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Inhalation Pathway Risk Assessment of Hazardous Waste Incineration Facilities

C. C. Travis
E. L. Etnier
G. A. Holton
F. R. O'Donnell
D. M. Hetrick
E. Dixon
E. S. Harrington

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HEALTH AND SAFETY RESEARCH DIVISION

INHALATION PATHWAY RISK ASSESSMENT OF HAZARDOUS WASTE INCINERATION FACILITIES

C. C. Travis, E. L. Etnier, G. A. Holton,
F. R. O'Donnell, D. M. Hetrick,* E. Dixon,†
and E. S. Harrington**

*Computer Sciences Division
†Environmental and Occupational Safety Division
**Engineering Division Central Management
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831

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INHALATION PATHWAY RISK ASSESSMENT OF HAZARDOUS WASTE INCINERATION FACILITIES

1. SUMMARY

The purpose of this assessment was to determine the relative importance of plant design and waste physicochemical variables on human inhalation exposure and health risk resulting from hazardous waste incineration. A hypothetical waste incineration site in the northern Midwest was chosen as the primary site for analysis. This site (designated S-1) has a population of 0.45×10^6 persons, with the closest individuals residing 1500 m from the incineration site. To investigate the effect of population size and distribution on human inhalation exposure and health risk, two additional sites in heavily populated areas were chosen. One of these sites (S-2) had a population of 8.2×10^6 people with the nearest resident at 625 m, and the other site (S-3) had a population of 7.4×10^6 people, with the nearest resident at 200 m from the incineration facility. Unless otherwise indicated, all discussions and conclusions refer to the primary site, S-1.

To account for engineering variables, two facility designs (liquid injection and rotary kiln) of three sizes (1, 10, and 150×10^6 Btu/h), each burning three generic wastes, were selected. These are designated LI-1, LI-10, LI-150, and RK-1, RK-10, and RK-150, respectively. Three levels of destruction and removal efficiency (DRE) were considered (99.0, 99.9 and 99.99% DRE). The three waste groups selected for

study, in order of increasing incinerability were: (1) pesticide-related chemicals (chloroform, ethylene dichloride, hexachlorobutadiene, and 1,1,2,2-tetrachloroethane); (2) API separator sludge chemicals (arsenic, chromium, lead, and phenol) and (3) phenol/acetone distillation chemicals (toluene, pyridine, phthalic anhydride, and methyl styrene).

Annual-average ground level air concentrations of representative chemical pollutants were estimated using IEM, an automated inhalation exposure methodology (O'Donnell et al., 1982). Air concentrations were estimated for both stack and fugitive emissions using region-specific meteorological and climatological data.

Estimates of individual and total population exposure resulting from incineration of hazardous materials were calculated by multiplying ground-level air concentrations by site-specific population data obtained from the 1980 census. Estimates of risk associated with incineration of hazardous materials were obtained by multiplying the population exposure estimates by health risk estimators supplied by the U.S. Environmental Protection Agency (EPA) Environmental Criteria Assessment Office (ECAO). Chemicals studied were classified as either carcinogens or noncarcinogens, and separate measures of toxicity were used for these two classes. Carcinogenic toxicities are measured in terms of lifetime excess cancer risk, while noncarcinogenic toxicity is measured in terms of acceptable daily intake (ADI). Estimates of lifetime excess cancer risk were used for chloroform, ethylene dichloride, hexachlorobutadiene, 1,1,2,2-tetrachloroethane, and

arsenic. The ADI value was used for chromium, lead, arsenic, phenol, toluene, pyridine, phthalic anhydride, and methyl styrene. Health effects from stack emissions of hydrochloric acid and particulates were not considered in this assessment; existing regulations for emissions of these two pollutants from hazardous waste incinerators already account for their potential health effects.

Major conclusions to be drawn from this report are listed below. Estimates of exposure and health risk are presented only for the LI incinerator design since stack and fugitive emission source terms for the RK and LI incinerators were found to be very similar (see Table 4.5).

1. Fugitive emissions may be an important contributor to total pollutant emission rates. The largest contribution occurs when stack emission rates are lowest, that is for small incinerators (1 x 10^6 Btu/h) with DRE's ranging from 99.9 to 99.99%. For large incinerators, fugitive emissions are a relatively unimportant contributor to total emissions at all DRE's studied (Table 1.1). We have selected chlorogorm for our example as it is the most volatile chemical in our pesticide-related waste stream (see Appendix B). Caution should be used in interpreting these results since they are based on preliminary estimates of fugitive emissions rates; little data exists on measured emissions rates.

Table 1.1 Percent contribution of fugitive emissions to total emissions of chloroform at a liquid injection incinerator

% DRE	Contribution (%)		
	LI-1	LI-10	LI-150
99.99	93.5	78.8	24.8
99.90	58.8	27.1	3.2
99.00	12.5	3.6	0.3

2. Total population exposure is relatively insensitive to changes in DRE for small incinerators (1 x 10^6 Btu/h), increasing by only a factor of 7 from 99.99 to 99.0%. Total population exposure to volatile compounds is sensitive to incinerator size for low DRE's (99.0%) and is (i.e., those with the highest absolute fugitive emissions rates) to incinerator size for high DRE's (99.99%) (see Table 1.2).

Table 1.2 The effect of DRE on total population exposure (person-$\mu g/m^3$) to chloroform emissions from a liquid injection incinerator

% DRE	LI-1	LI-10	LI-150
99.99	2.5E+0	7.1E+0	2.0E+1
99.90	3.7E+0	1.7E+1	1.2E+2
99.00	1.7E+1[a]	1.1E+2	1.2E+3

[a]Read as 1.7 x 10^1

3. Human health risk from principle organic hazardous constituents (POHC) released during incineration was small. For incineration of pesticide-related waste at a site with a population of 0.45 x 10^6, expected number of additional cancers over 70 years are less than 1.6 x 10^{-3} for a DRE of 99.99% (see Table 1.3). The excess cancer risk over 70 years to the maximally exposed individual at site S-1 from incineration of pesticide-related waste is less than 1.2 x 10^{-7} for a DRE of 99.99% (see Table 1.4). Investigation of incinerators with populations residing closer to the site indicates that excess cancer risk to the maximally exposed individual could be increased by a factor of about 30.

Table 1.3. Expected number of excess cancers over 70 years from incineration of pesticide-related waste at a liquid injection incinerator (for a population of 0.45 x 10^6)

% DRE	LI-1	LI-10	LI-150
99.99	1.3E-4	4.0E-4	1.6E-3
99.90	2.6E-4	1.4E-3	1.2E-2
99.00	1.6E-3	1.1E-2	1.2E-1

Table 1.4. Excess cancer risk over 70 years to the maximally exposed individual from incineration of pesticide-related waste at liquid injection incinerators (99.99% DRE)

Site	LI-1	LI-10	LI-150
S-1	2.8E-8	7.8E-8	1.2E-7
S-2	6.5E-8	1.8E-7	2.8E-7
S-3	7.5E-7	2.1E-6	3.2E-6

4. Noncarcinogenic risk to the maximally exposed individual (as a fraction of ADI) from incineration of heavy metals is small (see Table 1.5). As can be seen from this table, all inhalation exposures to heavy metals result in average daily intakes for the maximally exposed individual which are at least 3 orders of magnitude less than the acceptable daily intake.

Table 1.5. Average daily intake of heavy metals (as a fraction of ADI) for the maximally exposed individual from incineration at a liquid injection incinerator (95% DRE)

	LI-1	LI-10	LI-150
Arsenic	2.6E-6	1.0E-5	2.6E-5
Chromium[a]	2.7E-6	1.1E-5	2.7E-5
Lead	2.1E-4	8.5E-4	2.1E-3

[a]The ADI value for chromium VI was used.

The mean concentration (μg/g) of heavy metals in the API separator sludge waste used in the estimates above was about 10 times less than the maximum measured at incinerator sites. Even assuming maximum heavy metal concentrations in the waste stream and a 50% removal efficiency for heavy metals, the daily intake (of the metals considered here) for the average individual at the largest incinerator site is less than 2% of the ADI.

5. Excess cancer risk to the maximally exposed individual from arsenic is estimated to be 4.8×10^{-8} and 4.8×10^{-7} for the LI-1 and LI-150, respectively. Under worst-case assumptions carcinogenic risk to the maximally exposed individual from arsenic is estimated to be 4.8×10^{-6} and 4.8×10^{-4} for the LI-1 and LI-150, respectively.

6. An upper bound estimate of total excess cancer risk from releases of products of incomplete combustion (PIC) from an LI-150 incinerator burning pesticide-related waste is estimated to be 1.2 for a population of 0.45×10^6. Excess lifetime cancer risk to the maximally exposed individual for an LI-1, LI-10, and LI-150 may be as high as 4.0×10^{-6}, 3.4×10^{-5}, and 1.8×10^{-4}, respectively. There is a large degree of uncertainty in estimating risk due to PICs, however, due to the incomplete characterization of the PIC emission stream.

In summary, it appears likely that both carcinogenic and noncarcinogenic risk from POHC emissions associated with hazardous waste incineration facilities will be insignificant over the range of waste streams, incinerator sizes, DRE's, and population distributions studied. The risk from incineration of noncarcinogenic heavy metals also appears to be insignificant for the waste streams considered here.

During the course of this assessment, two areas of concern have become apparent. These are the incineration of waste streams containing carcinogenic heavy metals, and the release of products of incomplete combustion during incineration. Based on limited data, we find that the human health risk from incineration of carcinogenic heavy metals may be significant under certain conditions. The formation and release of PIC during incineration may also pose a significant risk to the public. These conclusions are preliminary and suggest that further research is warranted. It is recommended that such research include an accurate determination of stack releases of heavy metals for a variety of waste streams, and a more detailed assessment of excess cancer risk for heavy metals suspected of being carcinogens (such as chromium,

cadmium, and beryllium). Further research is needed to identify the chemical composition, relative abundance and carcinogenicity of PIC in incinerator stack emissions.

2. INTRODUCTION

One objective of quantitative risk assessment is to arrive at a value or, more realistically, a range of values that describe the possible adverse effects on human health associated with low, chronic exposure to a known or suspected toxic substance. There is increasing impetus to use risk assessment to prioritize research needs in health and environmental areas. Quantitative risk assessment typically consists of two components, the measurement or estimation of the concentrations of pollutants to which a population will be exposed and an estimation of resultant health effects based on available dose-response relationships. These two components are called exposure assessment and health effects assessment, respectively.

Exposure assessment is defined as the determination of the concentration of toxic materials in space and time at the interface of target populations. This description must include identification of all major pathways (air, water, and soil) for movement and transformation of a toxic material in a selected environmental setting. The present assessment focuses only on atmospheric concentrations and exposure via the inhalation pathway.

Health effects assessment consists of relating population exposure to such potential human health impacts as carcinogenicity,

mutagenicity, teratogenicity, or neurotoxicity. Unfortunately, adequate data for assessing excess human risk resulting from exposure to most toxicological substances do not exist.

The U.S. Environmental Protection Agency is conducting research to determine air concentrations, public inhalation exposure, and health risk resulting from chemicals emitted during incineration of hazardous wastes. Incineration facilities produce stack and fugitive (non-stack) atmospheric emissions. The magnitude of public exposure to such emissions is dependent on both plant design and operation as well as the physicochemical properties of the waste. Engineering variables include facility design, size, DRE, and emission source strength (stack vs fugitive). Physiocochemical waste variables include incinerability, volatility, and toxicity. The present assessment was performed to determine the relative importance of these variables to human inhalation exposure and health risk.

It should be emphasized that both the exposure assessment and health effects assessment methodologies presented in this report are very generalized, and caution should be exercised in interpreting the results. Site-specific application of our results would require careful evaluation of the extent to which the models and parameter values used in this report are representative of conditions prevailing at the specific site.

3. INCINERATION FACILITY DESIGN

In the United States, there are at least 219 facilities operating 284 hazardous waste incinerators of varying design and capacity (Keitz et al., 1982). The liquid injection (LI) design is the most common type of hazardous waste incinerator (51%) employed in the United States (Keitz et al., 1982). Liquid injection incinerators can be applied to virtually all liquid wastes (liquid, slurries, sludges). Liquid injection systems employ a waste nozzle (burner) which atomizes the waste and mixes it with air to form a suspension that promotes complete combustion. Atomization is achieved mechanically or by pressure atomization systems using high-pressure air or steam (Bonner et al., 1980).

The rotary kiln (RK) design is employed at 7% of the incineration facilities in the United States (Keitz et al., 1982). A rotary kiln is a cylindrical refractory-lined shell mounted at a slight incline from the horizontal plane. Rotation of the shell provides for movement of the waste through the kiln as well as for enhanced mixing. Rotary kilns can be applied to both liquid and solid wastes (Bonner et al., 1980).

Incinerator capacity is extremely variable, with the largest units being as much as 100 times larger than the smallest units. The capacity of liquid hazardous waste incinerators ranges from 1-10,000 gallons/hour with the majority (55.2%) having capacities less

than 200 gallons/hour. The capacity of solid hazardous waste incinerators ranges from 1-20,000 lb/hour with 64.5% being less than 1,000 lb/hour (Keitz et al., 1982).

Although few data are currently available on heat throughput for existing incinerators, a rough estimate can be obtained from reported capacities by assuming an average heat content of 8,000 Btu/lb for liquid waste and 3,500 Btu/lb for solid waste. Ninety-five percent of incinerators burning liquid hazardous waste have a heat capacity of 120 x 10^6 Btu/h or less. The remaining 5% have heat capacities up to 640 x 10^6 Btu/h. The maximum heat capacity of incinerators burning solid waste is around 70 x 10^6 Btu/h, with 75% having heat capacities less than 7 x 10^6 Btu/h (MITRE, 1983).

Three incinerator sizes (1, 10, and 150 x 10^6 Btu/h) were chosen for analysis to provide a profile of existing incinerator capacities. Two facility designs (liquid injection and rotary kiln) for each of the three sizes were selected.

3.1 FACILITY DESIGN PARAMETERS

Facility design may be important in determining fugitive emissions, since such emissions are dependent on the number of pumps, tanks, valves and flanges in operation. Each incineration facility was designed following a review of existing-practice incinerators. For example, the hypothetical 150 x 10^6 Btu/h incinerator used in this study was assumed to possess one receiving tank for each of four categories of waste: clean or dirty high-Btu waste and clean or dirty

low-Btu waste (dirty waste is any waste that requires pretreatment to enhance viscosity). Two additional tanks were included to provide extra storage capacity for irregular shipments. The storage area of the facility was designed with sufficient capacity for 14 days continuous operation. The feed area was assumed to have sufficient storage for three days of operation. Other design factors such as piping or numbers of pumps were also considered. Process flow diagrams for each facility studied are shown in Figures A-1 through A-6 of Appendix A.

A compilation of important facility design parameters is presented in Table 3.1. Equipment quantities and operating assumptions for the receiving area are identical for both incinerator types, but vary slightly with size. The number of storage tanks in the storage and feed areas remains the same for all sizes of incinerators, but the holding capacity of the tanks increases. The number of pumps, valves, and flanges are identical in the storage and feed areas of the 10 and 150 x 10^6 Btu/h incinerators. Since these areas are the major contributors to fugitive emissions, one should not expect a large change in fugitive emissions as a function of incinerator size.

4. WASTE CHARACTERIZATION

Operation of a commercial incinerator is characterized by receipt of wastes of widely varying composition. Except in settings where an incinerator is dedicated to a particular chemical process waste stream, a detailed qualitative or quantitative makeup of the waste being burned

Table 3.1. Expected equipment quantities and operating assumptions for each incineration facility design

	Rotary kiln			Liquid injector		
	Size, 10^6 Btu/h					
	1	10	150	1	10	150
RECEIVING AREA:						
Capacity, trucks	1	2	2	1	2	2
Capacity, tank cars	0	0	1	0	0	1
Pumps (pairs)	1	3	4	1	3	4
In-line valves	13	39	52	13	39	52
Open-ended valves	2	6	8	2	6	8
Flanges	24	72	96	24	72	96
Instr. connections	4	12	16	4	12	16
Sampling connections	0	2	6	0	2	6
Storage tanks	0	2[a]	6[a]	0	2[a]	6[a]
STORAGE AREA:						
Pumps (pairs)	1	1	1	1	1	1
Pumps (single)	0	2	2	0	2	2
In-line valves	13	39	39	13	39	39
Open-ended valves	2	6	6	2	6	6
Flanges	24	72	72	24	72	72
Instr. connections	4	12	12	4	12	12
Sampling connections	4	4	4	4	4	4
Storage tanks	4[a]	4[b]	4[c]	4[d]	4[e]	4[f]
FEED AREA:						
Pumps (pairs)	1	1	1	1	1	1
In-line valves	13	13	13	13	13	13
Open-ended valves	2	2	2	2	2	2
Flanges	24	24	24	24	24	24
Instr. connections	4	4	4	4	4	4
Sampling connections	1	1	1	2	2	2
Storage tanks	1[g]	1[a]	1[h]	2[i]	2[d]	2[j]

[a] 1.0×10^4 gal capacity.
[b] 2.0×10^4 gal capacity.
[c] 1.5×10^5 gal capacity.
[d] 1.25×10^4 gal capacity.
[e] 2.5×10^4 gal capacity.
[f] 2.0×10^5 gal capacity.
[g] 5.0×10^3 gal capacity.
[h] 1.2×10^5 gal capacity.
[i] 6.0×10^3 gal capacity.
[j] 1.5×10^5 gal capacity.

is unknown. The EPA has conducted a survey of the composition of hazardous waste streams currently being incinerated (MITRE, 1983). A total of 237 different constituents have been identified as present in one or more of the 413 hazardous waste streams reviewed. Table 4.1 lists the ten most prevalent constituents of hazardous waste streams currently being incinerated.

Table 4.1. Ten most prevalent constituents of hazardous waste streams[a]

Constituent	Amount Incinerated (MT/y)
Methanol	133,168
Acetonitrile	58,646
Toluene	56,620
Ethanol	55,090
Amyl acetate	54,926
Acetone	51,535
Xylene	49,453
Methyl ethyl ketone	42,520
Adipic acid	36,135
Ethyl acetate	32,576

[a]from MITRE (1983)

To deal with the uncertainties inherent in the characterization of incineration waste streams, it was decided to examine the behavior of representative chemicals from three generic waste classes. To choose these waste classes, data from a survey of industrial wastes (USEPA, 1980a) were analyzed and grouped by incinerability characteristics. Incinerability in this report is defined as the inherent heating value

(Btu/lb) of the waste before fuel oil is added. The three waste groups selected for study, in order of increasing incinerability were: (1) pesticide-related chemicals (3,021 Btu/lb); (2) API separator sludge chemicals (4,049 Btu/lb); and (3) phenol/acetone distillation chemicals (15,850 Btu/lb). Four chemicals from each waste group were selected for analysis. Criteria for choosing specific chemicals were high and low volatility, high and low toxicity, and prevalence of the chemical in U.S. industrial waste streams. The chemicals chosen for the three waste groups were: (1) chloroform, ethylene dichloride, hexachlorobutadiene, and 1,1,2,2-tetrachloroethane; (2) chromium, lead, arsenic, and phenol; and (3) toluene, pyridine, phthalic anhydride, and methyl styrene.

4.1 STACK EMISSION SOURCE TERMS

The rate of release (mass per unit time) of specific chemicals in stack emissions is controlled by three facility variables: waste throughput, chemical concentration in the waste stream, and DRE. Waste throughput in an incineration facility is determined by the percent contribution of the waste to the total waste stream after supplementary addition of No. 2 fuel oil to insure combustibility. If the waste has a high enough Btu content (10,000 Btu/lb) to burn without the addition of supplementary fuel (as is the case with phenol/acetone distillation waste), waste throughput (TP_W) is determined as follows:

$$TP_W = 7200\ C_F/[\rho_{LW}(\Delta Hc)_W]$$

where

7200 = facility operating time (h/y);

C_F = incinerator capacity (Btu/h);

ρ_{Lw} = liquid density of the waste (lb/gal); and

$(\Delta Hc)_w$ = heat of combustion of the waste (Btu/lb).

When it is necessary to add fuel oil to the waste stream to insure incinerability (as is the case with the pesticide-related and the API separator sludge waste streams), waste and fuel oil throughput can be calculated using equations 1 and 2 of Table 4.2. This table also contains equations (Equations 3-10) necessary to estimate fugitive emissions from an incineration facility (Holton et al., 1982). Table 4.3 provides expected input parameters values for Equations 1-10 (Table 4.2) for the 150 x 10^6 Btu/h rotary kiln incinerator. A summary of both waste and supplementary fuel oil throughput is listed in Table 4.4.

Table 4.2. Emission equations

Number	Parameter	Symbol	Units	Equation
1	Waste throughput	TP_w	gal/y	$TP_w = 7200\left[\frac{1000\ C_F}{10\times10^6}(\Delta H_c)_{fo} - C_F\right] / \left[\rho_{lw}\left[(\Delta H_c)_{fo} - (\Delta H_c)_w\right]\right]$
2	Fuel oil throughput	TP_{fo}	gal/y	$TP_{fo} = 7200\left[C_F - \frac{1000\ C_F}{10\times10^6}(\Delta H_c)_w\right] / \left[\rho_{lfo}\left[(\Delta H_c)_{fo} - (\Delta H_c)_w\right]\right]$
3	Operating time	OT	h/y	$OT_w = TP\ /\ 60(FR)$
4	Tank emissions	L_T	lb/y	$L_T = \Sigma\left[9.15(P_w/(14.7 - P_w))^{0.68}\ D^{1.73}\ H^{0.51}\ \Delta T^{0.5}\ F_P C + 0.0109\ P_w\ (TP_w)\right]0.0022 M_w\ N_T(1 - EFF_T)$
5	Pump emissions	L_P	lb/y	$L_P = E_P(\Sigma N_P OT)\ (1 - EFF_P)$
6	In-line valve emissions	L_{ILV}	lb/y	$L_{ILV} = E_{ILV}(\Sigma N_P OT)\ R_{ILV}\ (1 - EFF_{ILV})$
7	Open-ended valve emissions	L_{OEV}	lb/y	$L_{OEV} = E_{OEV}\ (\Sigma N_P OT)\ R_{OEV}(1 - EFF_{OEV})$
8	Flange emissions	L_F	lb/y	$L_F = E_F(\Sigma N_p OT)\ R_F\ (1 - EFF_F)$
9	Instrument connection emissions	L_{IC}	lb/y	$L_{IC} = E_{IC}(\Sigma N_P OT)\ R_{IC}\ (1 - EFF_{IC})$
10	Sampling connection emissions	L_{SC}	lb/y	$L_{SC} = 7200\ E_{SC}\ N_T\ (1 - EFF_{SC})$

Table 4.3. Equation parameters -- definition and variability

Symbol	Parameter	Units	Lower bound	Expected value	Upper bound
$(\Delta H_c)_w$	Heat of combustion -- waste	Btu/lb	1500[a]	3000[b]	6000[a]
M_w	Vapor molecular weight -- waste	lb/mol	75[a]	150[b]	300[a]
P_w	Vapor pressure -- waste	psia	0.05[a]	0.10[b]	0.20[a]
ρ_{lw}	Liquid density -- waste	lb/gal	7[a]	14[b]	28[a]
$(\Delta H_c)_{fo}$	Heat of combustion -- fuel oil (#2)	Btu/lb	18,500[c]	19,000[b]	19,500[c]
M_{fo}	Vapor molecular weight -- fuel oil (#2)	lb/mol	128.7[c]	130.0[b]	131.3[c]
P_{fo}	Vapor pressure -- fuel oil (#2)	psia	5.7E-3[c]	5.8E-3[b]	5.9E-3[c]
ρ_{lfo}	Liquid density -- fuel oil (#2)	lb/gal	7.1[c]	7.2[b]	7.3[c]
C	Diameter adjustment factor	--	-14%[d]	See Table 4.3b	+34%[d]
C_F	Incinerator capacity	Btu/h	No error[e]	139,000,000	No error[e]
D	Tank diameter	ft	-17%[f]	See Table 4.3b	+53%[f]
E_P	Pump emission factor[g]	lb/h	0.024	0.11	0.49
E_{ILV}	In-line valve emission factor[g]	lb/h	0.0051	0.016	0.036
E_{OEV}	Open-ended valve emission factor[g]	lb/h	0.0013	0.0038	0.036
E_F	Flange emission factor[g]	lb/h	0.00076	0.0018	0.0038
E_{IC}	Instrument connection emission factor[g]	lb/h	0.00024	0.00066	0.0029
E_{SC}	Sampling connection emission factor[g]	lb/h	0.011	0.033	0.11

Table 4.3. (Continued)

Symbol	Parameter	Units	Lower bound	Expected value	Upper bound
EFF_T	Tank control efficiency	--	0[h]	0.96	0.98[i]
EFF_P	Pump control efficiency	--	0[h]	0.80	1.00[i]
EFF_{ILV}	In-line valve control efficiency	--	0[h]	0.77	1.00[i]
EFF_{OEV}	Open-ended valve control efficiency	--	0[h]	0.89	1.00[i]
EFF_F	Flange control efficiency	--	0[h]	0.70	1.00[i]
EFF_{IC}	Instrument connection control efficiency	--	0[h]	0.70	1.00[i]
EFF_{SC}	Sampling connection control efficiency	--	0[h]	0.89	1.00[i]
F_P	Paint factor	--	1.00[j]	1.29	1.58[j]
FR	Flow rate for pumps	gal/min	No error[e]	See Table 4.3a	No error[e]
H	Average vapor space height	ft	-19%[d]	See Table 4.3b	+27%[d]
R_{ILV}	In-line valves: pump ratio	--	11[a]	13	15[a]
R_{OEV}	Open-ended valves: pump ratio	--	1[a]	2	3[a]
R_F	Flanges: pump ratio	--	21[a]	24	27[a]
R_{IC}	Instrument connections: pump ratio	--	3[a]	4	5[a]
ΔT	Average diurnal temperature change	°F	15[a]	20	30[a]

[a]Factor of two variation assumed.

[b]Dean (1973), Perry and Chilton (1973), Reid et al. (1977), and Thibodeaux (1973).

[c]Engineering judgement.

[d]Derived from error in explicitly related parameter.

[e]Parameters obtained from flowsheets are assigned "no error."

[f]Buffalo Tank Division (1981).

[g]USEPA (1982a).

[h]No control assumed.

[i]State-of-the-art control assumed.

[j]USEPA (1980b).

Table 4.3a Pump parameters

Area	Pump type	NP[a]	Expected throughput (TP) [gal/y/pump]	Expected flow rate (FR) [gal/min]	Expected operating time (OT) [h/y/pump]
Receiving	Unloading	3	1,427,325	20	118.9
	Receiving	1	4,281,975	200	356.8
Storage	Circulating	2	2,140,987	5	7200.0
	Storage	1	4,281,975	20	356.8
Feed	Feed	1	4,281,975	10	7200.0

[a]Number of pumps.

Table 4.3b. Tank parameters

Area	NT[a]	D (ft)[b]			H (ft)[c]			C (ft)[d]		
		Lower bound	Expected value	Upper bound	Lower bound	Expected value	Upper bound	Lower bound	Expected value	Upper bound
Receiving	6	8.72	10.5	16.1	6.34	7.83	9.94	0.458	0.533	0.714
Storage	4	22.5	27.1	41.4	14.2	17.5	22.2	0.860	1.00	1.34
Feed	1	20.1	24.2	37.0	14.2	17.5	22.2	0.835	0.971	1.30

[a]Number of tanks.

[b]Diameter of tank

[c]Height of tank.

[c]Diameter adjustment factor.

Table 4.4 Facility throughputs

	Waste (g/yr)		
	Waste I Pesticide-Related Waste	Waste II API Separator Sludge Waste	Waste III Phenol/Acetone Distillation Waste
1 MM Btu/hr	1.84E+8	1.33E+8	3.53E+8
10 MM Btu/hr	1.84E+9	1.33E+9	3.53E+9
150 MM Btu/hr	2.76E+10	2.00E+10	5.29E+10
	Fuel Oil (g/yr)		
1 MM Btu/hr	2.82E+8	2.57E+8	0
10 MM Btu/hr	2.82E+9	2.57E+9	0
150 MM Btu/hr	4.23E+10	3.85E+10	0

To determine the effect of DRE on human exposure and risk estimates, three scenarios were chosen. These scenarios were 99.99 (the proposed emission standard for hazardous waste incinerators -- USEPA, 1981a), 99.9, and 99.0% DRE. An additional analysis of 95.0% DRE for the heavy metals arsenic, chromium, and lead was performed. Predicted annual incineration rates (MT/y), and annual stack emission rates (g/y) are given in Table 4.5 assuming 99.99% DRE.

Table 4.5. Consumption, concentration, and emission rates of incinerated chemicals (99.99% DRE)

Pollutant	Amount incinerated[a] (MT/y)	Fraction of waste stream[b] (%)	Emission rate, g/y											
			Rotary kiln						Liquid injector					
			1		10		150		1		10		150	
			Stack	Fugitive	Stack	Fugitive	Stack	Fugitive	Stack	Fugitive	Stack	Fugitive	Stack	Fugitive
PESTICIDE-RELATED WASTE														
Chloroform	9.13E+4	6.1	1.12E+3	1.52E+4	1.12E+4	4.09E+4	1.68E+5	5.46E+4	1.12E+3	1.60E+4	1.12E+4	4.18E+4	1.68E+5	5.56E+4
Ethylene dichloride	7.85E+4	19.0	3.50E+3	1.73E+4	3.50E+4	4.65E+4	5.23E+5	6.09E+4	3.50E+3	1.82E+4	3.50E+4	4.74E+4	5.23E+5	6.30E+4
Hexachlorobutadiene	6.79E+4	9.2	1.69E+3	1.02E+2	1.69E+4	2.74E+2	2.54E+5	3.59E+2	1.69E+3	1.07E+2	1.69E+4	1.69E+2	2.54E+5	3.73E+2
1,1,2,2-tetrachloroethane	2.10E+4	2.4	4.42E+2	2.03E+2	4.42E+3	5.44E+2	6.62E+4	7.15E+2	4.42E+2	2.14E+2	4.42E+3	5.58E+2	6.62E+4	7.43E+2
API SEPARATOR SLUDGE WASTE														
Chromium[c]	1.10E+2	0.025	1.66E+3	0	1.66E+4	0	2.50E+5	0	1.66E+3	0	1.66E+4	0	2.50E+5	0
Lead[c]	1.08E+1	0.033	2.20E+3	0	2.20E+4	0	3.30E+5	0	2.20E+3	0	2.20E+4	0	3.30E+5	0
Arsenic[c]	2.74E+0	0.006	4.00E+2	0	4.00E+3	0	6.00E+4	0	4.00E+2	0	4.00E+3	0	6.00E+4	0
Phenol	5.40E+0	0.003	6.87E-1	3.63E-2	6.87E+0	9.68E-2	1.03E+2	1.10E-1	6.87E-1	3.81E-2	6.87E+0	9.88E-2	1.03E+2	1.12E-1
PHENOL/ACETONE DISTILLATION WASTE														
Toluene	1.89E+1	0.6	3.91E+3	6.43E+3	3.91E+4	1.76E+4	5.87E+5	3.21E+4	3.91E+3	6.77E+3	3.91E+4	1.80E+4	5.87E+5	3.40E+4
Pyridine	5.02E+1	1.3	2.68E+2	3.45E+2	2.68E+3	9.47E+2	4.01E+4	1.72E+3	2.68E+2	3.64E+2	2.68E+3	9.69E+2	4.01E+4	1.83E+3
Phthalic anhydride	1.22E+1	0.001	2.05E-1	5.34E-3	2.05E+0	1.46E-2	3.09E+1	2.64E-2	2.05E-1	5.60E-3	2.05E+0	1.49E-2	3.09E+1	2.80E-2
Methyl styrene	5.66E+3	1.8	3.72E+3	9.91E+2	3.72E+4	2.72E+3	5.55E+5	4.96E+3	3.72E+3	1.05E+3	3.72E+4	2.79E+3	5.55E+5	5.25E+3

[a]From compilation of waste information (USEPA, 1980a).

[b]Calculated by averaging pesticide-related waste chemical concentrations.

[c]A DRE of 95.0% is assumed for the heavy metals.

4.2 FUGITIVE EMISSION SOURCE TERMS

Fugitive emissions consist of tank, pump, in-line valve, open-ended valve, flange, instrument connection, and sampling connection emissions from the receiving, storage, and feed areas of the incinerator. Tank emissions were calculated from Equation 4 of Table 4.2, a combination (with slight modification) of two equations for breathing and working losses from fixed-roof tanks (USEPA, 1980b). Factors were included to convert from gallons to pounds, to calculate emissions from an area containing more than one tank, and to allow application of pollution control. Equations 5 through 10 were used to calculate fugitive emissions for six other major types of equipment. These equations incorporate source emission factors (USEPA, 1982a) and various control factors.

Defined in Table 4.3 are the parameters utilized in Equations 1-10 of Table 4.2. Waste properties (vapor pressure, density, molecular weight, and heat of combustion) were determined from Weast (1973) or by the calculation procedures of Perry and Chilton (1973). Data relating to the chemical composition of waste were used as much as possible to define waste properties. Engineering judgement was used to set error bounds in several cases where no data were available in the literature.

Source emission factors and error bounds were based on a study of fugitive emissions from petroleum refinery operations (USEPA, 1981b, 1982a). The petroleum refinery data are the most comprehensive and definitive fugitive emissions data available and the study was designed to produce emission factors which would estimate uncontrolled fugitive

emissions of volatile organic compounds (USNRC, 1982a). Differences between incinerator facilities and petroleum refining units can logically be expected to result in different levels of fugitive emission rates. Hazardous waste incinerators are characterized by smaller plant and equipment sizes which lend themselves to improved fugitive emission control. Petroleum refineries, on the other hand, are characterized by more strenuous conditions, larger equipment, higher temperatures, and a greater number of outdoor continuous processes (USEPA, 1982a). These differences can be expected to lead to higher fugitive emission rates at petroleum refineries. The toxicity of the chemicals handled is another factor leading to greater control of fugitive emissions at hazardous waste incinerators. One might expect that a knowledge of this toxicity would influence design and operating practices, thus resulting in lower fugitive leak frequencies and emissions. Because of the possibility of enhanced control of fugitive emissions at hazardous waste incinerators, equations 4-10 in Table 4.2 include a control efficiency term. All control efficiency values were assigned lower bounds of 0.0, which represents the case of uncontrolled emissions. Upper bounds were determined from literature (USEPA, 1980b and 1981c) to be 1.0 for all equipment except tanks. The upper bound of tank control efficiency was set at 0.98 because small leaks will inevitably occur unless pressure vessels are used (a highly impractical alternative).

