,000.0
09	ACETON	11.7	4,000.0
	CHLORI	53.0	0.0
	ETHANO	3.7	734.0
	MECHLO	1.0	2,000.0
	MEKETO	1.0	40.0
	STYREN	35.0	3,500.0
	TITANI	243.0	0.0
11	ACETON	13.5	15,000.0
	ASBEST	28.7	0.0
	BACETA	0.1	200.0
	CDIOXI	10.0	50.0
	CHFORM	0.0	0.0
	CHLORI	2,831.1	66,163.5
	CHROMI	1.2	48.0
	EACETA	0.8	1,600.0
	EGLYCO	2.5	4,964.0
	ETHANO	24.6	340.0
	FORMAL	92.7	4,118.0
	FORMIC	27.9	27,744.0
	HCHLOR	46.5	26,464.0
	MECHLO	3.0	0.0
	MEKETO	6.9	13,850.0
	OXALIC	14.0	560.0
	TETHA1	126.3	252,675.0
	XYLENE	90.0	168,540.0
13	ACETON	12.4	24,750.0
	FORMIC	41.2	1,648.0
	HCHLOR	3.5	140.0
	MEKETO	0.8	1,608.0
	NITRIC	3.5	350.0
	TETHA1	1.8	36.0
	TETHYL	4.0	7,000.0
	TOLUEN	24.0	48,000.0
	XYLENE	5.5	8,316.0
15	ACETON	0.5	150.0
	HYDRAZ	3.5	140.0
	MECHLO	1.5	360.0
	MMETHA	11.6	650.0
	PCBIPH	55.0	0.0
	STYREN	10.3	205.0
	TETHA1	3.9	4,257.0
17	ACETON	3.4	6,733.0
	BACETA	32.0	64,054.0
	BARIIUM	3.7	0.0
	BUTANO	5.0	9,947.0



DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 HAZARDOUS AIR POLLUTANT SYSTEM  
 PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	CDIOXI	3,280.0	67,895.0
	CHFORM	0.0	0.0
	CHLORI	14,676.0	250,000.0
	DMETHA	45.0	90,000.0
	EACETA	4.7	9,354.0
	EGLYCO	9.6	19,094.0
	FORMIC	41.2	1,648.0
	HCHLOR	1.9	72.0
	HSULFI	220.0	41,000.0
	LEADPB	0.6	0.0
	MCELLO	21.0	42,092.0
	MECHLO	44.0	4,400.0
	MEKETO	15.4	30,578.0
	MMERCA	150.0	70,000.0
	VALINE	4.8	9,555.0
	NITRIC	23.1	920.0
	VPHENO	3.0	120.0
	OXALIC	8.1	0.0
	TETHAI	28.0	56,000.0
	TITANI	1,217.0	212.0
	TOLUEN	28.9	57,602.0
	TURPEN	4,000.0	12,000.0
	XYLENE	115.6	231,232.0
19	ACETON	140.7	224,700.8
	BACETA	1.2	0.0
	BARIUM	2.5	1,782.0
	BIPHEN	20.0	800.0
	CDIOXI	2,800.0	87,900.0
	CHFORM	0.0	0.0
	CHLORI	76,502.0	300,200.0
	CTETRA	2.5	0.0
	CYANID	1.3	2,600.0
	DBENZE	60.0	2,400.0
	EACETA	1.2	2,064.0
	ETHANO	6.4	0.0
	FORMIC	83.9	6,952.0
	HCHLOR	9,641.6	1,282.6
	HSULFI	377,394.8	45,110.0
	MECHLO	16.6	25,772.6
	MEKETO	87.1	143,730.6
	MERCUR	8.9	16.4
	MMERCA	377,320.2	49,440.0
	VALINE	0.4	800.0
	NITRIC	35.3	200.0
	STYREN	25.0	2,500.0
	TETHAI	88.7	101,256.3
	TETHYL	3.1	6,200.0
	TITANI	726.0	1,780.0
	TOLUEN	734.4	1,433,143.2
	TRICHL	7.8	3,000.0

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 HAZARDOUS AIR POLLUTANT SYSTEM  
 PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	TURPEN	5,000.0	17,000.0
	XYLENE	112.3	209,900.0
21	ACETON	28.0	56,000.0
	3ACETA	3.4	4,635.5
	BIPHEN	3.7	3,710.0
	BUTANO	0.1	76.0
	EACETA	0.1	224.0
	EGLYCO	0.1	48.0
	ETHANO	0.1	244.0
	MCHLOR	3.4	6,800.0
	MEKETO	13.8	27,280.0
	MISOBU	1.8	3,609.6
	VALINE	0.2	444.0
	TETHA1	7.6	15,262.0
	TOLUEN	29.8	59,662.8
	XYLENE	15.7	21,378.1
23	ACETON	5.0	10,000.0
	3ACETA	0.2	280.0
	BUTANO	9.0	11,020.0
	EACETA	10.5	17,056.0
	EBENZE	0.5	80.0
	EGLYCO	15.9	2,451.0
	LEADPB	160.0	0.0
	MCELLO	4.7	5,608.0
	MEKETO	13.0	26,000.0
	MISOBU	2.2	2,816.0
	TETHA1	3.5	5,960.0
	TOLUEN	6.2	11,780.0
	XYLENE	57.3	71,688.0
25	ACETON	98.9	64,806.0
	3ACETA	70.3	140,600.0
	3PHTHA	1.5	3,000.0
	BUTANO	2.7	5,400.0
	CDIOXI	4,520.0	16,800.0
	CHLORI	13,141.0	16,400.0
	EACETA	0.8	1,600.0
	EGLYCO	12.8	25,600.0
	ETHANO	1.0	2,000.0
	FORMAL	1.4	0.0
	FORMIC	58.1	2,320.0
	HCHLOR	84.7	3,300.0
	HSULFI	93.9	4,802.0
	LEADPB	2.0	80.0
	MCELLO	51.6	103,200.0
	MCHLOR	3.2	6,400.0
	MECHLO	1.4	2,713.0
	MEKETO	14.8	29,600.0
	MISOBU	1.6	2,739.0
	MMERCA	236.0	1,800.0
	VALINE	0.5	1,000.0

