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**Initial Atmospheric Dispersion
Modeling in Support of the
Multiple-Site Incineration
Study**

G. A. Holton
C. A. Little
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Printed in the United States of America. Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road, Springfield, Virginia 22161
NTIS price codes—Printed Copy: A06; Microfiche A01

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ORNL/TM-8181

Contract W-7405-eng-26
HEALTH AND SAFETY RESEARCH DIVISION

ORNL/TM--8181

DE82 013372

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Date Published: April 1982

Prepared for the
U.S. ENVIRONMENTAL PROTECTION AGENCY
under Interagency Agreements DOE 40-1174-81
and EPA AD-89-F-1-768-0

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ACKNOWLEDGMENTS

It is a pleasure to acknowledge the assistance of Ms. Laurel J. Staley and Mr. Ben Smith of the U.S. Environmental Protection Agency. Their cooperation in both defining the scope of the study and reviewing its results has been very valuable. Special thanks are also given to Ms. Karen Galloway for her help in the formatting and preparation of the final report.

INITIAL ATMOSPHERIC DISPERSION MODELING IN SUPPORT OF THE MULTIPLE-SITE INCINERATION STUDY

G. A. Holton, C. A. Little, F. R. O'Donnell,
E. L. Ethier, and C. C. Travis

ABSTRACT

Several modeling series which estimate population exposure to stack emissions from incineration of hazardous materials at 22 commercial incinerator sites are presented. These modeling series can be divided into three groups. One group estimates long- and short-term atmospheric concentrations and population exposures for each of 22 sites. These modeling predictions can be used to assess chronic and acute exposure. The second group consists of sensitivity analyses which show the effect of changes in stack parameters on the number of people exposed to specified concentration levels. The third group compares concentration estimates of two atmospheric dispersion computer codes. Results of each modeling series are contained in the appendices of this report.

INTRODUCTION

The objective of this study was to estimate atmospheric concentrations and population exposures resulting from a unit stack release of primary organic hazardous constituents (POHC) at 22 commercial incinerator sites. A second goal was to investigate sensitivity of the results to variations in stack parameters. Eight modeling series (Table 1), utilizing the Industrial Source Complex (ISC) Dispersion Model (Bowers, Bjorklund, and Cheney, 1979) and the Human Exposure Model (HEM) (Anderson et al., 1980), were designed and implemented to meet the study objectives.

The eight series can be divided into three groups. One group (modeling series A through D) consists of model applications to estimate long- and short-term atmospheric POHC concentrations and population exposures that result from stack emissions for each of the 22 sites. The ISC model consists of two codes, ISCLT and ISCST, which calculate long- and short-term atmospheric concentration estimates, respectively.

Table 1. Modeling series performed for multiple-site incineration study

Modeling series	Averaging time	Model	Nature of modeling
A	1 y	ISCLT ^a	Annual-average atmospheric concentrations -- 22 sites
B	1 y	HEM ^b	Annual population exposure -- 22 sites
C	1 h	ISCST ^c	One-hour atmospheric concentrations -- 22 sites, worst-case meteorology
D	1 h	HEM	One-hour population exposure -- 22 sites, worst-case meteorology
E	1 y	HEM	Annual-average atmospheric concentrations -- stack parameter sensitivity test using Cincinnati MSD ^d
F	1 y	HEM	Annual population exposure -- stack parameter sensitivity test using Cincinnati MSD
G	1 h	ISCST	One-hour atmospheric concentrations -- stack parameter sensitivity test using Cincinnati MSD and worst-case meteorology
H	1 y	ISCLT	Comparison of HEM to ISCLT-HEM results -- 2 sites

^aIndustrial Source Complex Long Term Model (Bowers et al., 1979).

^bHuman Exposure Model (Anderson et al., 1980).

^cIndustrial Source Complex Short Term Model (Bowers et al., 1979).

^dCincinnati Municipal Sewer District Incinerator.

HEM also consists of two codes, one to calculate atmospheric concentrations and another to determine population exposures. Long-term annual-average concentrations were calculated using both the ISCLT and HEM codes. Short-term 1-h concentrations were calculated using the ISCST code. All exposures were calculated using the HEM code, regardless of the dispersion code used to calculate concentration estimates. Both chronic exposure using annual-average meteorological data and acute exposure using 1-h worst-case meteorological conditions were considered. The second group (series E through G) consists of an analysis to determine the sensitivity of atmospheric concentrations and population exposures to variations in stack parameters (stack height, stack gas velocity, and stack gas temperature). Of particular interest was the effect of changes in stack parameters on the number of people exposed to various concentration levels. Meteorological and demographic data from the Cincinnati Municipal Sewer District (MSD) incinerator site were used for this series. The third group (modeling series H) was designed to investigate differences in model predictions of two atmospheric dispersion codes.

For simplicity, terrain elevation, stack downwash-building wake effects, degradation, or deposition options in the HEM and ISC codes were not utilized, even though such processes may affect atmospheric concentrations. Results presented in this report should, therefore, be considered order-of-magnitude estimates only.

Data resulting from the series are contained in Appendices A through H. An overview of salient features of each modeling series follows.

MODELING SERIES A

Modeling series A used the Industrial Source Complex Long Term (ISCLT) model to estimate annual-average atmospheric concentrations of POHC at 22 incineration sites. Annual-average meteorology (NOAA, 1974) from the nearest Class I weather station was utilized for each site in conjunction with site-specific stack parameters. Site locations and

stack parameters are listed in Table 2. A "unit" POHC stack release rate of 100 g/s was employed for each site.

Appendix A lists estimated POHC concentrations ($\mu\text{g}/\text{m}^3$) for the 22 sites. Concentrations are estimated for each of 16 wind directions at distances of 0.2, 0.3, 0.5, 0.7, 1.0, 2.0, 5.0, 10.0, 15.0, and 20.0 km. These data demonstrate that considerable variability in maximum atmospheric concentration of POHC may occur between incinerator sites. Variations up to four orders of magnitude are apparent, and result from differences in meteorologic and stack parameters at the various locations.

MODELING SERIES B

Modeling series B used the exposure portion of HEM in conjunction with atmospheric concentrations estimated by the ISCLT model to calculate population exposure (person- $\mu\text{g}/\text{m}^3$) at the 22 incineration sites. Presented as cumulative values, population and population exposure estimates (Appendix B) are listed by level of atmospheric concentration. The gradation of atmospheric concentration is in multiples of 10.0, 5.0, and 2.5, which span and also include the minimum and maximum values as estimated by ISCLT (Appendix A).

Comparison of the concentration and population values helps put the collective exposure estimates into perspective. Exposure is the product of concentration and exposed population. Incinerators are normally sited in locations of low population density, so at close-in locations where concentrations are highest, few people are exposed and total exposure is low. At more distant locations, even though the concentration is less, total exposure is much higher since more people are exposed. Consequently, for most incinerator sites, the distribution of population surrounding a site is the most important component of exposure calculations. Furthermore, exposure values alone may give a distorted view of the potential for health effects if a concentration threshold for the health effect exists. A site such as MSD with a much larger population exposed to higher concentrations may be more apt to result in measureable health effects than the L20 site which has about the same cumulative

Table 2. Location and description of employed meteorology and incinerator sites

Plant	Latitude			Longitude			Nearest meteorologic station			Distance to site (km)	Stack parameters ^a		
	deg	min	s	deg	min	s	Location	Data years	STAR number		Gas temperature (°C)	Diameter (m)	Height (m)
RK1	32	47	30	88	18	45	Meridian, MS	66-70	13865	65.4	50	1.0	9.1
RL2	33	14	38	92	18	45	Eldorado, AR	50-54	93992	45.4	50	1.7	24.4
L3	38	19	35	81	40	29	Charleston, WV	68-73	13866	7.9	250	0.43	4.6
L4	42	15	00	89	03	10	Rockford, IL	70-74	94833	6.8	250	0.52	9.1
L5	41	39	21	87	41	56	Chicago, IL	70-74	94846	40.0	50	0.51	9.1
RL6	33	02	50	88	21	12	Columbus, MS	66-70	13825	67.6	50	1.80	24.4
R7	30	33	35	91	15	40	Baton Rouge, LA	70-74	13970	10.8	50	1.65	24.4
FB8	44	22	12	68	30	30	Old Town, ME	60-64	14622	65.7	50	0.48	24.4
L9	39	14	11	76	34	41	Ft. Meade, MD	60-64	93733	23.5	250	0.30	4.6
L10	41	58	20	71	01	20	South Weymouth, MA	70-74	14790	21.1	50	1.15	24.4
RL11	42	13	57	70	58	40	South Weymouth, MA	70-74	14790	9.9	250	0.63	9.1
L12	42	39	00	83	05	10	Detroit, MI	70-74	14722	26.5	50	1.98	24.4
L13	42	37	10	85	37	20	Muskegon, MI	74	14840	93.7	250	0.43	4.6
R14	39	46	00	75	22	00	Philadelphia, PA	67-71	13739	16.3	50	1.62	24.4
L15	35	52	40	81	27	40	Charlotte, NC	69-73	13881	87.6	50	0.53	9.1
L16	41	16	40	82	03	15	Cleveland, OH	70-74	14820	21.8	50	0.81	9.1
L17	34	57	25	80	57	32	Charlotte, NC	69-73	13881	29.0	50	0.81	9.1
R18	29	45	50	95	09	00	Houston, TX	66-70	12906	16.4	50	1.62	24.4
L19	30	13	00	96	08	00	Houston, TX	71-75	12960	78.1	50	0.74	9.1
L20	37	28	53	77	25	06	Richmond, VA	74-75	13740	7.8	50	0.96	9.1
MSD	39	06	07	84	30	35	Dayton, OH	64	13840	88.9	90	2.1	24.4
R21	34	45	20	84	57	22	Chattanooga, TN	68-73	13882	38.0	250	0.65	9.1

*A gas velocity of 8.2 m/s was used at all sites except MSD, where a value of 6.4 m/s was used.

exposure, but with many more people exposed to relatively low concentrations of POHC.

Also included in Appendix B are results of a multiple-source modeling run. Population exposure estimates for stack releases from ten incinerators located in an industrialized urban area were made using the ISCLT-HEM models. Site descriptions and stack parameters for the ten incinerators are listed in Table 3. Concentration estimates ranged from a high of $1.74\text{E}+02$ to a low of $3.49\text{E}-03$ $\mu\text{g}/\text{m}^3$. Overall population exposure was not ten times that of a single incinerator located in a similar region (site R7, Table B.1) even when releases were normalized. This observation reinforces the importance of incinerator location relative to population distribution and augments the value of site-specific studies, especially in the case of multiple incinerators in the same locale.

Table 3. Description of stack parameters for incinerator sites located in a concentrated industrialized area

Plant	Stack parameters				Pollutant loading (g/s)
	Gas temperature (°C)	Gas velocity (m/s)	Diameter (m)	Height (m)	
1	50	8.2	1.0	9.1	14.0
2	250	8.2	0.30	4.6	1.2
3	50	8.2	1.98	24.4	100.0
4	50	8.2	1.62	24.4	35.0
5	50	8.2	0.53	9.1	6.6
6	50	8.2	0.81	9.1	16.0
7	50	8.2	0.81	9.1	14.0
8	50	8.2	1.62	24.4	35.0
9	50	8.2	0.74	9.1	14.0
10	50	8.2	0.51	9.1	5.5

MODELING SERIES C

Modeling series C used the Industrial Source Complex Short Term (ISCST) model with 1-h worst-case meteorology to estimate downwind atmospheric concentrations at 22 incineration sites. A POHC stack release rate of 100 g/s was used at each site. Stack parameters and site locations are listed in Table 2.

Worst-case meteorology is defined as that which maximizes population exposure on a 1-h basis (by producing the largest concentrations at locations greater than 2 km downwind from the site — not conditions which maximize exposure to a few, close-in receptors). To determine the appropriate worst-case meteorology, a number of model runs were performed with various wind speeds and stability categories. Stack parameters used were those of the Cincinnati MSD Incinerator. Table 4 contains the downwind concentrations from this site at several distances for the various meteorological conditions studied. As can be seen, stability class A with wind speeds of 1 m/s produced the largest concentrations at distances greater than 2 km and was selected as the worst-case meteorology. This condition is not unreasonable in Cincinnati for it occurs with frequency 0.343% of the time (ten 3-h periods per year).

Stability class A conditions are characterized by much vertical and horizontal mixing. Such conditions occur on hot, calm, sunny, summer afternoons. Under such conditions, winds are not associated with any one direction and plumes will spread out randomly from the plant. With persistent low wind speeds, the atmospheric pollutant loading will continue to build up, producing maximum concentrations in all directions. For short periods of time, these worst-case conditions are considered to be reasonable and applicable at all sites studied. However, it is noted that unusual, site-specific peculiarities of population distribution could result in less than maximum exposure even under worst-case meteorology conditions.

Concentrations estimated using the above-described site and stack characteristics and meteorology are listed in Appendix C for each of the 22 sites. Maximum atmospheric concentrations ($\mu\text{g}/\text{m}^3$) of POHC occurred within 700 m of the stack in all cases and within 300 m at 50% of the

Table 4. Downwind concentration ($\mu\text{g}/\text{m}^3$) profiles used to determine worst-case meteorology^a

Stability	Wind Speed (m/s)	Distance downwind, km									
		0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
A	1.0	0.022	4.46	391.0	<u>439.0</u>	<u>232.0</u>	114.0	<u>44.6</u>	<u>21.4</u>	<u>13.7</u>	<u>9.85</u>
A	2.0	80.0	303.0	<u>546.0</u>	282.0	118.0	56.9	22.3	10.7	6.83	4.93
A	3.0	365.0	572.0	453.0	198.0	79.1	37.9	14.9	7.13	4.56	3.28
A	4.0	589.0	<u>646.0</u>	370.0	152.0	59.4	28.4	11.2	5.35	3.42	2.46
A	5.0	701.0	636.0	309.0	123.0	47.6	22.7	8.93	4.28	2.73	1.97
A	6.0	741.0	600.0	265.0	103.0	39.7	19.0	7.44	3.56	2.28	1.64
A	7.0	<u>743.0</u>	558.0	230.0	88.7	34.0	16.2	6.38	3.05	1.95	1.41
A	8.0	727.0	517.0	204.0	77.8	29.8	14.2	5.58	2.67	1.71	1.23
A	9.0	701.0	479.0	183.0	69.3	26.5	12.6	4.96	2.38	1.52	1.09
A	12.0	613.0	388.0	139.0	52.2	19.8	9.48	3.72	1.78	1.14	0.821
B	1.0	0.0	0.0007	10.7	106.0	220.0	<u>131.0</u>	34.6	15.1	9.10	6.24
B	6.0	313.0	425.0	357.0	223.0	117.0	28.0	5.77	2.52	1.52	1.04
D	5.0	0.0004	0.072	3.95	9.64	11.3	4.83	0.696	0.114	0.035	0.014
F	2.0	0.0	0.0	0.0	0.0	0.0	0.00005	0.00001	0.0	0.0	0.0

^aUnderscored values had the highest concentration in the downwind direction for a given distance.

sites. The maximum χ/Q ranged from 4.2×10^{-6} (700 m at MSD) to 1.1×10^{-4} (200 m at L9). The values and downwind locations of maximum concentrations are related to stack diameter, stack height, stack gas exit velocity, and stack gas exit temperature, as expected from dispersion modeling theory. Such expectations include lower downwind concentrations with higher stack height, larger stack diameter (with stack gas velocity held constant), higher stack gas exit velocity, and higher stack gas exit temperature.