A triangular distribution was assumed for each parameter based on estimated minimum, maximum, and expected values. These parameter distributions were randomly sampled and solutions were computed for each

emission equation. Throughput (TP) and operating time (OT) were intermediate variables used in predicting total emissions from tanks (LT), pumps (LP), in-line valves (LILV), open-ended valves (LOEV), flanges (LF), instrument connections (LIC), and sampling connections (LSC).

This sampling and computation was performed in an iterative manner (1000 times) to develop distributions of emission rate estimates for receiving, storage, and feed areas. Table 4.6 lists expected gross fugitive emission rates based on the total waste throughput for each of the three waste streams. These values do not represent chemical-specific fugitive emission rates.

Fugitive emission rates have been measured at an incinerator facility located in Cincinnati (Staley et al., 1983). Measured emission rates fell below the 95% confidence bounds of our predicted values (Table 4.5). A possible reason for the difference between our model predictions and actual field measurements is that the Cincinnati incinerator is new and well-operated and maintained. One must also recognize that some hazardous waste incineration facilities may not achieve the control efficiencies which we have assumed. Assuming zero control efficiency could result in fugitive emission rates that are 3-25 times larger than we estimated. The EPA is currently gathering additional data on fugitive emissions at incinerator sites.

Chemical-specific fugitive emission rates were calculated from gross fugitive emission rates using chemical-specific information (vapor pressures, molecular weights, and concentrations) and Raoult's Law under simple gaseous-liquid equilibrium assumptions. The

Table 4.6. Expected gross fugitive emission rates for three waste streams (lb/y)

	Incinerator Size[a]	Area		
		Receiving	Storage	Feed
Pesticide-Related Waste				
	RK 1	0.683	569.2	2171.7
	RK 10	328.9	4828.9	2207.5
	RK 150	1861.6	5449.4	2338.3
	LI 1	0.683	571.3	2311.4
	LI 10	328.9	4838.4	2349.7
	LI 150	1861.6	5521.3	2635.7
API Separator Sludge Waste				
	RK 1	0.493	547.9	2169.5
	RK 10	303.8	4764.0	2198.0
	RK 150	1207.3	4840.1	2209.4
	LI 1	0.493	547.1	2306.6
	LI 10	303.8	4764.8	2329.8
	LI 150	1207.3	4846.4	2354.8
Phenol/Acetone Distillation Waste				
	RK 1	1.312	608.8	2175.7
	RK 10	398.5	5003.1	2232.1
	RK 150	4138.1	7082.8	2692.9
	LI 1	1.312	613.1	2319.7
	LI 10	398.5	5022.7	2400.1
	LI 150	4138.1	7231.1	3371.8

[a]RK = rotary kiln incinerator; LI = liquid injection incinerator; and 1, 10, and 150 = incineration capacity (Btu/h) x 10^6.

chemical-specific fractional representation (F) in the fugitive emission waste stream is calculated as follows:

$$F = \left[\frac{X\ P_w}{760}\right] \left[\frac{M_w}{24}\right] K,$$

where

X = mole fraction of the chemical in the waste;

P_w = vapor pressure of the chemical at 25°C;

M_w = molecular weight of the chemical; and

K = 0.16 L/g, a conversion factor.

For example, the fractional representation of chloroform is calcuated as follows:

$$F = \frac{(4.96E\text{-}2)(235.6)}{760} \frac{(119.4)}{24} (0.16).sp = 1.2E\text{-}2$$

Physico chemical properties and the calculated fractional representation in the fugitive emission waste stream for each chemical are given in Table 4.7. Using these factors for an LI-1 incinerator burning pesticide-related waste, the chloroform fugitive emissions from the receiving area would be calculated as

$$(0.683 lb/y) \quad (1.44E\text{-}5 \frac{g \cdot y}{lb \cdot s}) \quad (1.2E\text{-}2) = 1.27E\text{-}7 g/s.$$

It should be emphasized that these chemical-specific fugitive emission rates are only first approximations. An exact methodology for estimating volatilization rates of specific chemicals in complex mixtures does

Table 4.7. Fractional contribution (F) of volatile chemicals to the fugitive emission waste stream

	X^a	$M_W{}^b$	$P_W{}^c$	F^d
Pesticide-Related Waste				
Chloroform	4.96E-2	119.4	235.6	1.2E-2
Ethylene dichloride	1.85E-2	99.0	86.4	1.39E-2
Hexachlorobutadiene	3.60E-2	260.8	1.0	8.20E-5
1,1,2,2-tetrachloroethane	1.39E-2	167.9	16.2	1.63E-4
Phenol/Acetone Distillation Waste				
Toluene	1.97E-1	92	32.0	5.08E-3
Pyridine	1.58E-2	79	25.0	2.73E-4
Phthalic anhydride	6.49E-6	148	0.5	4.0E-9
Methyl styrene	1.52E-1	118	5	7.85E-4
API Separator Sludge Waste				
Phenol	3.57E-5	94	1.0	2.9E-8

[a]X = mole fraction of the chemical in the waste

[b]M_W = molecular weight of a chemical

[c]P_W = vapor pressure of the chemical at 25°C

[d]F = fractional contribution to the fugitive emission waste stream

not exist. Expected total fugitive emission rates for each chemical are given in Table 4.5.

4.3 SPILLS

Spills of volatile hazardous wastes during bulk transfer, storage, and operation of an incineration facility can contribute to fugitive emissions. In order to estimate this contribution, we assume that the frequency of spills at a hazardous waste incineration facility is similar in nature to that for the petroleum industry. Petty et al. (1982) estimate spill factors for bulk transfer, storage, and operation at a petroleum refinery to be 17.4×10^{-6}, 3.3×10^{-6}, and 0.5×10^{-6} of total throughput, respectively. To obtain an estimate of total waste spilled at an incineration facility, the total waste throughput is multiplied by the spill factor. For an LI-150 liquid injection incinerator, spill rates for pesticide-related wastes during bulk transfer, storage, and operation are estimated to be 74.5 gal/y, 14.1 gal/y, and 2.1 gal/y, respectively. Using an average of 8.4 lb/gal, for liquid waste, the total for all types of pesticide-related waste spills at an LI-150 incinerator is 757 lb/y. Only a fraction of this will volatilize before cleanup. However, even assuming total volatilization of the spills, they are still small when compared to total fugitive emissions (10,019 lb/y - see Table 4.6) from an LI-150 incinerator burning pesticide-related waste.

5.0 EXPOSURE ASSESSMENT

Three locations were considered for this assessment: a primary site (S-1) located in a rural area and two supplementary sites (S-2 and S-3) located in urban areas. The primary site was utilized to determine the relative importance of plant design and waste physicochemical variables on human inhalation exposure and health risk. The supplementary sites were used solely to determine the impact of incineration on maximally exposed individuals. Unless otherwise indicated, all discussions and conclusions refer to the primary site. Estimates of exposure and health risk are presented only for the LI design since stack and fugitive emission source terms for the RK and LI incinerators are very similar (see Table 4.5).

5.1 PRIMARY SITE

The primary location chosen for this assessment was a hypothetical northern Midwest site (S-1) located in Marathon County, Wisconsin at 44° 55′ latitude and 115° 30′ longitude. This site is located in a rural area adjacent to several large cities. Thus, even though the total population within 100 km of the site is 0.45 x 10^6 people, there are no people residing within 1500 m of the incinerator site (see Table 5.1). This location is neither a current nor a planned incineration facility site.

A circular area of 100-km radius around the incinerator facility was assumed for the assessment. Exposure and risk due to long-range transport (greater than 100 km) was not performed in this assessment.

Table 5.1. Cumulative population at three incinerator sites

Distance (m)	S-1	S-2	S-3
200	0	0	5
375	0	0	33
625	0	203	77
875	0	1,465	138
1,500	203	21,798	597
2,500	949	59,833	1,457
3,500	2,378	103,785	3,322
4,500	4,053	136,709	10,838
6,250	6,039	350,865	34,197
8,750	7,437	579,196	104,495
15,000	76,576	1,888,865	679,796
35,000	126,614	5,214,028	3,630,222
55,000	263,097	6,973,872	4,980,861
75,000	349,969	7,586,057	5,990,682
95,000	448,187	8,202,805	7,389,283

Although long-range transport can significantly contribute to total population exposure by incorporating large population centers, the average individual exposure to such transported materials is very low (orders of magnitude less than background in some cases).

5.2 SUPPLEMENTARY SITES

Since maximum air concentrations resulting from emissions from a hazardous waste incinerator generally occur close to the source, a true representation of the maximally exposed individual may not be possible at the primary site (S-1). In order to assess the impact of an incinerator located in a populated area on a maximally exposed individual, we selected two additional incinerator sites located in urban areas. The first urban site, which we designate S-2, has a total population of 8.2×10^6 persons, with the closest individuals residing 625 m from the incinerator site. The second urban site (S-3), has a total population of 7.4×10^6 persons, with the closest individuals residing 200 m from the site (see Table 5.1).

5.3 ATMOSPHERIC TRANSPORT MODELS

Annual-average ground-level air concentrations of representative chemical pollutants were estimated using IEM, an automated inhalation exposure methodology (O'Donnell et al., 1983). This methodology employs a slightly modified version of the Industrial Source Complex Long Term Model (ISCLTM), a Gaussian plume model developed for EPA (Bowers et al., 1979).

A circular area of 100-km radius around the incinerator facility was assumed for the assessment. Gaussian plume models are generally applied for distances of 20-50 km around a site. However, this type of dispersion model has been validated out to 150 km (Buckner, 1981), predicting annual-average air concentrations within a factor of three of those measured.

The assessment area was divided into sector segments consisting of 20 concentric circles about the origin and sixteen radial direction vectors. The circles had radii of 0.15, 0.25, 0.50, 0.75, 1.0, 2.0, 3.0, 4.0, 5.0, 7.5, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 km. Each radial vector was separated by 22.5° intervals with the first sector being centered on due north (0°), and proceeding clockwise. ISCLTM was then employed to calculate concentration estimates at segment centroids.

The total exposure in a sector segment is calculated by multiplying the annual-average ground level air concentration at the segment centroid by the number of persons located in the segment, as obtained from 1980 Census data tapes using an adaptation of the APORT computer code (Fields and Little, 1978).

5.4 MODEL INPUT PARAMETERS

IEM input parameters include model plant descriptors, pollutant behavior variables, and region-specific meteorological data. The stack for each of the six hypothetical incineration facilities (two designs in three sizes) was assumed to be located at the center of the circular

grid (site origin). This potentially artificial area source configuration of squares was necessitated by IEM modeling constraints and will not affect pollutant concentration estimates unduly. Each area was centered on the stack to simplify computation and to prevent possible bias of atmospheric dispersion estimates. Stack parameters employed are summarized in Table 5.2. Inspection of these values shows that stack and receiving parameters are identical for both designs. However, differences in area, width, and generic gas emission rates for the storage (10 and 150 x 10^6 Btu/h sizes) and feed (150 x 10^6 Btu/h size) areas do occur between designs because of size and number of storage tanks.

Region-specific meteorological data were obtained from Stability Array (STAR) data tapes (NOAA, 1974) and from a compendium of weather statistics (Ruffner, 1978). The STAR data were organized into six Pasquill stability categories (A through F) and six wind speed classes with average wind speeds of 0.75, 2.5, 4.3, 6.8, 9.5, and 12.5 m/s. The remaining meteorological parameters were obtained or derived from Ruffner (1978). For the principle site they include an average air temperature of 280.2° K and mixing layer heights of 1819.5, 1213.0, 1213.0, 1024.3, 10000.0, and 10000.0 m for stability categories A through F, respectively. Mixing layer heights were assumed equal for all wind speed classes within each stability category.

Table 5.2. Stack and area source parameters employed in atmospheric dispersion modeling

	Rotary kiln			Liquid injector		
	Size, 10^6 Btu/h			Size, 10^6 Btu/h		
	1	10	150	1	10	150
STACK:						
Height, m	15.24	30.48	30.48	15.24	30.48	30.48
Exit gas temperature, K	355	355	355	355	355	355
Exit gas velocity, m/s	1.10	11.0	41.1	1.10	11.0	41.1
Diameter, m	0.61	0.61	1.22	0.61	0.61	1.22
Generic gas emission rate, g/s	1.0	1.0	1.0	1.0	1.0	1.0
RECEIVING AREA:						
Height, m	6.1	6.1	6.1	6.1	6.1	6.1
Area (square), m^2	74.3	130	390	74.3	130	390
Width of area, m	8.6	11.4	19.8	8.6	11.4	19.8
Generic gas emission rate, g/s	74.3	130	390	74.3	130	390
STORAGE AREA:						
Height, m	6.1	6.1	6.1	6.1	6.1	6.1
Area (square), m^2	325.2	345	2165	325.2	423	2737
Width of area, m	18.0	18.6	46.5	18.0	20.6	52.3
Generic gas emission rate, g/s	325.2	345	2165	325.2	423	2737
FEED AREA:						
Height, m	6.1	6.1	6.1	6.1	6.1	6.1
Area (square), m^2	76.2	130	689	76.2	130	866
Width of area, m	8.73	11.4	26.3	8.73	11.4	29.4
Generic gas emission rate, g/s	76.2	130	689	76.2	130	866

Site-specific population data were obtained from 1980 Census data tapes that had been reformatted into coarse and fine rectangular latitude/longitude grids. Approximately 0.45 x 10^6 people reside within a 100-km radius around the principle generic site.

5.5 POPULATION EXPOSURE

5.5.1 Primary Site

Estimates of total collective exposure (person-$\mu g/m^3$) at the primary site are presented in Table 5.3 for an LI-10 incinerator with 99.99% DRE. The percent contribution of stack and expected fugitive emissions to total collective exposure for each of the chemical constituents of the waste classes considered are also given. Note that the percent contribution of fugitive emissions to total collective exposure varies widely, with the highest contribution coming from the more volatile chemicals. Total collective exposures from heavy metals result exclusively from stack emissions. Collective exposures for the other incinerators, DRE's and fugitive emission scenarios are presented in Appendix B.

5.5.2 Supplementary Sites

Cumulative population exposure to chloroform (person-$\mu g/m^3$) for the two supplementary sites are compared with that for the primary site (Table 5.4). Although total population size and distribution vary between the three sites (see Table 5.1), average exposure at all three sites is very similar (1.6 x 10^{-5}, 3.6 x 10^{-5}, and 1.7 x 10^{-5} $\mu g/m_3$,

Table 5.3. Source contributions to total collective exposure for an LI-10 incinerator (99.99% DRE) at the S-1 site

Pollutant	Total Value (person-μg/m^3)	Percent of Total from	
		Stack	Fugitives
Chloroform	7.13E+0	14.9	85.1
Ethylene Dichloride	1.02E+1	32.3	67.7
Hexachlorobutadiene	1.61E+0	98.5	1.5
1,1,2,2-tetrachloroethane	4.96E-1	83.6	16.4
Arsenic[a]	5.90E-1	100.0	0.0
Chromium[a]	2.30E+0	100.0	0.0
Lead[a]	3.04E+0	100.0	0.0
Phenol	6.61E-4	97.8	2.2
Toluene	6.30E+0	58.4	41.6
Pyridine	3.93E-1	64.1	35.9
Phthalic anhydride	1.95E-4	98.9	1.1
Methyl styrene	3.90E+0	89.6	10.4

[a]95% DRE assumed.

Table 5.4. Cumulative population exposure (person-μg/m^3) to chloroform at three incineration sites

Distance (m)	Site		
	S-1	S-2	S-3
200	0	0	1.74E-1
375	0	0	6.10E-1
625	0	6.61E-1	9.36E-1
875	0	3.00E+0	1.20E+0
1,500	2.05E-1	3.11E+0	1.87E+0
2,500	5.72E-1	5.35E+1	2.33E+0
3,500	1.02E+0	6.70E+1	3.08E+0
4,500	1.41E+0	7.42E+1	4.61E+0
6,250	1.75E+0	1.06E+2	7.52E+0
8,750	1.82E+0	1.28E+2	1.36E+1
15,000	4.99E+0	1.92E+2	3.57E+1
35,000	5.73E+0	2.70E+2	9.74E+1
55,000	6.55E+0	2.90E+2	1.11E+2
75,000	6.90E+0	2.92E+2	1.18E+2
95,000	7.12E+0	2.96E+2	1.23E+2

respectively). Thus, total population size and distribution around an incinerator site have little impact on the average population exposure within 100 km. However, population distribution will affect the location of the maximally exposed individual. Table 5.5 gives maximum annual average individual exposure ($\mu g/m^3$) to chloroform at each of the three sites. It can be seen that exposure from total emissions differs by up to a factor of 30, depending on the distance the nearest individual lives from the incinerator site (1500, 675, or 200 m). The impact of stack emissions on maximal individual exposure does not vary significantly from site to site, contributing only 13-18% to total emissions from all sources.

6. HEALTH EFFECTS ASSESSMENT

A key component of health effects assessment is the determination of human health response to a given exposure. Quantification of the exposure-response relationship can be made in a number of ways, depending on the availability of data and the health impact under consideration. There are many potential health endpoints in humans, including carcinogenicity, mutagenicity, and teratogenicity. Unfortunately, adequate human data for assessing risk to most toxicological endpoints do not exist, although a wealth of animal data are available for selected endpoints.

Toxicity data employed in this assessment are taken from a health effects assessment summary for 300 hazardous organic constituents (USEPA, 1982b) prepared by EPA's Environmental Criteria Assessment

Table 5.5. Maximum annual average individual exposure ($\mu g/m^3$) to chloroform at three incineration sites

Source	Site		
	S-1	S-2	S-3
Stack	1.17E-4	2.03E-4	3.05E-4
Receiving	6.07E-5	1.51E-4	1.94E-3
Storage	8.96E-4	2.22E-3	2.80E-2
Feed	4.33E-4	1.08E-3	1.39E-2
All sources	1.51E-3	3.65E-3	4.37E-2

Office (ECAO). Chemicals studied were classified as either carcinogens or non-carcinogens, and separate measures of toxicity were developed for these two classes. Carcinogenic toxicities are estimated in terms of lifetime excess cancer risk factors, while noncarcinogenic toxicity is estimated by acceptable daily intake (ADI), and threshold limit values (TLV).

Health effects data for compounds considered in this assessment are summarized in Table 6.1. It is apparent that not all health risk estimators are available for each chemical studied. The estimate of excess human lifetime risk to cancer was used for all compounds in the pesticide-related waste. In the absence of cancer risk estimates, the available ADI value was used for all compounds in the API separator sludge waste except for arsenic; the TLV (AGIH, 1980) was used to convert to ADI (see Section 6.2) for arsenic and for compounds in the phenol/acetone distillation waste for which there is no reported ADI. Health effects for stack emissions of hydrochloric acid and particulates were not considered in this assessment.

6.1 CARCINOGENIC TOXICITY

Potency factors for chemical carcinogens were derived by ECAO from available human epidemiological data and from animal studies when necessary. Excess lifetime risk factors for carcinogens are interpreted as the probability, at the 95% confidence level, that an individual will develop cancer after an exposure (for 70 years) to the chemical resulting in a dose of 1 mg/d for each kilogram body weight.

Table 6.1. Health risk estimators for chemicals in three generic wastes

Pollutant	Health Risk Estimator		
	Excess Risk[a] $(mg/kg/d)^{-1}$	ADI[b] (mg/d)	TLV[c] (mg/m^3)
PESTICIDE-RELATED WASTE			
Chloroform	1.8E-1	8.8E+0	5.0E+1
Ethylene dichloride	3.7E-2	NA[d]	4.0E+1
Hexachlorobutadiene	7.75E-2	1.4E-1	NA
1,1,2,2-tetrachloroethane	2.0E-1	NA	3.5E+1
API SEPARATOR SLUDGE WASTE			
Chromium VI	NA	1.4E-1	5.0E-2
Chromium III	NA	1.3E+2	5.0E-1
Lead	NA	4.5E-3	1.5E-1
Arsenic	1.4E+1	7.0E-2	2.0E-1
Phenol	NA	6.8E+0	1.9E+1
PHENOL/ACETONE DISTILLATION WASTE			
Toluene	NA	1.3E+2	3.75E+2
Pyridine	NA	5.4E+0	1.5E+1
Phthalic anhydride	NA	2.1E+0	6.0E+0
Methyl styrene	NA	1.7E+1	4.80E+2

[a]Excess risk of developing cancer after a lifetime exposure (USEPA, 1982).

[b]Acceptable daily intake (USEPA, 1983).

[c]Threshold limit value is the time-weighted concentration for an 8-h workday and 40-h workweek to be used as a guide in the control of health hazards (ACGIH, 1980).

[d]Not available.

ECAO's estimates of excess risk are purposefully conservative. The excess risk represents the upper 95% confidence limit of the largest possible slope of a linear dose-response curve consistent with empirical human or animal data. Thus, the true, or expected risk, associated with a chemical is smaller than this maximum risk with 95% confidence. These conservative assumptions concerning the ECAO's excess risk estimates should be kept in mind when interpreting the results of the present risk assessment.

Table 6.2 presents ECAO excess cancer risk estimates for selected constituents of hazardous waste streams currently being incinerated. These chemicals demonstrate an extremely broad range of excess risk (7 orders of magnitude). Most of the excess risk factors, however, tend toward the lower end of the distribution.

6.1.1 Sample Calculation for Carcinogenic Risk

The estimate of carcinogenic risk associated with a hazardous waste stream is obtained by multiplying the population exposure (person-$\mu g/m^3$) by a conversion factor which takes into account average weight and breathing rate to yield population dose (person-mg/kg/d). This in turn is multiplied by the excess cancer risk factor developed by ECAO. For example, for a population exposure of 1×10^6 person-$\mu g/m^3$ and an excess cancer risk factor of 1×10^{-2} $(mg/kg/d)^{-1}$ the calculation is as follows:

Table 6.2. Excess cancer risk for selected constituents of hazardous waste streams[a]

Chemical (CAS number)	$(mg/kg/d)^{-1}$
1,4-Dioxane (123-91-1)	0.0104
Vinyl chloride (75-01-4)	0.0174
Aniline (62-53-3)	0.0302
Benzene (71-43-2)	0.052
Hexachlorobutadiene (87-68-3)	0.0775
Carbon tetrachloride (56-23-5)	0.083
Formaldehyde (50-00-0)	0.083
Thiourea (62-56-6)	0.137
Chloroform (67-66-3)	0.18
Chlordane (57-74-9)	1.61
DDT (50-29-3)	8.42
Reserpine (50-55-5)	10.4
Arsenic (7440-38-2)	14
Benzidine (92-87-5)	234.1
Bis(chloromethyl)ether (542-88-1)	9300
2,3,7,8-Tetrachloro-dibenzo-p-dioxin (1746-01-6)	425,000

[a]USEPA (1982)

Excess cancers =

$$(1x10^6 \text{person-}\mu g/m^3) \left[\frac{22.8m^3}{\text{person-d}}\right] \left[\frac{1mg}{1000\mu g}\right] \left[\frac{1\text{person}}{70kg}\right]$$

$$(0.65) \left[\frac{1x10^{-2}\text{cancers}}{mg/kg/d}\right] = 2.08.$$

The 0.65 in the above calculation represents the amount of chemical assumed to be absorbed and retained upon inhalation. The 22.8 m^3/d represents the Reference Man breathing rate (ICRP, 1975).

6.1.2 Pesticide-Related Waste

Estimates of the excess number of cancers over 70 years associated with incinerating our pesticide-related waste stream are given in Table 6.3. As can be seen, excess cancer risk is fairly independent of incinerator size at a DRE of 99.99%. This is due to the relative importance of fugitive emissions to the total source term, and the fact that fugitive emissions appear to be independent of incinerator size (see section 3.1), and are not affected by DRE.

Table 6.3. Expected number of excess cancers over 70 years from incineration of pesticide-related waste at a liquid injection incinerator (for a population of 0.45×10^6)

% DRE	LI-1	LI-10	LI-150
99.99	1.3E-4	4.0E-4	1.6E-3
99.90	2.6E-4	1.4E-3	1.2E-2
99.00	1.6E-3	1.1E-2	1.2E-1

Estimates of excess lifetime cancer risk to the maximally exposed individual from incineration of pesticide-related waste are presented in Table 6.4. Excess cancer risk is less than 3.2×10^{-6} for all incinerator sizes at all sites.

Table 6.4. Excess cancer risk over 70 years to the maximally exposed individual from incineration of pesticide-related waste at liquid injection incinerators (99.99% DRE)

Site	LI-1	LI-10	LI-150
S-1	2.8E-8	7.8E-8	1.2E-7
S-2	6.5E-8	1.8E-7	2.8E-7
S-3	7.5E-7	2.1E-6	3.2E-6

As can be seen in Table 6.4, estimates of excess risk to the maximally exposed individual differ by about a factor of 30, depending on the proximity of the maximally exposed individual to the incineration site.

6.2 NON-CARCINOGENIC TOXICITY

Measures of toxicity for non-carcinogenic chemicals are usually expressed in terms of ADI's or TLV's. An ADI is defined as that daily intake (mg/d) which will result in no observed adverse acute or chronic effects. TLV's have been developed for an occupational setting, and represent time-weighted average air concentrations (mg/m^3) to which nearly all workers may be repeatedly exposed, day after day, 40 hrs/week, without adverse effect. TLV's are based on rather general evidence of toxicity, including information from industrial experience, human and animal studies, and similarity to other chemicals.

TLV's may be converted to ADI values by the following formula (Fed. Reg., 1980):

$$\text{ADI (mg/d)} = \frac{\text{TLV } (mg/m^3) \times 10\ (m^3/d) \times .5 \times \frac{5d}{7d}}{10}$$

where

$10\ m^3/d$ = volume of air breathed during an 8-hr work day;

.5 = the amount of chemical assumed to be absorbed and retained during inhalation; and

10 = a safety factor to account for sensitive individuals in the population.

Table 6.5 presents ECAO estimates of ADI values for selected constituents of hazardous waste streams currently being incinerated. These chemicals possess ADI's ranging over 5 orders of magnitude.

Table 6.5. ADI's for selected constituents of hazardous waste streams being incinerated[a]

Chemical (CAS Number)	ADI (mg/d)
Acrolein 107-02-8	0.009
Acrylamide 79-06-1	0.11
Pentachlorophenol 87-86-5	0.18
Cyanides (57-12-5)	0.33
Chlorobenzene (108-90-7)	1.008
Ethyl Benzene (100-41-4)	1.6
Methyl ethyl ketone (78-93-3)	1.72
DDT (50-29-3)	3.01
Phenol (108-95-2)	6.8
2,4,5-Trichlorophenol (95-95-4)	7.0
Cresols (1319-77-3)	7.9
Acetonitrile (75-05-8)	25
Toluene (108-88-3)	29.5
1,1,1-Trichloroethane (71-55-6)	37.5
Trichlorofluoromethane (75-69-4)	201
Diethyl phthalate (84-66-2)	875

[a]USEPA, 1983

6.2.1 Sample Calculation for Noncarcinogenic Risk

The estimate of average individual risk for a noncarcinogen (as measured as a fraction of the ADI) is obtained by comparing daily intake of the chemical with the ADI. If the daily intake is less than the ADI, there should be no adverse effects from continuous exposure to the chemical. As an example, consider an individual exposured to an average concentration of 1 $\mu g/m^3$ of a chemical with an ADI of 0.1 mg/d. The daily intake as a fraction of ADI is computed as follows:

$$1\ \mu g/m^3 \times 22.8\frac{m^3}{d} \times \frac{1mg}{1000\mu g} \times 0.5 \times \frac{1}{0.1mg/d} = 0.15$$

Thus, under the above conditions, an individual would be receiving 15% of the ADI.

6.2.2. Phenol/Acetone Distillation Waste

None of our four selected constituents of the phenol/acetone distillation wastes are known carcinogens. We therefore used the ADI as a measure of noncarcinogenic risk. Estimates of average daily intake of these constituents as measured as a fraction of the ADI are listed in Table 6.6. These estimates account for both stack and fugitive emissions.

Table 6.6. Average daily intake from phenol/acetone distillation wastes released by hazardous waste incinerators (presented as a fraction of ADI)

	ADI (mg/d)	Incineration Facility (99.99% DRE)					
		RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
Toluene	134	2.7E-10	1.2E-9	8.4E-9	2.8E-10	1.2E-9	8.5E-9
Pyridine	5.4	3.9E-10	1.8E-9	1.4E-8	4.1E-10	1.9E-9	1.4E-8
Phth. anhyd.	2.1	3.2E-13	2.4E-12	2.5E-11	3.2E-13	2.4E-12	2.5E-11
Methyl styrene	171	9.1E-11	5.8E-10	5.7E-9	9.3E-11	5.8E-10	5.7E-9

6.3 HEAVY METALS

Collective exposure estimates (person-$\mu g/m^3$) for heavy metal releases by incinerator facilities are given in Appendix C. Average individual exposures and highest sector ground level air concentrations are also presented. These data are calculated assuming 95% removal of heavy metals from the hazardous waste stream. Estimates of the average daily intake (measured as a fraction of the ADI) from heavy metals released from hazardous waste incinerators are given in Table 6.7. Strictly speaking, there is no acceptable daily intake for arsenic since it is a suspected human carcinogen. However, we have included it in this table for purposes of comparison. As can be seen from Table 6.7, all of these inhalation exposures result in intakes at least 4 orders of magnitude less than the acceptable daily intake.

Table 6.7. Average daily intake from heavy metals released by hazardous waste incinerators (presented as a fraction of ADI)

	ADI (mg/d)	Incineration Facility (95.0% DRE)					
		RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
Arsenic	0.07	2.90E-8	2.13E-7	2.33E-6	2.90E-8	2.13E-7	2.33E-6
Chromium[a]	0.14	5.62E-8	4.19E-7	4.48E-6	5.62E-8	4.19E-7	4.48E-6
Lead	0.0045	2.2E-6	1.7E-5	1.9E-4	2.2E-6	1.7E-5	1.9E-4

[a]The ADI value for chromium VI was used.

The Midwest Research Institute (MRI) (Trenholm et al., 1983) has sampled releases of heavy metals at four incinerator sites. They found that the ratio of heavy metal emissions to metal inputs could range as high as 0.53 (see Table 6.8). In general, however, the ratio was around 0.03, with roughly half of the remainder of heavy metals going into scrubber water and half into bottom ash. These results are consistent with our assumed 95% removal of heavy metals from waste streams. The risk from heavy metals presented in Table 6.7 would increase by a factor of 10 if we assume that only 50% of the metals are removed during the incineration process.

The mean concentration (μg/g) of heavy metals in the API separator sludge waste used in our assessment was about 10 times less than the maximum measured at incinerator sites (see Table 6.8). Thus, even assuming maximum heavy metal concentrations in the waste stream and a 50% removal efficiency for heavy metals, the daily intake (of the metals considered here) for the average individual at the largest incinerator site is less than 2% of the ADI. The maximally exposed

Table 6.8. Heavy metal stack emissions at hazardous waste incinerator sites[a]

Metal	Number of waste streams	Waste feed concentration range, μg/g	Stack emissions as a percent of input
Nickel	12	0.01-6,670	0.2-53
Chromium	10	0.1-2,170	0.4-35
Barium	9	<1-1,460	0.1-6
Lead	7	1-9,830	2-20
Cadmium	4	0.01-224	0.1-2
Antimony	4	<10-64	<1-7
Selenium	2	<100-380	6

[a]from Trenholm et al. (1983).

individual around the RK-150 site would have a daily intake less than 22% of the ADI, as long as there are no significant background concentrations.

Although we used an ADI value for arsenic, it is a suspected human carcinogen, and has a cancer potency factor of 14 $(mg/kg/day)^{-1}$ (see Table 6.1). The excess cancer risk to the maximally exposed individual from arsenic is estimated to be 4.8×10^{-8} and 7.3×10^{-6} for the RK-1 and RK-150, respectively (assuming 95% removal). Under the worst case assumptions (50% removal efficiency and maximum arsenic concentrations in the waste stream), we estimate a lifetime excess cancer risk to the maximally exposed individual to be 4.8×10^{-6} and 7.3×10^{-4} for the RK-1 and RK-150, respectively.

6.4 PRODUCTS OF INCOMPLETE COMBUSTION

Whenever principal organic hazardous constituents (POHCs) are incinerated, a number of products of incomplete combustion (PIC) can be formed and released to the atmosphere. MRI (Trenholm, et al., 1983) measured POHC and PIC concentrations in stack emissions at 8 incinerator sites in the United States. PICs were defined by MRI to be EPA Appendix VIII-listed compounds. This technique is believed capable of identifying about half of such compounds. Table 6.9 lists the PICs found in the stack effluents. In a preliminary comparison of PIC, POHC, and total hydrocarbon emissions from stacks of tested incinerators, MRI estimated that mass emissions rates of POHC, and identifiable PICs were of comparable magnitude and that, taken together, these com-

Table 6.9. PICs found in stack effluents[a]

PIC	Number of sites	Concentrations (ng/L)
Benzene	6	12-670
Chloroform	5	1-1,330
Bromodichloromethane	4	3-32
Dibromochloromethane	4	1-12
Bromoform	3	0.2-24
Naphthalene	3	5-100
Chlorobenzene	3	1-10
Tetrachloroethylene	3	0.1-2.5
1,1,1-Trichloroethane	3	0.1-1.5
Methylene chloride	2	2-27
o-Nitrophenol	2	25-50
Phenol	2	4-22
Toluene	2	2-75
Bromochloromethane	1	14
Carbon disulfide	1	32
Methylene bromide	1	18
2,4,6-Trichlorophenol	1	110
Bromomethane	1	1
Chloromethane	1	3
Pyrene	1	1
Fluoranthene	1	1
Dichlorobenzene	1	2-4
Trichlorobenzene	1	7
Hexachlorobenzene	1	7
Methyl ethyl ketone	1	3
Diethyl phthalate	1	7
o-Chlorophenol	1	2-22
Pentachlorophenol	1	6
2,4-Dimethyl phenol	1	1-21

[a]from Trenholm et al. (1983).

pounds accounted for only 1-20% of total stack hydrocarbon emissions. This raises the question of what the potential health risks from the unidentified hydrocarbons could be.

In order to estimate the worst case exposure that could result if, in fact, all the unidentified hydrocarbons were Appendix VIII compounds (i.e., they were unidentified PICs), we consider a 150 MBtu/hr incinerator for which only 1% of the emissions are identified PICs and POHCs and other 99 percent are unidentified PICs. We use MRI's data on the magnitude of (identified) PIC output as a percent of POHC input as a starting point for estimating an air emissions rate for unidentified PICs. The average PIC output was 0.0031% of POHC input (see Table 6.10). Multiplying this average output by the pesticide-related waste throughput for an LI-150 incinerator (see Table 4.4) yields 1107 (5.0×10^5 g/y) of observed PIC emissions (assuming 8.34 lb/gal). Assuming that the PIC output as measured by MRI represents only 1% of total PIC output (again, a worse case condition), we estimate as upper limit to total PIC releases from an LI-150 incinerator burning pesticide-related waste at 5.0×10^7 g/y. This compares with 1.6×10^6 g/y in total POHC stack emissions assuming 99.99% DRE.