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
 HAZARDOUS AIR POLLUTANT SYSTEM  
 PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	VPHENO	2.7	108.0
	OXALIC	4.8	192.0
	PHENOL	2.8	112.0
	TETHA1	16.8	31,109.0
	TITANI	2,617.8	1,448.0
	TOLUEN	36.8	71,423.0
	TURPEN	1,262.0	4,130.0
27	XYLENE	71.0	142,000.0
	ACETON	3.5	2,800.0
	BACETA	1.7	1,360.0
	FURFUR	7.3	5,840.0
	MEKETO	2.6	2,080.0
	MISOBU	6.1	4,880.0
	TOLUEN	14.2	11,360.0
29	XYLENE	11.2	8,960.0
	BACETA	22.5	900.0
	COIOXI	2,589.0	86,142.0
	CHLORI	13,900.0	287,139.0
	FORMAL	4.6	9,280.0
	HCHLOR	17.4	700.0
	HSULFI	300.0	57,000.0
	MMERCA	200.0	97,000.0
	VITRIC	28.8	1,200.0
	PHENOL	1.2	2,450.0
	TETHA1	1.0	2,000.0
	TITANI	650.0	0.0
	TURPEN	5,000.0	2,000.0
31	ACETON	12.4	21,597.0
	ANTIMO	4.0	0.0
	BACETA	0.1	0.0
	SPHTHA	3.6	7,190.0
	BUTANO	3.5	6,707.0
	CHLORI	6.6	9,200.0
	CHROMI	1.7	136.0
	CYANID	1.6	355.0
	DSULFA	135.6	5,424.0
	EACETA	0.1	0.0
	EGLYCO	108.8	217,500.0
	FORMIC	116.4	4,656.0
	FURFUR	3.2	1,270.0
	HCHLOR	13.5	5,500.0
	HYDRAZ	0.3	600.0
	MCELLO	236.9	473,640.0
	MECHLO	4.2	5,832.0
	MEKETO	32.3	41,344.0
	MMETHA	25,896.0	183,900.0
	VITRIC	130.9	25,660.0
	OXALIC	2.9	116.0
	PCBIPH	6.7	0.0
	TETHA1	150.7	189,796.0

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
HAZARDOUS AIR POLLUTANT SYSTEM  
PROCESS EMISSIONS BY COUNTY (HAP114)

COUNTY	POLLUTANT IDENT.	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	TETHYL	84.0	107,311.0
	TITANI	2.0	0.0
	TOLUEN	27.3	40,648.0
	TRICHL	117.5	51,468.0
	XYLENE	28.1	52,226.0

\*\* APPENDIX E \*\*

APPENDIX E

STANDARD INDUSTRIAL CLASSIFICATION

<u>DIVISION</u>	<u>MAJOR GROUP</u>	<u>INDUSTRY</u>
MANUFACTURING	20	FOOD AND KINDRED PRODUCTS
	22	TEXTILE MILL PRODUCTS
	24	LUMBER AND WOOD PRODUCTS
	25	WOOD FURNITURE AND FIXTURES
	26	PAPER AND ALLIED PRODUCTS
	28	CHEMICALS AND ALLIED PRODUCTS
	29	PETROLEUM REFINING AND RELATED INDUSTRIES
	30	RUBBER AND MISCELLANEOUS PLASTICS
	31	LEATHER AND LEATHER PRODUCTS
	32	STONE, CLAY, GLASS, AND CONCRETE PRODUCTS
	33	PRIMARY METAL PRODUCTS
	34	FABRICATED METAL PRODUCTS
	35	MACHINERY
	36	ELECTRICAL AND ELECTRONIC MACHINERY
TRANSPORTATION, COMMUNICATIONS, ELECTRIC, GAS, AND SANITARY SERVICES	37	TRANSPORTATION EQUIPMENT
	38	MEASURING, ANALYZING, AND CONTROLLING INSTRUMENTS; PHOTOGRAPHIC, MEDICAL, AND OPTICAL GOODS; WATCHES AND CLOCKS
	39	MISCELLANEOUS MANUFACTURING INDUSTRIES
	40	RAILROAD TRANSPORTATION
	42	MOTOR FREIGHT TRANSPORTATION AND WAREHOUSING
WHOLESALE TRADE	49	ELECTRIC, GAS, AND SANITARY SERVICES
	51	WHOLESALE TRADE- NONDURABLE GOODS
SERVICES	72	PERSONAL SERVICES
	73	BUSINESS SERVICES
	75	AUTOMOTIVE REPAIR, SERVICE, AND GARAGES
	80	HEALTH SERVICES
PUBLIC ADMINISTRATION	97	NATIONAL SECURITY AND INTERNATIONAL AFFAIRS

## STATEWIDE SUMMARY OF PROCESS EMISSIONS BY INDUSTRIAL CLASSIFICATION (HAP112)

	POLLUTANT	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR	
20	ACETIC	77.5	1,402.6	
	BACETA	22.5	900.0	
	COIOXI	6.0	0.0	
	CHLORI	19.9	2,400.0	
	EPOXYE	401.0	124,600.0	
	HCHLOR	36.5	600.0	
22	ANTIMO	4.0	0.0	
	BIPHEN	23.7	4,510.0	
	CHLORI	1.3	0.0	
	CHROMI	1.2	48.0	
	DBENZE	60.0	2,400.0	
	DSULFA	135.6	5,424.0	
	EGLYCO	2.1	4,140.0	
	FORMIC	72.4	22,296.0	
	MEKETO	15.4	13,664.0	
	OXALIC	22.1	560.0	
	TETHA1	143.8	287,673.3	
	TOLJEN	10.8	11,521.0	
24	XYLENE	174.6	337,390.0	
	BACETA	3.2	6,366.0	
	BUTANO	0.7	1,238.0	
	DMETHA	45.0	90,000.0	
	EACETA	1.8	3,695.0	
	EGLYCO	0.1	48.0	
	ETHANO	0.1	244.0	
	FORMAL	4.6	9,280.0	
	MECHLO	44.0	4,400.0	
	MEKETO	5.8	11,466.0	
	NALIVE	5.0	9,999.0	
	PHENOL	1.2	2,450.0	
	TETHA1	23.5	47,000.0	
	TOLJEN	30.9	61,802.0	
25	XYLENE	14.4	28,799.0	
	BACETA	10.3	16,351.5	
	EACETA	1.9	3,754.0	
	FURFUR	7.3	5,840.0	
	MEKETO	2.8	2,160.0	
	MISOBU	7.9	8,489.6	
	TOLJEN	32.1	47,050.8	
	XYLENE	44.6	65,863.1	
	26	ACETON	95.1	51,506.0
		BUTANO	83.8	116,300.0
COIOXI		16,933.0	296,787.0	
CHFORM		0.0	0.0	
CHLORI		87,058.6	1,304,902.5	
DETHAN		68.1	32,400.0	
EGLYCO		3.8	1,200.0	
EOXIDE		3.6	966.0	
ETHANO		29.7	1,074.0	
FORMAL	113.3	45,118.0		