MODELING SERIES D

Using worst-case atmospheric concentrations calculated in modeling series C, and the exposure portion of HEM, exposure estimates were calculated for each site (Appendix D). As in series B, population and exposure estimates at the various concentration levels are presented as cumulative sums.

As expected, this simulation series showed an increased level of cumulative exposure for each site relative to modeling series B which used annual-average meteorology. Cumulative exposures in this series ranged from 1.7 times the exposure values for series B (site L9) to 9.4 times the B series value (for site L12). The differences are directly attributable to the use in series D of concentration estimates from Appendix C which were generated with worst-case meteorology.

MODELING SERIES E

A sensitivity analysis was performed for the Cincinnati MSD incineration site to show the effect of changes in stack height, stack gas temperature, and stack gas velocity on atmospheric concentrations predicted by HEM. Annual-average meteorology was used, along with a constant stack diameter of 2.13 m and other variable stack parameters as listed in Table 5. The sensitivity analysis (Appendix E) indicates that HEM is insensitive to stack gas temperature [runs 1 vs 3, 2 vs 4, 5 vs 7, and 6 vs 8 (Figure 1)] and relatively insensitive to stack gas velocity [runs 1 vs 2, 3 vs 4, 5 vs 6, and 7 vs 8 (Figure 2)]. In fact, no

Table 5. Stack parameters for sensitivity analysis

Run	Stack height (m)	Stack gas velocity (m/s)	Stack gas temperature (°K)
1	4.57	4.57	323
2	4.57	15.20	323
3	4.57	4.57	723
4	4.57	15.20	723
5	24.4	4.57	323
6	24.4	15.20	323
7	24.4	4.57	723
8	24.4	15.20	723

AIR CONCENTRATION SENSITIVITY ANALYSIS

Figure 1. The effect of changing stack gas temperature on HEM-predicted maximum air concentrations (see Table 5 for stack parameters).

AIR CONCENTRATION SENSITIVITY ANALYSIS

Figure 2. The effect of changing stack gas velocity on HEM-predicted maximum air concentrations (see Table 5 for stack parameters).

differences exist between the low-temperature and the high-temperature runs. These findings are not consistent with dispersion theory and indicate face-validity problems in HEM — the higher temperature runs should produce lower downwind concentrations because the plume rise of such runs should be greater. This discrepancy indicates that there may be logical or computational problems in HEM. The small concentration differences seen in the stack gas velocity runs are consistent with theory; lower downwind concentrations result from plumes with higher momentum. The final parameter tested, stack height, shows that shorter stacks produce significantly higher downwind concentrations [runs 1 vs 5, 2 vs 6, 3 vs 7, and 4 vs 8 (Figure 3)], again consistent with dispersion theory.

Two conclusions can be drawn from the stack gas parameter sensitivity test. First, HEM may have computational problems in the buoyant plume rise portion of the model. Second, because of possible difficulties in plume rise calculations, the atmospheric concentration estimates are subject to uncertainty and should be used as approximate values only. HEM results are studied in more detail in a comparison test in modeling series H.

MODELING SERIES F

A sensitivity analysis was performed at the Cincinnati MSD incineration site to show the effect of changes in stack height, stack gas temperature, and stack gas velocity on population exposures predicted by HEM. Atmospheric concentration estimates from modeling series E were used in conjunction with the exposure portion of HEM to predict population exposures (Appendix F). Results of the sensitivity analysis show that about 31% higher population exposure occurs from emissions when the stack height is lowered from 24.4 m to 4.6 m (Figure 4). Changes in stack gas velocity from 4.6 to 15.2 m/s decreased exposure only slightly [$<2\%$ (Figure 5)], and the model calculated no exposure difference when the stack gas temperature was raised from 323°K to 723°K (Figure 6). These results are consistent with predicted air concentrations but, as stated earlier, they indicate face-validity problems in HEM.

AIR CONCENTRATION SENSITIVITY ANALYSIS

Figure 3. The effect of changing stack height on HEM-predicted maximum air concentrations (see Table 5 for stack parameters).

POPULATION EXPOSURE SENSITIVITY ANALYSIS

Figure 4. The effect of changing stack height on HEM-predicted total population exposure (see Table 5 for stack parameters).

POPULATION EXPOSURE SENSITIVITY ANALYSIS

Figure 5. The effect of changing stack gas velocity on HEM-predicted total population exposure (see Table 5 for stack parameters).

POPULATION EXPOSURE SENSITIVITY ANALYSIS

Figure 6. The effect of changing stack gas temperature on HEM-predicted total population exposure (see Table 5 for stack parameters).

MODELING SERIES G

Using conditions listed in Table 5, a sensitivity analysis was performed to determine the effect of changes in stack parameters on atmospheric concentrations predicted with the ISCST model and worst-case meteorology (stability class A, wind speed 1.0 m/s). Results of these model runs (Appendix G) show that the ISCST model was sensitive to all stack parameters tested. The effect of stack parameters on population exposure was not determined for this series.

Modeling runs for this series show the effects of varying effective stack height (stack height and plume rise). Plume rise has buoyancy and momentum components. Buoyancy is increased with increased temperature, while momentum is increased with increased stack gas velocity. With increased plume rise, the location of ground interception by the plume is further downwind. Because stability class A conditions are applied uniformly in this modeling series, the dispersion coefficients are the same from one run to another, so the amount of dispersion which occurs is directly dependent on the final effective height of the plume.

Increased stack height [runs 1 vs 5, 2 vs 6, and 3 vs 7 (Figure 7)] resulted in a slight decrease in atmospheric concentrations. Increased stack gas velocity yielded decreased atmospheric concentrations to downwind distances of about 2 km [runs 1 vs 2, 3 vs 4, 5 vs 6, and 7 vs 8 (Figure 8)]. Increased stack gas temperature [runs 1 vs 3, 2 vs 4, 5 vs 7, and 6 vs 8 (Figure 9)] greatly decreased the atmospheric concentrations within a radius of 1 km, but generally had little effect beyond that distance. Changes in stack temperature made the largest numerical differences in concentration close in [as much as six orders of magnitude (run 1 vs 3 at 0.2 km)]. Stack gas velocity was the next most important (about 10^5 difference at 0.2 km) and stack height was relatively unimportant (less than an order of magnitude change).

All results are consistent with dispersion modeling theory, except results of runs 4 and 8. Both of these runs have high stack temperature and velocity, but varied in stack height. Not only are the resultant concentrations extremely low ($<5 \times 10^{-6}$ $\mu\text{g}/\text{m}^3$ at all but one distance), but the higher stack (run 8) has the larger expressed value. We presently

AIR CONC. SENS. ANAL. - WORST CASE MET.

Figure 7. The effect of changing stack height on ISCST-predicted maximum air concentrations for several modeling runs.

AIR CONC. SENS. ANAL. -WORST CASE MET.

Figure 8. The effect of changing stack gas velocity on ISCST-predicted maximum air concentrations for several modeling runs.

AIR CONC. SENS. ANAL. - WORST CASE MET.

Stack Gas Temperature Effects

Figure 9. The effect of changing stack gas temperature on ISCST-predicted maximum air concentrations for several modeling runs.

have no explanation for this anomaly. Nevertheless, results of other runs appear reasonable with the effect that highest concentrations ($1286 \mu\text{g}/\text{m}^3$ at 0.5 km) occur under conditions of low stack height, low stack gas temperature, and low stack gas velocity.

MODELING SERIES H

Two sites — MSD and R18 — were simulated using the same meteorology and both the HEM and ISCLT computer codes for comparison. Results (Appendix H) show that, close to a point source (at 0.20 km), HEM produces concentration estimates over 100 times higher than ISCLT model estimates. Concentrations at 20-km downwind are of the same magnitude, with the ISCLT code estimates being slightly higher in all cases.

The comparison of HEM and ISCLT codes was extended to consider population exposure. In both cases, population exposure was estimated using the exposure portion of HEM. For the Cincinnati MSD site, total exposure estimates were higher using HEM, while for site R18, ISCLT-HEM estimates were higher. In each case, proximity of the population to the point of pollutant release has a greater influence on the estimate than the air concentrations estimated by the two methodologies. Despite these differences, under most circumstances, HEM and ISCLT codes produce population exposure estimates that are of the same order of magnitude.

SUMMARY AND RECOMMENDATIONS

This report lists and briefly describes results of eight model simulation series designed to estimate atmospheric pollutant concentrations and/or population exposures from stack releases of unnamed primary organic hazardous constituents (POHC) at 22 commercial incinerator sites. Eight series of model applications were made for three specific purposes. The first purpose was to estimate both long- and short-term POHC concentrations in the atmosphere, and resulting population exposures at each of the 22 sites (series A-D). The second purpose was to indicate the sensitivity of predicted atmospheric concentrations and population exposures to stack height, stack gas velocity, and stack gas temperature (series E-G). The

final purpose was to compare concentration estimates made with ISCLT and HEM models and to document any differences (series H).

Most concentration estimates made with the models appeared to be consistent with dispersion modeling theory. However, the predicted concentrations should be viewed with caution for several reasons. For instance, the simulations presented did not consider the effects of changes in elevation, building-wake effects, atmospheric deposition, or chemical degradation. Furthermore, the magnitude of the source was assumed to be 100 g/s, a value which is likely to be several orders of magnitude too large.

Population exposures were found to be largely a function of the spatial distribution of population and less a function of atmospheric dispersion. The location of an incinerator determines this population distribution. Consequently, population exposure estimates should likely be considered when siting or regulating an incinerator.

The sensitivity analyses performed generally indicated that the models respond as might be expected from dispersion theory. A few findings are worth reiterating, however. In modeling series E, the analysis indicates that HEM is totally insensitive to even large changes in stack gas temperature. These results seem to indicate that there may be some problem in HEM with the methodology, or its implementation, for calculation of plume rise. Consequently, in modeling series F which used modeling series E as input, population exposures calculated by HEM were found to be completely insensitive to stack gas temperature, only slightly sensitive to stack gas velocity, and somewhat sensitive to stack height.

It is somewhat surprising, given the apparent face-validity problems in the dispersion portion of HEM, that the population exposures generated by ISCLT and HEM were within 20% of each other. However, given the fact that the exposure portion of HEM was used for both models and that in urban situations population distribution is often more important than pollutant dispersion in determining total exposure, the agreement is not unreasonable. Furthermore, most population exposure occurs far from the site. ISC and HEM atmospheric concentration predictions are of the same order of magnitude for these distant locations. Consequently, total

exposure calculations by both codes are within 20% even though close-in population exposure predictions are more than a factor of two different.

Regarding code utilization, especially at sites remote from Research Triangle Park, this work has generated several recommendations. First, there is a need for a system of automated input of meteorology data to the ISC model. As it now stands, a user must hand-input the basic meteorological data because there is no system of electronic data entry by files. This results in poor use of time and an increased level of inaccuracy because of input errors. Likewise, there is a need for automated input of concentration profiles into the exposure portion of HEM. Currently a user must hand-enter the concentrations generated by some other program (e.g., ISCLT, ISCST) into the HEM. Finally, given the possible inaccuracies with plume rise calculations and population-concentration interpolation schemes in the HEM and the difficulties in using the HEM remotely, we would recommend development of a model system that is more accurate, more transferable between sites, and more completely documented.

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Appendix A

ATMOSPHERIC CONCENTRATION ESTIMATES FOR SELECTED MATERIALS
FROM 22 INCINERATION SITES USING THE ISCLT COMPUTER CODE
UNDER ANNUAL METEOROLOGY CONDITIONS

Table A.1. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site RK1 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	2.4760+002	3.3540+002	3.0870+002	2.6690+002	2.3140+002	1.3490+002	4.4700+001	1.7270+001	9.7920+000	6.5190+000
SSW	1.2860+002	1.7270+002	1.6570+002	1.5010+002	1.3730+002	8.3890+001	2.8340+001	1.1010+001	6.2640+000	4.1770+000
SW	1.0460+002	1.2260+002	1.0490+002	8.8140+001	7.4810+001	4.2680+001	1.3960+001	5.3710+000	3.0440+000	2.0290+001
WSW	1.1120+002	1.2050+002	9.5270+001	7.6370+001	6.1960+001	3.3860+001	1.0830+001	4.1360+000	2.3380+000	1.5580+000
W	1.1620+002	1.3020+002	1.0520+002	8.5670+001	7.0900+001	3.9670+001	1.2860+001	4.9360+000	2.7950+000	1.8630+000
WNW	1.2480+002	1.5300+002	1.3230+002	1.1160+002	9.5370+001	5.5000+001	1.8130+001	7.0030+000	3.9730+000	2.6480+000
NW	1.5330+002	1.9810+002	1.7710+002	1.5100+002	1.2960+002	7.4920+001	2.4750+001	9.5630+000	5.4250+000	3.6130+000
NNW	2.5540+002	3.2670+002	2.8370+002	2.3160+002	1.8690+002	1.0120+002	3.2400+001	1.2390+001	7.0070+000	4.6600+000
N	2.4320+002	2.9870+002	2.4980+002	1.9660+002	1.5080+002	7.6880+001	2.3840+001	9.0200+000	5.0820+000	3.3750+000
NNE	1.3940+002	1.5760+002	1.2400+002	9.2910+001	6.6870+001	3.1370+001	9.2390+000	3.4310+000	1.9220+000	1.2740+000
NE	1.1550+002	1.3050+002	1.0320+002	7.7240+001	5.5380+001	2.5820+001	7.5720+000	2.8120+000	1.5770+000	1.0470+000
ENE	1.0230+002	1.1570+002	9.1030+001	6.7930+001	4.8720+001	2.2760+001	6.6850+000	2.4830+000	1.3920+000	9.2380+001
E	1.0280+002	1.1600+002	9.1570+001	6.8760+001	4.9820+001	2.3620+001	7.0010+000	2.6040+000	1.4600+000	9.6840+001
ESE	1.0830+002	1.2530+002	1.0150+002	7.7590+001	5.7160+001	2.7590+001	8.2480+000	3.0770+000	1.7260+000	1.1450+000
SE	1.3230+002	1.5500+002	1.2480+002	9.5980+001	7.1960+001	3.5750+001	1.0890+001	4.0870+000	2.2960+000	1.5240+000
SSE	2.4540+002	3.1520+002	2.7180+002	2.2210+002	1.8040+002	9.8610+001	3.1690+001	1.2120+001	6.8480+000	4.5520+000