To place these numbers in perspective, consider that the LI-150 incinerator burning pesticide-related waste, 2.8×10^{10} g/y of waste are input. Since combustion air and, usually, supplemental fuel are also part of the combustion process, and since removal of combustion products by scrubbers or bottom ash are small, there are at least 2.8×10^{10} g/y of stack emissions. Therefore, for typically incinerated

Table 6.10. Comparison of PIC and POHC emissions[a]

Plant	PIC Output (g/min)	POHC Input (g/min)	%
A	0.090	9800	0.00092
B (Semivolatiles only)	0.0046	100	0.0044
C	0.092	780	0.012
D	0.00062	27	0.0023
E	0.011	1200	0.00091
F	0.00090	310	0.00029
G	0.26	8300	0.0031
H	0.0076	1200	0.00061

[a]from Trenholm et al. (1983).

waste streams only a small fraction of stack emissions are POHCs or PICs. The remainder is mostly water, carbon monoxide, nitrogen oxides, unreacted oxygen, carbon dioxide, particulates and, in some cases, hydrogen chloride.

In order to estimate the potential health risks for PICs, the compounds listed in Table 6.9 for which cancer potency data are available were identified. These are listed in Table 6.11. Their toxicities fall in the range of 0.02 to 1.7 $(mg/kg/d)^{-1}$ which is similar to the excess cancer risk estimates found for the pesticide-related wastes (Table 6.1). Based on the earlier analysis of POHCs in this report, it was assumed that the noncarcinogenic health effects associated with the PICs would not be as significant as the carcinogenic impact.

Table 6.11. Excess cancer risk from PIC identified in incinerator stack effluents

PIC[a]	Excess Cancer Risk[b] $(mg/kg/d)^{-1}$
Benzene	0.052
Chloroform	0.18
Tetrachloroethylene	0.04
2,4,6-Trichlorophenol	0.02
Hexachlorobenzene	1.68

[a]Trenholm et al. (1983).
[b]USEPA (1982b).

PIC emissions of 5.0×10^7 g/y from an LI-150 incinerator would result in a collective population exposure of 3.4×10^3 person-$\mu g/m^3$. Assuming the entire PIC emission stream has a toxicity of 1.7

$(mg/kg/d)^{-1}$ (again, probably a worst case assumption), we obtain an upper bound estimate of the lifetime excess cancer risk for the entire population (0.45×10^6 persons) from PIC released by an LI-150 to be 1.2. This is equivalent to an average individual lifetime excess cancer risk within 100 km of the incinerator site of 2.7×10^{-6}.

Excess lifetime cancer risks from PICs to the maximally exposed individual for all three sites burning pesticide-related wastes are given in Table 6.12. It can be seen that, for a given incinerator size, risk to maximally exposed individual varies by only a factor of 3 between sites. This small variation results from the fact that for PIC emissions we only consider the impact of stack emissions on maximally exposed individual. For pesticide-related wastes, we considered both stack and fugitive emissions in estimating risk to the maximally exposed individual. In that case, risk varied by a factor of 30 between sites (see Table 6.4).

Table 6.12. Worse case estimate of excess cancer risk over 70 years to the maximally exposed individual from PICs at a liquid injection incinerator burning pesticide-related waste

Site	LI-1	LI-10	LI-150
S-1	1.3E-6	1.3E-5	1.9E-4
S-2	2.2E-6	2.2E-5	3.3E-4
S-3	3.3E-6	3.3E-5	5.0E-4

Data on the complete composition of the emissions from incinerators tested by Trenholm et al. are not available and the assumptions

made in estimating the potential impacts of PICs can result in risk estimates which vary by orders of magnitude. Of particular import is the question of whether the 90-99 percent of the hydrocarbons which have not been identified could result in a significant risk to human health. On the one hand, it can be argued that most of these hydrocarbons are low molecular weight compounds (e.g., alkanes) which either have no significant health effects or which have health effects which are low compared to those of the identified PICs. On the other hand, techniques used by Trenholm et al. (1983) allow for identification of only about 50% of Appendix VIII compounds.*

7. ANALYSIS OF DESIGN FACTORS

The goal of this assessment was to determine the relative importance of plant design and waste characteristics on human exposures and risks resulting from inhalation of pollutants emitted from hazardous waste incinerators. To achieve this goal, a hypothetical site in the northern Midwest was chosen, and estimates made of annual-average ground-level air concentrations for twelve chemicals emitted under a variety of conditions. These conditions involved 54 combinations of two incinerator types, three incinerator sizes, three fugitive emission assumptions, and three pollutant destruction removal efficiency (DRE) assumptions. The resulting atmospheric concentrations were then used

* As of August 1984, Trenholm and associates had revaluated emissions data from one the 8 incinerators. They identified 19% of the hydrocarbon emissions as PICs or POHCs and 13% of the emissions as non-Appendix VIII compounds. Further evaluation of incinerator emissions data is in progress.

in conjunction with site-specific population data and pollutant-specific risk factors to give the desired characterization of exposures and risks.

7.1 STACK VERSUS FUGITIVE EMISSION SOURCES

Table 7.1 shows the percent contribution of fugitive emissions to total pollutant emission rates for one selected chemical from each of the three waste streams. It is apparent that stack and fugitive emissions are insensitive to incinerator design (liquid injector versus rotary kiln). This finding is not unexpected since stack emissions are identical, and fugitive emissions are very similar for both designs (see Table 4.6). Since incinerator design does not affect total emissions, from this point on we present results for the LI incinerator only.

Table 7.1 Percent contribution of fugitive emissions to total pollutant emission rates (99.99% DRE)

	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
Chloroform	93.1	78.5	24.1	93.5	78.8	24.8
Arsenic	0.0	0.0	0.0	0.0	0.0	0.0
Toluene	62.1	31.0	5.2	63.4	31.6	5.5

Incinerator size affects the relative contribution of fugitive emissions to total emissions. For an RK-1 incinerator, fugitive emissions of volatile compounds contribute a large fraction of the total emissions (93% for chloroform and 62% for toluene). For an RK-150, fugitive emissions contribute a much smaller fraction to total

emissions (24% for chloroform and 5% for toluene). As we have discussed before, fugitive emissions are relatively independent of incinerator size. This is because the number of tanks remains constant with the only change being in their holding capacity. Consequently, the number of valves, flanges, and pumps also remains relatively constant (see Table 3.1). Stack emissions, however, do vary with size, and in the larger incinerator dwarf the impact of the fugitive emissions.

7.2 EFFECT OF DRE LEVEL

The effect of DRE on total population exposure is dependent on incinerator size (1, 10, or 150 x 10^6 BTU/h) but is relatively independent of facility design (liquid injector or rotary kiln). For nonvolatile organic pollutants, increasing DRE results in a linear decrease in total population exposure. That is, increasing DRE from 99.0% to 99.99% results in nearly a 100-fold decrease in stack emissions and a 100-fold decrease in population exposure. For volatile organics, the relationship between DRE and total population exposure is highly dependent on the volatility of the compound. For example, increasing the DRE from 99.0% to 99.99% for an LI-1 incinerator results in a decrease in population exposure to chloroform by a factor of 4 (see Table 7.2). The same increase in DRE results in a decrease in population exposure to phenol (a relatively nonvolatile organic) by a factor of 95.

Table 7.2 Effect of DRE on collective population exposure (person-$\mu g/m^3$)

	Chloroform			Phenol		
DRE (%)	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150
99.99	4.5E+0	7.1E+0	2.0E+1	9.2E-5	6.6E-4	7.0E-3
99.90	3.7E+0	1.7E+1	1.2E+2	8.7E-4	6.5E-3	7.0E-2
99.00	1.7E+1	1.1E+2	1.1E+3	8.7E-3	6.5E-2	7.0E-1

Stack releases of heavy metals (arsenic, chromium, and lead) are independent of DRE since heavy metals are not destroyed by incineration processes. We estimate that 5% of heavy metals placed in an incinerator facility is emitted through the stack, thus we assume that heavy metals have an effective DRE of 95.0%.

The results of this study show that total population exposure from volatile compounds (such as chloroform) is relatively insensitive to changes in DRE for small incinerators (1×10^6 Btu/h). This is because fugitive emissions for volatile compounds dominate total emission rates at a small incinerator (see Table 7.1).

7.3 EFFECT OF INCINERATOR SIZE

In studying the effect of incinerator size on total population exposure (and individual exposures), we find that the results vary depending on the volatility of the pollutant studied, and the relative contribution of the fugitive emissions to total emissions (see Section 4.2). Table 7.3 illustrates the effect of size on total emissions for a relatively volatile chemical (chloroform), a heavy metal

(chromium) and a relatively non-volatile chemical (phenol) at a DRE of 99.99%.

It can be seen from Table 7.3 that for chloroform, the total collective exposure near an LI-10 incinerator will be 3 times that of an LI-1, and exposure near an LI-150 will be only 8 times that at an LI-1 incinerator. For the more volatile organics, fugitive emissions contribute a high fraction of total emissions, and are not appreciably affected by incinerator size. For the heavy metals, an increase in incinerator size from an LI-1 to an LI-150 will result in an increase of about 80 for total population exposure. This is because there are no fugitive emissions involved with the heavy metals, and stack emissions (and thus total emissions) are directly proportional to incinerator size. One might expect collective exposure to heavy metals to increase by a factor of 150 since this is the increase in the source term emission rates (see Table 4.5), however differences in stack height and exit velocity between the LI-1 and LI-150 (see Table 5.2) reduce the effective exposure by about a factor of two.

In looking at Table 7.3, we can see that for methyl styrene (a comparatively non-volatile chemical), the increase in total exposure as a function of size is about 62 times, due to the fact that fugitive emissions make a smaller contribution to total emissions than for the more volatile chemicals.

Table 7.3 Effect of incinerator size on total collective exposure and risk at 99.99% DRE

Pollutant	Multiple of LI-1 Value		
	LI-1	LI-10	LI-150
Chloroform	1.0	2.9	7.9
Chromium	1.0	7.5	80.2
Methyl styrene	1.0	6.3	61.5

At lower DRE's (Table 7.4) the effect of incinerator size is more pronounced, as the contribution of stack to total emissions is greater, and size dependent (see Section 4.1).

Table 7.4 Effect of DRE and incinerator size on total collective exposure and risk to chloroform released from a liquid injection incinerator

DRE (%)	Multiple of LI-1 Value		
	LI-1	LI-10	LI-150
99.99	1.0	2.9	7.9
99.90	1.0	4.5	32.6
99.00	1.0	6.8	69.5

7.4 MAXIMUM EXPOSURES

The maximum atmospheric concentration occurring in a populated sector may be less than the maximum concentration occurring in the entire 100-km radius grid surrounding an incinerator. This occurs because the maximum air concentration is usually located in an uninhabited sector segment near the incinerator facility. The ratio of the

maximum possible atmospheric concentration to the maximum in a populated sector depends on the relative importance of stack and fugitive emissions under the 54 scenarios studied. When only stack emissions are considered, the ratio of the true maximum to the populated-sector maximum was found to be 2.1 for larger stacks (RK-10, RK-150, LI-10, and LI-150), and 7.4 for smaller stacks (RK-1 and LI-1). When both stack and fugitive emissions are considered, the ratio increases from 2.1 to 49. These high ratios can occur because fugitive emissions produce relatively high atmospheric concentrations near the incinerator facility.

8. DESCRIPTION OF APPENDICES

8.1 APPENDIX A - INCINERATOR FACILITY PROCESS FLOW DIAGRAMS

This appendix presents process flow diagrams for each of the six incinerator designs chosen for this study. These flow diagrams were developed at Oak Ridge National Laboratory and reviewed and approved by EPA.

8.2 APPENDIX B - CONTRIBUTION OF STACK AND FUGITIVE EMISSIONS TO EXPOSURE

Appendix B presents tables for each of the six incinerators showing the contribution of stack and fugitive emissions to total collective exposure (person-$\mu g/m^3$) and maximum exposure ($\mu g/m^3$ as a percent of the total. The contribution of receiving, storage, and feed areas to total fugitive emissions is also given. The expected, minimum, and maximum fugitive emission scenarios are given, as well as results for each of the three levels of DRE (99.99, 99.90, and 99.0%) for each incinerator considered.

8.3 APPENDIX C - EXPOSURE FROM HEAVY METALS ASSUMING 95% DRE

Appendix C lists the highest sector-averaged, annual-average, ground level concentrations ($\mu g/m^3$) of heavy metals in a populated sector. Also given are total collective exposure and average individual exposure within 100 km for each of the heavy metals at all six sites. These data are estimated assuming a 95% DRE.

8.4 APPENDIX D - EFFECT OF DESTRUCTION AND REMOVAL EFFICIENCY ON TOTAL COLLECTIVE EXPOSURE

This appendix shows the effect of varying the level of DRE from 99.99% to 99.90 and 99.0% on total collective exposure (person-$\mu g/m^3$) for each of the three fugitive emission scenarios. It also shows the ratio of the 99.90 and 99.0% values to the 99.99% value for each of the chemicals studied, and the percent change from the 99.99% value.

8.5 APPENDIX E - EFFECT OF INCINERATOR SIZE ON TOTAL COLLECTIVE EXPOSURE

Appendix E presents tables showing the effect of incinerator size on total collective exposure (person-$\mu g/m^3$) for each of the six incinerators, and varying DRE and fugitive emission scenarios. Also given are the fraction of the exposure from the 10 and 150 x 10^6 Btu/h incinerators to the 1 x 10^6 Btu/h, and the percent change from the 1 x 10^6 Btu/h value.

8.6 APPENDIX F - COLLECTIVE EXPOSURES AT SITES S-2 AND S-3

This appendix gives collective population exposures for emissions from an LI-10 incinerator burning pesticide-related wastes at the two supplementary sites, S-2 and S-3. Site S-2 is located at Chicago, Illinois and site S-3 is at Philadelphia, Pennsylvania. Population exposures are given for each sector segment. Segment centroids are described by the distance from the origin (meters), and in increments of 22.5 degrees from north.

8.7 APPENDIX G - SUMMARY DATA

This appendix summarizes the data found in Appendices B-D. Included are estimates of highest sector annual-average air concentrations, total collective population exposure, and average individual exposure for each of the incinerator facilities, DRE levels, and fugitive emission scenarios.

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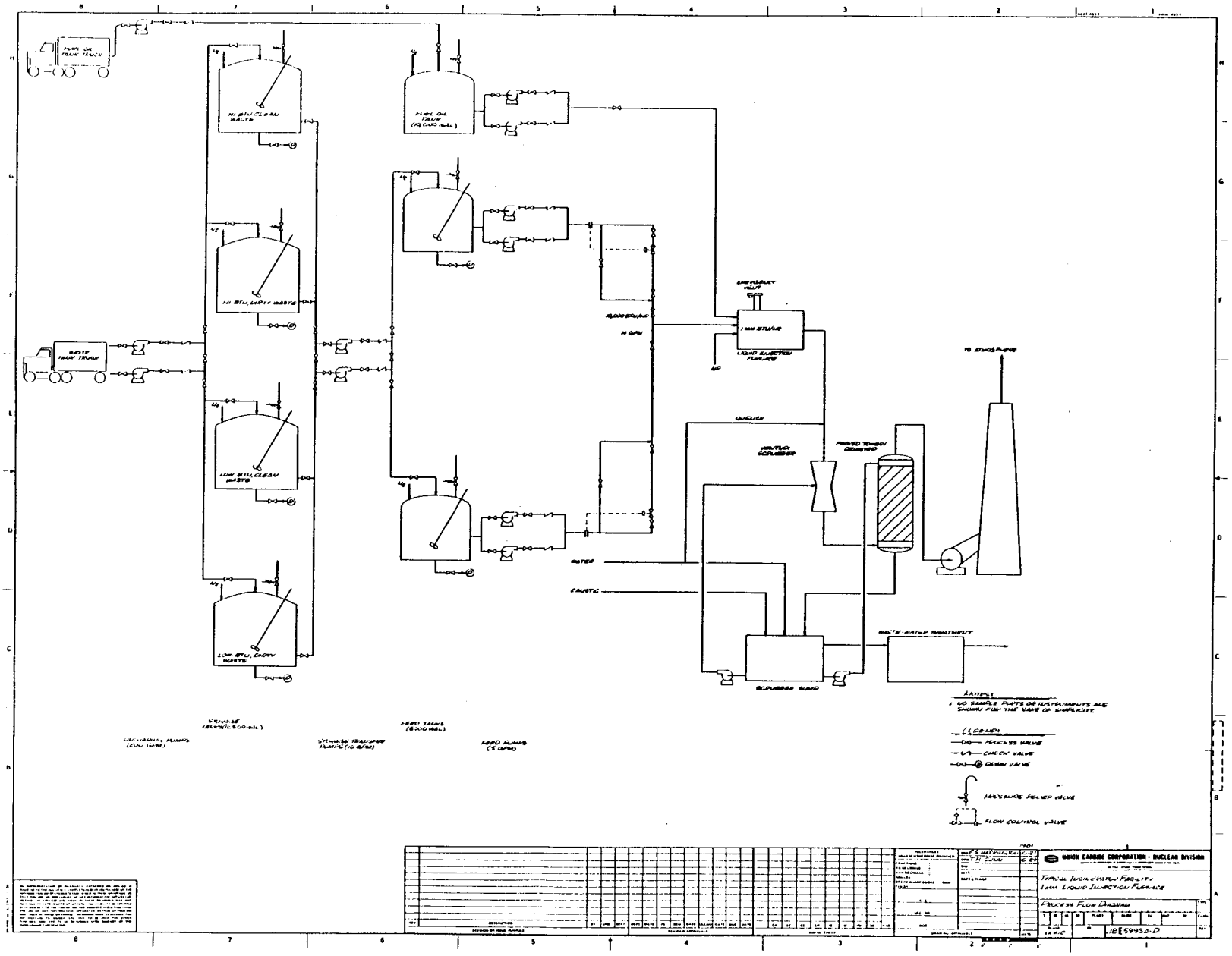
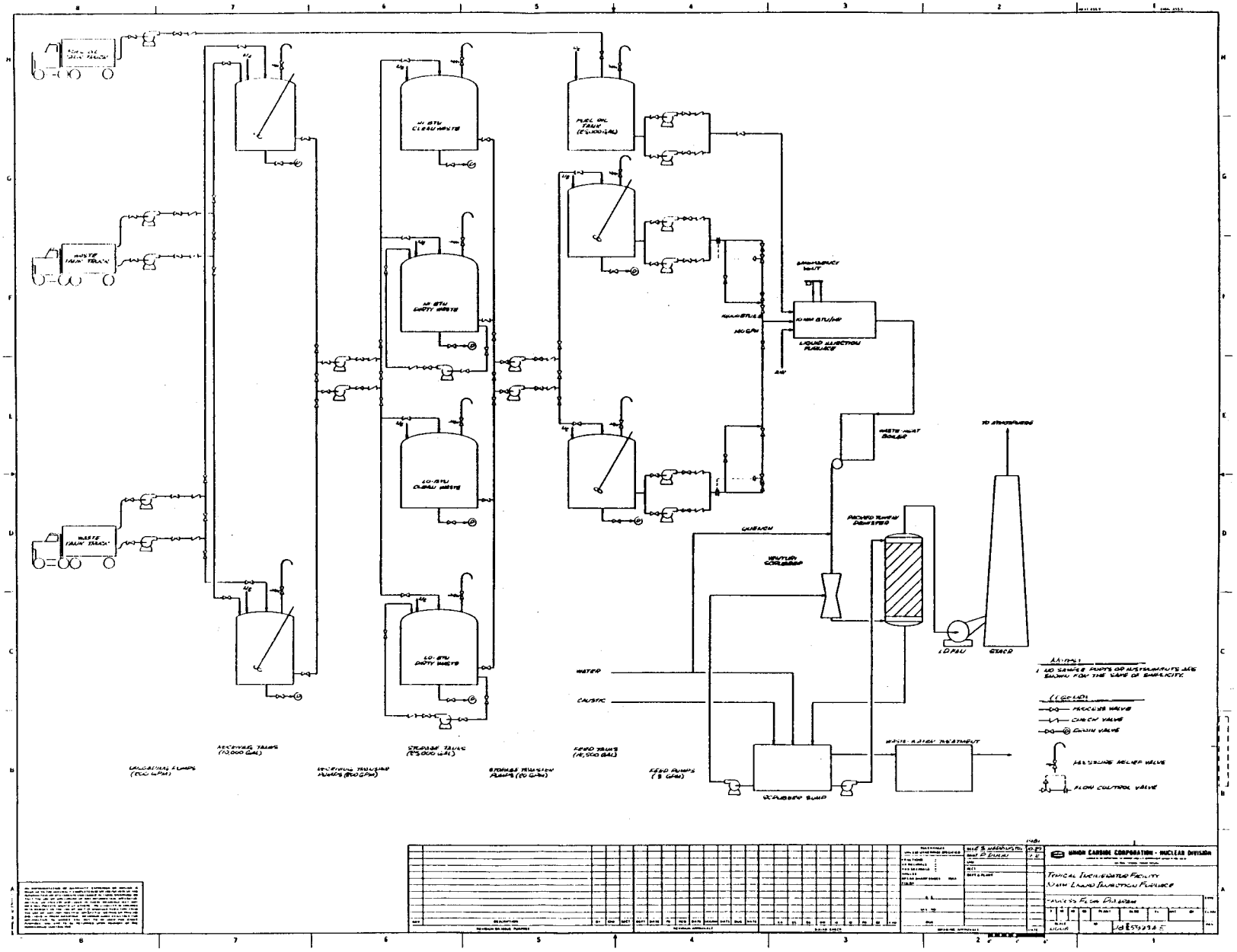
Appendix A

INCINERATOR FACILITY PROCESS FLOW DIAGRAMS

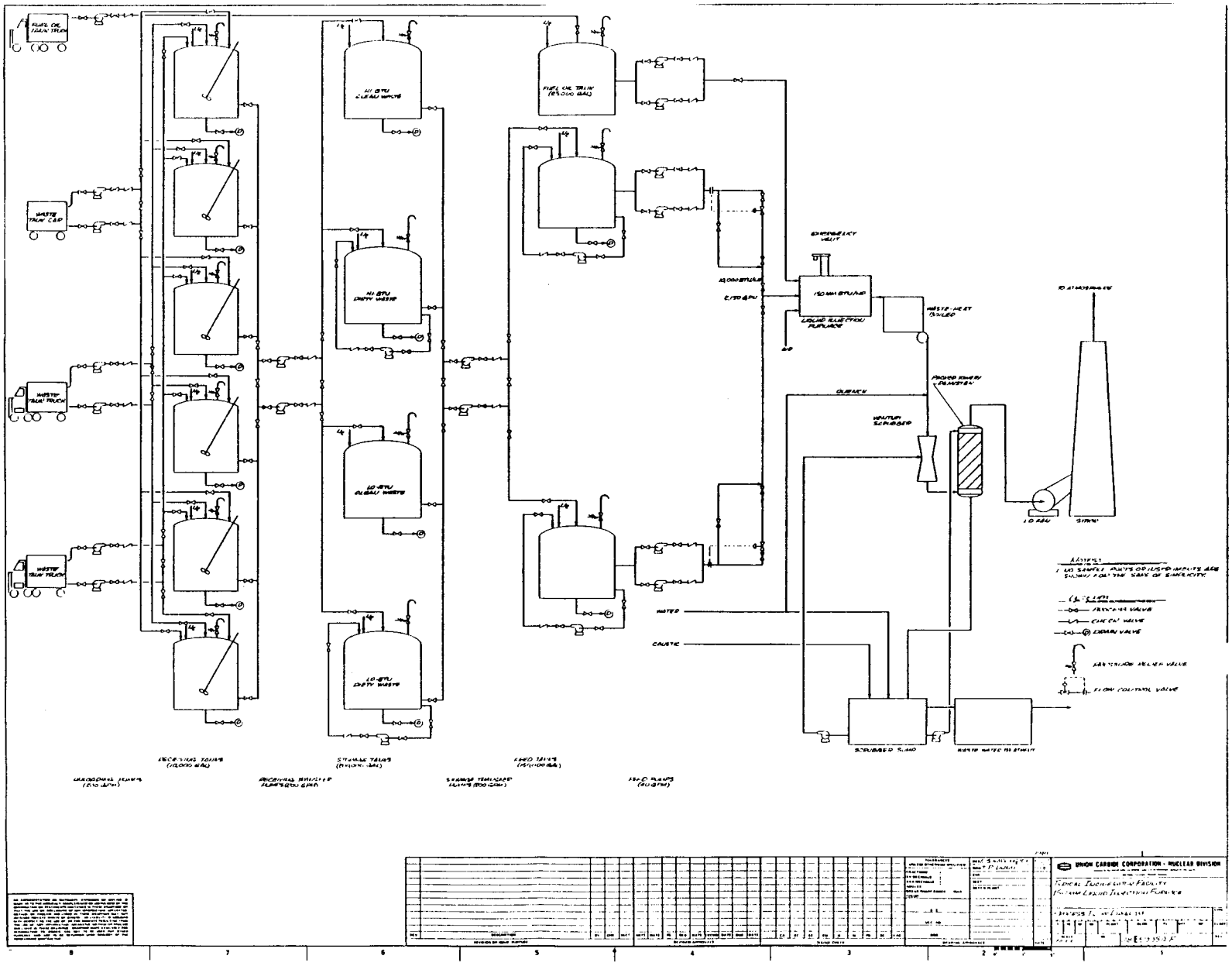
PROCESS FLOW CHART - LI-1



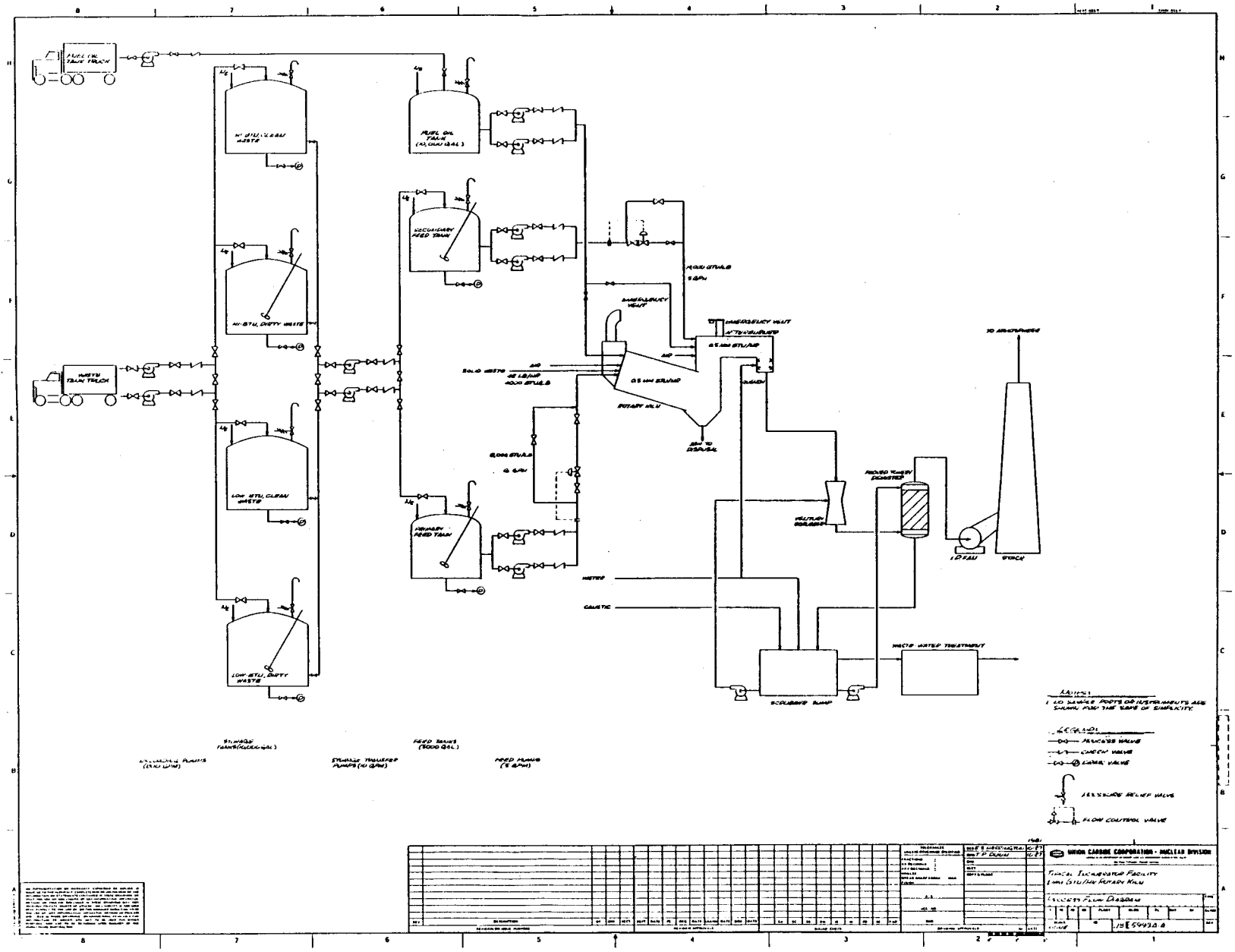
PROCESS FLOW CHART - LI-10



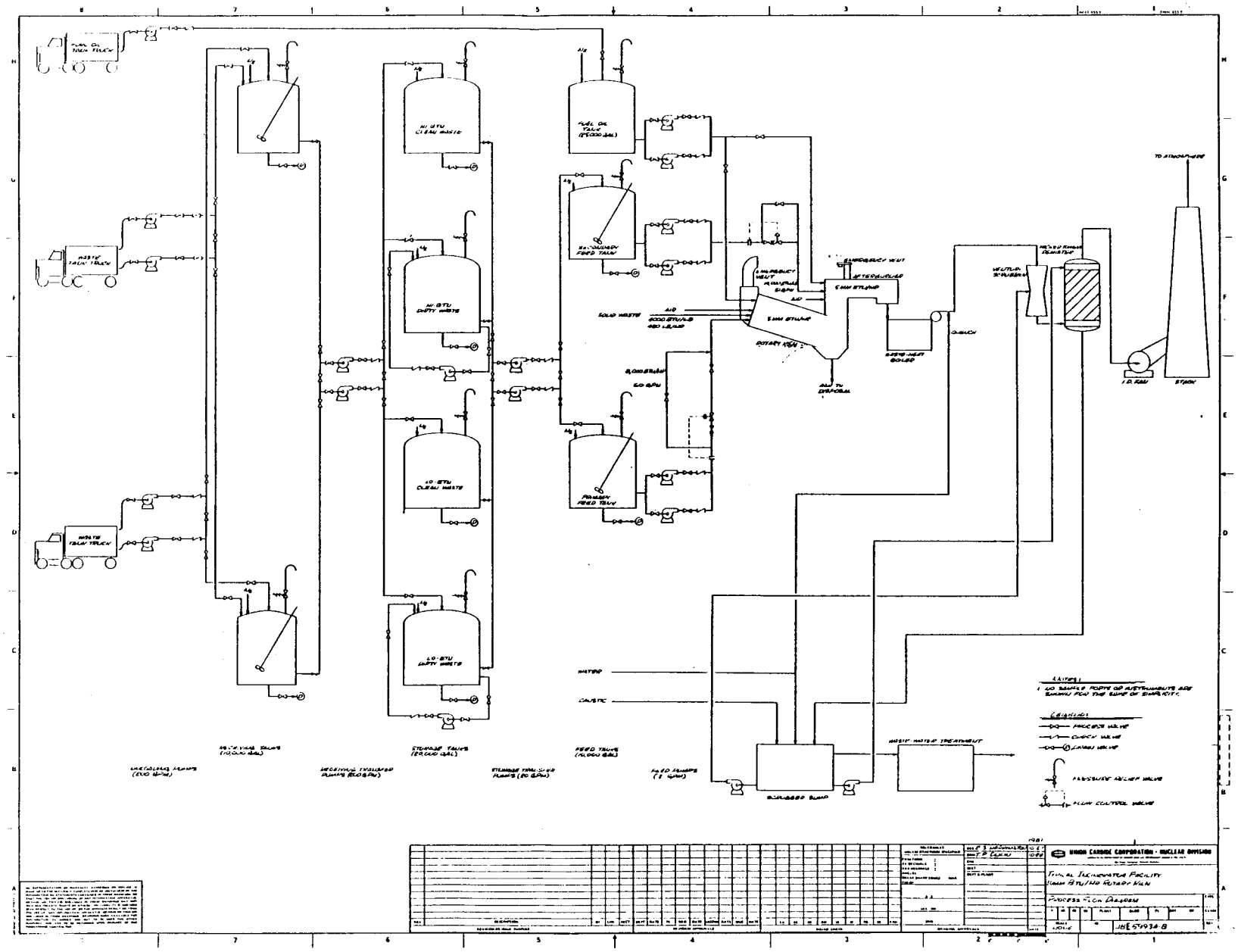
PROCESS FLOW CHART - LI-150



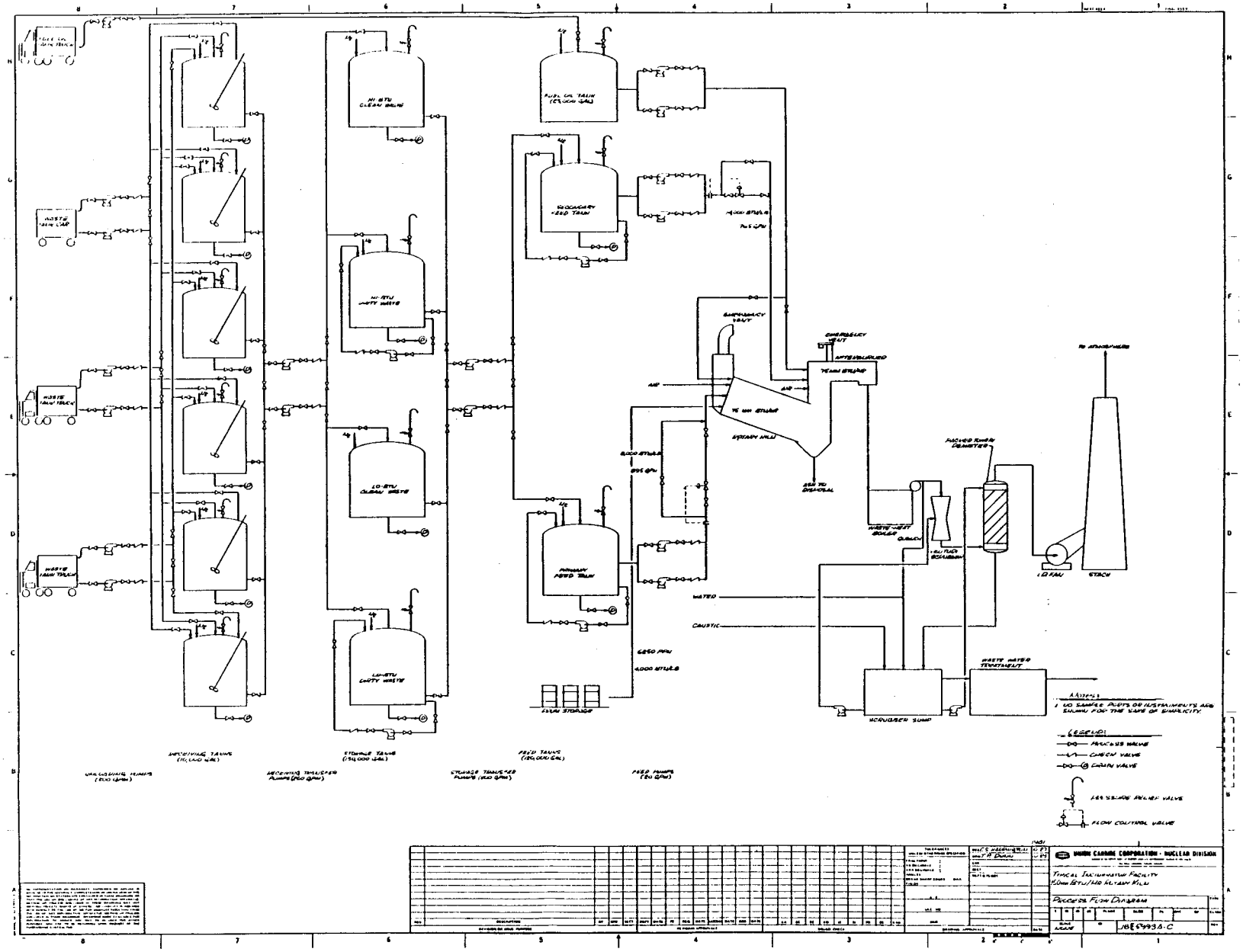
PROCESS FLOW CHART - RK-1



PROCESS FLOW CHART - RK-10



PROCESS FLOW CHART – RK-150



APPENDIX B

CONTRIBUTION OF STACK AND FUGITIVE EMISSIONS TO EXPOSURE

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-1 WITH DRE = 99.99%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	5.62E-04	5.176	94.824	0.022	18.854	75.948
ETHYLENE DICHLORIDE	6.94E-04	13.060	86.940	0.021	17.153	69.766
HEXACHLOROBUTADIENE	4.75E-05	92.490	7.510	0.002	1.483	6.026
1,1,2,2-TETRACHLOROETHANE	1.85E-05	61.616	38.384	0.009	7.567	30.808
PHENOL	1.91E-08	93.378	6.622	0.001	1.270	5.351
TOLUENE	3.25E-04	31.096	68.904	0.031	14.378	54.495
PYRIDINE	1.90E-05	36.444	63.556	0.028	13.305	50.222
PHTHALIC ANHYDRIDE	5.50E-09	96.612	3.388	0.002	0.711	2.675
METHYL STYRENE	1.31E-04	73.545	26.455	0.012	5.539	20.904
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.59E-04	18.317	81.683	0.024	5.495	76.163
ETHYLENE DICHLORIDE	2.38E-04	37.990	62.010	0.019	4.126	57.865
HEXACHLOROBUTADIENE	4.48E-05	98.056	1.944	0.001	0.130	1.814
1,1,2,2-TETRACHLOROETHANE	1.31E-05	86.847	13.153	0.004	0.884	12.265
PHENOL	1.81E-08	98.356	1.644	0.000	0.058	1.586
TOLUENE	1.58E-04	63.952	36.048	0.020	3.546	32.482
PYRIDINE	9.99E-06	69.351	30.649	0.017	3.012	27.620
PHTHALIC ANHYDRIDE	5.36E-09	99.116	0.884	0.000	0.087	0.797
METHYL STYRENE	1.05E-04	91.653	8.347	0.005	0.821	7.521
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.27E-03	2.287	97.713	0.021	32.616	65.075
ETHYLENE DICHLORIDE	1.50E-03	6.048	93.952	0.020	31.177	62.754
HEXACHLOROBUTADIENE	5.22E-05	84.065	15.935	0.003	5.304	10.628
1,1,2,2-TETRACHLOROETHANE	2.79E-05	40.855	59.145	0.013	19.711	39.421
PHENOL	2.08E-08	85.657	14.343	0.002	4.764	9.576
TOLUENE	6.18E-04	16.337	83.663	0.035	27.984	55.644
PYRIDINE	3.48E-05	19.936	80.064	0.033	26.811	53.220
PHTHALIC ANHYDRIDE	5.74E-09	92.506	7.494	0.003	2.509	4.982
METHYL STYRENE	1.76E-04	54.700	45.300	0.019	15.207	30.074