## STATEWIDE SUMMARY OF PROCESS EMISSIONS BY INDUSTRIAL CLASSIFICATION (HAP112)

POLLUTANT	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
FORMIC	55.9	13,200.0
HCHLOR	186.4	31,766.0
HSULFI	378,553.5	269,912.0
MCELLO	17.9	6,700.0
MECHLO	17.2	15,900.0
MEKETO	12.6	21,700.0
MMERCA	378,315.1	428,940.0
NITRIC	61.8	11,320.0
TETHA1	17.4	24,700.0
TETHYL	8.6	14,700.0
TITANI	9,039.6	3,580.0
TOLUEN	3,278.3	1,930,000.0
TRICHL	75.2	36,300.0
TURPEN	24,448.0	77,130.0
XYLENE	190.2	348,900.0
ZINCZN	89.7	900.0
23 ACETON	88.2	4,804.0
ANTIMO	6.7	0.0
BACETA	3.8	0.0
BARIUM	2.0	0.0
BUTANO	3.2	40.0
CHLORI	58,671.1	0.0
CHROMI	1.2	0.0
CTETRA	2.5	0.0
EGLYCO	8.0	320.0
ETHANO	26.4	0.0
FALCOH	2.0	0.0
FURFUR	3.2	1,270.0
HCHLOR	9,607.0	52.6
IMINOD	8.5	0.0
MCELLO	10.5	0.0
MECHLO	126.5	5,065.0
MEKETO	176.8	134.8
MERCUR	8.9	16.4
MMETHA	25,896.0	183,900.0
NITRIC	2.1	0.0
PCBIPH	0.5	0.0
TETHA1	444.4	2,751.0
TETHYL	222.7	179.0
TITANI	39.2	0.0
TOLUEN	119.5	593.0
TRICHL	8.8	0.0
XYLENE	327.2	2,243.8
29 MECHLO	1.5	275.0
30 ACETON	535.0	143,920.0
BACETA	0.1	0.0
BUTANO	0.1	0.0
OMETHA	412.5	0.0
EACETA	1.0	1,860.0
EPICHL	31.0	12.0



## STATEWIDE SUMMARY OF PROCESS EMISSIONS BY INDUSTRIAL CLASSIFICATION (HAP112)

	POLLUTANT	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	FORMAL	3,375.0	25,003.0
	FORMIC	7.5	1.0
	MALEIC	143.0	0.0
	MCELLO	0.1	0.0
	MECHLO	20.9	35,740.0
	MEKETO	63.9	62,031.0
	MELAMI	2,321.0	0.0
	MMETHA	11.6	650.0
	PHEVOL	3,524.0	3,247.0
	STYREN	96.3	226.0
	TETHA1	366.1	592,710.0
	TOLJEN	17.8	31,725.0
	TRICHL	1.2	2,420.0
	XYLENE	1.4	2,200.0
31	ACETON	250.3	471,927.8
	BACETA	97.6	195,262.0
	BPHTHA	5.1	10,190.0
	BUTANO	10.5	20,892.0
	CHLORI	4.6	9,200.0
	DMETHA	28.0	56,000.0
	EACETA	25.4	45,529.0
	EGLYCO	110.1	220,054.0
	ETHANO	1.0	2,000.0
	FORMAL	1.4	0.0
	FORMIC	251.1	10,044.0
	HCHLOR	3.5	140.0
	HSULFI	0.0	0.0
	LEADPB	2.0	80.0
	MCELLO	309.4	618,932.0
	MCHLOR	6.6	13,200.0
	MECHLO	13.3	26,582.6
	MEKETO	194.3	353,229.0
	NALINE	0.9	1,800.0
	NPHENO	5.7	228.0
	OXALIC	7.7	308.0
	PHEVOL	2.8	112.0
	TETHA1	6.3	10,200.0
	TETHYL	33.4	66,750.0
	TITANI	93.0	1,660.0
	TOLJEN	146.2	287,836.0
	XYLENE	79.4	158,847.0
32	ACRYLO	57.5	0.0
	MELAMI	50.0	0.0
	TDIOXI	1.6	0.0
	VCHLOR	501.4	0.0
33	TETHA1	23.1	28,665.0
34	CYANIO	1.6	355.0
	EACETA	1.4	2,808.0
	EGLYCO	2.5	4,964.0
	MCELLO	0.5	1,008.0

## STATEWIDE SUMMARY OF PROCESS EMISSIONS BY INDUSTRIAL CLASSIFICATION (HAP112)

POLLUTANT	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
MECHLO	1.8	1,032.0
MEKETO	9.0	18,045.9
NITRIC	4.7	4,700.0
PCBIPH	6.2	0.0
TETHA1	25.8	34,558.0
TOLUEN	7.6	11,882.0
TRICHL	39.6	47,520.0
XYLENE	12.9	17,876.7
ZINCZN	2.3	46.0
35. BARIUM	2.5	1,782.0
CYANID	1.3	2,600.0
EACETA	0.1	35.0
FORMIC	122.3	4,892.0
MECHLO	1.4	2,713.0
MEKETO	0.6	1,182.6
TETHA1	68.2	101,303.0
TOLUEN	26.6	53,203.2
TRICHL	3.1	1,677.0
35. ACETON	32.6	39,899.0
BACETA	20.7	34,203.0
BARIUM	43.4	374.0
CHLORI	48.0	100.0
COPPER	127.7	106.6
EACETA	2.5	5,000.0
EGLYCO	5.9	5,941.0
HCHLOR	170.5	6,672.0
HSULFI	0.0	0.0
LEADPB	22.8	550.0
MECHLO	104.3	190,571.0
NITRIC	108.5	4,470.0
OXALIC	6.0	0.0
PHEVOL	2.6	0.7
TETHA1	221.0	178,089.0
TETHYL	4.0	7,000.0
TITANI	1.9	0.0
TRICHL	82.9	5,948.0
XYLENE	57.5	19,469.0
37. ACETON	51.8	59,974.0
BACETA	0.2	280.0
BUTANO	9.0	11,020.0
CHLORI	2.0	0.0
CHROMI	1.7	136.0
EACETA	1.0	256.0
EBENZE	0.5	80.0
EGLYCO	34.9	40,451.0
HCHLOR	13.5	5,500.0
HYDRAZ	0.3	600.0
LEADPB	160.0	0.0
MCELLO	4.7	5,608.0
MECHLO	7.8	6,290.0