Table A.2. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site RL2 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	6.5400+000	1.9690+001	3.9860+001	4.7660+001	4.6270+001	3.1830+001	1.4450+001	6.4290+000	3.8310+000	2.6210+000
SSW	6.0050+000	1.7730+001	3.1370+001	3.4380+001	3.1430+001	2.0820+001	9.4610+000	4.2340+000	2.5320+000	1.7370+000
SW	5.0480+000	2.4380+001	2.3490+001	2.4600+001	2.2030+001	1.4960+001	7.1020+000	3.2340+000	1.9470+000	1.3410+000
WSW	3.8980+000	1.0910+001	1.8210+001	1.9270+001	1.7150+001	1.0930+001	4.8440+000	2.1650+000	1.2970+000	8.9140-001
W	2.7080+000	7.9240+000	1.4800+001	1.6660+001	1.5270+001	9.4810+000	3.9760+000	1.7410+000	1.0350+000	7.0850-001
WNW	1.8400+000	6.0570+000	1.2990+001	1.5500+001	1.4800+001	9.5800+000	4.0860+000	1.7850+000	1.0580+000	7.2180-001
NW	1.9420+000	6.5030+000	1.4690+001	1.7900+001	1.7350+001	1.1610+001	5.1160+000	2.2580+000	1.3430+000	9.1730-001
NNW	2.1840+000	7.4880+000	1.7030+001	2.0770+001	2.0080+001	1.3480+001	6.0100+000	2.6660+000	1.5880+000	1.0860+000
N	3.6840+000	1.2130+001	2.6750+001	3.2590+001	3.1610+001	2.1210+001	9.3990+000	4.1500+000	2.4660+000	1.6840+000
NNE	4.0610+000	1.2860+001	2.7240+001	3.3120+001	3.2510+001	2.2780+001	1.0540+001	4.7140+000	2.8110+000	1.9240+000
NE	3.4520+000	1.0230+001	1.9750+001	2.4040+001	2.4340+001	1.8640+001	9.3050+000	4.2610+000	2.5610+000	1.7590+000
ENE	3.3580+000	9.5980+000	1.7640+001	2.0980+001	2.0860+001	1.5710+001	7.8540+000	3.6180+000	2.1820+000	1.5030+000
E	2.5160+000	7.3260+000	1.3820+001	1.5690+001	1.6820+001	1.3090+001	6.7400+000	3.1350+000	1.8970+000	1.3080+000
ESE	3.1280+000	9.4360+000	1.9560+001	2.5330+001	2.7230+001	2.3020+001	1.2210+001	5.6780+000	3.4300+000	2.3620+000
SE	4.0150+000	1.2450+001	2.7890+001	3.6950+001	3.9680+001	3.2290+001	1.6490+001	7.5710+000	4.5520+000	3.1270+000
SSE	5.4220+000	1.6560+001	3.7010+001	4.7740+001	4.9300+001	3.6790+001	1.7570+001	7.9180+000	4.7340+000	3.2420+000

Table A.3. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L3 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	6.4250+002	5.7190+002	4.0270+002	3.1250+002	2.2210+002	9.6180+001	2.7020+001	1.0100+001	5.6960+000	3.8510+000
SSW	8.4580+002	6.9350+002	4.3670+002	3.1110+002	2.0690+002	8.4130+001	2.2730+001	8.3250+000	4.6580+000	3.1280+000
SW	1.0770+003	8.5180+002	5.0380+002	3.3820+002	2.1460+002	8.2810+001	2.1590+001	7.7700+000	4.3130+000	2.8770+000
WSW	8.5500+002	6.7770+002	3.9800+002	2.6620+002	1.6750+002	6.4440+001	1.6710+001	5.9710+000	3.3020+000	2.1930+000
W	5.7880+002	4.7850+002	2.9230+002	2.0080+002	1.2940+002	5.1060+001	1.3430+001	4.8220+000	2.6700+000	1.7760+000
WNW	3.3710+002	2.9310+002	1.8580+002	1.2930+002	8.4050+001	3.3320+001	8.7740+000	3.1570+000	1.7520+000	1.1660+000
NW	2.6230+002	2.3260+002	1.5470+002	1.1330+002	7.7270+001	3.2180+001	8.7460+000	3.2000+000	1.7890+000	1.1990+000
NNW	3.2720+002	3.0630+002	2.2660+002	1.8180+002	1.3290+002	5.8970+001	1.6620+001	6.1890+000	3.4860+000	2.3510+000
N	3.3410+002	3.2330+002	2.5400+002	2.1260+002	1.5960+002	7.2430+001	2.0730+001	7.7920+000	4.4070+000	2.9840+000
NNE	4.2080+002	4.1450+002	3.5180+002	3.1260+002	2.4300+002	1.1360+002	3.3160+001	1.2600+001	7.1610+000	4.8710+000
NE	4.4600+002	4.4410+002	4.1310+002	3.9350+002	3.1870+002	1.5400+002	4.5650+001	1.7450+001	9.9370+000	6.7700+000
ENE	3.0460+002	3.1370+002	3.3550+002	3.4770+002	2.9470+002	1.4730+002	4.4420+001	1.7100+001	9.7590+000	6.6600+000
E	2.8750+002	2.9560+002	3.0440+002	3.0870+002	2.5870+002	1.2840+002	3.8730+001	1.4920+001	8.5190+000	5.8150+000
ESE	3.0030+002	2.8830+002	2.5660+002	2.4040+002	1.9340+002	9.3250+001	2.7770+001	1.0640+001	6.0630+000	4.1310+000
SE	2.9450+002	2.6450+002	2.0900+002	1.8220+002	1.4060+002	6.5720+001	1.9250+001	7.3170+000	4.1530+000	2.8210+000
SSE	5.3200+002	4.7530+002	3.4310+002	2.7370+002	1.9860+002	8.7790+001	2.4970+001	9.3830+000	5.3040+000	3.5910+000

Table A.4. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L4 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	2.7810+002	3.7340+002	3.3200+002	2.6810+002	1.9900+002	9.7000+001	2.9880+001	1.1580+001	6.6250+000	4.5130+000
SSW	1.9060+002	2.3280+002	1.9020+002	1.4530+002	1.0370+002	4.7760+001	1.4200+001	5.4240+000	3.0860+000	2.0950+000
SW	1.5950+002	1.8540+002	1.4510+002	1.0820+002	7.4160+001	3.2530+001	9.3560+000	3.5200+000	1.9910+000	1.3460+000
WSW	2.0510+002	2.3640+002	1.7800+002	1.2910+002	8.6470+001	3.7040+001	1.0510+001	3.9220+000	2.2110+000	1.4900+000
W	2.6220+002	3.0560+002	2.2690+002	1.6190+002	1.0610+002	4.3900+001	1.2130+001	4.4730+000	2.5070+000	1.6800+000
WNW	2.3660+002	2.8360+002	2.1510+002	1.5460+002	1.0150+002	4.1770+001	1.1490+001	4.2290+000	2.3680+000	1.5860+000
NW	1.8360+002	2.2720+002	1.8070+002	1.3350+002	8.9930+001	3.8280+001	1.0800+001	4.0280+000	2.2690+000	1.5280+000
NNW	1.7450+002	2.1660+002	1.7230+002	1.2700+002	8.5180+001	3.5590+001	1.0090+001	3.7510+000	2.1120+000	1.4210+000
N	1.5670+002	1.9560+002	1.5310+002	1.1120+002	7.3510+001	3.0440+001	8.3950+000	3.0940+000	1.7350+000	1.1640+000
NNE	1.0090+002	1.2920+002	1.0260+002	7.5310+001	5.0570+001	2.1590+001	6.0870+000	2.2660+000	1.2750+000	8.5750-001
NE	1.0060+002	1.3040+002	1.0650+002	8.0200+001	5.5770+001	2.5190+001	7.3930+000	2.7980+000	1.5840+000	1.0700+000
ENE	1.4740+002	1.9390+002	1.6220+002	1.2540+002	9.0070+001	4.2640+001	1.2900+001	4.9460+000	2.8140+000	1.9080+000
E	1.3050+002	1.7360+002	1.4780+002	1.1580+002	8.4330+001	4.0670+001	1.2450+001	4.8040+000	2.7420+000	1.8620+000
ESE	1.0340+002	1.3870+002	1.1860+002	9.2290+001	6.6240+001	3.1100+001	9.3680+000	3.5900+000	2.0440+000	1.3850+000
SE	1.3020+002	1.7850+002	1.5850+002	1.2590+002	9.3500+001	4.5310+001	1.3910+001	5.3700+000	3.0660+000	2.0840+000
SSE	2.4290+002	3.3860+002	3.1150+002	2.5570+002	1.9260+002	9.5400+001	2.9670+001	1.1540+001	6.6080+000	4.5040+000

Table A.5. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L5 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	8.7640+002	8.2400+002	5.3630+002	3.6240+002	2.2360+002	8.1950+001	2.0400+001	7.1240+000	3.8960+000	2.5440+000
SSW	5.3250+002	4.9710+002	3.2640+002	2.2250+002	1.3840+002	5.1010+001	1.2730+001	4.4550+000	2.4400+000	1.5960+000
SW	4.7250+002	4.3450+002	2.8260+002	1.9200+002	1.1920+002	4.3830+001	1.0920+001	3.8140+000	2.0880+000	1.3650+000
WSW	5.1910+002	4.8340+002	3.1840+002	2.1850+002	1.3680+002	5.0870+001	1.2750+001	4.4620+000	2.4430+000	1.5970+000
W	4.7200+002	4.4460+002	2.9490+002	2.0310+002	1.2750+002	4.7540+001	1.1940+001	4.1820+000	2.2910+000	1.4970+000
WNW	3.7410+002	3.5520+002	2.3290+002	1.5810+002	9.7850+001	3.5960+001	8.9460+000	3.1220+000	1.7070+000	1.1140+000
NW	3.1570+002	2.9560+002	1.9030+002	1.2770+002	7.8230+001	2.8450+001	7.0250+000	2.4420+000	1.3330+000	8.6910-001
NNW	3.4100+002	3.1010+002	1.9410+002	1.2830+002	7.7720+001	2.8010+001	6.8670+000	2.3720+000	1.2900+000	8.3940-001
N	3.4060+002	3.0510+002	1.8880+002	1.2410+002	7.4880+001	2.6870+001	6.5650+000	2.2620+000	1.2290+000	7.9930-001
NNE	3.1010+002	2.7040+002	1.6480+002	1.0780+002	6.4800+001	2.3150+001	5.6310+000	1.9370+000	1.0520+000	6.8390-001
NE	3.7950+002	3.3540+002	2.0790+002	1.3730+002	8.3110+001	2.9850+001	7.2830+000	2.5080+000	1.3630+000	8.8690-001
ENE	3.8795+002	3.5340+002	2.2500+002	1.5040+002	9.1980+001	3.3320+001	8.1850+000	2.8310+000	1.5420+000	1.0050+000
E	2.8330+002	2.6840+002	1.7690+002	1.2050+002	7.4790+001	2.7540+001	6.8490+000	2.3860+000	1.3030+000	8.5070-001
ESE	2.2660+002	2.2390+002	1.5210+002	1.0500+002	6.5890+001	2.4530+001	6.1520+000	2.1540+000	1.1800+000	7.7060-001
SE	2.6310+002	2.5140+002	1.6540+002	1.1240+002	6.9630+001	2.5620+001	6.3750+000	2.2240+000	1.2160+000	7.9350-001
SSE	7.1170+002	6.6550+002	4.2960+002	2.8880+002	7.7430+001	6.4820+001	1.6090+001	5.6090+000	3.0650+000	1.9990+000

Table A.6. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site RL6 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	4.4230+000	1.4000+001	2.8720+001	3.3520+001	3.2630+001	2.4450+001	1.2540+001	5.8710+000	3.5610+000	2.4620+000
SSW	2.7880+000	8.0750+000	1.5570+001	1.6860+001	1.5400+001	1.0770+001	5.3050+000	2.4780+000	1.5070+000	1.0450+000
SW	2.6360+000	7.5770+000	1.3850+001	1.4180+001	1.2330+001	8.1020+000	3.8160+000	1.7670+000	1.0740+000	7.4660-001
WSW	3.0680+000	9.3770+000	1.7990+001	1.8520+001	1.6080+001	1.0720+001	5.2210+000	2.4410+000	1.4860+000	1.0320+000
W	2.8620+000	8.9440+000	1.8330+001	2.0400+001	1.8890+001	1.3520+001	6.9320+000	3.2680+000	1.9880+000	1.3770+000
WNW	2.4930+000	7.6340+000	1.6300+001	1.9240+001	1.8830+001	1.4920+001	8.2000+000	3.9030+000	2.3750+000	1.6420+000
NW	3.2920+000	1.0000+001	2.0720+001	2.4240+001	2.3800+001	1.9140+001	1.0570+001	5.0210+000	3.0510+000	2.1070+000
NNW	5.1730+000	1.5950+001	3.3000+001	3.9160+001	3.9230+001	3.2600+001	1.8220+001	8.6700+000	5.2730+000	3.6450+000
N	4.6350+000	1.4230+001	2.9060+001	3.4440+001	3.4740+001	2.9910+001	1.7170+001	9.2340+000	5.0220+000	3.4770+000
NNE	2.2830+000	6.8360+000	1.3000+001	1.5040+001	1.4990+001	1.3110+001	7.7220+000	3.7460+000	2.2950+000	1.5940+000
NE	1.5260+000	4.7240+000	9.2020+000	1.0530+001	1.0370+001	8.9000+000	5.3380+000	2.6000+000	1.5950+000	1.1090+000
ENE	1.7180+000	5.4010+000	1.1410+001	1.3440+001	1.3440+001	1.1720+001	6.9530+000	3.3860+000	2.0760+000	1.4420+000
E	2.1870+000	6.7300+000	1.4810+001	1.8290+001	1.9190+001	1.8170+001	1.1160+001	5.4510+000	3.3420+000	2.3200+000
ESE	2.3250+000	7.8340+000	1.8390+001	2.4240+001	2.7200+001	2.8440+001	1.8090+001	8.8520+000	5.4260+000	3.7630+000
SE	3.2070+000	1.0820+001	2.4160+001	3.1040+001	3.3630+001	3.1780+001	1.8990+001	9.1640+000	5.5960+000	3.8750+000
SSE	4.9200+000	1.5930+001	3.3170+001	4.0140+001	4.0410+001	3.1810+001	1.6810+001	7.9000+000	4.7910+000	3.3090+000

Table A-7. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site R7 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	4.4460+000	1.3060+001	2.5370+001	2.9090+001	2.6850+001	1.5490+001	5.5110+000	2.2180+000	1.2760+000	8.5760-001
SSW	3.5050+000	9.6530+000	1.7540+001	1.9740+001	1.8310+001	1.0790+001	3.9240+000	1.6010+000	9.2720-001	6.2550-001
SW	4.3140+000	1.1280+001	1.9200+001	2.2110+001	2.1490+001	1.3650+001	5.2720+000	2.1970+000	1.2820+000	8.6790-001
WSW	5.9930+000	1.4900+001	2.2030+001	2.4000+001	2.3020+001	1.5120+001	6.1620+000	2.6260+000	1.5450+000	1.0500+000
W	6.0100+000	1.5200+001	2.1890+001	2.2550+001	2.0470+001	1.2660+001	5.0040+000	2.1200+000	1.2460+000	8.4850-001
WNW	5.0350+000	1.2880+001	2.0710+001	2.2330+001	2.0630+001	1.2720+001	4.9300+000	2.0670+000	1.2090+000	8.2090-001
NW	5.3600+000	1.3320+001	2.3130+001	2.6370+001	2.5320+001	1.6290+001	6.4830+000	2.7310+000	1.5980+000	1.0830+000
NNW	7.5190+000	1.9650+001	3.4780+001	4.0370+001	3.9390+001	2.5770+001	1.0380+001	4.3830+000	2.5660+000	1.7380+000
N	7.6480+000	2.0340+001	3.5160+001	4.1070+001	4.0670+001	2.7810+001	1.1740+001	5.0440+000	2.9690+000	2.0170+000
NNE	5.7220+000	1.5120+001	2.5370+001	3.0500+001	3.1580+001	2.3820+001	1.0940+001	4.8300+000	2.8680+000	1.9570+000
NE	5.7930+000	1.5650+001	2.6950+001	3.3050+001	3.4890+001	2.6730+001	1.2280+001	5.4180+000	3.2160+000	2.1930+000
ENE	8.2210+000	2.1510+001	3.4740+001	4.0030+001	4.0160+001	2.8660+001	1.2550+001	5.4580+000	3.2260+000	2.1970+000
E	8.2750+000	2.2820+001	4.0320+001	4.7410+001	4.7030+001	3.1740+001	1.3170+001	5.6180+000	3.2990+000	2.2400+000
ESE	5.7380+000	1.7130+001	3.4400+001	4.2550+001	4.2880+001	2.8370+001	1.1360+001	4.7790+000	2.7920+000	1.8890+000
SE	4.9410+000	1.4210+001	2.7310+001	3.3210+001	3.3150+001	2.1580+001	8.5160+000	3.5580+000	2.0740+000	1.4020+000
SSE	5.0500+000	1.5040+001	2.9790+001	3.5280+001	3.3890+001	2.0690+001	7.7280+000	3.1590+000	1.8260+000	1.2290+000