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-1 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	8.24E-04	35.310	64.690	0.015	12.862	51.812
ETHYLENE DICHLORIDE	1.51E-03	60.034	39.966	0.010	7.885	32.071
HEXACHLOROBUTADIENE	4.43E-04	99.195	0.805	0.000	0.159	0.646
1,1,2,2-TETRACHLOROETHANE	1.21E-04	94.136	5.864	0.001	1.156	4.707
PHENOL	1.79E-07	99.296	0.704	0.000	0.135	0.569
TOLUENE	1.23E-03	81.861	18.139	0.008	3.785	14.346
PYRIDINE	8.14E-05	85.150	14.850	0.007	3.109	11.734
PHTHALIC ANHYDRIDE	5.33E-08	99.651	0.349	0.000	0.073	0.276
METHYL STYRENE	9.99E-04	96.528	3.472	0.002	0.727	2.744
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	4.21E-04	69.159	30.841	0.009	2.075	28.757
ETHYLENE DICHLORIDE	1.05E-03	85.968	14.032	0.004	0.934	13.094
HEXACHLOROBUTADIENE	4.40E-04	99.802	0.198	0.000	0.013	0.185
1,1,2,2-TETRACHLOROETHANE	1.16E-04	98.508	1.492	0.000	0.100	1.391
PHENOL	1.78E-07	99.833	0.167	0.000	0.006	0.161
TOLUENE	1.07E-03	94.664	5.336	0.003	0.525	4.808
PYRIDINE	7.24E-05	95.768	4.232	0.002	0.416	3.814
PHTHALIC ANHYDRIDE	5.31E-08	99.911	0.089	0.000	0.009	0.080
METHYL STYRENE	9.73E-04	99.098	0.902	0.001	0.089	0.813
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.53E-03	18.967	81.033	0.018	27.049	53.967
ETHYLENE DICHLORIDE	2.31E-03	39.165	60.835	0.013	20.188	40.634
HEXACHLOROBUTADIENE	4.47E-04	98.140	1.860	0.000	0.619	1.241
1,1,2,2-TETRACHLOROETHANE	1.31E-04	87.354	12.646	0.003	4.214	8.429
PHENOL	1.81E-07	98.353	1.647	0.000	0.547	1.100
TOLUENE	1.53E-03	66.133	33.867	0.014	11.328	22.525
PYRIDINE	9.71E-05	71.347	28.653	0.012	9.595	19.046
PHTHALIC ANHYDRIDE	5.35E-08	99.196	0.804	0.000	0.269	0.534
METHYL STYRENE	1.04E-03	92.352	7.648	0.003	2.567	5.077

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-1 WITH DRE = 99.00%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	3.44E-03	84.516	15.484	0.004	3.079	12.402
ETHYLENE DICHLORIDE	9.66E-03	93.758	6.242	0.001	1.231	5.009
HEXACHLOROBUTADIENE	4.39E-03	99.919	0.081	0.000	0.016	0.065
1,1,2,2-TETRACHLOROETHANE	1.15E-03	99.381	0.619	0.000	0.122	0.497
PHENOL	1.78E-06	99.929	0.071	0.000	0.014	0.057
TOLUENE	1.03E-02	97.832	2.168	0.001	0.452	1.714
PYRIDINE	7.05E-04	98.286	1.714	0.001	0.359	1.354
PHTHALIC ANHYDRIDE	5.31E-07	99.965	0.035	0.000	0.007	0.028
METHYL STYRENE	9.67E-03	99.642	0.358	0.000	0.075	0.283
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	3.04E-03	95.731	4.269	0.001	0.287	3.981
ETHYLENE DICHLORIDE	9.21E-03	98.394	1.606	0.000	0.107	1.499
HEXACHLOROBUTADIENE	4.39E-03	99.980	0.020	0.000	0.001	0.018
1,1,2,2-TETRACHLOROETHANE	1.14E-03	99.849	0.151	0.000	0.010	0.141
PHENOL	1.78E-06	99.983	0.017	0.000	0.001	0.016
TOLUENE	1.02E-02	99.439	0.561	0.000	0.055	0.505
PYRIDINE	6.96E-04	99.560	0.440	0.000	0.043	0.397
PHTHALIC ANHYDRIDE	5.31E-07	99.991	0.009	0.000	0.001	0.008
METHYL STYRENE	9.65E-03	99.909	0.091	0.000	0.009	0.082
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	4.15E-03	70.065	29.935	0.006	9.992	19.936
ETHYLENE DICHLORIDE	1.05E-02	86.555	13.445	0.003	4.462	8.980
HEXACHLOROBUTADIENE	4.40E-03	99.811	0.189	0.000	0.063	0.126
1,1,2,2-TETRACHLOROETHANE	1.16E-03	98.573	1.427	0.000	0.476	0.951
PHENOL	1.78E-06	99.833	0.167	0.000	0.056	0.112
TOLUENE	1.06E-02	95.129	4.871	0.002	1.629	3.240
PYRIDINE	7.21E-04	96.139	3.861	0.002	1.293	2.566
PHTHALIC ANHYDRIDE	5.31E-07	99.919	0.081	0.000	0.027	0.054
METHYL STYRENE	9.72E-03	99.179	0.821	0.000	0.276	0.545

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.99%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.51E-03	7.750	92.250	4.021	59.482	28.747
ETHYLENE DICHLORIDE	1.94E-03	18.663	81.337	3.548	52.442	25.347
HEXACHLOROBUTADIENE	1.82E-04	96.897	3.103	0.224	1.277	1.602
1,1,2,2-TETRACHLOROETHANE	6.44E-05	71.131	28.869	1.255	18.637	8.977
PHENOL	7.47E-08	95.576	4.424	0.181	2.851	1.392
TOLUENE	1.01E-03	40.258	59.742	3.024	38.473	18.245
PYRIDINE	6.02E-05	46.210	53.790	2.726	34.574	16.489
PHTHALIC ANHYDRIDE	2.18E-08	97.710	2.290	0.116	1.477	0.697
METHYL STYRENE	4.79E-04	80.581	19.419	0.985	12.484	5.950
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	4.84E-04	24.185	75.815	1.195	48.783	25.838
ETHYLENE DICHLORIDE	7.82E-04	46.445	53.555	0.841	34.546	18.169
HEXACHLOROBUTADIENE	1.77E-04	99.162	0.838	0.022	0.344	0.472
1,1,2,2-TETRACHLOROETHANE	5.07E-05	90.305	9.695	0.152	6.250	3.293
PHENOL	7.23E-08	98.818	1.182	0.014	0.763	0.406
TOLUENE	5.72E-04	70.959	29.041	0.849	9.840	18.352
PYRIDINE	3.67E-05	75.683	24.317	0.713	8.249	15.354
PHTHALIC ANHYDRIDE	2.14E-08	99.358	0.642	0.019	0.218	0.405
METHYL STYRENE	4.12E-04	93.768	6.232	0.183	2.113	3.935
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	3.10E-03	3.771	96.229	8.121	60.587	27.522
ETHYLENE DICHLORIDE	3.75E-03	9.685	90.315	7.631	56.830	25.854
HEXACHLOROBUTADIENE	1.88E-04	93.483	6.517	0.898	2.576	3.044
1,1,2,2-TETRACHLOROETHANE	8.57E-05	53.473	46.527	3.911	29.305	13.310
PHENOL	7.85E-08	90.948	9.052	0.746	5.694	2.611
TOLUENE	1.67E-03	24.253	75.747	6.691	47.611	21.446
PYRIDINE	9.60E-05	28.946	71.054	6.289	44.565	20.200
PHTHALIC ANHYDRIDE	2.24E-08	95.297	4.703	0.417	2.953	1.333
METHYL STYRENE	5.82E-04	66.300	33.700	2.989	21.127	9.584

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	2.56E-03	45.655	54.345	2.369	35.041	16.935
ETHYLENE DICHLORIDE	5.21E-03	69.647	30.353	1.324	19.570	9.459
HEXACHLOROBUTADIENE	1.77E-03	99.681	0.319	0.023	0.131	0.165
1,1,2,2-TETRACHLOROETHANE	4.77E-04	96.100	3.900	0.170	2.518	1.213
PHENOL	7.17E-07	99.539	0.461	0.019	0.297	0.145
TOLUENE	4.66E-03	87.078	12.922	0.654	8.322	3.946
PYRIDINE	3.10E-04	89.573	10.427	0.528	6.702	3.196
PHTHALIC ANHYDRIDE	2.13E-07	99.766	0.234	0.012	0.151	0.071
METHYL STYRENE	3.95E-03	97.647	2.353	0.119	1.513	0.721
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.54E-03	76.133	23.867	0.376	15.357	8.134
ETHYLENE DICHLORIDE	4.05E-03	89.661	10.339	0.162	6.669	3.507
HEXACHLOROBUTADIENE	1.76E-03	99.916	0.084	0.002	0.035	0.048
1,1,2,2-TETRACHLOROETHANE	4.63E-04	98.938	1.062	0.017	0.685	0.361
PHENOL	7.15E-07	99.881	0.119	0.001	0.077	0.041
TOLUENE	4.23E-03	96.068	3.932	0.115	1.332	2.485
PYRIDINE	2.87E-04	96.887	3.113	0.091	1.056	1.966
PHTHALIC ANHYDRIDE	2.13E-07	99.935	0.065	0.002	0.022	0.041
METHYL STYRENE	3.89E-03	99.340	0.660	0.019	0.224	0.417
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	4.16E-03	28.152	71.848	6.064	45.236	20.549
ETHYLENE DICHLORIDE	7.02E-03	51.746	48.254	4.077	30.364	13.813
HEXACHLOROBUTADIENE	1.77E-03	99.308	0.692	0.095	0.274	0.323
1,1,2,2-TETRACHLOROETHANE	4.98E-04	91.996	8.004	0.673	5.042	2.290
PHENOL	7.21E-07	99.015	0.985	0.081	0.620	0.284
TOLUENE	5.33E-03	76.201	23.799	2.102	14.959	6.738
PYRIDINE	3.46E-04	80.291	19.709	1.744	12.361	5.603
PHTHALIC ANHYDRIDE	2.14E-07	99.509	0.491	0.043	0.308	0.139
METHYL STYRENE	4.06E-03	95.163	4.837	0.429	3.032	1.376

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.00%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.31E-02	89.363	10.637	0.464	6.859	3.315
ETHYLENE DICHLORIDE	3.79E-02	95.824	4.176	0.182	2.693	1.301
HEXACHLOROBUTADIENE	1.76E-02	99.968	0.032	0.002	0.013	0.017
1,1,2,2-TETRACHLOROETHANE	4.60E-03	99.596	0.404	0.018	0.261	0.126
PHENOL	7.14E-06	99.954	0.046	0.002	0.030	0.015
TOLUENE	4.12E-02	98.538	1.462	0.074	0.942	0.447
PYRIDINE	2.81E-03	98.849	1.151	0.058	0.740	0.353
PHTHALIC ANHYDRIDE	2.13E-06	99.977	0.023	0.001	0.015	0.007
METHYL STYRENE	3.87E-02	99.760	0.240	0.012	0.155	0.074
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.21E-02	96.960	3.040	0.048	1.956	1.036
ETHYLENE DICHLORIDE	3.67E-02	98.860	1.140	0.018	0.735	0.387
HEXACHLOROBUTADIENE	1.76E-02	99.992	0.008	0.000	0.003	0.005
1,1,2,2-TETRACHLOROETHANE	4.58E-03	99.893	0.107	0.002	0.069	0.036
PHENOL	7.14E-06	99.988	0.012	0.000	0.008	0.004
TOLUENE	4.08E-02	99.592	0.408	0.012	0.138	0.258
PYRIDINE	2.79E-03	99.680	0.320	0.009	0.109	0.202
PHTHALIC ANHYDRIDE	2.13E-06	99.994	0.006	0.000	0.002	0.004
METHYL STYRENE	3.86E-02	99.934	0.066	0.002	0.023	0.042
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.47E-02	79.668	20.332	1.716	12.801	5.815
ETHYLENE DICHLORIDE	3.97E-02	91.470	8.530	0.721	5.367	2.442
HEXACHLOROBUTADIENE	1.76E-02	99.930	0.070	0.010	0.028	0.033
1,1,2,2-TETRACHLOROETHANE	4.62E-03	99.137	0.863	0.073	0.543	0.247
PHENOL	7.15E-06	99.901	0.099	0.008	0.063	0.029
TOLUENE	4.19E-02	96.971	3.029	0.268	1.904	0.857
PYRIDINE	2.85E-03	97.604	2.396	0.212	1.503	0.681
PHTHALIC ANHYDRIDE	2.13E-06	99.951	0.049	0.004	0.031	0.014
METHYL STYRENE	3.88E-02	99.494	0.506	0.045	0.317	0.144

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-150 WITH DRE = 99.99%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	2.15E-03	13.660	86.340	16.131	47.552	22.657
ETHYLENE DICHLORIDE	3.00E-03	30.293	69.707	13.049	38.282	18.375
HEXACHLOROBUTADIENE	4.54E-04	97.269	2.731	0.511	1.503	0.717
1,1,2,2-TETRACHLOROETHANE	1.40E-04	82.319	17.681	3.307	9.735	4.639
PHENOL	1.83E-07	97.960	2.040	0.294	1.171	0.575
TOLUENE	2.15E-03	47.398	52.602	14.777	25.790	12.035
PYRIDINE	1.31E-04	53.333	46.667	13.180	22.759	10.728
PHTHALIC ANHYDRIDE	5.46E-08	98.298	1.702	0.474	0.837	0.392
METHYL STYRENE	1.14E-03	84.686	15.314	4.318	7.503	3.493
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	8.12E-04	36.066	63.934	9.527	35.943	18.464
ETHYLENE DICHLORIDE	1.50E-03	60.679	39.321	5.848	22.071	11.402
HEXACHLOROBUTADIENE	4.45E-04	99.216	0.784	0.117	0.440	0.227
1,1,2,2-TETRACHLOROETHANE	1.22E-04	94.301	5.699	0.845	3.206	1.648
PHENOL	1.80E-07	99.457	0.543	0.059	0.314	0.169
TOLUENE	1.31E-03	77.809	22.191	4.691	11.671	5.828
PYRIDINE	8.52E-05	81.681	18.319	3.885	9.600	4.835
PHTHALIC ANHYDRIDE	5.39E-08	99.557	0.443	0.092	0.234	0.118
METHYL STYRENE	1.01E-03	95.553	4.447	0.942	2.337	1.168
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	4.21E-03	6.961	93.039	23.996	47.042	22.000
ETHYLENE DICHLORIDE	5.35E-03	17.009	82.991	21.308	42.056	19.626
HEXACHLOROBUTADIENE	4.68E-04	94.390	5.610	1.446	2.840	1.324
1,1,2,2-TETRACHLOROETHANE	1.67E-04	68.739	31.261	8.010	15.840	7.412
PHENOL	1.87E-07	95.482	4.518	1.013	2.395	1.110
TOLUENE	3.48E-03	29.277	70.723	23.852	31.573	15.299
PYRIDINE	2.02E-04	34.490	65.510	22.101	29.138	14.272
PHTHALIC ANHYDRIDE	5.57E-08	96.368	3.632	1.206	1.633	0.793
METHYL STYRENE	1.35E-03	71.731	28.269	9.515	12.637	6.118

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-150 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	4.78E-03	61.271	38.729	7.235	21.330	10.163
ETHYLENE DICHLORIDE	1.12E-02	81.294	18.706	3.502	10.273	4.931
HEXACHLOROBUTADIENE	4.43E-03	99.720	0.280	0.052	0.154	0.074
1,1,2,2-TETRACHLOROETHANE	1.17E-03	97.897	2.103	0.393	1.158	0.552
PHENOL	1.79E-06	99.792	0.208	0.030	0.119	0.059
TOLUENE	1.13E-02	90.011	9.989	2.806	4.898	2.286
PYRIDINE	7.57E-04	91.954	8.046	2.272	3.924	1.850
PHTHALIC ANHYDRIDE	5.38E-07	99.827	0.173	0.048	0.085	0.040
METHYL STYRENE	9.82E-03	98.224	1.776	0.501	0.870	0.405
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	3.45E-03	84.942	15.058	2.244	8.465	4.349
ETHYLENE DICHLORIDE	9.69E-03	93.914	6.086	0.905	3.416	1.765
HEXACHLOROBUTADIENE	4.42E-03	99.921	0.079	0.012	0.044	0.023
1,1,2,2-TETRACHLOROETHANE	1.16E-03	99.399	0.601	0.089	0.338	0.174
PHENOL	1.79E-06	99.945	0.055	0.006	0.032	0.017
TOLUENE	1.05E-02	97.227	2.773	0.586	1.458	0.728
PYRIDINE	7.12E-04	97.806	2.194	0.465	1.150	0.579
PHTHALIC ANHYDRIDE	5.37E-07	99.955	0.045	0.009	0.023	0.012
METHYL STYRENE	9.69E-03	99.537	0.463	0.098	0.243	0.122
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	6.85E-03	42.799	57.201	14.753	28.922	13.526
ETHYLENE DICHLORIDE	1.35E-02	67.208	32.792	8.419	16.617	7.755
HEXACHLOROBUTADIENE	4.45E-03	99.409	0.591	0.152	0.299	0.139
1,1,2,2-TETRACHLOROETHANE	1.20E-03	95.650	4.350	1.115	2.204	1.031
PHENOL	1.80E-06	99.529	0.471	0.106	0.250	0.116
TOLUENE	1.27E-02	80.543	19.457	6.562	8.686	4.209
PYRIDINE	8.28E-04	84.038	15.962	5.385	7.100	3.477
PHTHALIC ANHYDRIDE	5.39E-07	99.625	0.375	0.125	0.169	0.082
METHYL STYRENE	1.00E-02	96.208	3.792	1.276	1.695	0.821

SOURCE CONTRIBUTIONS TO MAXIMUM POPULATED-SECTOR CONCENTRATION (UG/M**3)
FOR DESIGN LI-150 WITH DRE = 99.00%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	3.12E-02	94.055	5.945	1.111	3.274	1.560
ETHYLENE DICHLORIDE	9.31E-02	97.751	2.249	0.421	1.235	0.593
HEXACHLOROBUTADIENE	4.42E-02	99.972	0.028	0.005	0.015	0.007
1,1,2,2-TETRACHLOROETHANE	1.15E-02	99.786	0.214	0.040	0.118	0.056
PHENOL	1.79E-05	99.979	0.021	0.003	0.012	0.006
TOLUENE	1.03E-01	98.902	1.098	0.308	0.538	0.251
PYRIDINE	7.02E-03	99.133	0.867	0.245	0.423	0.199
PHTHALIC ANHYDRIDE	5.37E-06	99.983	0.017	0.005	0.009	0.004
METHYL STYRENE	9.67E-02	99.819	0.181	0.051	0.088	0.041
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	2.98E-02	98.258	1.742	0.260	0.979	0.503
ETHYLENE DICHLORIDE	9.16E-02	99.356	0.644	0.096	0.361	0.187
HEXACHLOROBUTADIENE	4.42E-02	99.992	0.008	0.001	0.004	0.002
1,1,2,2-TETRACHLOROETHANE	1.15E-02	99.940	0.060	0.009	0.034	0.017
PHENOL	1.79E-05	99.995	0.005	0.001	0.003	0.002
TOLUENE	1.02E-01	99.716	0.284	0.060	0.150	0.075
PYRIDINE	6.98E-03	99.776	0.224	0.047	0.117	0.059
PHTHALIC ANHYDRIDE	5.37E-06	99.996	0.004	0.001	0.002	0.001
METHYL STYRENE	9.65E-02	99.953	0.047	0.010	0.024	0.012
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	3.32E-02	88.211	11.789	3.041	5.961	2.788
ETHYLENE DICHLORIDE	9.54E-02	95.348	4.652	1.194	2.358	1.100
HEXACHLOROBUTADIENE	4.42E-02	99.941	0.059	0.015	0.030	0.014
1,1,2,2-TETRACHLOROETHANE	1.16E-02	99.547	0.453	0.116	0.229	0.107
PHENOL	1.79E-05	99.953	0.047	0.011	0.025	0.012
TOLUENE	1.04E-01	97.641	2.359	0.795	1.053	0.510
PYRIDINE	7.09E-03	98.136	1.864	0.629	0.829	0.406
PHTHALIC ANHYDRIDE	5.37E-06	99.962	0.038	0.013	0.017	0.008
METHYL STYRENE	9.69E-02	99.607	0.393	0.132	0.175	0.085

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-1 WITH DRE = 99.99%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	2.46E+00	5.764	94.236	0.022	18.713	75.501
ETHYLENE DICHLORIDE	3.07E+00	14.385	85.615	0.020	16.924	68.671
HEXACHLOROBUTADIENE	2.30E-01	93.212	6.788	0.002	1.342	5.445
1,1,2,2-TETRACHLOROETHANE	8.67E-02	64.340	35.660	0.008	7.057	28.595
PHENOL	9.23E-05	94.020	5.980	0.001	1.148	4.831
TOLUENE	1.48E+00	33.482	66.518	0.030	13.894	52.594
PYRIDINE	8.65E-02	39.064	60.936	0.027	12.713	48.195
PHTHALIC ANHYDRIDE	2.67E-05	96.955	3.045	0.001	0.636	2.407
METHYL STYRENE	6.22E-01	75.591	24.409	0.011	5.098	19.300
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	7.09E-01	20.021	79.979	0.024	5.372	74.584
ETHYLENE DICHLORIDE	1.08E+00	40.741	59.259	0.018	3.936	55.305
HEXACHLOROBUTADIENE	2.18E-01	98.258	1.742	0.001	0.116	1.625
1,1,2,2-TETRACHLOROETHANE	6.34E-02	88.073	11.927	0.004	0.796	11.128
PHENOL	8.81E-05	98.517	1.483	0.000	0.052	1.430
TOLUENE	7.43E-01	66.528	33.472	0.019	3.286	30.167
PYRIDINE	4.72E-02	71.584	28.416	0.016	2.774	25.626
PHTHALIC ANHYDRIDE	2.61E-05	99.214	0.786	0.000	0.077	0.709
METHYL STYRENE	5.08E-01	92.447	7.553	0.004	0.744	6.806
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	5.57E+00	2.548	97.452	0.021	32.477	64.954
ETHYLENE DICHLORIDE	6.59E+00	6.704	93.296	0.020	30.940	62.336
HEXACHLOROBUTADIENE	2.50E-01	85.461	14.539	0.003	4.832	9.704
1,1,2,2-TETRACHLOROETHANE	1.28E-01	43.588	56.412	0.012	18.748	37.652
PHENOL	9.98E-05	86.946	13.054	0.002	4.347	8.705
TOLUENE	2.75E+00	17.951	82.049	0.034	27.508	54.507
PYRIDINE	1.55E-01	21.771	78.229	0.033	26.151	52.045
PHTHALIC ANHYDRIDE	2.78E-05	93.284	6.716	0.003	2.247	4.466
METHYL STYRENE	8.19E-01	57.377	42.623	0.018	14.283	28.322

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-1 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	3.74E+00	37.952	62.048	0.015	12.321	49.712
ETHYLENE DICHLORIDE	7.05E+00	62.689	37.311	0.009	7.375	29.926
HEXACHLOROBUTADIENE	2.16E+00	99.277	0.723	0.000	0.143	0.580
1,1,2,2-TETRACHLOROETHANE	5.89E-01	94.749	5.251	0.001	1.039	4.211
PHENOL	8.74E-04	99.368	0.632	0.000	0.121	0.511
TOLUENE	5.92E+00	83.426	16.574	0.007	3.462	13.105
PYRIDINE	3.91E-01	86.506	13.494	0.006	2.815	10.673
PHTHALIC ANHYDRIDE	2.60E-04	99.687	0.313	0.000	0.065	0.247
METHYL STYRENE	4.85E+00	96.872	3.128	0.001	0.653	2.473
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.99E+00	71.455	28.545	0.009	1.917	26.619
ETHYLENE DICHLORIDE	5.06E+00	87.302	12.698	0.004	0.843	11.851
HEXACHLOROBUTADIENE	2.14E+00	99.823	0.177	0.000	0.012	0.165
1,1,2,2-TETRACHLOROETHANE	5.66E-01	98.664	1.336	0.000	0.089	1.247
PHENOL	8.69E-04	99.850	0.150	0.000	0.005	0.145
TOLUENE	5.19E+00	95.210	4.790	0.003	0.470	4.317
PYRIDINE	3.51E-01	96.182	3.818	0.002	0.373	3.443
PHTHALIC ANHYDRIDE	2.59E-04	99.921	0.079	0.000	0.008	0.071
METHYL STYRENE	4.74E+00	99.190	0.810	0.000	0.080	0.730
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	6.85E+00	20.726	79.274	0.017	26.419	52.838
ETHYLENE DICHLORIDE	1.06E+01	41.811	58.189	0.013	19.297	38.879
HEXACHLOROBUTADIENE	2.18E+00	98.327	1.673	0.000	0.556	1.117
1,1,2,2-TETRACHLOROETHANE	6.30E-01	88.541	11.459	0.002	3.808	7.648
PHENOL	8.81E-04	98.521	1.479	0.000	0.493	0.986
TOLUENE	7.20E+00	68.631	31.369	0.013	10.517	20.839
PYRIDINE	4.59E-01	73.566	26.434	0.011	8.837	17.586
PHTHALIC ANHYDRIDE	2.61E-04	99.285	0.715	0.000	0.239	0.475
METHYL STYRENE	5.05E+00	93.085	6.915	0.003	2.317	4.595

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-1 WITH DRE = 99.00%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.65E+01	85.948	14.052	0.003	2.790	11.258
ETHYLENE DICHLORIDE	4.68E+01	94.383	5.617	0.001	1.110	4.506
HEXACHLOROBUTADIENE	2.14E+01	99.927	0.073	0.000	0.014	0.058
1,1,2,2-TETRACHLOROETHANE	5.61E+00	99.449	0.551	0.000	0.109	0.442
PHENOL	8.69E-03	99.936	0.064	0.000	0.012	0.051
TOLUENE	5.04E+01	98.052	1.948	0.001	0.407	1.540
PYRIDINE	3.43E+00	98.464	1.536	0.001	0.320	1.215
PHTHALIC ANHYDRIDE	2.59E-03	99.969	0.031	0.000	0.007	0.025
METHYL STYRENE	4.72E+01	99.678	0.322	0.000	0.067	0.254
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.48E+01	96.159	3.841	0.001	0.258	3.582
ETHYLENE DICHLORIDE	4.48E+01	98.566	1.434	0.000	0.095	1.338
HEXACHLOROBUTADIENE	2.14E+01	99.982	0.018	0.000	0.001	0.017
1,1,2,2-TETRACHLOROETHANE	5.59E+00	99.865	0.135	0.000	0.009	0.126
PHENOL	8.68E-03	99.985	0.015	0.000	0.001	0.015
TOLUENE	4.96E+01	99.499	0.501	0.000	0.049	0.451
PYRIDINE	3.39E+00	99.605	0.395	0.000	0.039	0.357
PHTHALIC ANHYDRIDE	2.59E-03	99.992	0.008	0.000	0.001	0.007
METHYL STYRENE	4.70E+01	99.918	0.082	0.000	0.008	0.074
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.96E+01	72.334	27.666	0.006	9.220	18.440
ETHYLENE DICHLORIDE	5.04E+01	87.783	12.217	0.003	4.052	8.163
HEXACHLOROBUTADIENE	2.14E+01	99.830	0.170	0.000	0.056	0.113
1,1,2,2-TETRACHLOROETHANE	5.65E+00	98.722	1.278	0.000	0.425	0.853
PHENOL	8.69E-03	99.850	0.150	0.000	0.050	0.100
TOLUENE	5.17E+01	95.629	4.371	0.002	1.465	2.904
PYRIDINE	3.50E+00	96.531	3.469	0.001	1.160	2.308
PHTHALIC ANHYDRIDE	2.59E-03	99.928	0.072	0.000	0.024	0.048
METHYL STYRENE	4.73E+01	99.263	0.737	0.000	0.247	0.490

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.99%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	7.13E+00	14.856	85.144	3.714	54.940	26.489
ETHYLENE DICHLORIDE	1.02E+01	32.315	67.685	2.956	43.611	21.118
HEXACHLOROBUTADIENE	1.61E+00	98.478	1.522	0.110	0.626	0.787
1,1,2,2-TETRACHLOROETHANE	4.96E-01	83.629	16.371	0.713	10.580	5.078
PHENOL	6.61E-04	97.825	2.175	0.089	1.405	0.682
TOLUENE	6.30E+00	58.385	41.615	2.110	26.813	12.692
PYRIDINE	3.93E-01	64.098	35.902	1.819	23.096	10.988
PHTHALIC ANHYDRIDE	1.95E-04	98.886	1.114	0.056	0.717	0.340
METHYL STYRENE	3.90E+00	89.638	10.362	0.528	6.659	3.176
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	2.66E+00	39.847	60.153	0.947	38.719	20.487
ETHYLENE DICHLORIDE	5.11E+00	64.389	35.611	0.560	22.898	12.154
HEXACHLOROBUTADIENE	1.60E+00	99.593	0.407	0.011	0.167	0.229
1,1,2,2-TETRACHLOROETHANE	4.36E-01	95.093	4.907	0.077	3.162	1.668
PHENOL	6.51E-04	99.426	0.574	0.007	0.370	0.197
TOLUENE	4.40E+00	83.576	16.424	0.481	5.587	10.356
PYRIDINE	2.91E-01	86.646	13.354	0.392	4.539	8.424
PHTHALIC ANHYDRIDE	1.94E-04	99.691	0.309	0.009	0.105	0.195
METHYL STYRENE	3.61E+00	96.905	3.095	0.091	1.047	1.957
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.41E+01	7.523	92.477	7.807	58.197	26.473
ETHYLENE DICHLORIDE	1.81E+01	18.197	81.803	6.914	51.383	23.507
HEXACHLOROBUTADIENE	1.64E+00	96.740	3.260	0.449	1.290	1.521
1,1,2,2-TETRACHLOROETHANE	5.90E-01	70.399	29.601	2.494	18.660	8.448
PHENOL	6.78E-04	95.416	4.584	0.378	2.891	1.315
TOLUENE	9.22E+00	39.909	60.091	5.325	37.740	17.026
PYRIDINE	5.50E-01	45.827	54.173	4.783	34.006	15.385
PHTHALIC ANHYDRIDE	1.98E-04	97.679	2.321	0.205	1.458	0.658
METHYL STYRENE	4.35E+00	80.426	19.574	1.742	12.271	5.561