## STATEWIDE SUMMARY OF PROCESS EMISSIONS BY INDUSTRIAL CLASSIFICATION (HAP112)

	POLLUTANT	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	MEKETO	11.3	19,790.0
	MISOBU	2.2	2,816.0
	NITRIC	122.7	20,960.0
	STYREN	107.4	12,775.0
	TETHA1	85.9	150,581.0
	TETHYL	50.6	40,561.0
	TOLUEN	0.9	1,280.0
	TRICHL	0.5	1,000.0
	XYLENE	70.4	99,096.0
33	MISOBU	1.6	2,739.0
	TETHA1	18.0	32,709.0
	TOLJEN	8.2	14,223.0
39	ACETON	16.3	32,490.0
	MEKETO	0.8	1,608.0
	TOLUEN	2.9	5,915.0
	XYLENE	1.2	2,353.0
40	BACETA	0.1	200.0
	EACETA	0.8	1,600.0
42	EACETA	1.0	2,000.0
	TRICHL	8.0	16,000.0
49	ASBEST	34.3	0.0
	CHLORI	12,000.0	0.0
	HYDRAZ	3.5	140.0
	MANGAN	6.2	9,320.0
	PCBIPH	95.5	0.0
51	ACETON	75.3	0.0
	BACETA	2.4	0.0
	CHLORI	644.7	0.0
	DBENZE	2.5	0.0
	EGLYCO	7.7	0.0
	FORMIC	48.2	0.0
	MCELLO	34.5	0.0
	MECHLO	22.8	0.0
	MEKETO	42.6	0.0
	MISOBU	1.0	0.0
	NITRIC	86.2	0.0
	OXALIC	1.3	0.0
	TETHA1	62.3	0.0
	TETHYL	7.1	0.0
	TOLJEN	56.4	0.0
	TRICHL	20.4	0.0
	XYLENE	42.6	0.0
72	TETHYL	0.0	0.0
73	CRESOL	2.5	0.0
	DBENZE	2.5	0.0
	MECHLO	2.5	0.0
75	EGLYCO	6.6	0.0
	TOLJEN	1.5	0.0
76	XYLENE	4.1	8,236.0
80	EOXIDE	2.0	569.0

STATEWIDE SUMMARY OF PROCESS EMISSIONS BY INDUSTRIAL CLASSIFICATION (HAP112)

	POLLUTANT	AMOUNT USED TONS/YEAR	EMISSIONS LBS./YEAR
	XYLENE	1.9	0.0
97	CHLORI	10.2	20,400.0
	MCHLOR	1.8	3,600.0
	MEKETO	6.5	7,600.0
	PCBIPH	42.8	0.0
	TETHA1	2.8	5,600.0
	TETHYL	9.7	15,260.0
	TFURAN	0.2	400.0
	TOLUEN	1.1	2,200.0

\*\* APPENDIX F \*\*

APPENDIX F

TOXICITY SCORING SUMMARY

Pollutant	CAS Registry Number	RTECS Accession Number	Categories					S	Tox. Score
			C	M	R	A	Tot		
Arsenic Trioxide	1327-53-3	CG3325000	4	4	4	4	16	0	16.0
N-Nitrosodimethylamine	62-75-9	IQ0525000	4	4	4	4	16	0	16.0
Acrylonitrile	107-13-1	AT5250000	4	4	4	3	15	0.50	15.5
Benzene	71-43-2	CY1400000	4	4	4	3	15	0.50	15.5
Chloroform	67-66-3	FS9100000	4	4	4	3	15	0.50	15.5
Chromium (Potassium Chromate)	7789-00-6	GB2940000	4	4	3	4	15	0.50	15.5
Dioxin	1746-01-6	HP3500000	3	4	4	4	15	0.50	15.5
Epichlorohydrin	106-89-8	TX4900000	4	4	4	3	15	0.50	15.5
Ethyleneimine	151-56-4	KX5075000	3	4	4	4	15	0.50	15.5
Formaldehyde	50-00-0	LP8925000	3	4	4	4	15	0.50	15.5
Nitroso-n-Methylurea	684-93-5	YT7875000	4	4	4	3	15	0.50	15.5
Styrene	100-42-5	WL3675000	4	4	4	3	15	0.50	15.5
Polychlorinated Biphenyls	11097-69-1	TQ1360000	4	4	4	2	14	1.00	15.0
Vinyl Chloride	75-01-4	KU9625000	4	4	4	2	14	1.00	15.0
Benzo(a)Pyrene	50-32-8	DJ3675000	3	4	4	3	14	0.58	14.6
Cadmium	7440-43-9	EU9800000	3	3	4	4	14	0.58	14.6
Cadmium chloride	10108-64-2	EV0175000	3	4	4	3	14	0.58	14.6
Carbon tetrachloride	56-23-5	FG4900000	4	4	3	3	14	0.58	14.6
Hydrazine	302-01-2	MU7175000	3	4	4	3	14	0.58	14.6
Beryllium	7440-41-7	DS1750000	4	4	1	4	13	1.50	14.5
Bis (chloromethyl) ether	542-88-1	KN1575000	4	4	1	4	13	1.50	14.5
Chloromethyl methyl ether	107-30-2	KN6650000	4	4	1	4	13	1.50	14.5
Methylchloromethyl Ether	107-30-2	KN6650000	4	4	1	4	13	1.50	14.5
Nitrogen Mustard	51-75-2	IA1750000	1	4	4	4	13	1.50	14.5
Acetamide, N-flouren-2-yl	53-96-3	AB9450000	3	4	4	2	13	0.96	14.0
Benzyl chloride	100-44-7	XS8925000	2	4	3	4	13	0.96	14.0
Dimethyl Sulfate	77-78-1	WS8225000	3	4	2	4	13	0.96	14.0
Urethane	51-79-6	FA8400000	3	4	4	2	13	0.96	14.0
Dimethylaminoazobenzene	60-11-7	BX7350000	3	4	3	3	13	0.50	13.5
Epoxypropane	75-56-9	TZ2975000	3	4	3	3	13	1.00	13.5
Acetaldehyde	75-07-0	AB1925000	1	4	4	3	12	1.41	13.4
Asbestos	1332-21-4	CI6475000	4	3	1	4	12	1.41	13.4
Auramine	2465-27-2	BY3500000	4	4	1	3	12	1.41	13.4
Benzidine	92-87-5	DC9625000	4	4	1	3	12	1.41	13.4
Beta-Propiolactone	57-57-8	RQ7350000	3	4	1	4	12	1.41	13.4
Bis (2-ethylhexyl) phthalate	117-81-7	TI0350000	3	4	4	1	12	1.41	13.4
Carbon Disulfide	75-15-0	FF6650000	1	4	4	3	12	1.41	13.4
Copper Sulfate	7758-98-7	GL8800000	1	4	4	3	12	1.41	13.4
Ethylene Oxide	75-21-8	KX2450000	1	4	4	3	12	1.41	13.4
Hydroquinone	123-31-9	MX3500000	1	4	3	4	12	1.41	13.4
Iodine	7553-56-2	NN1575000	1	3	4	4	12	1.41	13.4