Table A.8. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site FB8 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	4.6260+001	8.2700+001	1.0720+002	1.0190+002	8.6650+001	5.5780+001	2.1890+001	9.2870+000	5.4900+000	3.7930+000
SSW	5.8490+001	9.3600+001	1.0200+002	9.0480+001	7.6250+001	5.3100+001	2.2230+001	9.6870+000	5.7900+000	4.0330+000
SW	6.6270+001	1.0270+002	1.0580+002	9.2020+001	7.9090+001	6.0020+001	2.6410+001	1.1700+001	7.0030+000	4.9190+000
WSW	5.9760+001	9.4620+001	1.0110+002	8.9970+001	7.9980+001	6.4270+001	2.8970+001	1.2910+001	7.7750+000	5.4420+000
W	5.5900+001	9.5910+001	1.1060+002	9.9730+001	8.7020+001	6.6210+001	2.9040+001	1.2830+001	7.7040+000	5.3800+000
WNW	5.5600+001	9.6310+001	1.1160+002	9.8980+001	8.1780+001	5.4790+001	2.2450+001	9.7100+000	5.7860+000	4.0230+000
NW	4.5300+001	7.9780+001	9.3970+001	8.3230+001	6.6690+001	4.0250+001	1.5370+001	6.4770+000	3.8240+000	2.6430+000
NNW	3.8640+001	7.5690+001	9.8800+001	9.0780+001	7.2570+001	4.0390+001	1.4310+001	5.8360+000	3.4000+000	2.3280+000
N	3.4060+001	6.7720+001	9.0540+001	8.3990+001	6.6850+001	3.5920+001	1.2290+001	4.9320+000	2.8540+000	1.9450+000
NNE	2.2940+001	4.5190+001	6.0790+001	5.6780+001	4.5040+001	2.3070+001	7.4780+000	2.9230+000	1.6730+000	1.1310+000
NE	1.5640+001	3.0810+001	4.2400+001	4.0360+001	3.2250+001	1.6110+001	5.0360+000	1.9310+000	1.0960+000	7.3660+001
ENE	1.4800+001	2.6340+001	3.4550+001	3.2610+001	2.5320+001	1.2430+001	3.7260+000	1.3990+000	7.8760+001	5.2630+001
E	1.4680+001	2.6020+001	3.4570+001	3.3290+001	2.7030+001	1.3820+001	4.3990+000	1.7020+000	9.7000+001	6.5340+001
ESE	1.7400+001	3.2650+001	4.6500+001	4.6010+001	3.8290+001	2.0740+001	6.9640+000	2.7580+000	1.5860+000	1.0740+000
SE	2.0090+001	3.8800+001	5.7160+001	5.6960+001	4.7620+001	2.6130+001	8.8750+000	3.5300+000	2.0330+000	1.3780+000
SSE	3.0570+001	6.0080+001	8.6980+001	8.5850+001	7.3490+001	4.5450+001	1.7180+001	7.1670+000	4.2060+000	2.8910+000

Table A.9. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L9 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	5.8420+002	5.5650+002	5.7890+002	4.9980+002	3.5920+002	1.5000+002	4.1470+001	1.5580+001	8.8290+000	6.0150+000
SSW	5.6280+002	4.9660+002	4.6340+002	3.8630+002	2.7270+002	1.1210+002	3.0720+001	1.1500+001	6.5190+000	4.4410+000
SW	5.4160+002	4.7640+002	4.4230+002	3.6800+002	2.5960+002	1.0670+002	2.9270+001	1.0970+001	6.2210+000	4.2410+000
WSW	7.8110+002	6.9000+002	6.7150+002	5.6990+002	4.0680+002	1.6930+002	4.6980+001	1.7720+001	1.0060+001	6.8690+000
W	1.0850+003	9.3850+002	9.0850+002	7.7190+002	5.5150+002	2.3020+002	6.4040+001	2.4180+001	1.3740+001	9.3780+000
WNW	1.1910+003	1.0160+003	9.6730+002	8.1790+002	5.8310+002	2.4300+002	6.7580+001	2.5490+001	1.4470+001	9.8740+000
NW	9.8260+002	8.4050+002	7.9380+002	6.6860+002	4.7550+002	1.9770+002	5.4840+001	2.0660+001	1.1720+001	7.9950+000
NNW	6.5460+002	5.8950+002	5.8160+002	4.9510+002	3.5350+002	1.4710+002	4.0640+001	1.5250+001	8.6410+000	5.8820+000
N	4.9550+002	4.6500+002	4.7370+002	4.0600+002	2.9070+002	1.2100+002	3.3290+001	1.2440+001	7.0310+000	4.7750+000
NNE	4.0340+002	3.6890+002	3.5400+002	2.9690+002	2.1000+002	8.6440+001	2.3510+001	8.6980+000	4.8910+000	3.3070+000
NE	4.4620+002	3.9740+002	3.6340+002	2.9950+002	2.1000+002	8.5700+001	2.3150+001	8.5180+000	4.7760+000	3.2200+000
ENE	5.1150+002	4.5150+002	4.0930+002	3.3660+002	2.3540+002	9.6060+001	2.5920+001	9.5320+000	5.3450+000	3.6040+000
E	4.5860+002	4.2010+002	4.0700+002	3.4280+002	2.4300+002	1.0030+002	2.7320+001	1.0130+001	5.7010+000	3.8570+000
ESE	3.2460+002	3.2160+002	3.5660+002	3.1380+002	2.2760+002	9.5820+001	2.6570+001	9.9610+000	5.6360+000	3.8320+000
SE	3.4680+002	3.5040+002	4.0450+002	3.6050+002	2.6330+002	1.1150+002	3.1110+001	1.1710+001	6.6380+000	4.5210+000
SSE	5.1160+002	5.1080+002	5.5840+002	5.0060+002	3.6350+002	1.5310+002	4.2600+001	1.6030+001	9.0890+000	6.1930+000

Table A.10. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L10 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.0220+001	2.5430+001	4.8090+001	5.6390+001	5.6710+001	4.5630+001	2.5310+001	1.2840+001	8.1420+000	5.8190+000
SSW	9.1410+000	2.2910+001	4.0570+001	4.5500+001	4.3790+001	3.2740+001	1.7190+001	8.6000+000	5.4320+000	3.8780+000
SW	8.0220+000	1.8800+001	2.8440+001	2.9150+001	2.6350+001	1.9470+001	1.0880+001	5.6190+000	3.5920+000	2.5820+000
WSW	1.0770+001	2.6550+001	3.9800+001	3.9870+001	3.5770+001	2.6750+001	1.5100+001	7.8230+000	5.0010+000	3.6050+000
W	9.7180+000	2.6480+001	4.3250+001	4.4770+001	4.0640+001	2.9410+001	1.5770+001	8.0260+000	5.1080+000	3.6680+000
WNW	6.0320+000	1.7290+001	3.1240+001	3.3950+001	3.1700+001	2.3080+001	1.2160+001	6.1320+000	3.8880+000	2.7850+000
NW	4.3410+000	1.3000+001	2.5510+001	2.8970+001	2.8070+001	2.1060+001	1.0940+001	5.4420+000	3.4320+000	2.4480+000
NNW	6.5110+000	1.6540+001	3.0220+001	3.4200+001	3.2950+001	2.3390+001	1.1000+001	5.2160+000	3.2280+000	2.2770+000
N	7.4600+000	1.7210+001	3.1000+001	3.5690+001	3.4790+001	2.4280+001	1.0850+001	4.9770+000	3.0380+000	2.1230+000
NNE	5.1940+000	1.1920+001	2.2530+001	2.6630+001	2.6200+001	1.7960+001	7.6840+000	3.4300+000	2.0710+000	1.4370+000
NE	4.5770+000	1.0540+001	1.9120+001	2.1940+001	2.1170+001	1.4500+001	6.2900+000	2.8360+000	1.7190+000	1.1950+000
ENE	4.3640+000	1.1240+001	2.0220+001	2.2590+001	2.1670+001	1.5290+001	6.9680+000	3.2090+000	1.9610+000	1.3700+000
E	3.8330+000	9.7870+000	1.7360+001	1.9210+001	1.8360+001	1.3020+001	6.0730+000	2.8340+000	1.7420+000	1.2220+000
ESE	2.4030+000	5.8370+000	1.0370+001	1.1560+001	1.1090+001	8.0210+000	3.8630+000	1.8310+000	1.1370+000	7.9640+000
SE	1.6850+000	4.6350+000	9.6500+000	1.1620+001	1.1940+001	1.0020+001	5.6530+000	2.8500+000	1.8000+000	1.2810+000
SSE	5.4460+000	1.3600+001	2.7480+001	3.3440+001	3.4870+001	3.0170+001	1.7790+001	9.1380+000	5.8530+000	4.1900+000

Table A.11. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site RL11 (annual meteorology)

Wind dir. from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.8060+002	2.7880+002	3.0700+002	2.8850+002	2.5190+002	1.5540+002	5.5550+001	2.2770+001	1.3300+001	9.1570+000
SSW	1.4990+002	2.2510+002	2.3350+002	2.1590+002	1.8080+002	1.0620+002	3.7140+001	1.5130+001	8.8270+000	6.0770+000
SW	8.4540+001	1.2390+002	1.3480+002	1.2550+002	1.0930+002	6.8150+001	2.4560+001	1.0120+001	5.9320+000	4.0990+000
WSW	1.2400+002	1.7940+002	1.9330+002	1.7790+002	1.5350+002	9.5130+001	3.4280+001	1.4140+001	8.2910+000	5.7350+000
W	1.4500+002	2.1190+002	2.2260+002	1.9920+002	1.6640+002	9.9030+001	3.5010+001	1.4360+001	8.3960+000	5.8020+000
WNW	1.1470+002	1.6870+002	1.7510+002	1.5580+002	1.2930+002	7.5980+001	2.6650+001	1.0890+001	6.3590+000	4.3870+000
NW	9.9680+001	1.5050+002	1.5860+002	1.4200+002	1.1750+002	6.7780+001	2.3480+001	9.5450+000	5.5620+000	3.8280+000
NNW	1.0930+002	1.6610+002	1.7170+002	1.5130+002	1.2140+002	6.5760+001	2.1880+001	8.7470+000	5.0640+000	3.4620+000
N	1.0420+002	1.5980+002	1.6560+002	1.4660+002	1.1750+002	6.2460+001	2.0440+001	8.0780+000	4.6500+000	3.1620+000
NNE	7.3280+001	1.1460+002	1.1930+002	1.0570+002	8.4060+001	4.3560+001	1.3930+001	5.4390+000	3.1140+000	2.1080+000
NE	5.7680+001	8.9230+001	9.4740+001	8.5440+001	6.8930+001	3.6060+001	1.1570+001	4.5300+000	2.5980+000	1.7610+000
ENE	5.2810+001	8.3480+001	9.1880+001	8.5240+001	7.1190+001	3.9390+001	1.3110+001	5.1990+000	2.9950+000	2.0360+000
E	4.1270+001	6.7590+001	7.5600+001	7.0880+001	6.0260+001	3.4400+001	1.1660+001	4.6530+000	2.6870+000	1.8320+000
ESE	2.3380+001	3.7730+001	4.4080+001	4.2920+001	3.7640+001	2.2150+001	7.6030+000	3.0490+000	1.7650+000	1.2040+000
SE	2.4550+001	4.1300+001	5.1770+001	5.3720+001	5.0800+001	3.3330+001	1.2150+001	4.9870+000	2.9100+000	1.9980+000
SSE	9.0140+001	1.4790+002	1.7670+002	1.7710+002	1.6470+002	1.0840+002	3.9830+001	1.6440+001	9.2610+000	6.6280+000

Table A.12. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site C12 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	7.6590-001	4.5800+000	1.6600-001	2.4140+001	2.5890+001	1.6420+001	6.1380+000	2.7320+000	1.6780+000	1.1770+000
SSW	5.4330-001	3.9030+000	1.6450-001	2.4020+001	2.5080+001	1.4910+001	5.0680+000	2.0790+000	1.2260+000	8.3970-001
SW	4.7810-001	3.9760+000	1.8030-001	2.6400+001	2.7400+001	1.6020+001	5.3370+000	2.1610+000	1.2670+000	8.6370-001
WSW	8.0910-001	5.6110+000	2.2960-001	3.3250+001	3.4700+001	2.0800+001	7.2400+000	3.0450+000	1.8190+000	1.2550+000
W	1.0070+000	6.1970+000	2.3530+001	3.3970+001	3.5890+001	2.2240+001	8.0990+000	3.5360+000	2.1530+000	1.5030+000
WNW	6.7630-001	3.9810+000	1.4960+001	2.1730+001	2.3250+001	1.4810+001	5.5920+000	2.5170+000	1.5540+000	1.0950+000
NW	4.1810-001	2.8620+000	1.1480+001	1.6830+001	1.8080+001	1.1540+001	4.4100+000	2.0200+000	1.2580+000	8.9000-001
NNW	4.3150-001	3.0640+000	1.2250+001	1.8360+001	2.0360+001	1.3650+001	5.5390+000	2.6510+000	1.6830+000	1.2030+000
N	4.7130-001	2.8530+000	1.0790+001	1.5350+001	1.8440+001	1.2670+001	5.2630+000	2.5440+000	1.6180+000	1.1580+000
NNE	4.5560-001	2.2670+000	7.4940+000	1.0940+001	1.2250+001	8.2140+000	3.2650+000	1.5230+000	9.5260-001	6.7440-001
NE	6.2920-001	3.0730+000	9.1160+000	1.2950+001	1.4260+001	9.3530+000	3.5840+000	1.6310+000	1.0100+000	7.1170-001
ENE	1.0910+000	4.9150+000	1.3170+001	1.7870+001	1.9150+001	1.2260+001	4.6530+000	2.1230+000	1.3190+000	9.3080-001
E	1.0930+000	4.9230+000	1.3320+001	1.8180+001	1.9520+001	1.2430+001	4.6610+000	2.1000+000	1.2960+000	9.1110-001
ESE	5.7780-001	3.0540+000	9.1820+000	1.3060+001	1.4470+001	9.5270+000	3.6210+000	1.6300+000	1.0040+000	7.0540-001
SE	3.3730-001	1.9640+000	6.5630+000	1.0000+001	1.1710+001	8.2070+000	3.2990+000	1.5310+000	9.5480-001	6.7510-001
SSE	6.1480-001	3.6330+000	1.3050+001	1.9600+001	2.1940+001	1.4710+001	5.8120+000	2.6870+000	1.6760+000	1.1860+000