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.67E+01	63.568	36.432	1.589	23.508	11.334
ETHYLENE DICHLORIDE	3.98E+01	82.682	17.318	0.756	11.158	5.403
HEXACHLOROBUTADIENE	1.59E+01	99.846	0.154	0.011	0.063	0.080
1,1,2,2-TETRACHLOROETHANE	4.23E+00	98.080	1.920	0.084	1.241	0.596
PHENOL	6.48E-03	99.778	0.222	0.009	0.143	0.070
TOLUENE	3.94E+01	93.347	6.653	0.337	4.287	2.029
PYRIDINE	2.66E+00	94.696	5.304	0.269	3.412	1.623
PHTHALIC ANHYDRIDE	1.93E-03	99.887	0.113	0.006	0.072	0.034
METHYL STYRENE	3.54E+01	98.857	1.143	0.058	0.734	0.350
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.22E+01	86.884	13.116	0.207	8.442	4.467
ETHYLENE DICHLORIDE	3.47E+01	94.759	5.241	0.082	3.370	1.789
HEXACHLOROBUTADIENE	1.59E+01	99.959	0.041	0.001	0.017	0.023
1,1,2,2-TETRACHLOROETHANE	4.17E+00	99.487	0.513	0.008	0.331	0.175
PHENOL	6.47E-03	99.942	0.058	0.001	0.037	0.020
TOLUENE	3.75E+01	98.073	1.927	0.056	0.656	1.215
PYRIDINE	2.56E+00	98.482	1.518	0.045	0.516	0.957
PHTHALIC ANHYDRIDE	1.93E-03	99.969	0.031	0.001	0.011	0.020
METHYL STYRENE	3.51E+01	99.682	0.318	0.009	0.108	0.201
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	2.36E+01	44.858	55.142	4.655	34.702	15.785
ETHYLENE DICHLORIDE	4.77E+01	68.987	31.013	2.621	19.480	8.912
HEXACHLOROBUTADIENE	1.60E+01	99.664	0.336	0.046	0.133	0.157
1,1,2,2-TETRACHLOROETHANE	4.32E+00	95.965	4.035	0.340	2.544	1.152
PHENOL	6.50E-03	99.522	0.478	0.039	0.301	0.137
TOLUENE	4.23E+01	86.913	13.087	1.160	8.219	3.708
PYRIDINE	2.82E+00	89.428	10.572	0.933	6.636	3.002
PHTHALIC ANHYDRIDE	1.93E-03	99.763	0.237	0.021	0.149	0.067
METHYL STYRENE	3.59E+01	97.624	2.376	0.211	1.489	0.675

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.67E+01	63.568	36.432	1.589	23.508	11.334
ETHYLENE DICHLORIDE	3.98E+01	82.682	17.318	0.756	11.158	5.403
HEXACHLOROBUTADIENE	1.59E+01	99.846	0.154	0.011	0.063	0.080
1,1,2,2-TETRACHLOROETHANE	4.23E+00	98.080	1.920	0.084	1.241	0.596
PHENOL	6.48E-03	99.778	0.222	0.009	0.143	0.070
TOLUENE	3.94E+01	93.347	6.653	0.337	4.287	2.029
PYRIDINE	2.66E+00	94.696	5.304	0.269	3.412	1.623
PHTHALIC ANHYDRIDE	1.93E-03	99.887	0.113	0.006	0.072	0.034
METHYL STYRENE	3.54E+01	98.857	1.143	0.058	0.734	0.350
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.22E+01	86.884	13.116	0.207	8.442	4.467
ETHYLENE DICHLORIDE	3.47E+01	94.759	5.241	0.082	3.370	1.789
HEXACHLOROBUTADIENE	1.59E+01	99.959	0.041	0.001	0.017	0.023
1,1,2,2-TETRACHLOROETHANE	4.17E+00	99.487	0.513	0.008	0.331	0.175
PHENOL	6.47E-03	99.942	0.058	0.001	0.037	0.020
TOLUENE	3.75E+01	98.073	1.927	0.056	0.656	1.215
PYRIDINE	2.56E+00	98.482	1.518	0.045	0.516	0.957
PHTHALIC ANHYDRIDE	1.93E-03	99.969	0.031	0.001	0.011	0.020
METHYL STYRENE	3.51E+01	99.682	0.318	0.009	0.108	0.201
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	2.36E+01	44.858	55.142	4.655	34.702	15.785
ETHYLENE DICHLORIDE	4.77E+01	68.987	31.013	2.621	19.480	8.912
HEXACHLOROBUTADIENE	1.60E+01	99.664	0.336	0.046	0.133	0.157
1,1,2,2-TETRACHLOROETHANE	4.32E+00	95.965	4.035	0.340	2.544	1.152
PHENOL	6.50E-03	99.522	0.478	0.039	0.301	0.137
TOLUENE	4.23E+01	86.913	13.087	1.160	8.219	3.708
PYRIDINE	2.82E+00	89.428	10.572	0.933	6.636	3.002
PHTHALIC ANHYDRIDE	1.93E-03	99.763	0.237	0.021	0.149	0.067
METHYL STYRENE	3.59E+01	97.624	2.376	0.211	1.489	0.675

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-10 WITH DRE = 99.00%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.12E+02	94.580	5.420	0.236	3.498	1.686
ETHYLENE DICHLORIDE	3.36E+02	97.948	2.052	0.090	1.322	0.640
HEXACHLOROBUTADIENE	1.59E+02	99.985	0.015	0.001	0.006	0.008
1,1,2,2-TETRACHLOROETHANE	4.16E+01	99.805	0.195	0.009	0.126	0.061
PHENOL	6.47E-02	99.978	0.022	0.001	0.014	0.007
TOLUENE	3.71E+02	99.292	0.708	0.036	0.456	0.216
PYRIDINE	2.53E+01	99.443	0.557	0.028	0.358	0.170
PHTHALIC ANHYDRIDE	1.93E-02	99.989	0.011	0.001	0.007	0.003
METHYL STYRENE	3.50E+02	99.885	0.115	0.006	0.074	0.035
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.08E+02	98.513	1.487	0.023	0.957	0.507
ETHYLENE DICHLORIDE	3.31E+02	99.450	0.550	0.009	0.354	0.188
HEXACHLOROBUTADIENE	1.59E+02	99.996	0.004	0.000	0.002	0.002
1,1,2,2-TETRACHLOROETHANE	4.15E+01	99.948	0.052	0.001	0.033	0.018
PHENOL	6.47E-02	99.994	0.006	0.000	0.004	0.002
TOLUENE	3.69E+02	99.804	0.196	0.006	0.067	0.124
PYRIDINE	2.52E+01	99.846	0.154	0.005	0.052	0.097
PHTHALIC ANHYDRIDE	1.93E-02	99.997	0.003	0.000	0.001	0.002
METHYL STYRENE	3.50E+02	99.968	0.032	0.001	0.011	0.020
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.19E+02	89.053	10.947	0.924	6.889	3.134
ETHYLENE DICHLORIDE	3.44E+02	95.698	4.302	0.364	2.702	1.236
HEXACHLOROBUTADIENE	1.59E+02	99.966	0.034	0.005	0.013	0.016
1,1,2,2-TETRACHLOROETHANE	4.17E+01	99.581	0.419	0.035	0.264	0.119
PHENOL	6.47E-02	99.952	0.048	0.004	0.030	0.014
TOLUENE	3.74E+02	98.517	1.483	0.131	0.932	0.420
PYRIDINE	2.55E+01	98.832	1.168	0.103	0.733	0.332
PHTHALIC ANHYDRIDE	1.93E-02	99.976	0.024	0.002	0.015	0.007
METHYL STYRENE	3.51E+02	99.757	0.243	0.022	0.152	0.069

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-150 WITH DRE = 99.99%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.95E+01	58.402	41.598	7.736	23.002	10.861
ETHYLENE DICHLORIDE	4.46E+01	79.354	20.646	3.856	11.388	5.402
HEXACHLOROBUTADIENE	1.73E+01	99.684	0.316	0.059	0.174	0.083
1,1,2,2-TETRACHLOROETHANE	4.59E+00	97.635	2.365	0.440	1.305	0.619
PHENOL	6.97E-03	99.764	0.236	0.034	0.136	0.066
TOLUENE	4.47E+01	88.874	11.126	3.134	5.462	2.530
PYRIDINE	2.98E+00	91.028	8.972	2.523	4.400	2.049
PHTHALIC ANHYDRIDE	2.09E-03	99.805	0.195	0.054	0.096	0.045
METHYL STYRENE	3.83E+01	98.001	1.999	0.562	0.983	0.455
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.37E+01	83.303	16.697	2.470	9.426	4.801
ETHYLENE DICHLORIDE	3.80E+01	93.178	6.822	1.013	3.843	1.966
HEXACHLOROBUTADIENE	1.72E+01	99.911	0.089	0.013	0.050	0.026
1,1,2,2-TETRACHLOROETHANE	4.51E+00	99.324	0.676	0.100	0.381	0.195
PHENOL	6.95E-03	99.938	0.062	0.007	0.036	0.019
TOLUENE	4.10E+01	96.886	3.114	0.656	1.640	0.818
PYRIDINE	2.78E+00	97.531	2.469	0.522	1.299	0.648
PHTHALIC ANHYDRIDE	2.09E-03	99.950	0.050	0.010	0.027	0.013
METHYL STYRENE	3.77E+01	99.477	0.523	0.110	0.276	0.137
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	2.86E+01	39.818	60.182	15.403	30.632	14.146
ETHYLENE DICHLORIDE	5.49E+01	64.481	35.519	9.107	18.033	8.379
HEXACHLOROBUTADIENE	1.73E+01	99.332	0.668	0.170	0.340	0.158
1,1,2,2-TETRACHLOROETHANE	4.71E+00	95.119	4.881	1.246	2.484	1.151
PHENOL	6.99E-03	99.468	0.532	0.119	0.283	0.129
TOLUENE	5.05E+01	78.552	21.448	7.202	9.616	4.630
PYRIDINE	3.29E+00	82.321	17.679	5.954	7.898	3.827
PHTHALIC ANHYDRIDE	2.10E-03	99.575	0.425	0.141	0.192	0.092
METHYL STYRENE	3.92E+01	95.734	4.266	1.435	1.912	0.919

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-150 WITH DRE = 99.90%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.22E+02	93.351	6.649	1.236	3.677	1.736
ETHYLENE DICHLORIDE	3.63E+02	97.464	2.536	0.474	1.399	0.664
HEXACHLOROBUTADIENE	1.72E+02	99.968	0.032	0.006	0.017	0.008
1,1,2,2-TETRACHLOROETHANE	4.49E+01	99.758	0.242	0.045	0.133	0.063
PHENOL	6.95E-02	99.976	0.024	0.003	0.014	0.007
TOLUENE	4.02E+02	98.764	1.236	0.348	0.607	0.281
PYRIDINE	2.74E+01	99.024	0.976	0.274	0.479	0.223
PHTHALIC ANHYDRIDE	2.09E-02	99.980	0.020	0.005	0.010	0.004
METHYL STYRENE	3.76E+02	99.796	0.204	0.057	0.100	0.046
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.16E+02	98.035	1.965	0.291	1.109	0.565
ETHYLENE DICHLORIDE	3.57E+02	99.273	0.727	0.108	0.409	0.209
HEXACHLOROBUTADIENE	1.72E+02	99.991	0.009	0.001	0.005	0.003
1,1,2,2-TETRACHLOROETHANE	4.48E+01	99.932	0.068	0.010	0.038	0.020
PHENOL	6.95E-02	99.994	0.006	0.001	0.004	0.002
TOLUENE	3.98E+02	99.680	0.320	0.068	0.169	0.084
PYRIDINE	2.72E+01	99.748	0.252	0.053	0.133	0.066
PHTHALIC ANHYDRIDE	2.09E-02	99.995	0.005	0.001	0.003	0.001
METHYL STYRENE	3.75E+02	99.947	0.053	0.011	0.028	0.014
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.31E+02	86.870	13.130	3.361	6.683	3.086
ETHYLENE DICHLORIDE	3.74E+02	94.779	5.221	1.339	2.651	1.232
HEXACHLOROBUTADIENE	1.72E+02	99.933	0.067	0.017	0.034	0.016
1,1,2,2-TETRACHLOROETHANE	4.50E+01	99.489	0.511	0.130	0.260	0.120
PHENOL	6.95E-02	99.947	0.053	0.012	0.028	0.013
TOLUENE	4.08E+02	97.342	2.658	0.893	1.192	0.574
PYRIDINE	2.77E+01	97.898	2.102	0.708	0.939	0.455
PHTHALIC ANHYDRIDE	2.09E-02	99.957	0.043	0.014	0.019	0.009
METHYL STYRENE	3.77E+02	99.556	0.444	0.149	0.199	0.096

SOURCE CONTRIBUTIONS TO TOTAL COLLECTIVE EXPOSURE (PERSON*UG/M**3)
FOR DESIGN LI-150 WITH DRE = 99.00%

POLLUTANT	TOT. VALUE	PERCENT OF TOTAL FROM				
		STACK	FUGITIVES	RECEIVING	STORAGE	FEED
EXPECTED FUGITIVE EMISSIONS						
CHLOROFORM	1.15E+03	99.293	0.707	0.132	0.391	0.185
ETHYLENE DICHLORIDE	3.55E+03	99.741	0.259	0.048	0.143	0.068
HEXACHLOROBUTADIENE	1.72E+03	99.997	0.003	0.001	0.002	0.001
1,1,2,2-TETRACHLOROETHANE	4.48E+02	99.976	0.024	0.005	0.013	0.006
PHENOL	6.95E-01	99.998	0.002	0.000	0.001	0.001
TOLUENE	3.97E+03	99.875	0.125	0.035	0.061	0.028
PYRIDINE	2.71E+02	99.902	0.098	0.028	0.048	0.022
PHTHALIC ANHYDRIDE	2.09E-01	99.998	0.002	0.001	0.001	0.000
METHYL STYRENE	3.75E+03	99.980	0.020	0.006	0.010	0.005
MINIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.14E+03	99.800	0.200	0.030	0.113	0.058
ETHYLENE DICHLORIDE	3.54E+03	99.927	0.073	0.011	0.041	0.021
HEXACHLOROBUTADIENE	1.72E+03	99.999	0.001	0.000	0.001	0.000
1,1,2,2-TETRACHLOROETHANE	4.48E+02	99.993	0.007	0.001	0.004	0.002
PHENOL	6.95E-01	99.999	0.001	0.000	0.000	0.000
TOLUENE	3.97E+03	99.968	0.032	0.007	0.017	0.008
PYRIDINE	2.71E+02	99.975	0.025	0.005	0.013	0.007
PHTHALIC ANHYDRIDE	2.09E-01	99.999	0.001	0.000	0.000	0.000
METHYL STYRENE	3.75E+03	99.995	0.005	0.001	0.003	0.001
MAXIMUM FUGITIVE EMISSIONS						
CHLOROFORM	1.16E+03	98.511	1.489	0.381	0.758	0.350
ETHYLENE DICHLORIDE	3.56E+03	99.452	0.548	0.140	0.278	0.129
HEXACHLOROBUTADIENE	1.72E+03	99.993	0.007	0.002	0.003	0.002
1,1,2,2-TETRACHLOROETHANE	4.48E+02	99.949	0.051	0.013	0.026	0.012
PHENOL	6.95E-01	99.995	0.005	0.001	0.003	0.001
TOLUENE	3.98E+03	99.728	0.272	0.091	0.122	0.059
PYRIDINE	2.72E+02	99.786	0.214	0.072	0.096	0.046
PHTHALIC ANHYDRIDE	2.09E-01	99.996	0.004	0.001	0.002	0.001
METHYL STYRENE	3.75E+03	99.955	0.045	0.015	0.020	0.010

APPENDIX C

EXPOSURE FROM HEAVY METALS ASSUMING 95% DRE

HIGHEST SECTOR-AVERAGED ANNUAL-AVERAGE GROUND-LEVEL AIR CONCENTRATIONS
(MICROGRAMS PER CUBIC METER) IN A POPULATED SECTOR FOR DRE = 95.00%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
ARSENIC	1.63E-05	6.55E-05	1.64E-04	1.63E-05	6.55E-05	1.64E-04
CHROMIUM	6.35E-05	2.53E-04	6.35E-04	6.35E-05	2.53E-04	6.35E-04
LEAD	8.35E-05	3.36E-04	8.45E-04	8.35E-05	3.36E-04	8.45E-04

COLLECTIVE EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER) FOR DRE = 95.00%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
ARSENIC	7.95E-02	5.90E-01	6.40E+00	7.95E-02	5.90E-01	6.40E+00
CHROMIUM	3.08E-01	2.30E+00	2.48E+01	3.08E-01	2.30E+00	2.48E+01
LEAD	4.09E-01	3.04E+00	3.28E+01	4.09E-01	3.04E+00	3.28E+01

AVERAGE INDIVIDUAL EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER)
FOR DRE = 95.00%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
ARSENIC	1.77E-07	1.32E-06	1.43E-05	1.77E-07	1.32E-06	1.43E-05
CHROMIUM	6.90E-07	5.15E-06	5.50E-05	6.90E-07	5.15E-06	5.50E-05
LEAD	9.10E-07	6.80E-06	7.35E-05	9.10E-07	6.80E-06	7.35E-05

APPENDIX D

EFFECT OF DESTRUCTION AND REMOVAL EFFICIENCY ON TOTAL COLLECTIVE EXPOSURE

EFFECT OF DESTRUCTION REMOVAL EFFICIENCY (DRE) FOR RK-1
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF 99.99% VALUE			% CHANGE FROM 99.99% VALUE		
	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	2.36E+00	3.64E+00	1.64E+01	1.0	1.5	7.0	0.0	54.1	595.5
ETHYLENE DICHLORIDE	2.94E+00	6.92E+00	4.67E+01	1.0	2.4	15.9	0.0	135.2	1487.0
HEXACHLOROBUTADIENE	2.29E-01	2.15E+00	2.14E+01	1.0	9.4	93.6	0.0	841.9	9260.7
1,1,2,2-TETRACHLOROETHANE	8.53E-02	5.88E-01	5.61E+00	1.0	6.9	65.7	0.0	588.6	6474.1
PHENOL	9.21E-05	8.73E-04	8.69E-03	1.0	9.5	94.3	0.0	848.6	9334.3
TOLUENE	1.43E+00	5.87E+00	5.03E+01	1.0	4.1	35.3	0.0	311.9	3430.9
PYRIDINE	8.38E-02	3.88E-01	3.43E+00	1.0	4.6	40.9	0.0	362.9	3992.0
PHTHALIC ANHYDRIDE	2.67E-05	2.60E-04	2.59E-03	1.0	9.7	97.1	0.0	873.9	9612.6
METHYL STYRENE	6.13E-01	4.84E+00	4.71E+01	1.0	7.9	76.8	0.0	689.5	7584.8
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	6.92E-01	1.97E+00	1.48E+01	1.0	2.8	21.3	0.0	184.6	2030.1
ETHYLENE DICHLORIDE	1.06E+00	5.04E+00	4.48E+01	1.0	4.7	42.2	0.0	374.4	4118.8
HEXACHLOROBUTADIENE	2.18E-01	2.14E+00	2.14E+01	1.0	9.8	98.3	0.0	884.8	9732.9
1,1,2,2-TETRACHLOROETHANE	6.31E-02	5.65E-01	5.59E+00	1.0	9.0	88.5	0.0	795.8	8753.5
PHENOL	8.81E-05	8.69E-04	8.68E-03	1.0	9.9	98.6	0.0	887.1	9757.7
TOLUENE	7.33E-01	5.18E+00	4.96E+01	1.0	7.1	67.7	0.0	606.3	6669.0
PYRIDINE	4.66E-02	3.51E-01	3.39E+00	1.0	7.5	72.8	0.0	652.7	7179.5
PHTHALIC ANHYDRIDE	2.61E-05	2.59E-04	2.59E-03	1.0	9.9	99.2	0.0	893.2	9824.8
METHYL STYRENE	5.07E-01	4.74E+00	4.70E+01	1.0	9.3	92.8	0.0	834.6	9180.4
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	5.49E+00	6.77E+00	1.96E+01	1.0	1.2	3.6	0.0	23.3	255.9
ETHYLENE DICHLORIDE	6.48E+00	1.05E+01	5.02E+01	1.0	1.6	7.7	0.0	61.4	674.9
HEXACHLOROBUTADIENE	2.50E-01	2.18E+00	2.14E+01	1.0	8.7	85.9	0.0	771.6	8487.7
1,1,2,2-TETRACHLOROETHANE	1.27E-01	6.29E-01	5.65E+00	1.0	5.0	44.5	0.0	395.7	4352.7
PHENOL	9.96E-05	8.81E-04	8.69E-03	1.0	8.8	87.3	0.0	784.4	8628.4
TOLUENE	2.71E+00	7.15E+00	5.16E+01	1.0	2.6	19.1	0.0	164.2	1806.0
PYRIDINE	1.53E-01	4.57E-01	3.50E+00	1.0	3.0	22.9	0.0	198.9	2187.8
PHTHALIC ANHYDRIDE	2.77E-05	2.61E-04	2.59E-03	1.0	9.4	93.4	0.0	840.2	9241.7
METHYL STYRENE	8.13E-01	5.04E+00	4.73E+01	1.0	6.2	58.2	0.0	520.2	5722.2

EFFECT OF DESTRUCTION REMOVAL EFFICIENCY (DRE) FOR RK-10
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF 99.99% VALUE			% CHANGE FROM 99.99% VALUE		
	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	7.02E+00	1.66E+01	1.12E+02	1.0	2.4	16.0	0.0	136.0	1495.9
ETHYLENE DICHLORIDE	1.00E+01	3.97E+01	3.36E+02	1.0	3.9	33.4	0.0	294.9	3243.8
HEXACHLOROBUTADIENE	1.63E+00	1.59E+01	1.59E+02	1.0	9.8	97.6	0.0	878.0	9657.8
1,1,2,2-TETRACHLOROETHANE	4.94E-01	4.23E+00	4.16E+01	1.0	8.6	84.1	0.0	755.7	8312.8
PHENOL	6.61E-04	6.48E-03	6.47E-02	1.0	9.8	97.9	0.0	880.8	9688.4
TOLUENE	6.24E+00	3.94E+01	3.71E+02	1.0	6.3	59.4	0.0	530.9	5840.3
PYRIDINE	3.90E-01	2.66E+00	2.53E+01	1.0	6.8	65.0	0.0	581.9	6401.0
PHTHALIC ANHYDRIDE	1.95E-04	1.93E-03	1.93E-02	1.0	9.9	98.9	0.0	890.2	9791.9
METHYL STYRENE	3.90E+00	3.54E+01	3.50E+02	1.0	9.1	89.9	0.0	808.6	8894.7
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	2.59E+00	1.21E+01	1.08E+02	1.0	4.7	41.6	0.0	368.7	4056.1
ETHYLENE DICHLORIDE	5.02E+00	3.46E+01	3.31E+02	1.0	6.9	65.9	0.0	590.4	6493.9
HEXACHLOROBUTADIENE	1.60E+00	1.59E+01	1.59E+02	1.0	9.9	99.4	0.0	894.3	9836.9
1,1,2,2-TETRACHLOROETHANE	4.35E-01	4.17E+00	4.15E+01	1.0	9.6	95.4	0.0	858.1	9439.5
PHENOL	6.51E-04	6.47E-03	6.47E-02	1.0	10.0	99.5	0.0	895.1	9845.9
TOLUENE	4.36E+00	3.75E+01	3.69E+02	1.0	8.6	84.6	0.0	759.9	8359.4
PYRIDINE	2.88E-01	2.56E+00	2.52E+01	1.0	8.9	87.5	0.0	786.3	8649.3
PHTHALIC ANHYDRIDE	1.94E-04	1.93E-03	1.93E-02	1.0	10.0	99.7	0.0	897.4	9871.2
METHYL STYRENE	3.60E+00	3.51E+01	3.50E+02	1.0	9.7	97.1	0.0	873.8	9612.0
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.40E+01	2.36E+01	1.19E+02	1.0	1.7	8.5	0.0	67.9	747.4
ETHYLENE DICHLORIDE	1.80E+01	4.76E+01	3.44E+02	1.0	2.6	19.1	0.0	164.3	1807.5
HEXACHLOROBUTADIENE	1.68E+00	1.60E+01	1.59E+02	1.0	9.5	94.9	0.0	853.3	9386.5
1,1,2,2-TETRACHLOROETHANE	5.88E-01	4.32E+00	4.17E+01	1.0	7.4	70.9	0.0	635.2	6987.2
PHENOL	6.78E-04	6.50E-03	6.47E-02	1.0	9.6	95.5	0.0	859.0	9448.6
TOLUENE	9.16E+00	4.23E+01	3.73E+02	1.0	4.6	40.8	0.0	361.5	3976.9
PYRIDINE	5.47E-01	2.82E+00	2.55E+01	1.0	5.1	46.6	0.0	414.3	4557.5
PHTHALIC ANHYDRIDE	1.98E-04	1.93E-03	1.93E-02	1.0	9.8	97.7	0.0	879.2	9671.2
METHYL STYRENE	4.35E+00	3.58E+01	3.51E+02	1.0	8.2	80.7	0.0	724.2	7965.9

EFFECT OF DESTRUCTION REMOVAL EFFICIENCY (DRE) FOR RK-150
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF 99.99% VALUE			% CHANGE FROM 99.99% VALUE		
	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	1.92E+01	1.22E+02	1.15E+03	1.0	6.3	59.7	0.0	533.5	5869.0
ETHYLENE DICHLORIDE	4.43E+01	3.63E+02	3.55E+03	1.0	8.2	80.1	0.0	719.0	7909.3
HEXACHLOROBUTADIENE	1.73E+01	1.72E+02	1.72E+03	1.0	10.0	99.7	0.0	897.3	9869.9
1,1,2,2-TETRACHLOROETHANE	4.58E+00	4.49E+01	4.48E+02	1.0	9.8	97.7	0.0	879.4	9673.9
PHENOL	6.97E-03	6.95E-02	6.95E-01	1.0	10.0	99.8	0.0	897.9	9877.1
TOLUENE	4.44E+01	4.02E+02	3.97E+03	1.0	9.0	89.5	0.0	805.0	8854.6
PYRIDINE	2.96E+00	2.74E+01	2.71E+02	1.0	9.2	91.6	0.0	823.5	9058.0
PHTHALIC ANHYDRIDE	2.09E-03	2.09E-02	2.09E-01	1.0	10.0	99.8	0.0	898.3	9881.7
METHYL STYRENE	3.82E+01	3.76E+02	3.75E+03	1.0	9.8	98.1	0.0	883.0	9712.5
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.36E+01	1.16E+02	1.14E+03	1.0	8.6	84.3	0.0	757.1	8328.5
ETHYLENE DICHLORIDE	3.79E+01	3.56E+02	3.54E+03	1.0	9.4	93.6	0.0	841.7	9258.4
HEXACHLOROBUTADIENE	1.72E+01	1.72E+02	1.72E+03	1.0	10.0	99.9	0.0	899.2	9891.7
1,1,2,2-TETRACHLOROETHANE	4.51E+00	4.48E+01	4.48E+02	1.0	9.9	99.4	0.0	894.3	9836.8
PHENOL	6.95E-03	6.95E-02	6.95E-01	1.0	10.0	99.9	0.0	899.5	9894.2
TOLUENE	4.09E+01	3.98E+02	3.97E+03	1.0	9.7	97.1	0.0	873.5	9608.6
PYRIDINE	2.77E+00	2.72E+01	2.71E+02	1.0	9.8	97.7	0.0	879.0	9668.8
PHTHALIC ANHYDRIDE	2.09E-03	2.09E-02	2.09E-01	1.0	10.0	100.0	0.0	899.6	9895.3
METHYL STYRENE	3.77E+01	3.75E+02	3.75E+03	1.0	10.0	99.5	0.0	895.5	9850.9
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	2.83E+01	1.31E+02	1.16E+03	1.0	4.6	40.8	0.0	362.0	3982.4
ETHYLENE DICHLORIDE	5.47E+01	3.73E+02	3.56E+03	1.0	6.8	65.1	0.0	583.0	6412.8
HEXACHLOROBUTADIENE	1.73E+01	1.72E+02	1.72E+03	1.0	9.9	99.4	0.0	894.1	9835.2
1,1,2,2-TETRACHLOROETHANE	4.71E+00	4.50E+01	4.48E+02	1.0	9.6	95.2	0.0	856.8	9424.4
PHENOL	6.99E-03	6.95E-02	6.95E-01	1.0	10.0	99.5	0.0	895.2	9847.6
TOLUENE	4.98E+01	4.07E+02	3.98E+03	1.0	8.2	79.8	0.0	716.8	7884.3
PYRIDINE	3.26E+00	2.76E+01	2.72E+02	1.0	8.5	83.4	0.0	749.2	8241.6
PHTHALIC ANHYDRIDE	2.10E-03	2.09E-02	2.09E-01	1.0	10.0	99.6	0.0	896.4	9860.6
METHYL STYRENE	3.91E+01	3.77E+02	3.75E+03	1.0	9.6	96.0	0.0	863.9	9502.9

EFFECT OF DESTRUCTION REMOVAL EFFICIENCY (DRE) FOR LI-1
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF 99.99% VALUE			% CHANGE FROM 99.99% VALUE		
	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	2.46E+00	3.74E+00	1.65E+01	1.0	1.5	6.7	0.0	51.9	570.6
ETHYLENE DICHLORIDE	3.07E+00	7.05E+00	4.68E+01	1.0	2.3	15.2	0.0	129.5	1424.1
HEXACHLOROBUTADIENE	2.30E-01	2.16E+00	2.14E+01	1.0	9.4	93.3	0.0	838.9	9228.0
1,1,2,2-TETRACHLOROETHANE	8.67E-02	5.89E-01	5.61E+00	1.0	6.8	64.7	0.0	579.1	6369.6
PHENOL	9.23E-05	8.74E-04	8.69E-03	1.0	9.5	94.1	0.0	846.2	9308.0
TOLUENE	1.48E+00	5.92E+00	5.04E+01	1.0	4.0	34.1	0.0	301.3	3314.7
PYRIDINE	8.65E-02	3.91E-01	3.43E+00	1.0	4.5	39.7	0.0	351.6	3867.4
PHTHALIC ANHYDRIDE	2.67E-05	2.60E-04	2.59E-03	1.0	9.7	97.0	0.0	872.6	9598.6
METHYL STYRENE	6.22E-01	4.85E+00	4.72E+01	1.0	7.8	75.8	0.0	680.3	7483.5
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	7.09E-01	1.99E+00	1.48E+01	1.0	2.8	20.8	0.0	180.2	1982.0
ETHYLENE DICHLORIDE	1.08E+00	5.06E+00	4.48E+01	1.0	4.7	41.3	0.0	366.7	4033.4
HEXACHLOROBUTADIENE	2.18E-01	2.14E+00	2.14E+01	1.0	9.8	98.3	0.0	884.3	9727.5
1,1,2,2-TETRACHLOROETHANE	6.34E-02	5.66E-01	5.59E+00	1.0	8.9	88.2	0.0	792.7	8719.3
PHENOL	8.81E-05	8.69E-04	8.68E-03	1.0	9.9	98.5	0.0	886.7	9753.2
TOLUENE	7.43E-01	5.19E+00	4.96E+01	1.0	7.0	66.9	0.0	598.8	6586.3
PYRIDINE	4.72E-02	3.51E-01	3.39E+00	1.0	7.4	71.9	0.0	644.3	7086.8
PHTHALIC ANHYDRIDE	2.61E-05	2.59E-04	2.59E-03	1.0	9.9	99.2	0.0	892.9	9822.1
METHYL STYRENE	5.08E-01	4.74E+00	4.70E+01	1.0	9.3	92.5	0.0	832.0	9152.2
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	5.57E+00	6.85E+00	1.96E+01	1.0	1.2	3.5	0.0	22.9	252.2
ETHYLENE DICHLORIDE	6.59E+00	1.06E+01	5.04E+01	1.0	1.6	7.6	0.0	60.3	663.7
HEXACHLOROBUTADIENE	2.50E-01	2.18E+00	2.14E+01	1.0	8.7	85.6	0.0	769.1	8460.6
1,1,2,2-TETRACHLOROETHANE	1.28E-01	6.30E-01	5.65E+00	1.0	4.9	44.2	0.0	392.3	4315.3
PHENOL	9.98E-05	8.81E-04	8.69E-03	1.0	8.8	87.1	0.0	782.5	8607.7
TOLUENE	2.75E+00	7.20E+00	5.17E+01	1.0	2.6	18.8	0.0	161.6	1777.1
PYRIDINE	1.55E-01	4.59E-01	3.50E+00	1.0	3.0	22.6	0.0	195.9	2155.4
PHTHALIC ANHYDRIDE	2.78E-05	2.61E-04	2.59E-03	1.0	9.4	93.4	0.0	839.6	9235.1
METHYL STYRENE	8.19E-01	5.05E+00	4.73E+01	1.0	6.2	57.8	0.0	516.4	5680.3