Pollutant	CAS Registry Number	RTECS Accession Number	Categories					S	Tox. Score
			C	M	R	A	Tot		
Methylhydrazine	60-34-4	MV5600000	1	4	3	4	12	1.41	13.4
N-Nitrosomorpholine	59-89-2	QE7525000	4	4	1	3	12	1.41	13.4
Propyleneimine	75-55-8	CM8050000	3	4	1	4	12	1.41	13.4
Zinc Chloride	7646-85-7	ZHL400000	1	4	4	3	12	1.41	13.4
1,2-Dichloroethane	107-06-2	KI0525000	4	4	2	2	12	1.15	13.2
Tetrachloroethylene	127-18-4	KX3850000	2	4	4	2	12	1.15	13.2
Trichloroethylene	79-01-6	KX4550000	2	4	4	2	12	1.15	13.2
1,3-Propanesultone	1120-71-4	RP5425000	3	4	2	3	12	0.82	12.8
Hexachlorobutadiene	87-68-3	ES0700000	2	4	3	3	12	0.82	12.8
Hexamethylphosphamide	680-31-9	TD0875000	3	4	3	2	12	0.82	12.8
Nickel	7440-02-0	QR5950000	3	3	2	4	12	0.82	12.8
Acrolein	107-02-8	AS1050000	1	4	2	4	11	1.50	12.5
Alpha-Napthalene	134-32-7	QM1400000	4	4	1	2	11	1.50	12.5
Arsenic	7440-38-2	CG0525000	4	4	2	1	11	1.50	12.5
Benzotrichloride	98-07-07	XT9275000	4	2	1	4	11	1.50	12.5
Beta-Napthylamine	91-59-8	QM2100000	4	4	1	2	11	1.50	12.5
Ethyl Benzene	100-41-4	DA0700000	1	4	4	2	11	1.50	12.5
Hydrogen Chloride	7647-01-0	MW4025000	1	4	2	4	11	1.50	12.5
Lead	7439-92-1	OF7525000	1	4	4	2	11	1.50	12.5
Methylene Chloride	75-09-2	PA8050000	1	4	4	2	11	1.50	12.5
Pentachlorophenol	87-87-5	SM6300000	1	2	4	4	11	1.50	12.5
Styrene Oxide	96-09-3	CZ9625000	1	4	4	2	11	1.50	12.5
Toluene	108-88-3	XS5250000	1	4	4	2	11	1.50	12.5
o-Toluidine	95-53-4	XU2975000	4	4	1	2	11	1.50	12.5
p-Aminodiphenyl	92-67-1	DU8925000	4	4	1	2	11	1.50	12.5
1,1-Dimethyl Hydrazine	57-14-7	MV2450000	3	4	1	3	11	1.26	12.3
2,4-Toluene Diamine	95-80-7	XS9625000	3	4	1	3	11	1.26	12.3
Acetamide	60-35-5	AB4025000	3	4	3	1	11	1.26	12.3
Acrylamide	79-06-1	AS3325000	1	4	3	3	11	1.26	12.3
Alpha Benzene Hexachloride	319-84-6	GV3500000	3	4	1	3	11	1.26	12.3
Dimethylcarbanyl Chloride	79-44-7	FD4200000	3	4	1	3	11	1.26	12.3
Diphenylhydrazine	122-66-7	MW2625000	3	4	1	3	11	1.26	12.3
Glycidaldehyde	765-34-4	MB3150000	3	4	1	3	11	1.26	12.3
Mercury	7439-97-6	OV4550000	1	4	3	3	11	1.26	12.3
Phenol	108-95-2	SJ3325000	1	4	3	3	11	1.26	12.3
Diethyl Sulfate	64-67-5	WS8750000	3	4	2	2	11	0.96	12.0
Arsine	7784-42-1	CG6475000	4	1	1	4	10	1.73	11.7
Chlorine	7782-50-5	FO2100000	1	4	1	4	10	1.73	11.7
Chromium (Lead Chromate)	7758-97-6	GB2975000	4	4	1	1	10	1.73	11.7
Vinylidene Chloride	75-35-4	YZ8061000	1	4	4	1	10	1.73	11.7
Resorcinol	108-46-3	VG9625000	1	4	1	4	10	1.73	11.7
1,4-Dioxane	123-91-1	JG8225000	3	4	1	2	10	1.29	11.3
3,3-Dimethoxybenzidine	119-90-4	DD0875000	3	4	1	2	10	1.29	11.3
4-Nitrobiphenyl	92-93-3	DV5600000	3	4	1	2	10	1.29	11.3
Chloroprene	126-99-8	EI9625000	1	4	3	2	10	1.29	11.3
Melamine	108-78-1	OS0700000	3	4	1	2	10	1.29	11.3
Methyl Chloride	75-09-2	PA6300000	1	3	4	2	10	1.29	11.3
Methyl Methacrylate	80-62-6	OZ5075000	1	4	3	2	10	1.29	11.3
Napthalene	91-20-3	QJ0525000	1	4	2	3	10	1.29	11.3