Table A.13. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L13 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	6.9860+002	5.0620+002	2.8420+002	1.8960+002	1.1950+002	4.6430+001	1.2230+001	4.4270+000	2.4620+000	1.6460+000
SSW	6.6540+002	4.7220+002	2.6200+002	1.7450+002	1.0990+002	4.2610+001	1.1200+001	4.0540+000	2.2560+000	1.5100+000
SW	5.7220+002	4.1150+002	2.3110+002	1.5460+002	9.7570+001	3.7820+001	9.9210+000	3.5870+000	1.9970+000	1.3380+000
WSW	6.4360+002	4.6750+002	2.5990+002	1.7000+002	1.0500+002	3.9560+001	1.0150+001	3.6270+000	2.0080+000	1.3390+000
W	8.1350+002	5.8790+002	3.2180+002	2.0730+002	1.2590+002	4.6610+001	1.1820+001	4.1920+000	2.3130+000	1.5370+000
WNW	7.4810+002	5.4270+002	2.9760+002	1.9210+002	1.1700+002	4.3590+001	1.1140+001	3.9630+000	2.1880+000	1.4530+000
NW	5.7560+002	4.2580+002	2.3830+002	1.5590+002	9.6150+001	3.6420+001	9.4390+000	3.3880+000	1.8770+000	1.2490+000
NNW	6.1720+002	4.7980+002	2.8030+002	1.8800+002	1.1860+002	4.6000+001	1.2160+001	4.4110+000	2.4550+000	1.6390+000
N	5.1600+002	4.2080+002	2.5750+002	1.7800+002	1.1520+002	4.5890+001	1.2340+001	4.5150+000	2.5220+000	1.6890+000
NNE	2.6780+002	2.3500+002	1.5580+002	1.1380+002	7.6890+001	3.1880+001	8.7840+000	3.2540+000	1.8280+000	1.2320+000
NE	3.3150+002	2.5980+002	1.7290+002	1.2310+002	8.7690+001	3.6870+001	1.0250+001	3.8180+000	2.1510+000	1.4530+000
ENE	5.5130+002	4.5500+002	2.9090+002	2.1080+002	1.4190+002	5.8810+001	1.6170+001	5.9860+000	3.3630+000	2.2650+000
E	7.1990+002	6.0170+002	3.9090+002	2.8680+002	1.9490+002	8.1530+001	2.2590+001	8.3970+000	4.7150+000	3.1880+000
ESE	6.3140+002	5.4040+002	3.6160+002	2.7120+002	1.8750+002	7.9760+001	2.2350+001	8.3560+000	4.7130+000	3.1870+000
SE	4.6770+002	3.9110+002	2.5490+002	1.8800+002	1.2830+002	5.3960+001	1.4980+001	5.5730+000	3.1370+000	2.1170+000
SSE	5.4030+002	4.1230+002	2.4350+002	1.6790+002	1.0860+002	4.3310+001	1.1620+001	4.2480+000	2.3730+000	1.5920+000

Table A.14. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site R14 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	3.0170+000	9.5340+000	2.1710+001	2.7300+001	2.6770+001	1.5900+001	6.0270+000	2.6920+000	1.6440+000	1.1480+000
SSW	6.2510+000	1.9340+001	3.6950+001	4.2590+001	3.9860+001	2.2960+001	8.2130+000	3.5010+000	2.0950+000	1.4520+000
SW	6.7990+000	2.2070+001	4.1180+001	4.6570+001	4.3400+001	2.5480+001	9.4580+000	4.1390+000	2.5070+000	1.7500+000
WSW	3.9800+000	1.4870+001	3.2690+001	3.9070+001	3.7370+001	2.2720+001	8.8760+000	4.0080+000	2.4570+000	1.7250+000
W	2.6350+000	1.2510+001	3.4600+001	4.3340+001	4.1600+001	2.4500+001	9.0380+000	3.9240+000	2.3640+000	1.6420+000
WNW	2.3550+000	1.1230+001	3.0120+001	3.6620+001	3.4160+001	1.9210+001	6.7520+000	2.8520+000	1.6990+000	1.1720+000
NW	2.3110+000	9.4570+000	2.3450+001	2.8290+001	2.6540+001	1.5160+001	5.3630+000	2.2620+000	1.3460+000	9.2840-001
NNW	2.2520+000	9.2240+000	2.3600+001	2.9430+001	2.8360+001	1.6570+001	5.8130+000	2.3950+000	1.4050+000	9.6090-001
N	1.5760+000	7.0370+000	1.9140+001	2.4110+001	2.3130+001	1.3300+001	4.6250+000	1.9030+000	1.1170+000	7.6300-001
NNE	7.2820-001	3.8280+000	1.2130+001	1.5520+001	1.4600+001	7.8100+000	2.8570+000	1.0670+000	6.3080-001	4.3230-001
NE	1.0820+000	5.9160+000	1.8780+001	2.4120+001	2.2770+001	1.2020+001	3.8000+000	1.4920+000	8.5820-001	5.7760-001
ENE	2.1980+000	8.7760+000	2.3440-001	3.0070+001	2.9070+001	1.6010+001	5.2630+000	2.1000+000	1.2150+000	8.2150-001
E	2.1480+000	7.4040+000	1.7040-001	2.2000+001	2.2000+001	1.2780+001	4.4860+000	1.8700+000	1.1030+000	7.5490-001
ESE	1.4740+000	5.1690+000	1.1160-001	1.4420+001	1.4800+001	7.3000-002	3.4080+000	1.4760+000	8.8510-001	6.1140-001
SE	1.5330+000	5.2680+000	1.2000+001	1.5810+001	1.6430+001	2.6000-001	3.8940+000	1.7020+000	1.0260+000	7.1110-001
SSE	1.8650+000	6.7640+000	1.7810+001	2.3830+001	2.4420+001	5.0400+000	5.7830+000	2.5840+000	1.5770+000	1.1010+000

Table A.15. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L15 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	5.3600+002	4.9330+002	3.2980+002	2.2890+002	1.4650+002	5.8140+001	1.5700+001	5.7870+000	3.2500+000	2.1840+000
SSW	6.0030+002	5.2230+002	3.3000+002	2.2250+002	1.3900+002	5.3610+001	1.4160+001	5.1510+000	2.8770+000	1.9270+000
SW	5.3300+002	4.5780+002	2.9080+002	1.9770+002	1.2460+002	4.8580+001	1.2940+001	4.7390+000	2.6570+000	1.7860+000
WSW	4.1890+002	3.6080+002	2.3630+002	1.6490+002	1.0680+002	4.3170+001	1.1790+001	4.3720+000	2.4640+000	1.6640+000
W	3.1410+002	2.7490+002	1.8710+002	1.3410+002	8.8920+001	3.6970+001	1.0290+001	3.8460+000	2.1740+000	1.4710+000
WNW	2.7340+002	2.5130+002	1.8190+002	1.3370+002	8.9340+001	3.6930+001	1.0230+001	3.8220+000	2.1600+000	1.4600+000
NW	3.5020+002	3.3240+002	2.4520+002	1.8090+002	1.2100+002	4.9950+001	1.3820+001	5.1560+000	2.9110+000	1.9680+000
NNW	4.7430+002	4.4410+002	3.1550+002	2.2780+002	1.5010+002	6.1060+002	1.6720+001	6.1970+000	3.4890+000	2.3530+000
N	5.8640+002	5.3840+002	3.5950+002	2.4900+002	1.5820+002	6.1650+001	1.6340+001	5.9480+000	3.3200+000	2.2230+000
NNE	5.1510+002	4.7400+002	3.0920+002	2.0980+002	1.3020+002	4.9000+001	1.2620+001	4.5200+000	2.5040+000	1.6640+000
NE	4.0010+002	3.7800+002	2.5620+002	1.7810+002	1.1320+002	4.4120+001	1.1690+001	4.2490+000	2.3690+000	1.5830+000
ENE	4.1240+002	4.0400+002	2.8490+002	2.0260+002	1.3190+002	5.3320+001	1.4490+001	5.3220+000	2.9800+000	1.9980+000
E	3.6380+002	3.6240+002	2.5960+002	1.8600+002	1.2210+002	4.9990+001	1.3720+001	5.0670+000	2.8450+000	1.9110+000
ESE	2.5720+002	2.5390+002	1.8070+002	1.2900+002	8.4540+001	3.4510+001	9.4820+000	3.5180+000	1.9810+000	1.3340+000
SE	2.4970+002	2.4870+002	1.7930+002	1.2860+002	8.4080+001	3.3910+001	9.2190+000	3.4040+000	1.9140+000	1.2870+000
SSE	3.8180+002	3.7530+002	2.6880+002	1.9310+002	1.2680+002	5.1700+001	1.4230+001	5.2950+000	2.9860+000	2.0130+000

Table A.16. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L16 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	2.8890+000	1.5010+001	4.5600+001	5.9650+001	5.9010+001	3.5420+001	1.3120+001	5.7100+000	3.4460+000	2.3960+000
SSW	3.1750+000	1.4270+001	3.9160+001	4.9930+001	4.8890+001	2.8990+001	1.0460+001	4.4480+000	2.6540+000	1.8330+000
SW	3.0360+000	1.3760+001	3.7630+001	4.6080+001	4.2950+001	2.3540+001	7.9340+000	3.2570+000	1.9150+000	1.3110+000
WSW	2.6130+000	1.1680+001	3.0720+001	3.6290+001	3.2490+001	1.6700+001	5.2730+000	2.0860+000	1.2080+000	8.1880-001
W	2.3770+000	9.3510+000	2.3670+001	2.8270+001	2.5560+001	1.3140+001	4.0400+000	1.5520+000	8.8370-001	5.9240-001
WNW	1.9650+000	7.8760+000	1.9740+001	2.3900+001	2.2050+001	1.1780+001	3.9350+000	1.6210+000	9.5480-001	6.5320-001
NW	2.7540+000	9.3980+000	1.8310+001	2.0600+001	1.8630+001	1.0140+001	3.7240+000	1.6760+000	1.0310+000	7.2410-001
NNW	5.8640+000	1.7560+001	2.9770+001	3.2150+001	2.8760+001	1.5590+001	5.5430+000	2.4260+000	1.4750+000	1.0310+000
N	5.7980+000	1.7280+001	3.0360+001	3.3650+001	3.0650+001	1.6850+001	5.8740+000	2.4950+000	1.4930+000	1.0340+000
NNE	1.9840+000	6.7350+000	1.4730+001	1.8130+001	1.7540+001	1.0140+001	3.6100+000	1.5280+000	9.0970-001	6.2680-001
NE	5.1140-001	2.5310+000	7.4940+000	1.0240+001	1.0510+001	6.3670+000	2.3020+000	9.7520-001	5.8000-001	3.9920-001
ENE	3.7600-001	2.0200+000	6.1410+000	8.4510+000	8.6890+000	5.2920+000	1.9430+000	8.3850-001	5.0400-001	3.4940-001
E	6.2560-001	2.3750+000	6.7630+000	9.2640+000	9.4710+000	5.7360+000	2.1000+000	9.0360-001	5.4210-001	3.7510-001
ESE	8.9160-001	3.3070+000	9.0510+000	1.2520+001	1.3230+001	8.5500+000	3.3690+000	1.5100+000	9.2090-001	6.4340-001
SE	1.1440+000	4.6600+000	1.4120+001	2.0610+001	2.2640+001	1.5420+001	6.5980+000	3.1320+000	1.9580+000	1.3870+000
SSE	2.2670+000	1.0910+001	3.4620+001	4.7000+001	4.7770+001	2.9570+001	1.1560+001	5.2420+000	3.2220+000	2.2620+000

Table A.17. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L17 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	2.9750+002	3.3280+002	2.5670+002	1.8820+002	1.2440+002	5.1690+001	1.4730+001	5.5650+000	3.1570+000	2.1310+000
SSW	3.5390+002	3.6860+002	2.6440+002	1.8690+002	1.2010+002	4.8220+001	1.3350+001	4.9690+000	2.8010+000	1.8840+000
SW	3.1700+002	3.2200+002	2.3080+002	1.6440+002	1.0660+002	4.3310+001	1.2140+001	4.5580+000	2.5810+000	1.7430+000
WSW	2.4450+002	2.4660+002	1.8080+002	1.3180+002	8.7860+001	3.7410+001	1.0910+001	4.1720+000	2.3800+000	1.6160+000
W	1.8000+002	1.8390+002	1.3900+002	1.0410+002	7.1210+001	3.1510+001	9.4600+000	3.6580+000	2.0950+000	1.4260+000
WNW	1.5300+002	1.6500+002	1.3320+002	1.0350+002	7.2330+001	3.2070+001	9.5200+000	3.6630+000	2.0930+000	1.4220+000
NW	1.9070+002	2.1390+002	1.7810+002	1.3980+002	9.8130+001	4.3480+001	1.2870+001	4.9440+000	2.8230+000	1.9180+000
NNW	2.5830+002	2.8890+002	2.3320+002	1.7890+002	1.2310+002	5.3460+001	1.5610+001	5.9470+000	3.3840+000	2.2940+000
N	3.2500+002	3.6380+002	2.7770+002	2.0340+002	1.3440+002	5.5310+001	1.5440+001	5.7480+000	3.2380+000	2.1760+000
NNE	2.8870+002	3.2770+002	2.4530+002	1.7580+002	1.1360+002	4.5000+001	1.2090+001	4.4060+000	2.4570+000	1.6380+000
NE	2.1660+002	2.5250+002	1.9770+002	1.4580+002	9.6530+001	3.9700+001	1.1070+001	4.1120+000	2.3120+000	1.5510+000
ENE	2.0780+002	2.5260+002	2.0930+002	1.5850+002	1.0790+002	4.6450+001	1.3490+001	5.0990+000	2.8870+000	1.9450+000
E	1.7860+002	2.2120+002	1.8800+002	1.4390+002	9.8740+001	4.3140+001	1.2700+001	4.8400+000	2.7510+000	1.8570+000
ESE	1.2620+002	1.5510+002	1.3220+002	1.0100+002	6.8980+001	2.9900+001	8.7870+000	3.3620+000	1.9160+000	1.2970+000
SE	1.2200+002	1.5210+002	1.3100+002	1.0100+002	6.9210+001	2.9740+001	8.6100+000	3.2690+000	1.8570+000	1.2550+000
SSE	1.9500+002	2.3790+002	2.0090+002	1.5410+002	1.0520+002	4.5380+001	1.3270+001	5.0780+000	2.8950+000	1.9610+000

Table A.18. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site R18 (annual meteorology)