EFFECT OF DESTRUCTION REMOVAL EFFICIENCY (DRE) FOR LI-10
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF 99.99% VALUE			% CHANGE FROM 99.99% VALUE		
	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	7.13E+00	1.67E+01	1.12E+02	1.0	2.3	15.7	0.0	133.7	1470.8
ETHYLENE DICHLORIDE	1.02E+01	3.98E+01	3.36E+02	1.0	3.9	33.0	0.0	290.8	3199.2
HEXACHLOROBUTADIENE	1.61E+00	1.59E+01	1.59E+02	1.0	9.9	98.5	0.0	886.3	9749.3
1,1,2,2-TETRACHLOROETHANE	4.96E-01	4.23E+00	4.16E+01	1.0	8.5	83.8	0.0	752.7	8279.3
PHENOL	6.61E-04	6.48E-03	6.47E-02	1.0	9.8	97.8	0.0	880.4	9684.6
TOLUENE	6.30E+00	3.94E+01	3.71E+02	1.0	6.3	58.8	0.0	525.5	5780.1
PYRIDINE	3.93E-01	2.66E+00	2.53E+01	1.0	6.8	64.5	0.0	576.9	6345.7
PHTHALIC ANHYDRIDE	1.95E-04	1.93E-03	1.93E-02	1.0	9.9	98.9	0.0	890.0	9789.7
METHYL STYRENE	3.90E+00	3.54E+01	3.50E+02	1.0	9.1	89.7	0.0	806.7	8874.1
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	2.66E+00	1.22E+01	1.08E+02	1.0	4.6	40.4	0.0	358.6	3944.8
ETHYLENE DICHLORIDE	5.11E+00	3.47E+01	3.31E+02	1.0	6.8	64.7	0.0	579.5	6374.5
HEXACHLOROBUTADIENE	1.60E+00	1.59E+01	1.59E+02	1.0	10.0	99.6	0.0	896.3	9859.7
1,1,2,2-TETRACHLOROETHANE	4.36E-01	4.17E+00	4.15E+01	1.0	9.6	95.1	0.0	855.8	9414.2
PHENOL	6.51E-04	6.47E-03	6.47E-02	1.0	9.9	99.4	0.0	894.8	9843.2
TOLUENE	4.40E+00	3.75E+01	3.69E+02	1.0	8.5	83.7	0.0	752.2	8274.0
PYRIDINE	2.91E-01	2.56E+00	2.52E+01	1.0	8.8	86.8	0.0	779.8	8577.9
PHTHALIC ANHYDRIDE	1.94E-04	1.93E-03	1.93E-02	1.0	10.0	99.7	0.0	897.2	9869.4
METHYL STYRENE	3.61E+00	3.51E+01	3.50E+02	1.0	9.7	96.9	0.0	872.1	9593.6
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.41E+01	2.36E+01	1.19E+02	1.0	1.7	8.4	0.0	67.7	744.8
ETHYLENE DICHLORIDE	1.81E+01	4.77E+01	3.44E+02	1.0	2.6	19.0	0.0	163.8	1801.5
HEXACHLOROBUTADIENE	1.64E+00	1.60E+01	1.59E+02	1.0	9.7	96.8	0.0	870.7	9577.3
1,1,2,2-TETRACHLOROETHANE	5.90E-01	4.32E+00	4.17E+01	1.0	7.3	70.7	0.0	633.6	6969.5
PHENOL	6.78E-04	6.50E-03	6.47E-02	1.0	9.6	95.5	0.0	858.7	9446.2
TOLUENE	9.22E+00	4.23E+01	3.74E+02	1.0	4.6	40.5	0.0	359.2	3951.0
PYRIDINE	5.50E-01	2.82E+00	2.55E+01	1.0	5.1	46.4	0.0	412.4	4536.8
PHTHALIC ANHYDRIDE	1.98E-04	1.93E-03	1.93E-02	1.0	9.8	97.7	0.0	879.1	9670.3
METHYL STYRENE	4.35E+00	3.59E+01	3.51E+02	1.0	8.2	80.6	0.0	723.8	7962.2

EFFECT OF DESTRUCTION REMOVAL EFFICIENCY (DRE) FOR LI-150
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF 99.99% VALUE			% CHANGE FROM 99.99% VALUE		
	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%	99.99%	99.90%	99.00%
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	1.95E+01	1.22E+02	1.15E+03	1.0	6.3	58.8	0.0	525.6	5781.8
ETHYLENE DICHLORIDE	4.46E+01	3.63E+02	3.55E+03	1.0	8.1	79.6	0.0	714.2	7856.1
HEXACHLOROBUTADIENE	1.73E+01	1.72E+02	1.72E+03	1.0	10.0	99.7	0.0	897.2	9868.7
1,1,2,2-TETRACHLOROETHANE	4.59E+00	4.49E+01	4.48E+02	1.0	9.8	97.7	0.0	878.7	9665.9
PHENOL	6.97E-03	6.95E-02	6.95E-01	1.0	10.0	99.8	0.0	897.9	9876.6
TOLUENE	4.47E+01	4.02E+02	3.97E+03	1.0	9.0	89.0	0.0	799.9	8798.5
PYRIDINE	2.98E+00	2.74E+01	2.71E+02	1.0	9.2	91.1	0.0	819.3	9011.8
PHTHALIC ANHYDRIDE	2.09E-03	2.09E-02	2.09E-01	1.0	10.0	99.8	0.0	898.2	9880.7
METHYL STYRENE	3.83E+01	3.76E+02	3.75E+03	1.0	9.8	98.0	0.0	882.0	9702.1
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.37E+01	1.16E+02	1.14E+03	1.0	8.5	83.5	0.0	749.7	8247.0
ETHYLENE DICHLORIDE	3.80E+01	3.57E+02	3.54E+03	1.0	9.4	93.2	0.0	838.6	9224.6
HEXACHLOROBUTADIENE	1.72E+01	1.72E+02	1.72E+03	1.0	10.0	99.9	0.0	899.2	9891.2
1,1,2,2-TETRACHLOROETHANE	4.51E+00	4.48E+01	4.48E+02	1.0	9.9	99.3	0.0	893.9	9833.1
PHENOL	6.95E-03	6.95E-02	6.95E-01	1.0	10.0	99.9	0.0	899.4	9893.9
TOLUENE	4.10E+01	3.98E+02	3.97E+03	1.0	9.7	96.9	0.0	872.0	9591.7
PYRIDINE	2.78E+00	2.72E+01	2.71E+02	1.0	9.8	97.6	0.0	877.8	9655.6
PHTHALIC ANHYDRIDE	2.09E-03	2.09E-02	2.09E-01	1.0	10.0	100.0	0.0	899.5	9895.0
METHYL STYRENE	3.77E+01	3.75E+02	3.75E+03	1.0	10.0	99.5	0.0	895.3	9848.2
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	2.86E+01	1.31E+02	1.16E+03	1.0	4.6	40.4	0.0	358.4	3942.0
ETHYLENE DICHLORIDE	5.49E+01	3.74E+02	3.56E+03	1.0	6.8	64.8	0.0	580.3	6383.6
HEXACHLOROBUTADIENE	1.73E+01	1.72E+02	1.72E+03	1.0	9.9	99.3	0.0	894.0	9833.9
1,1,2,2-TETRACHLOROETHANE	4.71E+00	4.50E+01	4.48E+02	1.0	9.6	95.2	0.0	856.1	9416.8
PHENOL	6.99E-03	6.95E-02	6.95E-01	1.0	10.0	99.5	0.0	895.2	9847.3
TOLUENE	5.05E+01	4.08E+02	3.98E+03	1.0	8.1	78.8	0.0	707.0	7776.6
PYRIDINE	3.29E+00	2.77E+01	2.72E+02	1.0	8.4	82.5	0.0	740.9	8149.8
PHTHALIC ANHYDRIDE	2.10E-03	2.09E-02	2.09E-01	1.0	10.0	99.6	0.0	896.2	9858.0
METHYL STYRENE	3.92E+01	3.77E+02	3.75E+03	1.0	9.6	95.8	0.0	861.6	9477.7

APPENDIX E

EFFECT OF INCINERATOR SIZE ON TOTAL COLLECTIVE EXPOSURE

EFFECT OF INCINERATOR SIZE WITH DRE = 99.90%
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF LI-1 VALUE			% CHANGE FROM LI-1 VALUE		
	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	3.74E+00	1.67E+01	1.22E+02	1.0	4.5	32.6	0.0	345.7	3163.9
ETHYLENE DICHLORIDE	7.05E+00	3.98E+01	3.63E+02	1.0	5.6	51.5	0.0	464.4	5051.5
HEXACHLOROBUTADIENE	2.16E+00	1.59E+01	1.72E+02	1.0	7.4	79.8	0.0	638.8	7881.8
1,1,2,2-TETRACHLOROETHANE	5.89E-01	4.23E+00	4.49E+01	1.0	7.2	76.3	0.0	618.5	7525.5
PHENOL	8.74E-04	6.48E-03	6.95E-02	1.0	7.4	79.6	0.0	642.3	7858.2
TOLUENE	5.92E+00	3.94E+01	4.02E+02	1.0	6.7	67.9	0.0	565.8	6688.4
PYRIDINE	3.91E-01	2.66E+00	2.74E+01	1.0	6.8	70.0	0.0	581.1	6904.2
PHTHALIC ANHYDRIDE	2.60E-04	1.93E-03	2.09E-02	1.0	7.4	80.5	0.0	643.7	7945.8
METHYL STYRENE	4.85E+00	3.54E+01	3.76E+02	1.0	7.3	77.4	0.0	629.7	7644.9
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.99E+00	1.22E+01	1.16E+02	1.0	6.1	58.5	0.0	513.9	5751.5
ETHYLENE DICHLORIDE	5.06E+00	3.47E+01	3.57E+02	1.0	6.9	70.4	0.0	585.8	6943.2
HEXACHLOROBUTADIENE	2.14E+00	1.59E+01	1.72E+02	1.0	7.4	80.2	0.0	642.0	7923.9
1,1,2,2-TETRACHLOROETHANE	5.66E-01	4.17E+00	4.48E+01	1.0	7.4	79.3	0.0	637.6	7826.8
PHENOL	8.69E-04	6.47E-03	6.95E-02	1.0	7.4	80.0	0.0	644.7	7895.4
TOLUENE	5.19E+00	3.75E+01	3.98E+02	1.0	7.2	76.8	0.0	623.2	7576.1
PYRIDINE	3.51E-01	2.56E+00	2.72E+01	1.0	7.3	77.3	0.0	628.1	7631.1
PHTHALIC ANHYDRIDE	2.59E-04	1.93E-03	2.09E-02	1.0	7.4	80.6	0.0	644.8	7963.5
METHYL STYRENE	4.74E+00	3.51E+01	3.75E+02	1.0	7.4	79.2	0.0	641.0	7818.2
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	6.85E+00	2.36E+01	1.31E+02	1.0	3.4	19.2	0.0	244.9	1815.4
ETHYLENE DICHLORIDE	1.06E+01	4.77E+01	3.74E+02	1.0	4.5	35.3	0.0	351.1	3433.1
HEXACHLOROBUTADIENE	2.18E+00	1.60E+01	1.72E+02	1.0	7.3	79.1	0.0	633.0	7808.2
1,1,2,2-TETRACHLOROETHANE	6.30E-01	4.32E+00	4.50E+01	1.0	6.9	71.5	0.0	586.2	7045.2
PHENOL	8.81E-04	6.50E-03	6.95E-02	1.0	7.4	78.9	0.0	637.9	7792.7
TOLUENE	7.20E+00	4.23E+01	4.08E+02	1.0	5.9	56.7	0.0	488.2	5566.1
PYRIDINE	4.59E-01	2.82E+00	2.77E+01	1.0	6.1	60.3	0.0	513.3	5925.0
PHTHALIC ANHYDRIDE	2.61E-04	1.93E-03	2.09E-02	1.0	7.4	80.2	0.0	641.6	7915.2
METHYL STYRENE	5.05E+00	3.59E+01	3.77E+02	1.0	7.1	74.6	0.0	610.1	7360.1

EFFECT OF INCINERATOR SIZE WITH DRE = 99.00%
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF LI-1 VALUE			% CHANGE FROM LI-1 VALUE		
	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	1.65E+01	1.12E+02	1.15E+03	1.0	6.8	69.5	0.0	578.4	6849.2
ETHYLENE DICHLORIDE	4.68E+01	3.36E+02	3.55E+03	1.0	7.2	75.8	0.0	617.2	7478.8
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	1.0	7.4	80.3	0.0	642.6	7931.8
1,1,2,2-TETRACHLOROETHANE	5.61E+00	4.16E+01	4.48E+02	1.0	7.4	79.9	0.0	641.1	7886.4
PHENOL	8.69E-03	6.47E-02	6.95E-01	1.0	7.5	80.0	0.0	645.1	7902.0
TOLUENE	5.04E+01	3.71E+02	3.97E+03	1.0	7.4	78.9	0.0	635.6	7789.8
PYRIDINE	3.43E+00	2.53E+01	2.71E+02	1.0	7.4	79.0	0.0	638.2	7802.4
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	1.0	7.5	80.7	0.0	645.0	7967.1
METHYL STYRENE	4.72E+01	3.50E+02	3.75E+03	1.0	7.4	79.5	0.0	643.1	7854.7
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.48E+01	1.08E+02	1.14E+03	1.0	7.3	77.4	0.0	628.6	7635.2
ETHYLENE DICHLORIDE	4.48E+01	3.31E+02	3.54E+03	1.0	7.4	79.0	0.0	637.7	7800.0
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	1.0	7.4	80.4	0.0	642.9	7936.0
1,1,2,2-TETRACHLOROETHANE	5.59E+00	4.15E+01	4.48E+02	1.0	7.4	80.2	0.0	643.1	7918.4
PHENOL	8.68E-03	6.47E-02	6.95E-01	1.0	7.5	80.1	0.0	645.3	7905.8
TOLUENE	4.96E+01	3.69E+02	3.97E+03	1.0	7.4	80.0	0.0	642.7	7898.8
PYRIDINE	3.39E+00	2.52E+01	2.71E+02	1.0	7.4	79.9	0.0	643.8	7888.1
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	1.0	7.5	80.7	0.0	645.1	7968.9
METHYL STYRENE	4.70E+01	3.50E+02	3.75E+03	1.0	7.4	79.7	0.0	644.3	7872.6
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.96E+01	1.19E+02	1.16E+03	1.0	6.1	58.9	0.0	506.3	5794.9
ETHYLENE DICHLORIDE	5.04E+01	3.44E+02	3.56E+03	1.0	6.8	70.7	0.0	582.8	6969.3
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	1.0	7.4	80.2	0.0	642.0	7924.3
1,1,2,2-TETRACHLOROETHANE	5.65E+00	4.17E+01	4.48E+02	1.0	7.4	79.3	0.0	637.3	7830.2
PHENOL	8.69E-03	6.47E-02	6.95E-01	1.0	7.4	80.0	0.0	644.6	7895.3
TOLUENE	5.17E+01	3.74E+02	3.98E+03	1.0	7.2	77.1	0.0	623.1	7606.2
PYRIDINE	3.50E+00	2.55E+01	2.72E+02	1.0	7.3	77.6	0.0	628.2	7656.3
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	1.0	7.4	80.6	0.0	644.8	7964.0
METHYL STYRENE	4.73E+01	3.51E+02	3.75E+03	1.0	7.4	79.2	0.0	641.0	7823.4

EFFECT OF INCINERATOR SIZE WITH DRE = 99.99%
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF RK-1 VALUE			% CHANGE FROM RK-1 VALUE		
	RK-1	RK-10	RK-150	RK-1	RK-10	RK-150	RK-1	RK-10	RK-150
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	2.36E+00	7.02E+00	1.92E+01	1.0	3.0	8.1	0.0	197.2	714.6
ETHYLENE DICHLORIDE	2.94E+00	1.00E+01	4.43E+01	1.0	3.4	15.1	0.0	241.2	1405.8
HEXACHLOROBUTADIENE	2.29E-01	1.63E+00	1.73E+01	1.0	7.1	75.4	0.0	612.4	7441.3
1,1,2,2-TETRACHLOROETHANE	8.53E-02	4.94E-01	4.58E+00	1.0	5.8	53.7	0.0	479.2	5273.1
PHENOL	9.21E-05	6.61E-04	6.97E-03	1.0	7.2	75.7	0.0	618.1	7466.8
TOLUENE	1.43E+00	6.24E+00	4.44E+01	1.0	4.4	31.1	0.0	337.6	3013.9
PYRIDINE	8.38E-02	3.90E-01	2.96E+00	1.0	4.6	35.3	0.0	365.0	3433.5
PHTHALIC ANHYDRIDE	2.67E-05	1.95E-04	2.09E-03	1.0	7.3	78.5	0.0	631.5	7749.7
METHYL STYRENE	6.13E-01	3.90E+00	3.82E+01	1.0	6.4	62.3	0.0	535.0	6130.8
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	6.92E-01	2.59E+00	1.36E+01	1.0	3.7	19.6	0.0	273.6	1856.9
ETHYLENE DICHLORIDE	1.06E+00	5.02E+00	3.79E+01	1.0	4.7	35.6	0.0	372.1	3463.0
HEXACHLOROBUTADIENE	2.18E-01	1.60E+00	1.72E+01	1.0	7.4	79.1	0.0	635.1	7808.3
1,1,2,2-TETRACHLOROETHANE	6.31E-02	4.35E-01	4.51E+00	1.0	6.9	71.4	0.0	589.7	7044.5
PHENOL	8.81E-05	6.51E-04	6.95E-03	1.0	7.4	79.0	0.0	638.7	7796.5
TOLUENE	7.33E-01	4.36E+00	4.09E+01	1.0	5.9	55.8	0.0	494.3	5477.8
PYRIDINE	4.66E-02	2.88E-01	2.77E+00	1.0	6.2	59.5	0.0	518.9	5853.6
PHTHALIC ANHYDRIDE	2.61E-05	1.94E-04	2.09E-03	1.0	7.4	80.1	0.0	641.7	7912.1
METHYL STYRENE	5.07E-01	3.60E+00	3.77E+01	1.0	7.1	74.4	0.0	611.2	7335.6
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	5.49E+00	1.40E+01	2.83E+01	1.0	2.6	5.2	0.0	155.6	415.9
ETHYLENE DICHLORIDE	6.48E+00	1.80E+01	5.47E+01	1.0	2.8	8.4	0.0	177.9	742.9
HEXACHLOROBUTADIENE	2.50E-01	1.68E+00	1.73E+01	1.0	6.7	69.4	0.0	571.8	6836.2
1,1,2,2-TETRACHLOROETHANE	1.27E-01	5.88E-01	4.71E+00	1.0	4.6	37.1	0.0	363.3	3608.1
PHENOL	9.96E-05	6.78E-04	6.99E-03	1.0	6.8	70.2	0.0	580.7	6915.6
TOLUENE	2.71E+00	9.16E+00	4.98E+01	1.0	3.4	18.4	0.0	238.3	1740.9
PYRIDINE	1.53E-01	5.47E-01	3.26E+00	1.0	3.6	21.3	0.0	257.9	2028.3
PHTHALIC ANHYDRIDE	2.77E-05	1.98E-04	2.10E-03	1.0	7.1	75.6	0.0	612.1	7463.0
METHYL STYRENE	8.13E-01	4.35E+00	3.91E+01	1.0	5.3	48.0	0.0	434.9	4704.4

EFFECT OF INCINERATOR SIZE WITH DRE = 99.99%
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF LI-1 VALUE			% CHANGE FROM LI-1 VALUE		
	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150	LI-1	LI-10	LI-150
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	2.46E+00	7.13E+00	1.95E+01	1.0	2.9	7.9	0.0	189.6	692.4
ETHYLENE DICHLORIDE	3.07E+00	1.02E+01	4.46E+01	1.0	3.3	14.5	0.0	231.3	1351.9
HEXACHLOROBUTADIENE	2.30E-01	1.61E+00	1.73E+01	1.0	7.0	75.2	0.0	603.3	7415.6
1,1,2,2-TETRACHLOROETHANE	8.67E-02	4.96E-01	4.59E+00	1.0	5.7	52.9	0.0	472.2	5190.7
PHENOL	9.23E-05	6.61E-04	6.97E-03	1.0	7.2	75.5	0.0	616.4	7445.9
TOLUENE	1.48E+00	6.30E+00	4.47E+01	1.0	4.3	30.3	0.0	327.2	2927.6
PYRIDINE	8.65E-02	3.93E-01	2.98E+00	1.0	4.5	34.4	0.0	354.4	3340.8
PHTHALIC ANHYDRIDE	2.67E-05	1.95E-04	2.09E-03	1.0	7.3	78.4	0.0	630.6	7739.1
METHYL STYRENE	6.22E-01	3.90E+00	3.83E+01	1.0	6.3	61.5	0.0	528.0	6054.2
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	7.09E-01	2.66E+00	1.37E+01	1.0	3.8	19.3	0.0	275.1	1829.4
ETHYLENE DICHLORIDE	1.08E+00	5.11E+00	3.80E+01	1.0	4.7	35.0	0.0	371.0	3401.9
HEXACHLOROBUTADIENE	2.18E-01	1.60E+00	1.72E+01	1.0	7.3	79.0	0.0	633.0	7804.4
1,1,2,2-TETRACHLOROETHANE	6.34E-02	4.36E-01	4.51E+00	1.0	6.9	71.2	0.0	588.8	7019.3
PHENOL	8.81E-05	6.51E-04	6.95E-03	1.0	7.4	78.9	0.0	638.6	7793.1
TOLUENE	7.43E-01	4.40E+00	4.10E+01	1.0	5.9	55.2	0.0	493.0	5418.4
PYRIDINE	4.72E-02	2.91E-01	2.78E+00	1.0	6.2	58.8	0.0	516.0	5784.7
PHTHALIC ANHYDRIDE	2.61E-05	1.94E-04	2.09E-03	1.0	7.4	80.1	0.0	641.6	7910.1
METHYL STYRENE	5.08E-01	3.61E+00	3.77E+01	1.0	7.1	74.1	0.0	610.4	7314.8
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	5.57E+00	1.41E+01	2.86E+01	1.0	2.5	5.1	0.0	152.8	413.7
ETHYLENE DICHLORIDE	6.59E+00	1.81E+01	5.49E+01	1.0	2.7	8.3	0.0	174.2	732.7
HEXACHLOROBUTADIENE	2.50E-01	1.64E+00	1.73E+01	1.0	6.6	69.1	0.0	556.4	6815.0
1,1,2,2-TETRACHLOROETHANE	1.28E-01	5.90E-01	4.71E+00	1.0	4.6	36.8	0.0	360.5	3579.2
PHENOL	9.98E-05	6.78E-04	6.99E-03	1.0	6.8	70.0	0.0	579.2	6898.9
TOLUENE	2.75E+00	9.22E+00	5.05E+01	1.0	3.4	18.4	0.0	235.1	1736.5
PYRIDINE	1.55E-01	5.50E-01	3.29E+00	1.0	3.5	21.2	0.0	254.2	2020.4
PHTHALIC ANHYDRIDE	2.78E-05	1.98E-04	2.10E-03	1.0	7.1	75.6	0.0	611.6	7459.6
METHYL STYRENE	8.19E-01	4.35E+00	3.92E+01	1.0	5.3	47.8	0.0	431.3	4681.9

EFFECT OF INCINERATOR SIZE WITH DRE = 99.90%
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF RK-1 VALUE			% CHANGE FROM RK-1 VALUE		
	RK-1	RK-10	RK-150	RK-1	RK-10	RK-150	RK-1	RK-10	RK-150
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	3.64E+00	1.66E+01	1.22E+02	1.0	4.5	33.5	0.0	355.0	3248.3
ETHYLENE DICHLORIDE	6.92E+00	3.97E+01	3.63E+02	1.0	5.7	52.4	0.0	472.9	5143.9
HEXACHLOROBUTADIENE	2.15E+00	1.59E+01	1.72E+02	1.0	7.4	79.8	0.0	639.7	7884.7
1,1,2,2-TETRACHLOROETHANE	5.88E-01	4.23E+00	4.49E+01	1.0	7.2	76.4	0.0	619.8	7543.0
PHENOL	8.73E-04	6.48E-03	6.95E-02	1.0	7.4	79.6	0.0	642.5	7860.5
TOLUENE	5.87E+00	3.94E+01	4.02E+02	1.0	6.7	68.4	0.0	570.3	6741.4
PYRIDINE	3.88E-01	2.66E+00	2.74E+01	1.0	6.8	70.5	0.0	584.9	6949.0
PHTHALIC ANHYDRIDE	2.60E-04	1.93E-03	2.09E-02	1.0	7.4	80.5	0.0	643.8	7946.9
METHYL STYRENE	4.84E+00	3.54E+01	3.76E+02	1.0	7.3	77.6	0.0	630.8	7657.3
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.97E+00	1.21E+01	1.16E+02	1.0	6.2	58.9	0.0	515.4	5794.6
ETHYLENE DICHLORIDE	5.04E+00	3.46E+01	3.56E+02	1.0	6.9	70.7	0.0	587.0	6971.9
HEXACHLOROBUTADIENE	2.14E+00	1.59E+01	1.72E+02	1.0	7.4	80.2	0.0	642.2	7924.3
1,1,2,2-TETRACHLOROETHANE	5.65E-01	4.17E+00	4.48E+01	1.0	7.4	79.3	0.0	637.7	7830.0
PHENOL	8.69E-04	6.47E-03	6.95E-02	1.0	7.4	80.0	0.0	644.7	7895.7
TOLUENE	5.18E+00	3.75E+01	3.98E+02	1.0	7.2	76.9	0.0	623.6	7588.3
PYRIDINE	3.51E-01	2.56E+00	2.72E+01	1.0	7.3	77.4	0.0	628.7	7643.5
PHTHALIC ANHYDRIDE	2.59E-04	1.93E-03	2.09E-02	1.0	7.4	80.6	0.0	644.8	7963.7
METHYL STYRENE	4.74E+00	3.51E+01	3.75E+02	1.0	7.4	79.2	0.0	641.1	7820.6
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	6.77E+00	2.36E+01	1.31E+02	1.0	3.5	19.3	0.0	248.2	1833.8
ETHYLENE DICHLORIDE	1.05E+01	4.76E+01	3.73E+02	1.0	4.6	35.7	0.0	355.3	3467.9
HEXACHLOROBUTADIENE	2.18E+00	1.60E+01	1.72E+02	1.0	7.3	79.1	0.0	634.8	7811.0
1,1,2,2-TETRACHLOROETHANE	6.29E-01	4.32E+00	4.50E+01	1.0	6.9	71.6	0.0	587.2	7057.0
PHENOL	8.81E-04	6.50E-03	6.95E-02	1.0	7.4	78.9	0.0	638.1	7794.8
TOLUENE	7.15E+00	4.23E+01	4.07E+02	1.0	5.9	56.9	0.0	491.0	5591.3
PYRIDINE	4.57E-01	2.82E+00	2.76E+01	1.0	6.2	60.5	0.0	515.9	5947.3
PHTHALIC ANHYDRIDE	2.61E-04	1.93E-03	2.09E-02	1.0	7.4	80.2	0.0	641.7	7915.6
METHYL STYRENE	5.04E+00	3.58E+01	3.77E+02	1.0	7.1	74.7	0.0	610.9	7366.9

EFFECT OF INCINERATOR SIZE WITH DRE = 99.00%
ON TOTAL COLLECTIVE EXPOSURE

POLLUTANT	VALUE			FRACTION OF RK-1 VALUE			% CHANGE FROM RK-1 VALUE		
	RK-1	RK-10	RK-150	RK-1	RK-10	RK-150	RK-1	RK-10	RK-150
EXPECTED FUGITIVE EMISSIONS									
CHLOROFORM	1.64E+01	1.12E+02	1.15E+03	1.0	6.8	69.9	0.0	581.9	6891.1
ETHYLENE DICHLORIDE	4.67E+01	3.36E+02	3.55E+03	1.0	7.2	76.0	0.0	618.9	7499.3
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	1.0	7.4	80.3	0.0	642.7	7932.1
1,1,2,2-TETRACHLOROETHANE	5.61E+00	4.16E+01	4.48E+02	1.0	7.4	79.9	0.0	641.2	7888.3
PHENOL	8.69E-03	6.47E-02	6.95E-01	1.0	7.5	80.0	0.0	645.1	7902.2
TOLUENE	5.03E+01	3.71E+02	3.97E+03	1.0	7.4	79.0	0.0	636.2	7797.0
PYRIDINE	3.43E+00	2.53E+01	2.71E+02	1.0	7.4	79.1	0.0	638.7	7808.2
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	1.0	7.5	80.7	0.0	645.0	7967.2
METHYL STYRENE	4.71E+01	3.50E+02	3.75E+03	1.0	7.4	79.6	0.0	643.3	7856.0
MINIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.48E+01	1.08E+02	1.14E+03	1.0	7.3	77.4	0.0	629.0	7643.1
ETHYLENE DICHLORIDE	4.48E+01	3.31E+02	3.54E+03	1.0	7.4	79.0	0.0	637.9	7803.7
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	1.0	7.4	80.4	0.0	642.9	7936.1
1,1,2,2-TETRACHLOROETHANE	5.59E+00	4.15E+01	4.48E+02	1.0	7.4	80.2	0.0	643.1	7918.7
PHENOL	8.68E-03	6.47E-02	6.95E-01	1.0	7.5	80.1	0.0	645.3	7905.8
TOLUENE	4.96E+01	3.69E+02	3.97E+03	1.0	7.4	80.0	0.0	642.7	7900.1
PYRIDINE	3.39E+00	2.52E+01	2.71E+02	1.0	7.4	79.9	0.0	643.8	7889.4
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	1.0	7.5	80.7	0.0	645.1	7968.9
METHYL STYRENE	4.70E+01	3.50E+02	3.75E+03	1.0	7.4	79.7	0.0	644.3	7872.9
MAXIMUM FUGITIVE EMISSIONS									
CHLOROFORM	1.96E+01	1.19E+02	1.16E+03	1.0	6.1	59.2	0.0	508.6	5817.5
ETHYLENE DICHLORIDE	5.02E+01	3.44E+02	3.56E+03	1.0	6.8	70.8	0.0	584.2	6984.3
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	1.0	7.4	80.2	0.0	642.2	7924.6
1,1,2,2-TETRACHLOROETHANE	5.65E+00	4.17E+01	4.48E+02	1.0	7.4	79.3	0.0	637.4	7831.6
PHENOL	8.69E-03	6.47E-02	6.95E-01	1.0	7.4	80.0	0.0	644.7	7895.6
TOLUENE	5.16E+01	3.73E+02	3.98E+03	1.0	7.2	77.1	0.0	623.6	7611.4
PYRIDINE	3.50E+00	2.55E+01	2.72E+02	1.0	7.3	77.6	0.0	628.6	7660.3
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	1.0	7.4	80.6	0.0	644.8	7964.1
METHYL STYRENE	4.73E+01	3.51E+02	3.75E+03	1.0	7.4	79.2	0.0	641.1	7824.2

APPENDIX F

COLLECTIVE EXPOSURE AT SITES S-2 AND S-3

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
CHLOFORM EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN CHICAGO, IL

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	0.0	0.0	0.0	0.0	8.99E 00	7.59E 00	6.09E-01	1.67E-02	8.81E 00	7.29E 00
22.50	0.0	0.0	0.0	0.0	7.52E 00	6.51E 00	8.56E-01	0.0	6.22E 00	3.09E 00
45.00	0.0	0.0	0.0	0.0	2.13E 00	2.92E-01	1.52E 00	2.21E 00	1.28E 00	3.73E 00
67.50	0.0	0.0	0.0	0.0	0.0	6.25E-04	3.05E 00	2.03E 00	5.21E 00	7.76E-01
90.00	0.0	0.0	0.0	0.0	0.0	0.0	1.74E-01	5.74E-02	1.31E 00	9.63E-01
112.50	0.0	0.0	0.0	0.0	2.77E-01	2.98E-01	3.37E 00	1.41E 00	1.58E 00	4.48E-01
135.00	0.0	0.0	0.0	4.86E-01	3.50E 00	1.50E-01	7.23E-01	1.75E-01	8.12E-01	1.12E 00
157.50	0.0	0.0	1.70E-01	8.79E-01	2.53E 00	1.17E 00	0.0	9.92E-02	6.64E-01	4.04E-01
180.00	0.0	0.0	4.88E-01	9.66E-01	2.43E 00	8.52E-01	0.0	4.55E-01	7.84E-01	8.18E-01
202.50	0.0	0.0	0.0	0.0	0.0	3.35E-02	1.34E-04	6.36E-02	6.68E-01	2.24E-01
225.00	0.0	0.0	0.0	0.0	1.04E-01	1.22E 00	5.57E-01	0.0	3.94E-01	2.90E-01
247.50	0.0	0.0	0.0	0.0	4.84E-01	1.42E 00	2.19E-01	2.80E-01	4.89E-01	2.88E-01
270.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.08E-01	2.17E-01	2.63E-01
292.50	0.0	0.0	0.0	0.0	0.0	4.07E-01	1.95E-01	1.78E-01	6.29E-01	3.62E-01
315.00	0.0	0.0	0.0	0.0	3.41E-02	2.34E 00	1.96E 00	7.98E-02	7.25E-01	1.52E 00
337.50	0.0	0.0	0.0	0.0	0.0	8.84E-02	2.94E-01	0.0	2.30E 00	5.84E-01

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	2.02E 01	4.28E 01	1.65E 01	1.09E 01	3.30E 00	2.81E-01	3.52E-01	1.79E 00	6.11E-01
22.50	1.90E 01	1.67E-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.00	6.70E 00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67.50	1.92E 00	0.0	0.0	0.0	0.0	0.0	0.0	1.87E-02	1.75E-02
90.00	2.78E 00	8.26E-01	5.11E-01	1.43E-01	1.73E-01	3.20E-01	3.47E-01	6.86E-02	3.91E-02
112.50	3.64E 00	1.92E 00	1.48E 00	3.07E-01	2.13E-01	5.40E-02	2.36E-02	2.09E-02	3.58E-02
135.00	1.50E 00	6.65E-01	2.32E-01	8.45E-02	2.44E-02	1.67E-02	1.79E-02	9.30E-03	9.71E-03
157.50	8.77E-01	1.92E-01	3.41E-02	3.46E-02	9.91E-03	1.52E-02	4.28E-03	7.66E-03	1.65E-02
180.00	1.21E 00	5.24E-01	3.63E-02	3.03E-02	2.49E-02	2.35E-02	2.87E-02	8.15E-03	4.99E-03
202.50	1.60E-01	3.13E-02	1.25E-02	2.18E-02	4.10E-02	9.08E-02	1.59E-02	4.60E-03	3.59E-03
225.00	2.51E-01	1.12E-01	5.92E-02	1.23E-02	2.84E-02	2.97E-02	8.63E-03	6.65E-03	1.00E-02
247.50	2.21E-01	1.73E-01	1.07E 00	1.29E-01	2.56E-02	1.49E-02	3.70E-02	9.76E-03	1.75E-02
270.00	3.87E-01	2.19E-01	3.90E-01	8.45E-02	3.30E-01	4.71E-02	7.69E-02	3.84E-02	1.37E-02
292.50	4.72E-01	6.00E-01	5.77E-01	2.95E-01	2.36E-01	4.19E-02	7.95E-03	2.39E-02	7.06E-02
315.00	1.85E 00	1.73E 00	1.91E 00	7.82E-01	3.66E-01	3.83E-01	1.72E-01	8.93E-02	5.25E-02
337.50	2.84E 00	3.41E 00	1.84E 00	9.88E-01	6.32E-01	1.42E-01	1.72E-01	1.14E-01	8.67E-02

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
CHLOFORM EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN PHILADELPHIA, PA