Pollutant	CAS Registry Number	RTECS Accession Number	Categories					S	Tox. Score
			C	M	R	A	Tot		
Phenylhydrazine	100-63-0	MV8925000	1	4	2	3	10	1.29	11.3
Vinyl Cyclohexene Dioxide	106-87-6	RN8640000	3	4	1	2	10	1.29	11.3
1,1,1-Trichloroethane	71-55-6	KJ2975000	1	3	3	3	10	1.00	11.0
Methyl Iodide	74-88-4	PA9450000	3	3	1	3	10	1.00	11.0
Rotenone	83-79-4	DJ2800000	1	3	3	3	10	1.00	11.0
2,5-Diaminotoluene	95-70-5	XS9700000	1	4	1	3	9	1.50	10.5
3,3-Dichlorobenzidine	91-94-1	DD0525000	3	4	1	1	9	1.50	10.5
4,4-Methylene Dianiline	101-77-9	BY5425000	1	4	1	3	9	1.50	10.5
Aldicarb	116-06-3	UE2275000	1	3	1	4	9	1.50	10.5
Aniline	62-53-3	BW6650000	1	4	1	3	9	1.50	10.5
Formic Acid	64-18-6	LQ4900000	1	4	1	3	9	1.50	10.5
Methyl Mercaptan	74-93-1	PB4375000	1	4	1	3	9	1.50	10.5
Picric Acid	88-89-1	TJ7875000	1	4	1	3	9	1.50	10.5
n-Butylamine	109-73-9	EO2975000	1	4	1	3	9	1.50	10.5
p-Chloronitrobenzene	100-00-5	CZ1050000	1	4	1	3	9	1.50	10.5
p-Nitrophenol	100-02-7	SM2275000	1	4	1	3	9	1.50	10.5
p-Phenylenediamine	106-50-3	SS8050000	1	4	1	3	9	1.50	10.5
1,1,2-Trichloroethane	79-00-5	KJ3150000	2	4	1	2	9	1.26	10.3
Allyl chloride	107-05-1	UC7350000	1	4	2	2	9	1.26	10.3
Nitrobenzene	98-95-3	DA6475000	1	2	2	4	9	1.26	10.3
Xylene	1330-20-7	ZE2100000	1	2	4	2	9	1.26	10.3
Manganese Chloride	7773-01-5	OO0962500	1	3	3	2	9	0.96	10.0
Acrylic Acid, Ethyl Ester	140-88-5	AT0700000	1	4	1	2	8	1.41	9.4
Barium Chloride	10361-37-2	CQ8750000	1	1	2	4	8	1.41	9.4
Chlorine Dioxide	10049-04-4	FO3000000	1	1	2	4	8	1.41	9.4
Chrysene	218-01-9	GC0700000	2	4	1	1	8	1.41	9.4
Ethylene Glycol Ethyl Ether	110-80-5	KK8050000	1	1	4	2	8	1.41	9.4
Formamide	75-12-7	LQ0525000	1	2	4	1	8	1.41	9.4
Methyl Cellosolve	109-86-4	KL5775000	1	1	4	2	8	1.41	9.4
N-Phenyl-Beta-Napthylamine	133-88-6	QM4550000	2	4	1	1	8	1.41	9.4
Nitroglycerine	55-63-0	OX2100000	1	2	1	4	8	1.41	9.4
Phosphorus	7723-14-0	TH3500000	1	1	2	4	8	1.41	9.4
Vanadium Pentoxide	1314-62-1	YW2450000	1	2	1	4	8	1.41	9.4
Vinyl Bromide	593-60-2	KU8400000	1	4	1	2	8	1.41	9.4
p-Anisidine	104-94-9	BZ5450000	1	4	1	2	8	1.41	9.4
Acrylic Acid	79-10-7	AS4375000	1	1	3	3	8	1.15	9.2
Barium Carbonate	513-77-9	CQ8600000	1	1	3	3	8	1.15	9.2
Ethyl Ether	60-29-7	KI5775000	1	3	1	3	8	1.15	9.2
Furfural	98-01-1	LT7000000	1	3	1	3	8	1.15	9.2
Furfuryl Alcohol	98-00-0	LU9100000	1	3	1	3	8	1.15	9.2
Maleic Anhydride	108-31-6	ON3675000	1	3	1	3	8	1.15	9.2
Quinoline	91-22-5	VA9275000	1	3	1	3	8	1.15	9.2
p-Chloroaniline	106-47-8	BX0700000	1	3	1	3	8	1.15	9.2
1,1,2,2-Tetrachloroethane	79-34-5	KI8575000	2	2	1	3	8	0.82	8.8
Antimony	7440-36-0	CC4025000	1	1	1	4	7	1.50	8.5
Cyanide	57-12-5	GS7175000	1	1	1	4	7	1.50	8.5
Cyanogen	460-19-5	GT1925000	1	1	1	4	7	1.50	8.5
Fluorine	7782-41-4	LM6470000	1	1	1	4	7	1.50	8.5
Hexachloronapthalene	1335-87-1	QJ7350000	1	1	1	4	7	1.50	8.5