Wind dir From	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	7.1980+000	2.1230+001	4.1550+001	4.6040+001	4.1400+001	2.4320+001	9.7560+000	4.5410+000	2.8250+000	1.9980+000
SSW	4.1460+000	1.0780+001	1.7010+001	1.7540+001	1.5510+001	9.2470+000	3.8150+000	1.8060+000	1.1310+000	8.0460-001
SW	3.7360+000	9.0660+000	1.2640+001	1.2230+001	1.0540+001	6.4240+000	2.8760+000	1.4450+000	9.2790-001	6.6910-001
MSW	3.6170+000	8.5280+000	1.1900+001	1.1880+001	1.0560+001	6.8540+000	3.4170+000	1.8250+000	1.1990+000	8.7440-001
W	2.8670+000	7.2400+000	1.1300+001	1.1800+001	1.0590+001	6.7230+000	3.2830+000	1.7390+000	1.1390+000	8.2850-001
WNW	1.9710+000	5.9820+000	1.1230+001	1.2180+001	1.0820+001	6.3420+000	2.7580+000	1.3830+000	8.8810-001	6.3910-001
NW	2.0840+000	8.1350+000	1.8110+001	2.0210+001	1.7870+001	1.0080+001	4.1110+000	1.9890+000	1.2600+000	9.0000-001
NNW	2.5500+000	1.3570+001	3.1430+001	3.6100+001	3.2450+001	1.8210+001	7.0820+000	3.3020+000	2.0610+000	1.4590+000
N	3.8480+000	1.2740+001	2.7650+001	3.1730+001	2.8660+001	1.5980+001	6.0590+000	2.7710+000	1.7150+000	1.2080+000
NNE	3.3870+000	9.9100+000	1.8870+001	2.1300+001	1.9360+001	1.0960+001	4.2620+000	1.9760+000	1.2290+000	8.6880-001
NE	3.8990+000	1.1910+001	2.2570+001	2.5460+001	2.3160+001	1.3190+001	5.2900+000	2.5210+000	1.5870+000	1.1290+000
ENE	4.2630+000	1.3910+001	2.7190+001	3.0150+001	2.6890+001	1.5040+001	6.2060+000	3.0500+000	1.9460+000	1.3950+000
E	4.1670+000	1.4520+001	3.0480+001	3.4570+001	3.1350+001	1.8010+001	7.4660+000	3.6420+000	2.3150+000	1.6550+000
ESE	4.3750+000	1.5360+001	3.4050+001	4.0140+001	3.7600+001	2.2620+001	9.3830+000	4.4800+000	2.8160+000	2.0020+000
SE	5.3530+000	1.9090+001	4.4600+001	5.2640+001	4.8840+001	2.8940+001	1.1600+001	5.4140+000	3.3720+000	2.3850+000
SSE	7.8430+000	2.5880+001	5.7220+001	6.5380+001	5.9220+001	3.4380+001	1.3520+001	6.2390+000	3.8690+000	2.7310+000

Table A.19. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L19 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	3.5250+002	3.4080+002	2.4110+002	1.7790+002	1.2950+002	7.4710+001	2.7760+001	1.1640+001	6.8660+000	4.7520+000
SSW	1.8150+002	1.6230+002	1.0930+002	7.9570+001	5.8580+001	3.5250+001	1.3460+001	5.7070+000	3.3810+000	2.3480+000
SW	1.5230+002	1.3170+002	8.5150+001	6.0380+001	4.3440+001	2.5400+001	9.5740+000	4.0490+000	2.3990+000	1.6660+000
WSW	1.3220+002	1.1650+002	7.5880+001	5.3400+001	3.7870+001	2.1520+001	7.9880+000	3.3700+000	1.9970+000	1.3880+000
W	1.0870+002	9.8560+001	6.6030+001	4.8310+001	3.7250+001	2.5100+001	1.0180+001	4.4060+000	2.6300+000	1.8350+000
WNW	1.1810+002	1.0910+002	7.5960+001	5.7700+001	4.6140+001	3.2500+001	1.3410+001	5.8170+000	3.4710+000	2.4210+000
NW	1.7610+002	1.7090+002	1.2110+002	9.0330+001	6.7500+001	4.1210+001	1.5810+001	6.7030+000	3.9670+000	2.7530+000
NNW	2.5040+002	2.5660+002	1.8730+002	1.4020+002	1.0310+002	5.9830+001	2.2230+001	9.3110+000	5.4860+000	3.7940+000
N	2.3790+002	2.4980+002	1.8570+002	1.3940+002	1.0210+002	5.8110+001	2.1300+001	8.8740+000	5.2180+000	3.6030+000
NNE	1.8150+002	1.9350+002	1.4580+002	1.1010+002	8.1600+001	4.7590+001	1.7680+001	7.3960+000	4.3550+000	3.0100+000
NE	2.3180+002	2.4410+002	1.8550+002	1.4140+002	1.0690+002	6.5300+001	2.4970+001	1.0560+001	6.2470+000	4.3300+000
ENE	3.2430+002	3.2940+002	2.4340+002	1.8150+002	1.3250+002	7.5670+001	2.7900+001	1.1660+001	6.8660+000	4.7470+000
E	3.8090+002	3.7440+002	2.6090+002	1.8630+002	1.2750+002	6.3940+001	2.1670+001	8.7840+000	5.1150+000	3.5120+000
ESE	4.3280+002	4.2490+002	2.9180+002	2.0570+002	1.3790+002	6.6180+001	2.1760+001	8.7350+000	5.0690+000	3.4720+000
SE	4.2490+002	4.2420+002	2.9950+002	2.1660+002	1.5110+002	7.9460+001	2.7890+001	1.1470+001	6.7110+000	4.6220+000
SSE	4.4430+002	4.4210+002	3.1550+002	2.3240+002	1.6760+002	9.4690+001	3.4740+001	1.4500+001	8.5290+000	5.8930+000

Table A.20. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site L20 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	2.2850+002	2.9860+002	2.7500+002	2.2120+002	1.5870+002	8.1000+001	2.9670+001	1.2590+001	7.4670+000	5.1720+000
SSW	2.3550+002	2.8010+002	2.3230+002	1.7570+002	1.2021+002	5.5960+001	1.8770+001	7.7040+000	4.5170+000	3.1100+000
SW	2.0090+002	2.2860+002	1.8050+002	1.3360+002	8.9250+001	3.9570+001	1.2740+001	5.1430+000	2.9990+000	2.0590+000
WSW	1.5150+002	1.7180+002	1.3520+002	1.0200+002	6.8930+001	3.0900+001	9.9550+000	4.0150+000	2.3400+000	1.6060+000
W	1.1920+002	1.3770+002	1.1070+002	8.3190+001	5.6370+001	2.5380+001	8.2010+000	3.3130+000	1.9320+000	1.3260+000
WNW	9.6150+001	1.1240+002	8.9560+001	6.6920+001	4.5290+001	2.0860+001	6.9830+000	2.8650+000	1.6800+000	1.1560+000
NW	1.0560+002	1.2560+002	1.0400+002	8.0160+001	5.5910+001	2.7290+001	9.6080+000	4.0180+000	2.3720+000	1.6400+000
NNW	1.9010+002	2.3930+002	2.0900+002	1.6430+002	1.1580+002	5.6520+001	1.9730+001	8.2110+000	4.8360+000	3.3380+000
N	2.2520+002	2.8690+002	2.4800+002	1.9170+002	1.3270+002	6.2290+001	2.0940+001	8.5770+000	5.0200+000	3.4500+000
NNE	1.6020+002	2.0560+002	1.7750+002	1.3540+002	9.2410+001	4.2220+001	1.3770+001	5.5490+000	3.2260+000	2.2060+000
NE	1.1580+002	1.5150+002	1.3570+002	1.0480+002	7.2410+001	3.4250+001	1.1610+001	4.7590+000	2.7850+000	1.9120+000
ENE	8.5420+001	1.1610+002	1.0750+002	8.3710+001	5.8390+001	2.8570+001	1.0070+001	4.1930+000	2.4680+000	1.7000+000
E	7.1890+001	1.0070+002	9.6290+001	7.6870+001	5.5140+001	2.8840+001	1.0800+001	4.6030+000	2.7330+000	1.8920+000
ESE	6.0870+001	8.8520+001	9.0660+001	7.6210+001	5.7270+001	3.3130+001	1.3530+001	5.9630+000	3.5840+000	2.5000+000
SE	7.1510+001	1.0160+002	1.0440+002	8.8720+001	6.7270+001	3.9630+001	1.6430+001	7.2840+000	4.3860+000	3.0640+000
SSE	1.5900+002	2.1750+002	2.1200+002	1.7510+002	1.2890+002	7.0080+001	2.7210+001	1.1790+001	7.0430+000	4.9000+000

Table A.21. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site R21 (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.6580+002	2.8110+002	3.2260+002	3.0390+002	2.4590+002	1.1840+002	3.4890+001	1.2970+001	7.2530+000	4.7940+000
SSW	8.8850+001	1.3430+002	1.4780+002	1.3820+002	1.1140+002	5.3540+001	1.5780+001	5.8800+000	3.2960+000	2.1820+000
SW	6.7980+001	9.7170+001	1.0570+002	1.0010+002	8.1760+001	3.9650+001	1.1690+001	4.3640+000	2.4500+000	1.6250+000
WSW	7.1460+001	1.0130+002	1.1240+002	1.0950+002	9.1590+001	4.5280+001	1.3470+001	5.0460+000	2.8360+000	1.8820+000
W	8.3050+001	1.2230+002	1.3620+002	1.2220+002	1.1030+002	5.4670+001	1.6340+001	6.1300+000	3.4450+000	2.3850+000
WNW	8.6270+001	1.3400+002	1.4730+002	1.4020+002	1.1560+002	5.7110+001	1.7120+001	6.4160+000	3.6000+000	2.3830+000
NW	8.7810+001	1.3760+002	1.4770+002	1.3750+002	1.1140+002	5.4250+001	1.6170+001	6.0510+000	3.3930+000	2.2450+000
NNW	1.3730+002	2.1560+002	2.2940+002	2.1000+002	1.6730+002	7.9930+001	2.3590+001	8.8000+000	4.9310+000	3.2620+000
N	1.5450+002	2.4380+002	2.6450+002	2.4570+002	1.9790+002	9.5240+001	2.8120+001	1.0480+001	5.8720+000	3.8840+000
NNE	1.1470+002	1.7780+002	1.9980+002	1.9220+002	1.5920+002	7.8360+001	2.3330+001	8.7190+000	4.8880+000	3.2360+000
NE	7.4110+001	1.1410+002	1.3450+002	1.3370+002	1.1330+002	5.7130+001	1.7340+001	6.5180+000	3.6590+000	2.4240+000
ENE	3.2130+001	5.0690+001	6.6750+001	7.0630+001	6.2020+001	3.2200+001	9.9700+000	3.7800+000	2.1290+000	1.4130+000
E	2.3220+001	3.6500+001	4.7980+001	5.0830+001	4.4600+001	2.3040+001	7.0930+000	2.6920+000	1.5200+000	1.0110+000
ESE	3.2490+001	5.3580+001	6.9010+001	7.1310+001	6.1660+001	3.1490+001	9.6190+000	3.6390+000	2.0520+000	1.3640+000
SE	7.0390+001	1.1850+002	1.4360+002	1.4240+002	1.1980+002	5.9500+001	1.7780+001	6.6640+000	3.7430+000	2.4810+000
SSE	1.6370+002	2.8380+002	3.3040+002	3.1440+002	2.5630+002	1.2400+002	3.6540+001	1.3590+001	7.6050+000	5.0270+000

Table A.22. ISCLT predicted atmospheric concentrations ($\mu\text{g}/\text{m}^3$) – site MSD (annual meteorology)

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	8.9124-001	3.8770+000	2.1670-001	3.4420+001	3.9230+001	2.8500+001	1.1490+001	5.0870+000	3.0840+000	2.1560+000
SSW	7.1563-001	3.1110+000	1.7030-001	2.6820+001	3.0510+001	2.2120+001	8.8980+000	3.9340+000	2.3840+000	1.6660+000
SW	4.4737-001	1.8460+000	9.3890-000	1.4640+001	1.6770+001	1.2360+001	5.1220+000	2.3230+000	1.4250+000	1.0020+000
WSW	6.9059-001	2.6470+000	1.2610+001	1.9490+001	2.2120+001	1.6240+001	6.7000+000	3.0130+000	1.8390+000	1.2900+000
W	6.5090-001	2.5070+000	1.2230+001	1.9180+001	2.2020+001	1.6500+001	6.8880+000	3.0960+000	1.8880+000	1.3230+000
WNW	4.6184-001	1.6040+000	7.5530+000	1.1960+001	1.4030+001	1.0960+001	4.7850+000	2.2070+000	1.3600+000	9.5880-001
NW	5.0561-001	1.7070+000	7.9950+000	1.2710+001	1.5170+001	1.2380+001	5.5420+000	2.5870+000	1.6030+000	1.1340+000
NNW	5.2061-001	1.8480+000	8.6640+000	1.3800+001	1.6460+001	1.3690+001	6.3030+000	2.9940+000	1.8690+000	1.3280+000
N	5.6625-001	1.8730+000	7.9690+000	1.2440+001	1.4840+001	1.2400+001	5.7670+000	2.7650+000	1.7330+000	1.2340+000
NNE	3.7474-001	1.2760+000	5.5050+000	8.5560+000	1.0250+001	8.5690+000	3.9350+000	1.8690+000	1.1670+000	8.2880-001
NE	2.8723-001	1.0560+000	4.7250+000	7.3180+000	8.7410+000	7.4350+000	3.4630+000	1.6500+000	1.0310+000	7.3290-001
ENE	5.2255-001	1.7130+000	6.9920+000	1.0520+001	1.2480+001	1.0720+001	5.0760+000	2.4430+000	1.5320+000	1.0920+000
E	4.5941-001	1.6340+000	7.0400+000	1.0500+001	1.2380+001	1.0580+001	4.9800+000	2.3970+000	1.5040+000	1.0730+000
ESE	3.5814-001	1.4195+000	7.0060+000	1.0900+001	1.3060+001	1.1120+001	5.2270+000	2.5210+000	1.5830+000	1.1290+000
SE	5.3967-001	1.9670+000	9.6360+000	1.5380+001	1.8600+001	1.6200+001	7.7980+000	3.7770+000	2.3730+000	1.6930+000
SSE	7.0357-001	2.8480+000	1.5290+001	2.4540+001	2.8340+001	2.2940+001	1.0120+001	4.7020+000	2.9070+000	2.0550+000

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Appendix B

ANNUAL AVERAGE ESTIMATES OF POPULATION EXPOSURE TO SELECTED MATERIALS
FROM 22 INCINERATION SITES USING THE HEM COMPUTER CODE AND
ISCLT GENERATED ATMOSPHERIC CONCENTRATION ESTIMATE

Table B.1. Annual average estimates of population exposure
to selected materials from indicated incineration
sites using the HEM Computer Code and
ISCLT concentration estimates

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
RK1	1	3.35+002	0.	.00
	2	2.50+002	0.	.00
	3	1.00+002	0.	.00
	4	5.00+001	0.	.00
	5	2.50+001	0.	.00
	6	1.00+001	1196.	1.36+004
	7	5.00+000	3395.	2.77+004
	8	2.50+000	5650.	3.53+004
	9	1.00+000	7058.	3.76+004
	10	9.24-001	7058.	3.76+004
RL2	1	4.93+001	0.	.00
	2	2.50+001	0.	.00
	3	1.00+001	0.	.00
	4	5.00+000	811.	5.00+003
	5	2.50+000	2881.	1.07+004
	6	1.00+000	3763.	1.19+004
	7	7.08-001	3763.	1.19+004
L3	1	1.08+003	3.	3.70+003
	2	1.00+003	3.	3.70+003
	3	5.00+002	57.	3.84+004
	4	2.50+002	332.	1.28+005
	5	1.00+002	1534.	3.21+005
	6	5.00+001	9483.	8.46+005
	7	2.50+001	28794.	1.46+006
	8	1.00+001	96770.	2.65+006
	9	5.00+000	147150.	3.00+006
	10	2.50+000	187089.	3.16+006
	11	1.17+000	201688.	3.19+006
L4	1	3.73+002	23.	8.49+003
	2	2.50+002	465.	1.37+005
	3	1.00+002	8432.	1.22+006
	4	5.00+001	22772.	2.32+006
	5	2.50+001	61587.	3.75+006
	6	1.00+001	161715.	5.31+006
	7	5.00+000	209471.	5.68+006
	8	2.50+000	218532.	5.71+006
	9	1.00+000	244899.	5.76+006
	10	8.58-001	244899.	5.76+006