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS									
	200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	2.71E-02	3.78E-02	3.02E-02	2.85E-02	6.78E-02	0.0	9.83E-02	3.45E-01	1.66E-01	3.15E 00
22.50	2.30E-02	6.43E-02	4.34E-02	3.29E-02	9.02E-02	3.85E-03	2.05E-02	1.24E-01	6.21E-02	3.06E-01
45.00	4.35E-02	1.40E-01	1.05E-01	8.49E-02	2.36E-01	2.00E-02	0.0	1.56E-02	3.16E-01	2.59E-01
67.50	3.65E-02	1.13E-01	8.08E-02	6.33E-02	9.15E-02	3.15E-03	2.00E-01	8.17E-02	1.12E-01	1.07E-01
90.00	4.37E-02	8.39E-02	6.09E-02	4.81E-02	5.20E-02	2.62E-02	2.05E-01	6.12E-02	2.72E-01	1.89E-01
112.50	0.0	0.0	0.0	0.0	0.0	0.0	2.56E-02	8.40E-02	1.62E-01	4.74E-02
135.00	0.0	0.0	0.0	0.0	0.0	5.10E-03	3.60E-02	1.54E-01	4.71E-02	2.84E-02
157.50	0.0	0.0	0.0	0.0	4.41E-03	1.24E-01	6.44E-02	2.03E-04	1.88E-02	9.12E-03
180.00	0.0	0.0	0.0	0.0	1.80E-02	9.73E-02	6.21E-02	0.0	9.02E-02	2.93E-02
202.50	0.0	0.0	0.0	0.0	0.0	1.13E-03	6.16E-03	1.72E-03	3.70E-03	3.90E-03
225.00	0.0	0.0	0.0	0.0	0.0	6.99E-03	1.43E-02	3.43E-03	9.92E-03	3.32E-02
247.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.53E-03	4.83E-02	1.02E-01
270.00	0.0	0.0	0.0	0.0	5.79E-02	6.00E-02	0.0	9.49E-02	2.47E-01	5.31E-01
292.50	0.0	0.0	0.0	0.0	4.62E-02	6.55E-02	7.60E-03	3.42E-02	5.43E-02	8.46E-02
315.00	0.0	0.0	0.0	0.0	9.83E-03	4.57E-02	2.20E-03	4.99E-02	7.97E-01	1.75E-01
337.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.74E-01	4.98E-01	9.89E-01

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS								
	15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	4.02E 00	2.37E 00	2.32E 00	7.23E-01	5.13E-01	3.71E-01	1.94E-01	4.35E-01	1.52E 00
22.50	4.16E 00	6.22E 00	3.10E 00	9.95E-01	5.18E-01	1.01E-01	6.21E-02	4.88E-02	6.28E-02
45.00	2.45E 00	1.93E 01	1.25E 01	4.70E 00	2.67E 00	1.71E 00	2.35E 00	4.84E-01	3.27E-01
67.50	2.02E 00	4.09E 00	2.62E 00	5.47E-01	4.38E-01	2.72E-01	3.22E-01	7.45E-02	1.85E-01
90.00	2.05E 00	2.72E 00	1.18E 00	2.83E-01	1.27E-01	4.89E-02	5.99E-02	7.52E-02	2.40E-01
112.50	4.48E-01	5.30E-01	2.26E-01	1.37E-01	9.10E-02	5.91E-02	7.81E-02	1.62E-01	2.43E-02
135.00	1.24E-01	1.49E-01	1.96E-01	6.36E-01	1.05E-01	2.70E-02	6.87E-02	1.47E-01	6.24E-03
157.50	1.37E-01	6.16E-02	1.89E-01	1.70E-01	5.36E-02	3.19E-02	7.60E-03	1.11E-02	7.16E-02
180.00	1.51E-01	1.05E-01	6.51E-02	3.81E-02	3.15E-03	4.09E-03	6.46E-02	1.89E-02	5.99E-02
202.50	2.51E-02	4.89E-02	6.27E-03	5.69E-03	1.48E-02	1.26E-02	5.60E-02	1.59E-02	7.65E-03
225.00	1.76E-01	4.05E-02	2.38E-02	2.07E-02	8.99E-03	5.97E-03	3.74E-03	1.49E-02	3.71E-03
247.50	1.24E 00	8.29E-01	3.41E-01	8.16E-02	3.02E-02	7.51E-02	8.50E-02	5.37E-02	9.23E-02
270.00	3.33E 00	7.45E-01	2.13E-01	6.34E-02	9.76E-02	3.33E-02	4.15E-02	6.22E-02	2.27E-02
292.50	6.61E-01	8.84E-02	7.86E-02	1.18E-01	3.67E-02	2.82E-02	8.15E-02	1.52E-01	1.68E-01
315.00	4.44E-01	4.07E-01	3.49E-01	1.38E-01	3.50E-02	4.26E-02	1.28E-01	4.12E-01	5.22E-02
337.50	6.69E-01	2.43E-01	3.48E-01	2.59E-01	2.44E-01	1.45E-01	6.91E-02	6.37E-02	7.22E-02

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
ETHYDICH EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN CHICAGO, IL

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	0.0	0.0	0.0	0.0	1.15E 01	1.00E 01	8.21E-01	2.28E-02	1.22E 01	1.02E 01
22.50	0.0	0.0	0.0	0.0	9.46E 00	8.52E 00	1.14E 00	0.0	8.55E 00	4.30E 00
45.00	0.0	0.0	0.0	0.0	2.68E 00	3.82E-01	2.03E 00	2.99E 00	1.75E 00	5.19E 00
67.50	0.0	0.0	0.0	0.0	0.0	8.16E-04	4.06E 00	2.75E 00	7.15E 00	1.08E 00
90.00	0.0	0.0	0.0	0.0	0.0	0.0	2.32E-01	7.76E-02	1.80E 00	1.34E 00
112.50	0.0	0.0	0.0	0.0	3.47E-01	3.88E-01	4.48E 00	1.90E 00	2.17E 00	6.22E-01
135.00	0.0	0.0	0.0	5.92E-01	4.44E 00	1.98E-01	9.73E-01	2.38E-01	1.12E 00	1.57E 00
157.50	0.0	0.0	2.01E-01	1.07E 00	3.22E 00	1.55E 00	0.0	1.35E-01	9.20E-01	5.66E-01
180.00	0.0	0.0	5.85E-01	1.20E 00	3.15E 00	1.14E 00	0.0	6.29E-01	1.10E 00	1.16E 00
202.50	0.0	0.0	0.0	0.0	0.0	4.47E-02	1.82E-04	8.74E-02	9.30E-01	3.15E-01
225.00	0.0	0.0	0.0	0.0	1.36E-01	1.65E 00	7.65E-01	0.0	5.53E-01	4.11E-01
247.50	0.0	0.0	0.0	0.0	6.17E-01	1.88E 00	2.96E-01	3.83E-01	6.77E-01	4.04E-01
270.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.47E-01	3.00E-01	3.67E-01
292.50	0.0	0.0	0.0	0.0	0.0	5.27E-01	2.58E-01	2.40E-01	8.60E-01	5.02E-01
315.00	0.0	0.0	0.0	0.0	4.31E-02	3.07E 00	2.63E 00	1.08E-01	9.99E-01	2.12E 00
337.50	0.0	0.0	0.0	0.0	0.0	1.15E-01	3.92E-01	0.0	3.16E 00	8.13E-01

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	2.86E 01	6.11E 01	2.36E 01	1.57E 01	4.75E 00	4.06E-01	5.08E-01	2.58E 00	8.82E-01
22.50	2.68E 01	2.38E-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.00	9.45E 00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67.50	2.70E 00	0.0	0.0	0.0	0.0	0.0	0.0	2.70E-02	2.52E-02
90.00	3.92E 00	1.18E 00	7.31E-01	2.05E-01	2.48E-01	4.61E-01	4.99E-01	9.88E-02	5.64E-02
112.50	5.13E 00	2.74E 00	2.11E 00	4.40E-01	3.06E-01	7.77E-02	3.39E-02	3.01E-02	5.16E-02
135.00	2.13E 00	9.50E-01	3.33E-01	1.22E-01	3.52E-02	2.41E-02	2.59E-02	1.34E-02	1.40E-02
157.50	1.24E 00	2.75E-01	4.90E-02	4.98E-02	1.43E-02	2.20E-02	6.18E-03	1.11E-02	2.39E-02
180.00	1.73E 00	7.53E-01	5.23E-02	4.38E-02	3.60E-02	3.41E-02	4.15E-02	1.18E-02	7.22E-03
202.50	2.27E-01	4.50E-02	1.79E-02	3.15E-02	5.93E-02	1.31E-01	2.31E-02	6.66E-03	5.20E-03
225.00	3.59E-01	1.61E-01	8.55E-02	1.78E-02	4.11E-02	4.30E-02	1.25E-02	9.64E-03	1.46E-02
247.50	3.14E-01	2.48E-01	1.53E 00	1.85E-01	3.68E-02	2.15E-02	5.34E-02	1.41E-02	2.53E-02
270.00	5.47E-01	3.13E-01	5.59E-01	1.21E-01	4.75E-01	6.79E-02	1.11E-01	5.55E-02	1.98E-02
292.50	6.65E-01	8.54E-01	8.24E-01	4.23E-01	3.38E-01	6.02E-02	1.14E-02	3.44E-02	1.02E-01
315.00	2.62E 00	2.48E 00	2.74E 00	1.12E 00	5.27E-01	5.51E-01	2.48E-01	1.29E-01	7.57E-02
337.50	4.01E 00	4.86E 00	2.63E 00	1.42E 00	9.09E-01	2.05E-01	2.48E-01	1.64E-01	1.25E-01

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
ETHYDICH EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN PHILADELPHIA, PA

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	3.09E-02	4.34E-02	3.56E-02	3.45E-02	8.51E-02	0.0	1.31E-01	4.66E-01	2.28E-01	4.38E 00
22.50	2.62E-02	7.40E-02	5.10E-02	3.95E-02	1.12E-01	4.94E-03	2.69E-02	1.65E-01	8.42E-02	4.22E-01
45.00	4.96E-02	1.63E-01	1.26E-01	1.04E-01	3.01E-01	2.64E-02	0.0	2.13E-02	4.37E-01	3.62E-01
67.50	4.17E-02	1.30E-01	9.48E-02	7.55E-02	1.13E-01	4.02E-03	2.61E-01	1.09E-01	1.51E-01	1.46E-01
90.00	4.99E-02	9.64E-02	7.15E-02	5.76E-02	6.45E-02	3.38E-02	2.70E-01	8.20E-02	3.70E-01	2.62E-01
112.50	0.0	0.0	0.0	0.0	0.0	0.0	3.41E-02	1.14E-01	2.22E-01	6.60E-02
135.00	0.0	0.0	0.0	0.0	0.0	6.70E-03	4.82E-02	2.09E-01	6.48E-02	3.96E-02
157.50	0.0	0.0	0.0	0.0	5.53E-03	1.62E-01	8.58E-02	2.74E-04	2.58E-02	1.27E-02
180.00	0.0	0.0	0.0	0.0	2.31E-02	1.30E-01	8.44E-02	0.0	1.26E-01	4.13E-02
202.50	0.0	0.0	0.0	0.0	0.0	1.48E-03	8.29E-03	2.34E-03	5.12E-03	5.46E-03
225.00	0.0	0.0	0.0	0.0	0.0	9.39E-03	1.96E-02	4.75E-03	1.39E-02	4.69E-02
247.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.96E-03	6.84E-02	1.46E-01
270.00	0.0	0.0	0.0	0.0	7.43E-02	8.00E-02	0.0	1.31E-01	3.44E-01	7.48E-01
292.50	0.0	0.0	0.0	0.0	5.86E-02	8.66E-02	1.02E-02	4.67E-02	7.52E-02	1.19E-01
315.00	0.0	0.0	0.0	0.0	1.24E-02	6.01E-02	2.96E-03	6.78E-02	1.10E 00	2.45E-01
337.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.40E-01	6.82E-01	1.37E 00

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS 15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	5.67E 00	3.37E 00	3.32E 00	1.04E 00	7.36E-01	5.34E-01	2.79E-01	6.27E-01	2.20E 00
22.50	5.83E 00	8.82E 00	4.42E 00	1.42E 00	7.41E-01	1.45E-01	8.91E-02	7.01E-02	9.04E-02
45.00	3.47E 00	2.75E 01	1.80E 01	6.76E 00	3.85E 00	2.46E 00	3.39E 00	6.98E-01	4.73E-01
67.50	2.83E 00	5.79E 00	3.73E 00	7.81E-01	6.27E-01	3.89E-01	4.61E-01	1.07E-01	2.66E-01
90.00	2.88E 00	3.86E 00	1.68E 00	4.05E-01	1.82E-01	7.03E-02	8.61E-02	1.08E-01	3.45E-01
112.50	6.32E-01	7.55E-01	3.23E-01	1.96E-01	1.31E-01	8.51E-02	1.12E-01	2.33E-01	3.50E-02
135.00	1.75E-01	2.13E-01	2.81E-01	9.13E-01	1.50E-01	3.89E-02	9.89E-02	2.12E-01	9.00E-03
157.50	1.94E-01	8.78E-02	2.71E-01	2.44E-01	7.70E-02	4.59E-02	1.09E-02	1.61E-02	1.03E-01
180.00	2.15E-01	1.50E-01	9.36E-02	5.50E-02	4.55E-03	5.92E-03	9.34E-02	2.73E-02	8.67E-02
202.50	3.56E-02	7.00E-02	9.00E-03	8.20E-03	2.13E-02	1.82E-02	8.09E-02	2.30E-02	1.11E-02
225.00	2.52E-01	5.82E-02	3.44E-02	2.99E-02	1.30E-02	8.65E-03	5.42E-03	2.15E-02	5.38E-03
247.50	1.79E 00	1.20E 00	4.95E-01	1.19E-01	4.38E-02	1.09E-01	1.24E-01	7.81E-02	1.34E-01
270.00	4.74E 00	1.07E 00	3.06E-01	9.15E-02	1.41E-01	4.82E-02	6.01E-02	9.00E-02	3.29E-02
292.50	9.39E-01	1.27E-01	1.13E-01	1.70E-01	5.30E-02	4.08E-02	1.18E-01	2.20E-01	2.43E-01
315.00	6.29E-01	5.81E-01	5.01E-01	1.99E-01	5.03E-02	6.14E-02	1.84E-01	5.95E-01	7.54E-02
337.50	9.43E-01	3.46E-01	4.98E-01	3.72E-01	3.51E-01	2.08E-01	9.95E-02	9.18E-02	1.04E-01

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
HEXACHLO EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN CHICAGO, IL

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS									
	200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	0.0	0.0	0.0	0.0	9.57E-01	1.09E 00	9.95E-02	2.94E-03	1.68E 00	1.48E 00
22.50	0.0	0.0	0.0	0.0	7.13E-01	8.65E-01	1.32E-01	0.0	1.14E 00	6.09E-01
45.00	0.0	0.0	0.0	0.0	2.03E-01	3.85E-02	2.32E-01	3.68E-01	2.32E-01	7.30E-01
67.50	0.0	0.0	0.0	0.0	0.0	8.12E-05	4.62E-01	3.36E-01	9.44E-01	1.51E-01
90.00	0.0	0.0	0.0	0.0	0.0	0.0	2.64E-02	9.50E-03	2.37E-01	1.88E-01
112.50	0.0	0.0	0.0	0.0	2.51E-02	3.82E-02	5.05E-01	2.32E-01	2.85E-01	8.70E-02
135.00	0.0	0.0	0.0	3.20E-02	3.60E-01	2.10E-02	1.16E-01	3.03E-02	1.53E-01	2.26E-01
157.50	0.0	0.0	6.53E-03	5.79E-02	2.65E-01	1.68E-01	0.0	1.75E-02	1.27E-01	8.22E-02
180.00	0.0	0.0	2.44E-02	7.91E-02	2.98E-01	1.36E-01	0.0	8.61E-02	1.58E-01	1.74E-01
202.50	0.0	0.0	0.0	0.0	0.0	5.07E-03	2.29E-05	1.16E-02	1.31E-01	4.66E-02
225.00	0.0	0.0	0.0	0.0	1.32E-02	1.99E-01	1.01E-01	0.0	8.05E-02	6.23E-02
247.50	0.0	0.0	0.0	0.0	5.20E-02	2.06E-01	3.62E-02	4.97E-02	9.37E-02	5.88E-02
270.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.88E-02	4.08E-02	5.27E-02
292.50	0.0	0.0	0.0	0.0	0.0	5.01E-02	2.84E-02	2.87E-02	1.12E-01	6.97E-02
315.00	0.0	0.0	0.0	0.0	3.36E-03	3.19E-01	3.09E-01	1.37E-02	1.35E-01	3.04E-01
337.50	0.0	0.0	0.0	0.0	0.0	1.15E-02	4.49E-02	0.0	4.19E-01	1.15E-01

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS								
	15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	4.34E 00	9.62E 00	3.77E 00	2.52E 00	7.69E-01	6.59E-02	8.28E-02	4.21E-01	1.44E-01
22.50	4.02E 00	3.70E-02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.00	1.41E 00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67.50	4.03E-01	0.0	0.0	0.0	0.0	0.0	0.0	4.38E-03	4.09E-03
90.00	5.83E-01	1.82E-01	1.15E-01	3.26E-02	3.98E-02	7.42E-02	8.06E-02	1.60E-02	9.16E-03
112.50	7.62E-01	4.24E-01	3.33E-01	7.01E-02	4.91E-02	1.25E-02	5.47E-03	4.86E-03	8.37E-03
135.00	3.22E-01	1.49E-01	5.31E-02	1.95E-02	5.69E-03	3.92E-03	4.21E-03	2.19E-03	2.29E-03
157.50	1.90E-01	4.34E-02	7.85E-03	8.04E-03	2.32E-03	3.58E-03	1.01E-03	1.81E-03	3.92E-03
180.00	2.70E-01	1.21E-01	8.50E-03	7.16E-03	5.91E-03	5.61E-03	6.85E-03	1.95E-03	1.20E-03
202.50	3.52E-02	7.17E-03	2.90E-03	5.12E-03	9.69E-03	2.15E-02	3.79E-03	1.10E-03	8.58E-04
225.00	5.66E-02	2.60E-02	1.40E-02	2.93E-03	6.78E-03	7.11E-03	2.08E-03	1.60E-03	2.42E-03
247.50	4.80E-02	3.92E-02	2.46E-01	2.99E-02	5.99E-03	3.51E-03	8.73E-03	2.31E-03	4.16E-03
270.00	8.27E-02	4.91E-02	8.90E-02	1.95E-02	7.69E-02	1.10E-02	1.81E-02	9.05E-03	3.24E-03
292.50	9.84E-02	1.32E-01	1.30E-01	6.72E-02	5.42E-02	9.68E-03	1.85E-03	5.56E-03	1.65E-02
315.00	3.95E-01	3.88E-01	4.37E-01	1.80E-01	8.51E-02	8.93E-02	4.03E-02	2.10E-02	1.24E-02
337.50	6.02E-01	7.59E-01	4.18E-01	2.27E-01	1.47E-01	3.32E-02	4.02E-02	2.67E-02	2.04E-02

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
HEXACHLO EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN PHILADELPHIA, PA

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS									
	200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	1.37E-04	4.68E-04	1.05E-03	1.65E-03	6.28E-03	0.0	1.49E-02	5.69E-02	3.01E-02	6.14E-01
22.50	1.20E-04	8.33E-04	1.37E-03	1.64E-03	7.21E-03	4.40E-04	2.79E-03	1.87E-02	1.05E-02	5.66E-02
45.00	2.63E-04	2.53E-03	4.76E-03	5.93E-03	2.51E-02	2.85E-03	0.0	2.74E-03	6.00E-02	5.23E-02
67.50	2.00E-04	1.53E-03	2.45E-03	2.90E-03	6.81E-03	3.44E-04	2.64E-02	1.21E-02	1.85E-02	1.95E-02
90.00	2.19E-04	9.81E-04	1.83E-03	2.34E-03	4.21E-03	3.12E-03	2.90E-02	9.60E-03	4.73E-02	3.58E-02
112.50	0.0	0.0	0.0	0.0	0.0	0.0	3.90E-03	1.40E-02	2.94E-02	9.29E-03
135.00	0.0	0.0	0.0	0.0	0.0	6.94E-04	5.64E-03	2.62E-02	8.70E-03	5.62E-03
157.50	0.0	0.0	0.0	0.0	4.03E-04	1.61E-02	9.71E-03	3.35E-05	3.40E-03	1.78E-03
180.00	0.0	0.0	0.0	0.0	2.02E-03	1.47E-02	1.06E-02	0.0	1.77E-02	6.11E-03
202.50	0.0	0.0	0.0	0.0	0.0	1.57E-04	9.90E-04	2.99E-04	6.99E-04	7.88E-04
225.00	0.0	0.0	0.0	0.0	0.0	1.12E-03	2.56E-03	6.53E-04	2.01E-03	7.07E-03
247.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.25E-04	1.04E-02	2.30E-02
270.00	0.0	0.0	0.0	0.0	6.60E-03	9.12E-03	0.0	1.74E-02	4.86E-02	1.11E-01
292.50	0.0	0.0	0.0	0.0	4.75E-03	9.34E-03	1.25E-03	6.06E-03	1.04E-02	1.73E-02
315.00	0.0	0.0	0.0	0.0	9.72E-04	6.25E-03	3.48E-04	8.55E-03	1.49E-01	3.50E-02
337.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.78E-02	8.97E-02	1.92E-01

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS								
	15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	8.44E-01	5.23E-01	5.24E-01	1.65E-01	1.18E-01	8.60E-02	4.51E-02	1.01E-01	3.56E-01
22.50	8.43E-01	1.34E 00	6.87E-01	2.24E-01	1.18E-01	2.31E-02	1.43E-02	1.13E-02	1.46E-02
45.00	5.27E-01	4.33E 00	2.87E 00	1.09E 00	6.23E-01	4.00E-01	5.53E-01	1.14E-01	7.74E-02
67.50	4.06E-01	8.76E-01	5.77E-01	1.22E-01	9.91E-02	6.19E-02	7.36E-02	1.71E-02	4.28E-02
90.00	4.21E-01	5.92E-01	2.63E-01	6.40E-02	2.90E-02	1.12E-02	1.38E-02	1.74E-02	5.57E-02
112.50	9.45E-02	1.17E-01	5.10E-02	3.13E-02	2.10E-02	1.37E-02	1.82E-02	3.78E-02	5.69E-03
135.00	2.63E-02	3.32E-02	4.45E-02	1.46E-01	2.42E-02	6.29E-03	1.60E-02	3.45E-02	1.47E-03
157.50	2.88E-02	1.36E-02	4.27E-02	3.89E-02	1.24E-02	7.39E-03	1.77E-03	2.60E-03	1.68E-02
180.00	3.32E-02	2.39E-02	1.51E-02	8.93E-03	7.43E-04	9.69E-04	1.53E-02	4.49E-03	1.43E-02
202.50	5.41E-03	1.10E-02	1.44E-03	1.32E-03	3.46E-03	2.97E-03	1.32E-02	3.76E-03	1.81E-03
225.00	3.95E-02	9.39E-03	5.60E-03	4.90E-03	2.14E-03	1.43E-03	8.96E-04	3.57E-03	8.92E-04
247.50	2.90E-01	1.98E-01	8.24E-02	1.98E-02	7.35E-03	1.83E-02	2.08E-02	1.31E-02	2.26E-02
270.00	7.33E-01	1.70E-01	4.95E-02	1.49E-02	2.31E-02	7.90E-03	9.88E-03	1.48E-02	5.42E-03
292.50	1.44E-01	2.01E-02	1.82E-02	2.77E-02	8.65E-03	6.68E-03	1.93E-02	3.62E-02	4.01E-02
315.00	9.50E-02	9.11E-02	7.99E-02	3.19E-02	8.14E-03	9.97E-03	3.00E-02	9.72E-02	1.23E-02
337.50	1.40E-01	5.38E-02	7.87E-02	5.93E-02	5.63E-02	3.36E-02	1.61E-02	1.49E-02	1.69E-02

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
TETRACHL EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN CHICAGO, IL

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS									
	200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	0.0	0.0	0.0	0.0	3.53E-01	3.69E-01	3.27E-02	9.48E-04	5.32E-01	4.63E-01
22.50	0.0	0.0	0.0	0.0	2.73E-01	2.99E-01	4.40E-02	0.0	3.65E-01	1.92E-01
45.00	0.0	0.0	0.0	0.0	7.77E-02	1.33E-02	7.74E-02	1.20E-01	7.44E-02	2.31E-01
67.50	0.0	0.0	0.0	0.0	0.0	2.82E-05	1.54E-01	1.10E-01	3.03E-01	4.79E-02
90.00	0.0	0.0	0.0	0.0	0.0	0.0	8.84E-03	3.11E-03	7.61E-02	5.93E-02
112.50	0.0	0.0	0.0	0.0	9.78E-03	1.33E-02	1.69E-01	7.59E-02	9.17E-02	2.75E-02
135.00	0.0	0.0	0.0	1.41E-02	1.34E-01	7.17E-03	3.83E-02	9.82E-03	4.86E-02	7.09E-02
157.50	0.0	0.0	3.76E-03	2.55E-02	9.83E-02	5.68E-02	0.0	5.65E-03	4.02E-02	2.58E-02
180.00	0.0	0.0	1.22E-02	3.19E-02	1.05E-01	4.49E-02	0.0	2.74E-02	4.96E-02	5.40E-02
202.50	0.0	0.0	0.0	0.0	0.0	1.69E-03	7.44E-06	3.73E-03	4.14E-02	1.45E-02
225.00	0.0	0.0	0.0	0.0	4.62E-03	6.55E-02	3.24E-02	0.0	2.52E-02	1.93E-02
247.50	0.0	0.0	0.0	0.0	1.91E-02	6.95E-02	1.19E-02	1.60E-02	2.97E-02	1.84E-02
270.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.08E-03	1.30E-02	1.66E-02
292.50	0.0	0.0	0.0	0.0	0.0	1.77E-02	9.59E-03	9.45E-03	3.60E-02	2.21E-02
315.00	0.0	0.0	0.0	0.0	1.27E-03	1.09E-01	1.02E-01	4.44E-03	4.30E-02	9.55E-02
337.50	0.0	0.0	0.0	0.0	0.0	4.01E-03	1.50E-02	0.0	1.34E-01	3.62E-02

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS								
	15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	1.35E 00	2.96E 00	1.16E 00	7.71E-01	2.35E-01	2.01E-02	2.53E-02	1.28E-01	4.40E-02
22.50	1.25E 00	1.14E-02	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.00	4.39E-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
67.50	1.25E-01	0.0	0.0	0.0	0.0	0.0	0.0	1.34E-03	1.25E-03
90.00	1.82E-01	5.62E-02	3.54E-02	9.99E-03	1.22E-02	2.27E-02	2.46E-02	4.89E-03	2.80E-03
112.50	2.37E-01	1.31E-01	1.02E-01	2.15E-02	1.50E-02	3.82E-03	1.67E-03	1.49E-03	2.56E-03
135.00	1.00E-01	4.59E-02	1.63E-02	5.98E-03	1.74E-03	1.20E-03	1.29E-03	6.68E-04	6.99E-04
157.50	5.88E-02	1.33E-02	2.40E-03	2.46E-03	7.09E-04	1.09E-03	3.08E-04	5.52E-04	1.20E-03
180.00	8.30E-02	3.70E-02	2.60E-03	2.18E-03	1.80E-03	1.71E-03	2.08E-03	5.94E-04	3.64E-04
202.50	1.09E-02	2.20E-03	8.86E-04	1.56E-03	2.96E-03	6.56E-03	1.15E-03	3.34E-04	2.61E-04
225.00	1.74E-02	7.95E-03	4.26E-03	8.92E-04	2.06E-03	2.16E-03	6.31E-04	4.87E-04	7.36E-04
247.50	1.49E-02	1.20E-02	7.53E-02	9.15E-03	1.83E-03	1.07E-03	2.66E-03	7.04E-04	1.27E-03
270.00	2.57E-02	1.51E-02	2.73E-02	5.97E-03	2.35E-02	3.37E-03	5.51E-03	2.76E-03	9.89E-04
292.50	3.07E-02	4.08E-02	3.99E-02	2.06E-02	1.66E-02	2.96E-03	5.64E-04	1.70E-03	5.04E-03
315.00	1.23E-01	1.19E-01	1.34E-01	5.52E-02	2.60E-02	2.73E-02	1.23E-02	6.40E-03	3.77E-03
337.50	1.87E-01	2.34E-01	1.28E-01	6.96E-02	4.48E-02	1.01E-02	1.23E-02	8.14E-03	6.23E-03

ANNUAL AVERAGE EXPOSURES (PERSON-MICROGRAMS PER CUBIC METER) IN SEGMENTS,
TETRACHL EMISSIONS FROM ALL SOURCES AT LI-10 LOCATED IN PHILADELPHIA, PA

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS									
	200.00	375.00	625.00	875.00	1500.00	2500.00	3500.00	4500.00	6250.00	8750.00
0.0	3.70E-04	5.86E-04	6.39E-04	7.69E-04	2.42E-03	0.0	4.97E-03	1.86E-02	9.66E-03	1.94E-01
22.50	3.15E-04	1.01E-03	8.84E-04	8.23E-04	2.94E-03	1.59E-04	9.60E-04	6.25E-03	3.42E-03	1.81E-02
45.00	6.04E-04	2.38E-03	2.51E-03	2.55E-03	9.27E-03	9.68E-04	0.0	8.86E-04	1.91E-02	1.64E-02
67.50	5.04E-04	1.78E-03	1.62E-03	1.52E-03	2.85E-03	1.26E-04	9.14E-03	4.06E-03	6.06E-03	6.24E-03
90.00	5.97E-04	1.29E-03	1.22E-03	1.19E-03	1.71E-03	1.11E-03	9.87E-03	3.18E-03	1.53E-02	1.14E-02
112.50	0.0	0.0	0.0	0.0	0.0	0.0	1.30E-03	4.57E-03	9.43E-03	2.93E-03
135.00	0.0	0.0	0.0	0.0	0.0	2.39E-04	1.87E-03	8.53E-03	2.78E-03	1.77E-03
157.50	0.0	0.0	0.0	0.0	1.56E-04	5.59E-03	3.25E-03	1.10E-05	1.09E-03	5.62E-04
180.00	0.0	0.0	0.0	0.0	7.32E-04	4.91E-03	3.45E-03	0.0	5.59E-03	1.91E-03
202.50	0.0	0.0	0.0	0.0	0.0	5.36E-05	3.26E-04	9.67E-05	2.22E-04	2.47E-04
225.00	0.0	0.0	0.0	0.0	0.0	3.68E-04	8.25E-04	2.07E-04	6.30E-04	2.20E-03
247.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.27E-04	3.22E-03	7.06E-03
270.00	0.0	0.0	0.0	0.0	2.38E-03	3.04E-03	0.0	5.58E-03	1.53E-02	3.45E-02
292.50	0.0	0.0	0.0	0.0	1.77E-03	3.17E-03	4.09E-04	1.95E-03	3.30E-03	5.42E-03
315.00	0.0	0.0	0.0	0.0	3.67E-04	2.14E-03	1.15E-04	2.78E-03	4.74E-02	1.10E-02
337.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.55E-02	2.88E-02	6.08E-02

LOCATION OF SEGMENT CENTROID:

DIRECTION, DEGREES FROM NORTH	DISTANCE FROM ORIGIN, METERS								
	15000.00	25000.00	35000.00	45000.00	55000.00	65000.00	75000.00	85000.00	95000.00
0.0	2.63E-01	1.61E-01	1.61E-01	5.06E-02	3.61E-02	2.63E-02	1.38E-02	3.10E-02	1.09E-01
22.50	2.64E-01	4.16E-01	2.12E-01	6.88E-02	3.61E-02	7.09E-03	4.37E-03	3.45E-03	4.45E-03
45.00	1.64E-01	1.33E 00	8.79E-01	3.33E-01	1.90E-01	1.22E-01	1.69E-01	3.48E-02	2.36E-02
67.50	1.28E-01	2.72E-01	1.78E-01	3.76E-02	3.04E-02	1.90E-02	2.26E-02	5.24E-03	1.31E-02
90.00	1.32E-01	1.83E-01	8.10E-02	1.97E-02	8.88E-03	3.44E-03	4.23E-03	5.33E-03	1.70E-02
112.50	2.94E-02	3.62E-02	1.57E-02	9.60E-03	6.43E-03	4.20E-03	5.56E-03	1.16E-02	1.74E-03
135.00	8.16E-03	1.02E-02	1.37E-02	4.48E-02	7.41E-03	1.92E-03	4.90E-03	1.05E-02	4.47E-04
157.50	8.98E-03	4.20E-03	1.31E-02	1.19E-02	3.78E-03	2.26E-03	5.40E-04	7.95E-04	5.12E-03
180.00	1.02E-02	7.33E-03	4.62E-03	2.73E-03	2.27E-04	2.95E-04	4.67E-03	1.37E-03	4.35E-03
202.50	1.68E-03	3.39E-03	4.41E-04	4.05E-04	1.06E-03	9.07E-04	4.03E-03	1.15E-03	5.52E-04
225.00	1.21E-02	2.87E-03	1.71E-03	1.49E-03	6.52E-04	4.35E-04	2.73E-04	1.08E-03	2.71E-04
247.50	8.85E-02	6.03E-02	2.50E-02	6.01E-03	2.23E-03	5.56E-03	6.30E-03	3.99E-03	6.86E-03
270.00	2.26E-01	5.23E-02	1.51E-02	4.54E-03	7.03E-03	2.41E-03	3.01E-03	4.51E-03	1.65E-03
292.50	4.46E-02	6.18E-03	5.57E-03	8.45E-03	2.64E-03	2.04E-03	5.89E-03	1.10E-02	1.22E-02
315.00	2.95E-02	2.81E-02	2.45E-02	9.77E-03	2.49E-03	3.04E-03	9.17E-03	2.96E-02	3.76E-03
337.50	4.37E-02	1.66E-02	2.42E-02	1.82E-02	1.72E-02	1.03E-02	4.92E-03	4.55E-03	5.17E-03