Pollutant	CAS Registry Number	RTECS Accession Number	Categories					S	Tox. Score
			C	M	R	A	Tot		
Hydrogen Cyanide	74-90-8	MW6825000	1	1	1	4	7	1.50	8.5
Hydrogen Sulfide	7783-06-4	MX1225000	1	1	1	4	7	1.50	8.5
Methyl Isocyanate	624-83-9	NQ9450000	1	1	1	4	7	1.50	8.5
Phosgene	75-44-5	SY5600000	1	1	1	4	7	1.50	8.5
Tetrachlorodibenzofuran	51207-31-9	HP5295000	1	1	1	4	7	1.50	8.5
Thallium	7440-28-0	XG3425000	1	1	1	4	7	1.50	8.5
Vinyl Fluoride	75-02-5	YZ7351000	1	4	1	1	7	1.50	8.5
1,2-Dichloropropane	78-87-5	TX9625000	1	2	1	3	7	0.96	8.0
2,4-Toluene Diisocyanate	584-84-9	CZ6300000	1	2	1	3	7	0.96	8.0
Biphenyl	92-52-4	DU8050000	1	3	1	2	7	0.96	8.0
Diazomethane	334-88-3	PA7000000	3	2	1	1	7	0.96	8.0
Hexachlorocyclopentadiene	77-47-4	GY1225000	1	1	2	3	7	0.96	8.0
Methyl Ethyl Ketone	78-93-3	EL6475000	1	1	3	2	7	0.96	8.0
Quinone	106-51-4	DK2625000	1	2	1	3	7	0.96	8.0
Tetrahydrofuran	109-99-9	LU5950000	1	3	1	2	7	0.96	8.0
m-Cresol	108-39-4	GO1250000	1	1	2	3	7	0.96	8.0
m-Dinitrobenzene	99-65-0	CZ7350000	1	2	1	3	7	0.96	8.0
p-Nitrosophenol	104-91-6	SM4725000	1	2	1	3	7	0.96	8.0
Acetone	67-64-1	AL3150000	1	2	2	2	7	0.50	7.5
Diethyl phthalate	84-66-2	TI1050000	1	2	2	2	7	0.50	7.5
2-Chloroacetophenone	532-27-4	AM6300000	1	1	1	3	6	1.00	7.0
Bromine	7726-95-6	EF9100000	1	1	1	3	6	1.00	7.0
Cobalt Oxide	1307-96-6	GG2800000	1	1	1	3	6	1.00	7.0
Cyanimide	420-04-2	GS5950000	1	1	1	3	6	1.00	7.0
Hydrogen Bromide	10035-10-6	MW3850000	1	1	1	3	6	1.00	7.0
Isopropylamine	75-31-0	NT8400000	1	1	1	3	6	1.00	7.0
Nitric Acid	7697-37-2	QU5775000	1	1	1	3	6	1.00	7.0
Oxalic Acid	144-62-7	RO2450000	1	1	1	3	6	1.00	7.0
1,2,4-Trichlorobenzene	120-82-1	DC2100000	1	1	2	2	6	0.58	6.6
1,3-Butadiene	106-99-0	EI9275000	1	2	1	2	6	0.58	6.6
Butanol	71-36-3	EO1400000	1	2	1	2	6	0.58	6.6
Isoamyl Alcohol	123-51-3	EL5425000	1	2	1	2	6	0.58	6.6
Pyridine	110-86-1	UR8400000	1	2	1	2	6	0.58	6.6
n-Butyl Acetate	123-86-4	AF7350000	1	1	2	2	6	0.58	6.6
p-Nitroaniline	100-01-6	BY7000000	1	2	1	2	6	0.58	6.6
p-Nitrotoluene	99-99-0	XT3325000	1	2	1	2	6	0.58	6.6
1,2-Dichlorobenzene	95-50-1	CZ4500000	1	1	1	2	5	0.50	5.5
1-Nitropropane	108-03-2	TZ5075000	1	1	1	2	5	0.50	5.5
2,2-Iminodiethanol	111-42-2	KL2975000	1	1	1	2	5	0.50	5.5
Acetic Anhydride	108-24-7	AK1925000	1	1	1	2	5	0.50	5.5
Butanethiol	109-79-5	EK6300000	1	1	1	2	5	0.50	5.5
Cyclohexane	110-82-7	GU6300000	1	2	1	1	5	0.50	5.5
Diphen. meth. 4,4-diisocyan.	101-68-8	NQ9350000	1	2	1	1	5	0.50	5.5
Ethanethiol	75-08-1	KI9625000	1	1	1	2	5	0.50	5.5
Ethanolamine	141-43-5	KJ5775000	1	1	1	2	5	0.50	5.5
Ethyl Acetate	141-78-6	AH5425000	1	1	1	2	5	0.50	5.5
Ethyl Chloride	75-00-3	KH7525000	1	1	1	2	5	0.50	5.5
Isophorone	78-59-1	GW7700000	1	1	1	2	5	0.50	5.5
Ketene	463-51-4	OA7700000	1	1	1	2	5	0.50	5.5

Pollutant	CAS Registry Number	RTECS Accession Number	Categories					S	Tox. Score
			C	M	R	A	Tot		
Monochlorobenzene	108-90-7	CZ0175000	1	1	1	2	5	0.50	5.5
Potassium Cyanate	590-28-3	GS6825000	1	1	1	2	5	0.50	5.5
Selenium	7782-49-2	VS7700000	1	1	2	1	5	0.50	5.5
Sodium Cyanate	917-61-3	GS7000000	1	1	1	2	5	0.50	5.5
Turpentine	8006-64-2	YO8400000	1	1	1	2	5	0.50	5.5
Xylidine	1300-73-8	ZE8575000	1	1	1	2	5	0.50	5.5
m-Nitrotoluene	99-08-1	XT2975000	1	1	1	2	5	0.50	5.5
Cyanoacetamide	107-91-5	AB5950000	1	1	1	1	4	0	4.0
Dioctyl Phthalate	27554-26-3	TI1300000	1	1	1	1	4	0	4.0
Diisodecyl Phthalate	26761-40-0	TI1300000	1	1	1	1	4	0	4.0
Ethylene	74-85-1	KU5340000	1	1	1	1	4	0	4.0
Methyl Isobutyl Ketone	108-10-1	SA9275000	1	1	1	1	4	0	4.0
Octachloronaphthalene	2234-13-1	QK0250000	1	1	1	1	4	0	4.0
Terephthalic Acid	100-21-0	WZ0875000	1	1	1	1	4	0	4.0
Titanium Oxide	13463-67-7	XR2275000	1	1	1	1	4	0	4.0