Table B.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L5	1	8.76+002	2.	1.75+003
	2	5.00+002	21.	1.38+004
	3	2.50+002	166.	6.03+004
	4	1.00+002	2272.	3.85+005
	5	5.00+001	12289.	1.11+006
	6	2.50+001	46586.	2.28+006
	7	1.00+001	166690.	4.05+006
	8	5.00+000	473606.	6.14+006
	9	2.50+000	1261423.	8.79+006
	10	1.00+000	2108952.	1.04+007
	11	6.84-001	2158331.	1.04+007
RL6	1	4.04+001	0.	.00
	2	2.50+001	0.	.00
	3	1.00+001	0.	.00
	4	5.00+000	1383.	8.55+003
	5	2.50+000	5040.	2.23+004
	6	1.00+000	10619.	3.01+004
	7	7.47-001	10619.	3.01+004
R7	1	4.74+001	1.	5.11+001
	2	2.50+001	246.	7.44+003
	3	1.00+001	579.	1.30+004
	4	5.00+000	3981.	3.42+004
	5	2.50+000	40766.	1.49+005
	6	1.00+000	270825.	5.52+005
	7	6.26-001	281167.	5.62+005
FB8	1	1.12+002	1.	5.98+001
	2	1.00+002	4.	4.68+002
	3	5.00+001	223.	1.45+004
	4	2.50+001	390.	2.08+004
	5	1.00+001	883.	2.70+004
	6	5.00+000	4314.	5.06+004
	7	2.50+000	8976.	6.89+004
	8	1.00+000	11867.	7.29+004
	9	5.26-001	12203.	7.32+004
L9	1	1.19+003	48.	5.67+004
	2	1.00+003	121.	1.33+005
	3	5.00+002	2776.	1.99+006
	4	2.50+002	8499.	4.06+006
	5	1.00+002	24980.	6.64+006
	6	5.00+001	70363.	9.75+006
	7	2.50+001	225061.	1.51+007
	8	1.00+001	790075.	2.38+007
	9	5.00+000	1413375.	2.84+007
	10	3.22+000	1471028.	2.87+007

Table B.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L10	1	5.67+001	5.	2.84+002
	2	5.00+001	26.	1.49+003
	3	2.50+001	1125.	3.84+004
	4	1.00+001	54837.	7.16+005
	5	5.00+000	200768.	1.79+006
	6	2.50+000	328165.	2.27+006
	7	1.00+000	371114.	2.34+006
	8	7.96-001	375000.	2.35+006
RL11	1	3.07+002	20.	6.29+003
	2	2.50+002	232.	6.14+004
	3	1.00+002	11460.	1.57+006
	4	5.00+001	40888.	3.66+006
	5	2.50+001	87413.	5.32+006
	6	1.00+001	249367.	7.75+006
	7	5.00+000	678369.	1.08+007
	8	2.50+000	1197915.	1.27+007
	9	1.20+000	1421680.	1.32+007
L12	1	3.59+001	15.	5.56+002
	2	2.50+001	89.	2.65+003
	3	1.00+001	13568.	2.01+005
	4	5.00+000	39501.	3.72+005
	5	2.50+000	95825.	5.59+005
	6	1.00+000	680381.	1.37+006
	7	5.00-001	890168.	1.55+006
	8	3.37-001	890172.	1.55+006
L13	1	8.13+002	1.	5.71+002
	2	5.00+002	17.	1.04+004
	3	2.50+002	97.	3.62+004
	4	1.00+002	585.	1.08+005
	5	5.00+001	1811.	1.94+005
	6	2.50+001	5155.	3.15+005
	7	1.00+001	13551.	4.57+005
	8	5.00+000	21112.	5.09+005
	9	2.50+000	46169.	5.86+005
	10	1.23+000	141474.	7.72+005
R14	1	4.66+001	1.	3.20+001
	2	2.50+001	53.	1.66+003
	3	1.00+001	292.	5.87+003
	4	5.00+000	8235.	6.16+004
	5	2.50+000	104260.	3.51+005
	6	1.00+000	576340.	1.14+006
	7	5.00-001	691808.	1.24+006
	8	2.50-001	691827.	1.24+006
	9	1.00-001	691827.	1.24+006
	10	7.30-002	691845.	1.24+006

Table B.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L15	1	6.00+002	1.	5.29+002
	2	5.00+002	8.	4.18+003
	3	2.50+002	71.	2.55+004
	4	1.00+002	481.	8.59+004
	5	5.00+001	1430.	1.43+005
	6	2.50+001	2964.	2.09+005
	7	1.00+001	8806.	2.92+005
	8	5.00+000	29694.	4.36+005
	9	2.50+000	76297.	5.99+005
	10	1.29+000	114073.	6.78+005
L16	1	5.97+001	2.	1.30+002
	2	5.00+001	11.	6.71+002
	3	2.50+001	583.	1.90+004
	4	1.00+001	2260.	4.07+004
	5	5.00+000	29775.	2.08+005
	6	2.50+000	99402.	4.62+005
	7	1.00+000	194393.	6.29+005
	8	5.00-001	245914.	6.68+005
	9	3.49-001	251387.	6.70+005
L17	1	3.69+002	0.	8.00+001
	2	2.50+002	4.	1.12+003
	3	1.00+002	53.	7.84+003
	4	5.00+001	1374.	8.04+004
	5	2.50+001	3904.	1.82+005
	6	1.00+001	21897.	4.10+005
	7	5.00+000	58161.	6.68+005
	8	2.50+000	74628.	7.26+005
	9	1.25+000	88667.	7.54+005
R18	1	6.54+001	32.	2.12+003
	2	5.00+001	194.	1.16+004
	3	2.50+001	3492.	1.15+005
	4	1.00+001	26142.	4.70+005
	5	5.00+000	54735.	6.78+005
	6	2.50+000	249563.	1.30+006
	7	1.00+000	801845.	2.33+006
	8	6.39-001	849219.	2.37+006
L19	1	4.44+002	0.	.00
	2	2.50+002	0.	.00
	3	1.00+002	0.	.00
	4	5.00+001	0.	.00
	5	2.50+001	0.	.00
	6	1.00+001	1379.	2.07+004
	7	5.00+000	6279.	5.37+004
	8	2.50+000	16321.	8.83+004
	9	1.39+000	16321.	8.83+004

Table B.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L20	1	2.99+002	3.	9.51+002
	2	2.50+002	16.	4.55+003
	3	1.00+002	491.	7.46+004
	4	5.00+001	3770.	2.98+005
	5	2.50+001	19678.	7.70+005
	6	1.00+001	176770.	3.04+006
	7	5.00+000	356252.	4.29+006
	8	2.50+000	487498.	4.78+006
	9	1.16+000	492464.	4.79+006
R21	1	3.30+002	29.	9.44+003
	2	2.50+002	300.	8.63+004
	3	1.00+002	5519.	7.48+005
	4	5.00+001	16358.	1.42+006
	5	2.50+001	23037.	1.67+006
	6	1.00+001	43388.	1.98+006
	7	5.00+000	60204.	2.10+006
	8	2.50+000	74102.	2.15+006
	9	1.01+000	79081.	2.16+006
MSD	1	3.92+001	677.	2.66+004
	2	2.50+001	15078.	4.52+005
	3	1.00+001	132435.	2.12+006
	4	5.00+000	310087.	3.35+006
	5	2.50+000	706459.	4.73+006
	6	1.00+000	1024506.	5.32+006
	7	5.00+001	1037264.	5.33+006
	8	2.87+001	1037315.	5.33+006

Table B.2. Exposure estimates from 10 incinerators
in an industrial area

Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
1	1.74+002	1.	1.50+002
2	1.00+002	21.	2.45+003
3	5.00+001	100.	7.80+003
4	2.50+001	819.	2.98+004
5	1.00+001	2482.	5.57+004
6	5.00+000	8173.	9.28+004
7	2.50+000	48551.	2.28+005
8	1.00+000	180765.	4.13+005
9	5.00-001	419247.	5.86+005
10	2.50-001	713986.	6.90+005
11	1.00-001	1065686.	7.50+005
12	5.00-002	1292940.	7.66+005
13	2.50-002	1441611.	7.72+005
14	1.00-002	1486544.	7.72+005
15	5.00-003	1510621.	7.73+005
16	3.49-003	1512493.	7.73+005

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Appendix C

ISCST ATMOSPHERIC CONCENTRATIONS -- WORST-CASE METEOROLOGY

Table C.1. ISCST worst-case meteorology. Concentration estimates ($\mu\text{g}/\text{m}^3$).^a

Site	Range, km									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
RK1	<u>4450</u>	4140	1708	656.7	244.4	113.9	44.16	20.88	13.23	9.47
RL2	18.6	477.8	<u>1013</u>	540.5	243.8	119.2	46.22	21.86	13.85	9.91
L3	<u>7046</u>	4940	1772	662.7	254.5	121.4	47.07	22.66	14.10	10.09
L4	2995	<u>3557</u>	1654	651.9	281.9	138.7	53.78	25.42	16.10	11.53
L5	<u>10396</u>	5736	1829	667.9	275.8	135.0	52.34	24.75	15.68	11.22
RL6	11.04	391.1	<u>971.1</u>	535.3	255.0	125.7	48.75	23.06	14.60	10.45
R7	54.54	722.5	<u>1104</u>	551.8	211.2	94.57	36.66	17.34	10.98	7.86
FB8	<u>5387</u>	4218	1598	603.9	211.2	91.29	35.39	16.74	10.60	7.58
L9	<u>11419</u>	5946.6	1842	668.9	237.6	102.8	39.88	18.86	11.95	8.55
L10	449.5	<u>1624</u>	1308.4	571.8	204.7	83.2	32.2	15.3	9.66	6.91
RL11	1067	<u>2393</u>	152.7	633.5	224.4	90.96	35.26	16.68	10.56	7.56
L12	.2403	73.61	<u>684.5</u>	491.0	225.5	110.8	42.90	20.33	12.9	9.2
L13	<u>6925.6</u>	4907.2	1769.8	662.5	251.5	119.3	46.2	21.9	13.8	9.91
R14	18.4	478.8	<u>1011.8</u>	540.2	201.1	80.42	31.17	14.75	9.34	6.68
L15	<u>10576.3</u>	5773.9	1831.1	668.6	301.4	149.3	57.89	27.38	17.34	12.41
L16	14.9	439.07	<u>994.9</u>	537.9	229.8	110.4	42.79	20.24	12.82	9.18
L17	<u>6102.5</u>	4674.4	1751.8	661.4	301.3	149.3	57.85	27.37	17.34	12.40
R18	78.73	835.8	<u>1137.3</u>	555.85	227.3	108.26	41.97	19.84	6.87	8.99
L19	<u>7943.4</u>	5172.6	1789.4	664.25	250.3	118.3	45.9	21.65	13.74	9.83
L20	3710.6	<u>3861.2</u>	1683.2	654.4	234.9	105.0	40.7	19.25	12.19	8.75
R21	981.8	<u>2316.9</u>	1512.4	637.9	286.4	141.3	54.8	25.9	16.4	11.74
MSD	0.01877	3.55	362.9	<u>420.6</u>	230.5	113.4	43.95	22.25	13.16	9.42

^aUnderscored values are the maxima for each site.

Appendix D

ESTIMATES OF POPULATION EXPOSURES TO SELECTED MATERIALS FROM 22
INCINERATION SITES USING THE HEM COMPUTER CODE AND ISCST
GENERATED ATMOSPHERIC CONCENTRATION ESTIMATES
UNDER WORST-CASE METEOROLOGICAL CONDITIONS

Table D.1. ISCST-HEM estimates of population exposures to selected materials from indicated incineration sites under worst-case meteorological conditions

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
RK1	1	4.45+003	0.	.00
	2	2.50+003	0.	.00
	3	1.00+003	0.	.00
	4	5.00+002	0.	.00
	5	2.50+002	0.	.00
	6	1.00+002	0.	.00
	7	5.00+001	0.	.00
	8	2.50+001	0.	.00
	9	1.00+001	5703.	9.06+004
	10	9.47+000	7058.	1.04+005
RL2	1	1.01+003	0.	.00
	2	1.00+003	0.	.00
	3	5.00+002	0.	.00
	4	2.50+002	0.	.00
	5	1.00+002	0.	.00
	6	5.00+001	0.	.00
	7	2.50+001	937.	4.32+004
	8	1.00+001	3763.	7.98+004
	9	9.91+000	3763.	7.98+004
L3	1	7.04+003	28.	2.00+005
	2	5.00+003	28.	2.00+005
	3	2.50+003	76.	4.33+005
	4	1.00+003	168.	5.96+005
	5	5.00+002	324.	7.00+005
	6	2.50+002	991.	8.69+005
	7	1.00+002	5281.	1.39+006
	8	5.00+001	30172.	3.00+006
	9	2.50+001	104269.	5.84+006
	10	1.00+001	201688.	7.31+006
	11	1.01+001	201688.	7.31+006
L4	1	3.56+003	638.	2.27+006
	2	2.50+003	951.	3.21+006
	3	1.00+003	2188.	5.25+006
	4	5.00+002	4159.	6.54+006
	5	2.50+002	11890.	8.73+006
	6	1.00+002	52783.	1.44+007
	7	5.00+001	118243.	1.88+007
	8	2.50+001	202062.	2.20+007
	9	1.00+001	244899.	2.27+007
	10	1.15+001	244899.	2.27+007

Table D.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L5	1	1.04+004	19.	2.02+005
	2	1.00+004	19.	2.02+005
	3	5.00+003	76.	5.26+005
	4	2.50+003	76.	5.26+005
	5	1.00+003	293.	9.24+005
	6	5.00+002	960.	1.40+006
	7	2.50+002	4855.	2.66+006
	8	1.00+002	36172.	7.07+006
	9	5.00+001	152595.	1.46+007
	10	2.50+001	582540.	2.94+007
	11	1.00+001	2158331.	5.46+007
	12	1.12+001	2158331.	5.46+007
RL6	1	9.71+002	0.	.00
	2	5.00+002	0.	.00
	3	2.50+002	0.	.00
	4	1.00+002	0.	.00
	5	5.00+001	730.	3.94+004
	6	2.50+001	730.	3.94+004
	7	1.00+001	10619.	1.67+005
	8	1.05+001	10619.	1.67+005
R7	1	1.10+003	10.	1.05+004
	2	1.00+003	10.	1.05+004
	3	5.00+002	31.	2.34+004
	4	2.50+002	31.	2.34+004
	5	1.00+002	104.	3.87+004
	6	5.00+001	582.	8.38+004
	7	2.50+001	3881.	1.75+005
	8	1.00+001	199308.	2.86+006
	9	7.86+000	281167.	3.59+006
FB8	1	5.38+003	2.	1.21+004
	2	5.00+003	2.	1.21+004
	3	2.50+003	6.	2.98+004
	4	1.00+003	15.	4.35+004
	5	5.00+002	31.	5.29+004
	6	2.50+002	31.	5.29+004
	7	1.00+002	96.	6.67+004
	8	5.00+001	525.	1.06+005
	9	2.50+001	525.	1.06+005
	10	1.00+001	5417.	1.74+005
	11	7.58+000	12203.	2.35+005