APPENDIX G

SUMMARY DATA

HIGHEST SECTOR ANNUAL-AVERAGE GROUND-LEVEL AIR CONCENTRATIONS
(MICROGRAMS PER CUBIC METER) IN A POPULATED SECTOR FOR DRE = 99.99%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	5.36E-04	1.48E-03	2.07E-03	5.62E-04	1.51E-03	2.15E-03
ETHYLENE DICHLORIDE	6.65E-04	1.92E-03	2.93E-03	6.94E-04	1.94E-03	3.00E-03
HEXACHLOROBUTADIENE	4.73E-05	1.85E-04	4.54E-04	4.75E-05	1.82E-04	4.54E-04
1,1,2,2-TETRACHLOROETHANE	1.81E-05	6.39E-05	1.39E-04	1.85E-05	6.44E-05	1.40E-04
PHENOL	1.90E-08	7.46E-08	1.83E-07	1.91E-08	7.47E-08	1.83E-07
TOLUENE	3.15E-04	9.93E-04	2.09E-03	3.25E-04	1.01E-03	2.15E-03
PYRIDINE	1.84E-05	5.93E-05	1.27E-04	1.90E-05	6.02E-05	1.31E-04
PHTHALIC ANHYDRIDE	5.49E-09	2.18E-08	5.46E-08	5.50E-09	2.18E-08	5.46E-08
METHYL STYRENE	1.29E-04	4.77E-04	1.13E-03	1.31E-04	4.79E-04	1.14E-03
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.54E-04	4.66E-04	7.83E-04	1.59E-04	4.84E-04	8.12E-04
ETHYLENE DICHLORIDE	2.33E-04	7.60E-04	1.47E-03	2.38E-04	7.82E-04	1.50E-03
HEXACHLOROBUTADIENE	4.47E-05	1.78E-04	4.45E-04	4.48E-05	1.77E-04	4.45E-04
1,1,2,2-TETRACHLOROETHANE	1.31E-05	5.05E-05	1.22E-04	1.31E-05	5.07E-05	1.22E-04
PHENOL	1.81E-08	7.22E-08	1.80E-07	1.81E-08	7.23E-08	1.80E-07
TOLUENE	1.56E-04	5.61E-04	1.29E-03	1.58E-04	5.72E-04	1.31E-03
PYRIDINE	9.87E-06	3.62E-05	8.44E-05	9.99E-06	3.67E-05	8.52E-05
PHTHALIC ANHYDRIDE	5.36E-09	2.14E-08	5.39E-08	5.36E-09	2.14E-08	5.39E-08
METHYL STYRENE	1.05E-04	4.10E-04	1.01E-03	1.05E-04	4.12E-04	1.01E-03
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.25E-03	3.09E-03	4.15E-03	1.27E-03	3.10E-03	4.21E-03
ETHYLENE DICHLORIDE	1.48E-03	3.74E-03	5.29E-03	1.50E-03	3.75E-03	5.35E-03
HEXACHLOROBUTADIENE	5.21E-05	1.96E-04	4.68E-04	5.22E-05	1.88E-04	4.68E-04
1,1,2,2-TETRACHLOROETHANE	2.76E-05	8.54E-05	1.66E-04	2.79E-05	8.57E-05	1.67E-04
PHENOL	2.07E-08	7.85E-08	1.87E-07	2.08E-08	7.85E-08	1.87E-07
TOLUENE	6.10E-04	1.66E-03	3.33E-03	6.18E-04	1.67E-03	3.48E-03
PYRIDINE	3.43E-05	9.53E-05	1.94E-04	3.48E-05	9.60E-05	2.02E-04
PHTHALIC ANHYDRIDE	5.73E-09	2.23E-08	5.56E-08	5.74E-09	2.24E-08	5.57E-08
METHYL STYRENE	1.75E-04	5.80E-04	1.32E-03	1.76E-04	5.82E-04	1.35E-03

HIGHEST SECTOR ANNUAL-AVERAGE GROUND-LEVEL AIR CONCENTRATIONS
(MICROGRAMS PER CUBIC METER) IN A POPULATED SECTOR FOR DRE = 99.90%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	7.98E-04	2.53E-03	4.71E-03	8.24E-04	2.56E-03	4.78E-03
ETHYLENE DICHLORIDE	1.48E-03	5.18E-03	1.11E-02	1.51E-03	5.21E-03	1.12E-02
HEXACHLOROBUTADIENE	4.42E-04	1.77E-03	4.43E-03	4.43E-04	1.77E-03	4.43E-03
1,1,2,2-TETRACHLOROETHANE	1.21E-04	4.76E-04	1.17E-03	1.21E-04	4.77E-04	1.17E-03
PHENOL	1.79E-07	7.17E-07	1.79E-06	1.79E-07	7.17E-07	1.79E-06
TOLUENE	1.22E-03	4.65E-03	1.13E-02	1.23E-03	4.66E-03	1.13E-02
PYRIDINE	8.08E-05	3.09E-04	7.53E-04	8.14E-05	3.10E-04	7.57E-04
PHTHALIC ANHYDRIDE	5.33E-08	2.13E-07	5.38E-07	5.33E-08	2.13E-07	5.38E-07
METHYL STYRENE	9.97E-04	3.95E-03	9.82E-03	9.99E-04	3.95E-03	9.82E-03
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	4.16E-04	1.52E-03	3.42E-03	4.21E-04	1.54E-03	3.45E-03
ETHYLENE DICHLORIDE	1.05E-03	4.03E-03	9.66E-03	1.05E-03	4.05E-03	9.69E-03
HEXACHLOROBUTADIENE	4.40E-04	1.76E-03	4.42E-03	4.40E-04	1.76E-03	4.42E-03
1,1,2,2-TETRACHLOROETHANE	1.16E-04	4.63E-04	1.16E-03	1.16E-04	4.63E-04	1.16E-03
PHENOL	1.78E-07	7.15E-07	1.79E-06	1.78E-07	7.15E-07	1.79E-06
TOLUENE	1.06E-03	4.21E-03	1.05E-02	1.07E-03	4.23E-03	1.05E-02
PYRIDINE	7.22E-05	2.86E-04	7.11E-04	7.24E-05	2.87E-04	7.12E-04
PHTHALIC ANHYDRIDE	5.31E-08	2.13E-07	5.37E-07	5.31E-08	2.13E-07	5.37E-07
METHYL STYRENE	9.72E-04	3.88E-03	9.69E-03	9.73E-04	3.89E-03	9.69E-03
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.51E-03	4.15E-03	6.79E-03	1.53E-03	4.16E-03	6.85E-03
ETHYLENE DICHLORIDE	2.29E-03	7.01E-03	1.35E-02	2.31E-03	7.02E-03	1.35E-02
HEXACHLOROBUTADIENE	4.47E-04	1.78E-03	4.45E-03	4.47E-04	1.77E-03	4.45E-03
1,1,2,2-TETRACHLOROETHANE	1.30E-04	4.98E-04	1.20E-03	1.31E-04	4.98E-04	1.20E-03
PHENOL	1.81E-07	7.21E-07	1.80E-06	1.81E-07	7.21E-07	1.80E-06
TOLUENE	1.52E-03	5.32E-03	1.25E-02	1.53E-03	5.33E-03	1.27E-02
PYRIDINE	9.66E-05	3.46E-04	8.20E-04	9.71E-05	3.46E-04	8.28E-04
PHTHALIC ANHYDRIDE	5.35E-08	2.14E-07	5.39E-07	5.35E-08	2.14E-07	5.39E-07
METHYL STYRENE	1.04E-03	4.05E-03	1.00E-02	1.04E-03	4.06E-03	1.00E-02

HIGHEST SECTOR ANNUAL-AVERAGE GROUND-LEVEL AIR CONCENTRATIONS
(MICROGRAMS PER CUBIC METER) IN A POPULATED SECTOR FOR DRE = 99.00%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	3.42E-03	1.31E-02	3.11E-02	3.44E-03	1.31E-02	3.12E-02
ETHYLENE DICHLORIDE	9.63E-03	3.79E-02	9.30E-02	9.66E-03	3.79E-02	9.31E-02
HEXACHLOROBUTADIENE	4.39E-03	1.76E-02	4.42E-02	4.39E-03	1.76E-02	4.42E-02
1,1,2,2-TETRACHLOROETHANE	1.15E-03	4.60E-03	1.15E-02	1.15E-03	4.60E-03	1.15E-02
PHENOL	1.78E-06	7.14E-06	1.79E-05	1.78E-06	7.14E-06	1.79E-05
TOLUENE	1.03E-02	4.12E-02	1.03E-01	1.03E-02	4.12E-02	1.03E-01
PYRIDINE	7.04E-04	2.81E-03	7.02E-03	7.05E-04	2.81E-03	7.02E-03
PHTHALIC ANHYDRIDE	5.31E-07	2.13E-06	5.37E-06	5.31E-07	2.13E-06	5.37E-06
METHYL STYRENE	9.67E-03	3.87E-02	9.67E-02	9.67E-03	3.87E-02	9.67E-02
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	3.04E-03	1.20E-02	2.98E-02	3.04E-03	1.21E-02	2.98E-02
ETHYLENE DICHLORIDE	9.20E-03	3.67E-02	9.16E-02	9.21E-03	3.67E-02	9.16E-02
HEXACHLOROBUTADIENE	4.39E-03	1.76E-02	4.42E-02	4.39E-03	1.76E-02	4.42E-02
1,1,2,2-TETRACHLOROETHANE	1.14E-03	4.58E-03	1.15E-02	1.14E-03	4.58E-03	1.15E-02
PHENOL	1.78E-06	7.14E-06	1.79E-05	1.78E-06	7.14E-06	1.79E-05
TOLUENE	1.02E-02	4.08E-02	1.02E-01	1.02E-02	4.08E-02	1.02E-01
PYRIDINE	6.96E-04	2.79E-03	6.97E-03	6.96E-04	2.79E-03	6.98E-03
PHTHALIC ANHYDRIDE	5.31E-07	2.13E-06	5.37E-06	5.31E-07	2.13E-06	5.37E-06
METHYL STYRENE	9.65E-03	3.86E-02	9.65E-02	9.65E-03	3.86E-02	9.65E-02
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	4.13E-03	1.47E-02	3.32E-02	4.15E-03	1.47E-02	3.32E-02
ETHYLENE DICHLORIDE	1.04E-02	3.97E-02	9.54E-02	1.05E-02	3.97E-02	9.54E-02
HEXACHLOROBUTADIENE	4.40E-03	1.76E-02	4.42E-02	4.40E-03	1.76E-02	4.42E-02
1,1,2,2-TETRACHLOROETHANE	1.16E-03	4.62E-03	1.16E-02	1.16E-03	4.62E-03	1.16E-02
PHENOL	1.78E-06	7.15E-06	1.79E-05	1.78E-06	7.15E-06	1.79E-05
TOLUENE	1.06E-02	4.19E-02	1.04E-01	1.06E-02	4.19E-02	1.04E-01
PYRIDINE	7.20E-04	2.85E-03	7.08E-03	7.21E-04	2.85E-03	7.09E-03
PHTHALIC ANHYDRIDE	5.31E-07	2.13E-06	5.37E-06	5.31E-07	2.13E-06	5.37E-06
METHYL STYRENE	9.72E-03	3.88E-02	9.69E-02	9.72E-03	3.88E-02	9.69E-02

COLLECTIVE EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER) FOR DRE = 99.99%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	2.36E+00	7.02E+00	1.92E+01	2.46E+00	7.13E+00	1.95E+01
ETHYLENE DICHLORIDE	2.94E+00	1.00E+01	4.43E+01	3.07E+00	1.02E+01	4.46E+01
HEXACHLOROBUTADIENE	2.29E-01	1.63E+00	1.73E+01	2.30E-01	1.61E+00	1.73E+01
1,1,2,2-TETRACHLOROETHANE	8.53E-02	4.94E-01	4.58E+00	8.67E-02	4.96E-01	4.59E+00
PHENOL	9.21E-05	6.61E-04	6.97E-03	9.23E-05	6.61E-04	6.97E-03
TOLUENE	1.43E+00	6.24E+00	4.44E+01	1.48E+00	6.30E+00	4.47E+01
PYRIDINE	8.38E-02	3.90E-01	2.96E+00	8.65E-02	3.93E-01	2.98E+00
PHTHALIC ANHYDRIDE	2.67E-05	1.95E-04	2.09E-03	2.67E-05	1.95E-04	2.09E-03
METHYL STYRENE	6.13E-01	3.90E+00	3.82E+01	6.22E-01	3.90E+00	3.83E+01
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	6.92E-01	2.59E+00	1.36E+01	7.09E-01	2.66E+00	1.37E+01
ETHYLENE DICHLORIDE	1.06E+00	5.02E+00	3.79E+01	1.08E+00	5.11E+00	3.80E+01
HEXACHLOROBUTADIENE	2.18E-01	1.60E+00	1.72E+01	2.18E-01	1.60E+00	1.72E+01
1,1,2,2-TETRACHLOROETHANE	6.31E-02	4.35E-01	4.51E+00	6.34E-02	4.36E-01	4.51E+00
PHENOL	8.81E-05	6.51E-04	6.95E-03	8.81E-05	6.51E-04	6.95E-03
TOLUENE	7.33E-01	4.36E+00	4.09E+01	7.43E-01	4.40E+00	4.10E+01
PYRIDINE	4.66E-02	2.88E-01	2.77E+00	4.72E-02	2.91E-01	2.78E+00
PHTHALIC ANHYDRIDE	2.61E-05	1.94E-04	2.09E-03	2.61E-05	1.94E-04	2.09E-03
METHYL STYRENE	5.07E-01	3.60E+00	3.77E+01	5.08E-01	3.61E+00	3.77E+01
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	5.49E+00	1.40E+01	2.83E+01	5.57E+00	1.41E+01	2.86E+01
ETHYLENE DICHLORIDE	6.48E+00	1.80E+01	5.47E+01	6.59E+00	1.81E+01	5.49E+01
HEXACHLOROBUTADIENE	2.50E-01	1.68E+00	1.73E+01	2.50E-01	1.64E+00	1.73E+01
1,1,2,2-TETRACHLOROETHANE	1.27E-01	5.88E-01	4.71E+00	1.28E-01	5.90E-01	4.71E+00
PHENOL	9.96E-05	6.78E-04	6.99E-03	9.98E-05	6.78E-04	6.99E-03
TOLUENE	2.71E+00	9.16E+00	4.98E+01	2.75E+00	9.22E+00	5.05E+01
PYRIDINE	1.53E-01	5.47E-01	3.26E+00	1.55E-01	5.50E-01	3.29E+00
PHTHALIC ANHYDRIDE	2.77E-05	1.98E-04	2.10E-03	2.78E-05	1.98E-04	2.10E-03
METHYL STYRENE	8.13E-01	4.35E+00	3.91E+01	8.19E-01	4.35E+00	3.92E+01

COLLECTIVE EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER) FOR DRE = 99.90%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	3.64E+00	1.66E+01	1.22E+02	3.74E+00	1.67E+01	1.22E+02
ETHYLENE DICHLORIDE	6.92E+00	3.97E+01	3.63E+02	7.05E+00	3.98E+01	3.63E+02
HEXACHLOROBUTADIENE	2.15E+00	1.59E+01	1.72E+02	2.16E+00	1.59E+01	1.72E+02
1,1,2,2-TETRACHLOROETHANE	5.88E-01	4.23E+00	4.49E+01	5.89E-01	4.23E+00	4.49E+01
PHENOL	8.73E-04	6.48E-03	6.95E-02	8.74E-04	6.48E-03	6.95E-02
TOLUENE	5.87E+00	3.94E+01	4.02E+02	5.92E+00	3.94E+01	4.02E+02
PYRIDINE	3.88E-01	2.66E+00	2.74E+01	3.91E-01	2.66E+00	2.74E+01
PHTHALIC ANHYDRIDE	2.60E-04	1.93E-03	2.09E-02	2.60E-04	1.93E-03	2.09E-02
METHYL STYRENE	4.84E+00	3.54E+01	3.76E+02	4.85E+00	3.54E+01	3.76E+02
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.97E+00	1.21E+01	1.16E+02	1.99E+00	1.22E+01	1.16E+02
ETHYLENE DICHLORIDE	5.04E+00	3.46E+01	3.56E+02	5.06E+00	3.47E+01	3.57E+02
HEXACHLOROBUTADIENE	2.14E+00	1.59E+01	1.72E+02	2.14E+00	1.59E+01	1.72E+02
1,1,2,2-TETRACHLOROETHANE	5.65E-01	4.17E+00	4.48E+01	5.66E-01	4.17E+00	4.48E+01
PHENOL	8.69E-04	6.47E-03	6.95E-02	8.69E-04	6.47E-03	6.95E-02
TOLUENE	5.18E+00	3.75E+01	3.98E+02	5.19E+00	3.75E+01	3.98E+02
PYRIDINE	3.51E-01	2.56E+00	2.72E+01	3.51E-01	2.56E+00	2.72E+01
PHTHALIC ANHYDRIDE	2.59E-04	1.93E-03	2.09E-02	2.59E-04	1.93E-03	2.09E-02
METHYL STYRENE	4.74E+00	3.51E+01	3.75E+02	4.74E+00	3.51E+01	3.75E+02
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	6.77E+00	2.36E+01	1.31E+02	6.85E+00	2.36E+01	1.31E+02
ETHYLENE DICHLORIDE	1.05E+01	4.76E+01	3.73E+02	1.06E+01	4.77E+01	3.74E+02
HEXACHLOROBUTADIENE	2.18E+00	1.60E+01	1.72E+02	2.18E+00	1.60E+01	1.72E+02
1,1,2,2-TETRACHLOROETHANE	6.29E-01	4.32E+00	4.50E+01	6.30E-01	4.32E+00	4.50E+01
PHENOL	8.81E-04	6.50E-03	6.95E-02	8.81E-04	6.50E-03	6.95E-02
TOLUENE	7.15E+00	4.23E+01	4.07E+02	7.20E+00	4.23E+01	4.08E+02
PYRIDINE	4.57E-01	2.82E+00	2.76E+01	4.59E-01	2.82E+00	2.77E+01
PHTHALIC ANHYDRIDE	2.61E-04	1.93E-03	2.09E-02	2.61E-04	1.93E-03	2.09E-02
METHYL STYRENE	5.04E+00	3.58E+01	3.77E+02	5.05E+00	3.59E+01	3.77E+02

COLLECTIVE EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER) FOR DRE = 99.00%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.64E+01	1.12E+02	1.15E+03	1.65E+01	1.12E+02	1.15E+03
ETHYLENE DICHLORIDE	4.67E+01	3.36E+02	3.55E+03	4.68E+01	3.36E+02	3.55E+03
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	2.14E+01	1.59E+02	1.72E+03
1,1,2,2-TETRACHLOROETHANE	5.61E+00	4.16E+01	4.48E+02	5.61E+00	4.16E+01	4.48E+02
PHENOL	8.69E-03	6.47E-02	6.95E-01	8.69E-03	6.47E-02	6.95E-01
TOLUENE	5.03E+01	3.71E+02	3.97E+03	5.04E+01	3.71E+02	3.97E+03
PYRIDINE	3.43E+00	2.53E+01	2.71E+02	3.43E+00	2.53E+01	2.71E+02
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	2.59E-03	1.93E-02	2.09E-01
METHYL STYRENE	4.71E+01	3.50E+02	3.75E+03	4.72E+01	3.50E+02	3.75E+03
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.48E+01	1.08E+02	1.14E+03	1.48E+01	1.08E+02	1.14E+03
ETHYLENE DICHLORIDE	4.48E+01	3.31E+02	3.54E+03	4.48E+01	3.31E+02	3.54E+03
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	2.14E+01	1.59E+02	1.72E+03
1,1,2,2-TETRACHLOROETHANE	5.59E+00	4.15E+01	4.48E+02	5.59E+00	4.15E+01	4.48E+02
PHENOL	8.68E-03	6.47E-02	6.95E-01	8.68E-03	6.47E-02	6.95E-01
TOLUENE	4.96E+01	3.69E+02	3.97E+03	4.96E+01	3.69E+02	3.97E+03
PYRIDINE	3.39E+00	2.52E+01	2.71E+02	3.39E+00	2.52E+01	2.71E+02
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	2.59E-03	1.93E-02	2.09E-01
METHYL STYRENE	4.70E+01	3.50E+02	3.75E+03	4.70E+01	3.50E+02	3.75E+03
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.96E+01	1.19E+02	1.16E+03	1.96E+01	1.19E+02	1.16E+03
ETHYLENE DICHLORIDE	5.02E+01	3.44E+02	3.56E+03	5.04E+01	3.44E+02	3.56E+03
HEXACHLOROBUTADIENE	2.14E+01	1.59E+02	1.72E+03	2.14E+01	1.59E+02	1.72E+03
1,1,2,2-TETRACHLOROETHANE	5.65E+00	4.17E+01	4.48E+02	5.65E+00	4.17E+01	4.48E+02
PHENOL	8.69E-03	6.47E-02	6.95E-01	8.69E-03	6.47E-02	6.95E-01
TOLUENE	5.16E+01	3.73E+02	3.98E+03	5.17E+01	3.74E+02	3.98E+03
PYRIDINE	3.50E+00	2.55E+01	2.72E+02	3.50E+00	2.55E+01	2.72E+02
PHTHALIC ANHYDRIDE	2.59E-03	1.93E-02	2.09E-01	2.59E-03	1.93E-02	2.09E-01
METHYL STYRENE	4.73E+01	3.51E+02	3.75E+03	4.73E+01	3.51E+02	3.75E+03

AVERAGE INDIVIDUAL EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER)
FOR DRE = 99.99%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	5.26E-06	1.56E-05	4.29E-05	5.51E-06	1.59E-05	4.35E-05
ETHYLENE DICHLORIDE	6.57E-06	2.24E-05	9.88E-05	6.86E-06	2.27E-05	9.95E-05
HEXACHLOROBUTADIENE	5.10E-07	3.64E-06	3.85E-05	5.12E-07	3.60E-06	3.85E-05
1,1,2,2-TETRACHLOROETHANE	1.91E-07	1.10E-06	1.02E-05	1.94E-07	1.11E-06	1.02E-05
PHENOL	2.06E-10	1.47E-09	1.55E-08	2.06E-10	1.47E-09	1.55E-08
TOLUENE	3.18E-06	1.39E-05	9.91E-05	3.29E-06	1.41E-05	9.97E-05
PYRIDINE	1.87E-07	8.69E-07	6.61E-06	1.93E-07	8.77E-07	6.65E-06
PHTHALIC ANHYDRIDE	5.95E-11	4.36E-10	4.67E-09	5.96E-11	4.36E-10	4.67E-09
METHYL STYRENE	1.37E-06	8.69E-06	8.53E-05	1.39E-06	8.71E-06	8.54E-05
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.55E-06	5.77E-06	3.02E-05	1.58E-06	5.95E-06	3.05E-05
ETHYLENE DICHLORIDE	2.37E-06	1.12E-05	8.45E-05	2.42E-06	1.14E-05	8.48E-05
HEXACHLOROBUTADIENE	4.85E-07	3.57E-06	3.84E-05	4.85E-07	3.56E-06	3.84E-05
1,1,2,2-TETRACHLOROETHANE	1.41E-07	9.71E-07	1.01E-05	1.42E-07	9.74E-07	1.01E-05
PHENOL	1.97E-10	1.45E-09	1.55E-08	1.97E-10	1.45E-09	1.55E-08
TOLUENE	1.63E-06	9.72E-06	9.13E-05	1.66E-06	9.83E-06	9.14E-05
PYRIDINE	1.04E-07	6.44E-07	6.19E-06	1.05E-07	6.49E-07	6.20E-06
PHTHALIC ANHYDRIDE	5.82E-11	4.32E-10	4.66E-09	5.83E-11	4.32E-10	4.66E-09
METHYL STYRENE	1.13E-06	8.04E-06	8.41E-05	1.14E-06	8.06E-06	8.41E-05
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.22E-05	3.13E-05	6.32E-05	1.24E-05	3.14E-05	6.38E-05
ETHYLENE DICHLORIDE	1.45E-05	4.02E-05	1.22E-04	1.47E-05	4.03E-05	1.23E-04
HEXACHLOROBUTADIENE	5.56E-07	3.74E-06	3.87E-05	5.58E-07	3.67E-06	3.87E-05
1,1,2,2-TETRACHLOROETHANE	2.84E-07	1.31E-06	1.05E-05	2.86E-07	1.32E-06	1.05E-05
PHENOL	2.23E-10	1.51E-09	1.56E-08	2.23E-10	1.51E-09	1.56E-08
TOLUENE	6.03E-06	2.04E-05	1.11E-04	6.12E-06	2.06E-05	1.13E-04
PYRIDINE	3.41E-07	1.22E-06	7.27E-06	3.46E-07	1.22E-06	7.35E-06
PHTHALIC ANHYDRIDE	6.19E-11	4.41E-10	4.68E-09	6.20E-11	4.41E-10	4.68E-09
METHYL STYRENE	1.81E-06	9.71E-06	8.72E-05	1.83E-06	9.71E-06	8.74E-05

AVERAGE INDIVIDUAL EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER)
FOR DRE = 99.90%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	8.11E-06	3.70E-05	2.71E-04	8.36E-06	3.73E-05	2.72E-04
ETHYLENE DICHLORIDE	1.54E-05	8.85E-05	8.10E-04	1.57E-05	8.88E-05	8.11E-04
HEXACHLOROBUTADIENE	4.80E-06	3.56E-05	3.84E-04	4.80E-06	3.56E-05	3.84E-04
1,1,2,2-TETRACHLOROETHANE	1.32E-06	9.44E-06	1.00E-04	1.32E-06	9.44E-06	1.00E-04
PHENOL	1.95E-09	1.44E-08	1.55E-07	1.95E-09	1.44E-08	1.55E-07
TOLUENE	1.31E-05	8.78E-05	8.96E-04	1.32E-05	8.80E-05	8.97E-04
PYRIDINE	8.66E-07	5.93E-06	6.11E-05	8.72E-07	5.94E-06	6.11E-05
PHTHALIC ANHYDRIDE	5.80E-10	4.31E-09	4.66E-08	5.80E-10	4.31E-09	4.66E-08
METHYL STYRENE	1.08E-05	7.90E-05	8.39E-04	1.08E-05	7.90E-05	8.39E-04
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	4.40E-06	2.71E-05	2.59E-04	4.44E-06	2.73E-05	2.59E-04
ETHYLENE DICHLORIDE	1.12E-05	7.73E-05	7.95E-04	1.13E-05	7.74E-05	7.96E-04
HEXACHLOROBUTADIENE	4.78E-06	3.55E-05	3.84E-04	4.78E-06	3.55E-05	3.84E-04
1,1,2,2-TETRACHLOROETHANE	1.27E-06	9.31E-06	1.00E-04	1.27E-06	9.31E-06	1.00E-04
PHENOL	1.94E-09	1.44E-08	1.55E-07	1.94E-09	1.44E-08	1.55E-07
TOLUENE	1.15E-05	8.36E-05	8.89E-04	1.16E-05	8.37E-05	8.89E-04
PYRIDINE	7.83E-07	5.70E-06	6.06E-05	7.84E-07	5.71E-06	6.07E-05
PHTHALIC ANHYDRIDE	5.78E-10	4.31E-09	4.66E-08	5.78E-10	4.31E-09	4.66E-08
METHYL STYRENE	1.06E-05	7.83E-05	8.37E-04	1.06E-05	7.83E-05	8.37E-04
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	1.51E-05	5.27E-05	2.92E-04	1.53E-05	5.28E-05	2.92E-04
ETHYLENE DICHLORIDE	2.33E-05	1.06E-04	8.33E-04	2.36E-05	1.06E-04	8.34E-04
HEXACHLOROBUTADIENE	4.85E-06	3.57E-05	3.84E-04	4.85E-06	3.56E-05	3.84E-04
1,1,2,2-TETRACHLOROETHANE	1.41E-06	9.65E-06	1.01E-04	1.41E-06	9.65E-06	1.01E-04
PHENOL	1.97E-09	1.45E-08	1.55E-07	1.97E-09	1.45E-08	1.55E-07
TOLUENE	1.59E-05	9.43E-05	9.09E-04	1.60E-05	9.44E-05	9.10E-04
PYRIDINE	1.02E-06	6.28E-06	6.17E-05	1.02E-06	6.28E-06	6.18E-05
PHTHALIC ANHYDRIDE	5.82E-10	4.32E-09	4.66E-08	5.82E-10	4.32E-09	4.66E-08
METHYL STYRENE	1.13E-05	8.00E-05	8.40E-04	1.13E-05	8.00E-05	8.41E-04

AVERAGE INDIVIDUAL EXPOSURE WITHIN 100 KM (PERSON-MICROGRAMS PER CUBIC METER)
FOR DRE = 99.00%

POLLUTANT	INCINERATION FACILITY					
	RK-1	RK-10	RK-150	LI-1	LI-10	LI-150
FOR EXPECTED FUGITIVE EMISSION SCENARIO						
CHLOROFORM	3.66E-05	2.50E-04	2.56E-03	3.69E-05	2.51E-04	2.56E-03
ETHYLENE DICHLORIDE	1.04E-04	7.49E-04	7.92E-03	1.04E-04	7.49E-04	7.92E-03
HEXACHLOROBUTADIENE	4.77E-05	3.55E-04	3.84E-03	4.77E-05	3.55E-04	3.84E-03
1,1,2,2-TETRACHLOROETHANE	1.26E-05	9.28E-05	1.00E-03	1.26E-05	9.28E-05	1.00E-03
PHENOL	1.94E-08	1.44E-07	1.55E-06	1.94E-08	1.44E-07	1.55E-06
TOLUENE	1.12E-04	8.27E-04	8.87E-03	1.12E-04	8.27E-04	8.87E-03
PYRIDINE	7.65E-06	5.65E-05	6.06E-04	7.66E-06	5.65E-05	6.06E-04
PHTHALIC ANHYDRIDE	5.78E-09	4.31E-08	4.66E-07	5.78E-09	4.31E-08	4.66E-07
METHYL STYRENE	1.05E-04	7.82E-04	8.37E-03	1.05E-04	7.82E-04	8.37E-03
FOR MINIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	3.29E-05	2.40E-04	2.54E-03	3.30E-05	2.41E-04	2.55E-03
ETHYLENE DICHLORIDE	1.00E-04	7.38E-04	7.91E-03	1.00E-04	7.38E-04	7.91E-03
HEXACHLOROBUTADIENE	4.77E-05	3.55E-04	3.84E-03	4.77E-05	3.55E-04	3.84E-03
1,1,2,2-TETRACHLOROETHANE	1.25E-05	9.26E-05	1.00E-03	1.25E-05	9.26E-05	1.00E-03
PHENOL	1.94E-08	1.44E-07	1.55E-06	1.94E-08	1.44E-07	1.55E-06
TOLUENE	1.11E-04	8.23E-04	8.86E-03	1.11E-04	8.23E-04	8.86E-03
PYRIDINE	7.57E-06	5.63E-05	6.05E-04	7.57E-06	5.63E-05	6.05E-04
PHTHALIC ANHYDRIDE	5.78E-09	4.31E-08	4.66E-07	5.78E-09	4.31E-08	4.66E-07
METHYL STYRENE	1.05E-04	7.81E-04	8.37E-03	1.05E-04	7.81E-04	8.37E-03
FOR MAXIMUM FUGITIVE EMISSION SCENARIO						
CHLOROFORM	4.36E-05	2.66E-04	2.58E-03	4.38E-05	2.66E-04	2.58E-03
ETHYLENE DICHLORIDE	1.12E-04	7.67E-04	7.94E-03	1.12E-04	7.67E-04	7.94E-03
HEXACHLOROBUTADIENE	4.78E-05	3.55E-04	3.84E-03	4.78E-05	3.55E-04	3.84E-03
1,1,2,2-TETRACHLOROETHANE	1.27E-05	9.30E-05	1.00E-03	1.27E-05	9.30E-05	1.00E-03
PHENOL	1.94E-08	1.44E-07	1.55E-06	1.94E-08	1.44E-07	1.55E-06
TOLUENE	1.15E-04	8.33E-04	8.88E-03	1.15E-04	8.33E-04	8.88E-03
PYRIDINE	7.81E-06	5.69E-05	6.06E-04	7.81E-06	5.69E-05	6.06E-04
PHTHALIC ANHYDRIDE	5.78E-09	4.31E-08	4.66E-07	5.78E-09	4.31E-08	4.66E-07
METHYL STYRENE	1.06E-04	7.83E-04	8.37E-03	1.06E-04	7.83E-04	8.37E-03

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100. Bob Scarberry, JRB Associates, 8400 Westpark Drive, McLean, Virginia 22102.
101. Brad Stachovik, Bureau of Air Management, Department of Natural Resources, P. O. Box 7921, Madison, Wisconsin 53707.
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86. Michael Drovencher, Environmental Impact Service, Quebec Environmental Department, 2360 Chenin-St. Foy, Quebec, Canada G1V4H2.
87. Richard Fisher, U.S. Environmental Protection Agency, Region 6, 1860 Lincoln Street, Denver, Colorado 80295.
88. Watson Gin, California Air Resources Board, P. O. Box 2815, Sacramento, California 95812.
89. Lauren Hall (TS-798), Exposure Assessment Branch, U.S. Environmental Protection Agency, OTS, 401 M Street, SW, Washington, DC 20460.
90. Brian Higgins, PEER Consultants, 1160 Rockville Pike, Suite 202, Rockville, Maryland 20852.
91. Jan Jablanski, JRB, Inc., 8400 W. Park Drive, McLean, Virginia 22101.
92. Ted Johnson, Pedco Environmental, Inc., Suite 503, 505 South Duke Street, Durham, North Carolina 27701.
93. Kathryn Kelly, 120 N. Washington Street, Tarrytown, New York 10591.
94. Joan Lefler (TS-798), Exposure Assessment Branch, U.S. Environmental Protection Agency, OTS, 401 M Street, SW, Washington, DC 20460.
95. Jim Lent, Technical Division, GCA, Inc., 500 Eastowne Drive, Suite 100, Chapel Hill, North Carolina 27514.
96. Terrence A. LiPuma, P.E., Engineering Science, 10521 Rosehaven Street, Fairfax, Virginia 22030.
97. Ramesh M. Naik, General Technology Division, E. Fishkill Route 52, Hopewell Junction, New York 12533.
98. John C. Reed, AQPS, DAPC, Illinois Environmental Protection Agency, 2200 Churchill Road, Springfield, Illinois 62706.
99. Brad Reynolds, Missouri D-NR, Air Pollution Control Program, P. O. Box 1368, Jefferson City, Missouri 65102.
100. Bob Scarberry, JRB Associates, 8400 Westpark Drive, McLean, Virginia 22102.
101. Brad Stachovik, Bureau of Air Management, Department of Natural Resources, P. O. Box 7921, Madison, Wisconsin 53707.
102. David Sussman, Treatment Branch (WH-565A), OSW, U.S. Environmental Protection Agency, 401 M Street, SW, Washington, DC 20460.
103. Andrew Trenholm, Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110.
104. Mark Turgeon, Treatment Branch (WH-565A), OSW, U.S. Environmental Protection Agency, 401 M Street, Washington, DC 20460.
105. Shelly Williamson, U.S. Environmental Protection Agency, EMSL, P. O. Box 15027, Las Vegas, Nevada 89114.
106. Gregory A. Holton, The MAXIMA Corporation, 107 Union Valley Road, Oak Ridge, Tennessee 37830.
107. Office of Assistant Manager for Energy Research and Development, DOE/ORO.

108-134. Technical Information Center, Oak Ridge, Tennessee 37831.