\*\* APPENDIX G \*\*

## APPENDIX G

## TOXICITY RANKING FOR HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE

Pollutant	Toxicity Score	Emissions (lbs/yr)	Toxicity Rank	Emissions Rank	Total Rank
Arsenic	16.0	430	1	50	51
Chromium	15.5	184	2	54	56
Epichlorhydrin	15.5	12	2	58	60
Formaldehyde	15.5	79,401	2	21	23
Styrene	15.5	13,001	2	32	34
Benzene	15.5	52,392	2	24	26
Hydrazine	14.6	740	7	49	56
Cadmium	14.6	238	7	52	59
Benzo-a-Pyrene	14.6	15,180	7	30	37
Epoxypropane	13.5	124,600	10	19	29
Bis 2-ethylhexyl phthalate	13.4	10,190	11	34	45
Copper	13.4	107	11	55	66
Ethylene Oxide	13.4	1,535	11	45	56
Zinc	13.4	946	11	47	58
1,2 Dichloroethane	13.2	32,400	15	28	43
Tetrachloroethylene	13.2	708,050	15	6	21
Trichloroethylene	13.2	110,865	15	20	35
Hydrogen Chloride	12.5	44,731	18	26	44
Lead	12.5	178,630	18	16	34
Methylene Chloride	12.5	288,569	18	13	31
Napthalene	12.5	11,799	18	33	51
Ethyl Benzene	12.5	80	18	56	74
Toluene	12.5	2,511,623	18	1	19
Mercury	12.3	16	24	57	81
Phenol	12.3	5,180	24	37	61
Diethyl Sulfate	12.0	5,424	26	38	64
Chlorine	11.7	1,433,003	27	3	30
Methyl Chloride	11.3	16,800	28	29	57
Methyl Methacrylate	11.3	184,550	28	15	43
1,1,1-Trichloroethane	11.0	1,496,539	30	2	32
Methyl Mercaptan	10.5	428,940	31	9	40
p-Nitrophenol	10.5	228	31	53	84
Formic Acid	10.5	50,433	31	25	56
Xylene	10.3	1,091,274	34	4	38
Manganese	10.0	9,320	35	35	70
Barium	9.4	2,156	36	44	80
Chlorine Dioxide	9.4	296,787	36	10	46
Methyl Cellosolve	9.4	632,248	36	7	43
Ethylene Glycol Ethyl Ether	9.4	277,118	36	11	47
Furfural	9.2	7,110	40	36	76
Hydrogen Sulfide	8.5	269,912	41	12	53
Cyanide	8.5	2,955	41	42	83

TOXICITY RANKING FOR HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE (con't)

Pollutant	Toxicity Score	Emissions (lbs/yr)	Toxicity Rank	Emissions Rank	Total
Biphenyl	8.0	4,510	43	40	83
Methyl Ethyl Ketone	8.0	512,611	43	8	51
Tetrahydrofuran	8.0	400	43	51	94
Acetone	7.5	804,521	46	5	51
Nitric Acid	7.0	41,450	47	27	74
Oxalic Acid	7.0	868	47	48	95
n-Butyl Acetate	6.6	253,563	49	14	63
Butanol	6.6	149,490	49	17	66
Acetic Anhydride	5.5	1,403	51	46	97
1,2 Dichlorobenzene	5.5	2,400	51	43	94
Diphenyl Methyl 4,4-Diisocyanate	5.5	146,000	51	18	69
Ethyl Acetate	5.5	66,537	51	23	74
Ethanolamine	5.5	3,318	51	41	92
Turpentine	5.5	77,130	51	22	73
Methyl Isobutyl Ketone	4.0	14,045	57	31	88
Titanium Oxide	4.0	5,240	57	39	96

\*\* APPENDIX H \*\*

APPENDIX H

EXPOSURE RANKING FOR HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE

Pollutant	Toxicity Score	Emissions (lbs/yr)	Toxicity Rank	Emissions Rank	Total
Toluene	12.5	2,511,623	18	1	19
1,1,1-Trichloroethane	11.0	1,496,539	30	2	32
Chlorine	11.7	1,433,003	27	3	30
Xylene	10.3	1,091,274	34	4	38
Acetone	7.5	804,521	46	5	51
Tetrachloroethylene	13.2	708,050	15	6	21
Methyl Cellosolve	9.4	632,248	36	7	43
Methyl Ethyl Ketone	8.0	512,611	43	8	51
Methyl Mercaptan	10.5	428,940	31	9	40
Chlorine Dioxide	9.4	296,787	36	10	46
Ethylene Glycol Ethyl Ether	9.4	277,118	36	11	47
Hydrogen Sulfide	8.5	269,912	41	12	53
Methylene Chloride	12.5	288,569	18	13	31
n-Butyl Acetate	6.6	253,563	49	14	63
Methyl Methacrylate	11.3	184,550	28	15	43
Lead	12.5	178,630	18	16	34
Butanol	6.6	149,490	49	17	66
Diphenyl Methyl 4,4-Diisocyanate	5.5	146,000	51	18	69
Epoxypropane	13.5	124,600	10	19	29
Trichloroethylene	13.2	110,865	15	20	35
Formaldehyde	15.5	79,401	2	21	23
Turpentine	5.5	77,130	51	22	73
Ethyl Acetate	5.5	66,537	51	23	74
Benzene	15.5	52,392	2	24	26
Formic Acid	10.5	50,433	31	25	56
Hydrogen Chloride	12.5	44,731	18	26	44
Nitric Acid	7.0	41,450	47	27	74
1,2 Dichloroethane	13.2	32,400	15	28	43
Methyl Chloride	11.3	16,800	28	29	57
Benzo-a-Pyrene	14.6	15,180	7	30	37
Methyl Isobutyl Ketone	4.0	14,045	57	31	88
Styrene	15.5	13,001	2	32	34
Napthalene	12.5	11,799	18	33	51
Bis 2-ethylhexyl phthalate	13.4	10,190	11	34	45
Manganese	10.0	9,320	35	35	70
Furfural	9.2	7,110	40	36	76
Phenol	12.3	5,180	24	37	61
Diethyl Sulfate	12.0	5,424	26	38	64
Titanium Oxide	4.0	5,240	57	39	96
Biphenyl	8.0	4,510	43	40	83
Ethanolamine	5.5	3,318	51	41	92
Cyanide	8.5	2,955	41	42	83
1,2 Dichlorobenzene	5.5	2,400	51	43	94
Barium	9.4	2,156	36	44	80

EXPOSURE RANKING FOR HAZARDOUS AIR POLLUTANTS EMITTED IN MAINE (con't)

Pollutant	Toxicity Score	Emissions (lbs/yr)	Toxicity Rank	Emissions Rank	Total
Ethylene Oxide	13.4	1,535	11	45	56
Acetic Anhydride	5.5	1,403	51	46	97
Zinc	13.4	946	11	47	58
Oxalic Acid	7.0	868	47	48	95
Hydrazine	14.6	740	7	49	56
Arsenic	16.0	430	1	50	51
Tetrahydrofuran	8.0	400	43	51	94
Cadmium	14.6	238	7	52	59
p-Nitrophenol	10.5	228	31	53	84
Chromium	15.5	184	2	54	56
Copper	13.4	107	11	55	66
Ethyl Benzene	12.5	80	18	56	74
Mercury	12.3	16	24	57	81
Epichlorhydrin	15.5	12	2	58	60



\*\* NOTES \*\*

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