Table D.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L9	1	1.14+004	754.	8.61+006
	2	1.00+004	754.	8.61+006
	3	5.00+003	1572.	1.35+007
	4	2.50+003	1572.	1.35+007
	5	1.00+003	2697.	1.55+007
	6	5.00+002	4220.	1.66+007
	7	2.50+002	4220.	1.66+007
	8	1.00+002	26475.	1.98+007
	9	5.00+001	69929.	2.27+007
	10	2.50+001	307143.	3.04+007
	11	1.00+001	1331929.	4.68+007
	12	8.54+000	1471028.	4.81+007
L10	1	1.62+003	22.	3.54+004
	2	1.00+003	67.	9.40+004
	3	5.00+002	148.	1.40+005
	4	2.50+002	159.	1.46+005
	5	1.00+002	501.	2.16+005
	6	5.00+001	2893.	4.15+005
	7	2.50+001	18111.	9.57+005
	8	1.00+001	231999.	3.88+006
	9	6.91+000	375000.	5.04+006
RL11	1	2.39+003	230.	5.51+005
	2	1.00+003	383.	7.13+005
	3	5.00+002	2043.	1.77+006
	4	2.50+002	2043.	1.77+006
	5	1.00+002	17340.	4.35+006
	6	5.00+001	78745.	8.59+006
	7	2.50+001	178641.	1.20+007
	8	1.00+001	858169.	2.15+007
	9	7.56+000	1421680.	2.64+007
L12	1	6.84+002	32.	2.20+004
	2	5.00+002	32.	2.20+004
	3	2.50+002	139.	7.47+004
	4	1.00+002	14083.	1.78+006
	5	5.00+001	26064.	2.47+006
	6	2.50+001	89733.	4.71+006
	7	1.00+001	717996.	1.28+007
	8	5.00+000	890163.	1.45+007
	9	2.50+000	890163.	1.45+007
	10	1.00+000	890163.	1.45+007
	11	5.00+001	890163.	1.45+007
	12	2.50+001	890163.	1.45+007
	13	2.40+001	890172.	1.45+007

Table D.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L13	1	6.93+003	11.	7.78+004
	2	5.00+003	11.	7.78+004
	3	2.50+003	37.	2.04+005
	4	1.00+003	97.	3.10+005
	5	5.00+002	211.	3.86+005
	6	2.50+002	719.	5.14+005
	7	1.00+002	3923.	8.96+005
	8	5.00+001	7363.	1.14+006
	9	2.50+001	18503.	1.52+006
	10	1.00+001	138485.	3.04+006
	11	9.91+000	141474.	3.07+006
R14	1	1.01+003	6.	6.13+003
	2	1.00+003	6.	6.13+003
	3	5.00+002	17.	1.21+004
	4	2.50+002	20.	1.35+004
	5	1.00+002	66.	2.28+004
	6	5.00+001	369.	4.72+004
	7	2.50+001	7867.	2.90+005
	8	1.00+001	263753.	3.77+006
	9	6.68+000	691845.	7.22+006
L15	1	1.06+004	14.	1.49+005
	2	1.00+004	14.	1.49+005
	3	5.00+003	40.	3.01+005
	4	2.50+003	40.	3.01+005
	5	1.00+003	94.	3.99+005
	6	5.00+002	188.	4.62+005
	7	2.50+002	569.	5.77+005
	8	1.00+002	2964.	9.34+005
	9	5.00+001	8055.	1.25+006
	10	2.50+001	45939.	2.56+006
	11	1.00+001	114073.	3.61+006
	12	1.24+001	114073.	3.61+006
L16	1	9.95+002	19.	1.91+004
	2	5.00+002	50.	3.59+004
	3	2.50+002	60.	4.00+004
	4	1.00+002	1295.	1.90+005
	5	5.00+001	2409.	2.55+005
	6	2.50+001	15161.	7.07+005
	7	1.00+001	186832.	3.18+006
	8	9.18+000	251387.	3.79+006

Table D.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
L17	1	6.10+003	2.	1.14+004
	2	5.00+003	2.	1.14+004
	3	2.50+003	5.	2.77+004
	4	1.00+003	12.	4.01+004
	5	5.00+002	25.	4.87+004
	6	2.50+002	80.	6.51+004
	7	1.00+002	3904.	6.36+005
	8	5.00+001	22792.	1.77+006
	9	2.50+001	62836.	3.21+006
	10	1.00+001	88667.	3.64+006
	11	1.24+001	88667.	3.64+006
R18	1	1.14+003	116.	1.32+005
	2	1.00+003	116.	1.32+005
	3	5.00+002	342.	2.69+005
	4	2.50+002	342.	2.69+005
	5	1.00+002	12344.	1.65+006
	6	5.00+001	31987.	2.87+006
	7	2.50+001	90412.	4.75+006
	8	1.00+001	285748.	8.16+006
	9	6.87+000	849219.	1.27+007
L19	1	7.94+003	0.	.00
	2	5.00+003	0.	.00
	3	2.50+003	0.	.00
	4	1.00+003	0.	.00
	5	5.00+002	0.	.00
	6	2.50+002	0.	.00
	7	1.00+002	0.	.00
	8	5.00+001	0.	.00
	9	2.50+001	1379.	4.09+004
	10	1.00+001	11059.	1.80+005
	11	9.83+000	16321.	2.32+005
L20	1	3.86+003	51.	1.97+005
	2	2.50+003	78.	2.99+005
	3	1.00+003	183.	4.75+005
	4	5.00+002	340.	5.77+005
	5	2.50+002	340.	5.77+005
	6	1.00+002	9435.	1.66+006
	7	5.00+001	20288.	2.27+006
	8	2.50+001	143672.	6.29+006
	9	1.00+001	444634.	1.11+007
	10	8.75+000	492464.	1.15+007

Table D.1. (continued)

Site	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
R21	1	2.32+003	203.	4.71+005
	2	1.00+003	613.	1.09+006
	3	5.00+002	1357.	1.60+006
	4	2.50+002	4606.	2.53+006
	5	1.00+002	19712.	4.65+006
	6	5.00+001	33968.	5.68+006
	7	2.50+001	49997.	6.20+006
	8	1.00+001	79081.	6.71+006
	9	1.17+001	79081.	6.71+006
MSD	1	4.21+002	2432.	1.02+006
	2	2.50+002	4077.	1.62+006
	3	1.00+002	60982.	9.93+006
	4	5.00+001	188305.	1.90+007
	5	2.50+001	478327.	2.90+007
	6	1.00+001	1016283.	3.77+007
	7	5.00+000	1036564.	3.79+007
	8	2.50+000	1037187.	3.79+007
	9	1.00+000	1037187.	3.79+007
	10	5.00-001	1037187.	3.79+007
	11	2.50-001	1037187.	3.79+007
	12	1.00-001	1037187.	3.79+007
	13	5.00-002	1037187.	3.79+007
	14	2.50-002	1037187.	3.79+007
	15	1.88-002	1037315.	3.79+007

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Appendix E

ATMOSPHERIC CONCENTRATIONS ($\mu\text{g}/\text{m}^3$) ESTIMATED USING THE
HEM COMPUTER CODE WITH VARYING STACK PARAMETERS
AND ANNUAL METEOROLOGY

Table E.1. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology – run 1

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.63695+002	2.05091+002	2.28421+002	1.85064+002	1.26935+002	4.94920+001	1.25508+001	4.38411+000	2.37171+000	1.53481+000
SSW	1.09005+002	1.54501+002	1.80840+002	1.47806+002	1.01788+002	3.98064+001	1.01080+001	3.53250+000	1.91137+000	1.23705+000
SW	8.72154+001	1.13404+002	1.27474+002	1.03444+002	7.10065+001	2.76994+001	7.02406+000	2.45303+000	1.32683+000	8.58542-001
WSW	9.37410+001	1.04334+002	1.03513+002	8.11760+001	5.46376+001	2.09040+001	5.23586+000	1.81917+000	9.81993-001	6.34703-001
W	8.65527+001	1.08063+002	1.14827+002	9.15709+001	6.21881+001	2.39789+001	6.02977+000	2.09776+000	1.13288+000	7.32392-001
WNW	5.38982+001	6.52673+001	6.36613+001	4.94072-001	3.30036+001	1.24986+001	3.10000+000	1.07102+000	5.76591-001	3.72060-001
NW	4.65801+001	6.89378+001	7.98287+001	6.48376-001	4.44559+001	1.72959+001	4.37505+000	1.52636+000	8.25326-001	5.33956-001
NNW	1.11167+002	1.46128+002	1.67823+002	1.37034-002	9.44011+001	3.69583+001	9.39416+000	3.28418+000	1.77716+000	1.15022+000
N	1.95592+002	2.19065+002	2.30496+002	1.84470-002	1.25749+002	4.87881+001	1.23471+001	4.31103+000	2.33199+000	1.50909+000
NNE	3.09339+002	2.61447+002	2.33929+002	1.81156+002	1.21648+002	4.67298+001	1.17987+001	4.12009+000	2.22925+000	1.44288+000
NE	3.26013+002	2.53929+002	2.12099+002	1.61308+002	1.07317+002	4.09334+001	1.03115+001	3.60018+000	1.94821+000	1.26116+000
ENE	2.72007+002	2.14564+002	1.68582+002	1.24831+002	8.15991+001	3.05087+001	7.56939+000	2.62310+000	1.41481+000	9.14083-001
E	4.35541+002	3.08458+002	2.21910+002	1.60502+002	1.03705+002	3.84783+001	9.53663+000	3.30731+000	1.78480+000	1.15356+000
ESE	1.94576+002	1.55536+002	1.30420+002	9.92641+001	6.60571+001	2.51783+001	6.32909+000	2.20566+000	1.19233+000	7.71305-001
SE	1.25081+002	1.11858+002	1.03068+002	8.03010+001	5.40669+001	2.07960+001	5.24732+000	1.83075+000	9.90057-001	6.40597-001
SSE	1.08496+002	1.16241+002	1.15888+002	9.11983+001	6.15441+001	2.36346+001	5.94277+000	2.06959+000	1.11844+000	7.23403-001

Table E.2. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology – run 2

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.04253+002	1.77098+002	2.19907+002	1.81597+002	1.25654+002	4.93085+001	1.25354+001	4.38159+000	2.37081+000	1.53438+000
SSW	7.91431+001	1.40547+002	1.76630+002	1.46097+002	1.01158+002	3.97165+001	1.01005+001	3.53126+000	1.91094+000	1.23684+000
SW	5.85292+001	9.98949+001	1.23366+002	1.01771+002	7.03880+001	2.76109+001	7.01663+000	2.45182+000	1.32640+000	8.58336-001
WSW	5.76520+001	8.73383+001	9.83438+001	7.90709+001	5.38596+001	2.07926+001	5.22652+000	1.81764+000	9.81452-001	6.34443-001
W	6.80020+001	9.94417+001	1.22336+002	9.05217+001	6.18019+001	2.39239+001	6.02517+000	2.09700+000	1.13262+000	7.32264-001
WNW	4.85773+001	6.27615+001	6.28992+001	4.90969+001	3.28889+001	1.24822+001	3.09862+000	1.07079+000	5.76512-001	3.72021-001
NW	3.73265+001	6.45799+001	7.85034+001	6.42978+001	4.42564+001	1.72674+001	4.37265+000	1.52597+000	8.25187-001	5.33890-001
NNW	7.59846+001	1.29668+002	1.62850+002	1.35014+002	9.36564+001	3.68519+001	9.38526+000	3.28272+000	1.77665+000	1.14997+000
N	9.70488+001	1.72594+002	2.15363+002	1.78714+002	1.23622+002	4.84836+001	1.23216+001	4.30685+000	2.33051+000	1.50838+000
NNE	8.02607+001	1.54000+002	2.01422+002	1.67947+002	1.16775+002	4.60336+001	1.17404+001	4.11053+000	2.22587+000	1.44126+000
NE	5.67575+001	1.27769+002	1.74125+002	1.45911+002	1.01646+002	4.01248+001	1.02438+001	3.58910+000	1.94429+000	1.25928+000
ENE	8.33968+001	1.26212+002	1.41963+002	1.14033+002	7.76207+001	2.99412+001	7.52190+000	2.61532+000	1.41206+000	9.12763-001
E	8.99412+001	1.46274+002	1.73162+002	1.40748+002	9.64321+001	3.74419+001	9.44995+000	3.29311+000	1.77979+000	1.15115+000
ESE	5.17901+001	8.83690+001	1.10095+002	9.10041+001	6.30094+001	2.47429+001	6.29261+000	2.19968+000	1.19021+000	7.70290-001
SE	4.18829+001	7.27870+001	9.12182+001	7.54807+001	5.22871+001	2.05414+001	5.22598+000	1.82725+000	9.88821-001	6.40004-001
SSE	5.16588+001	8.95837+001	1.07814+002	8.79157+001	6.03326+001	2.34615+001	5.92825+000	2.06721+000	1.11760+000	7.22999-001

Table E.3. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology – run 3

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.63695+002	2.05091+002	2.28421+002	1.85064+002	1.26935+002	4.94920+001	1.25508+001	4.38411+000	2.37171+000	1.53481+000
SSW	1.09005+002	1.54501+002	1.80840+002	1.47806+002	1.01788+002	3.98064+001	1.01080+001	3.53250+000	1.91137+000	1.23705+000
SW	8.72154+001	1.13404+002	1.27474+002	1.03444+002	7.10065+001	2.76994+001	7.02406+000	2.45303+000	1.32683+000	8.58542-001
WSW	9.37410+001	1.04334+002	1.03513+002	8.11760+001	5.46376+001	2.09040+001	5.23586+000	1.81917+000	9.81993-001	6.34703-001
W	8.65527+001	1.08068+002	1.14827+002	9.15709+001	6.21881+001	2.39789+001	6.02977+000	2.09776+000	1.13288+000	7.32392-001
WNW	5.38982+001	6.52673+001	6.36613+001	4.94072+001	3.30036+001	1.24986+001	3.10000+000	1.07102+000	5.76591-001	3.72060-001
NW	4.65801+001	6.89378+001	7.98287+001	6.48376+001	4.44559+001	1.72959+001	4.37505+000	1.52636+000	8.25326-001	5.33956-001
NNW	1.11167+002	1.46128+002	1.67823+002	1.37034+002	9.44011+001	3.69583+001	9.39416+000	3.28418+000	1.77716+000	1.15022+000
N	1.95592+002	2.19065+002	2.30496+002	1.84770+002	1.25749+002	4.87881+001	1.23471+001	4.31103+000	2.33199+000	1.50909+000
NNE	3.09339+002	2.61447+002	2.33929+002	1.81156+002	1.21648+002	4.67298+001	1.17987+001	4.12009+000	2.22925+000	1.44288+000
NE	3.26013+002	2.53929+002	2.12099+002	1.61308+002	1.07317+002	4.09334+001	1.03115+001	3.60018+000	1.94821+000	1.26116+000
ENE	2.72007+002	2.14564+002	1.68582+002	1.24831+002	8.15991+001	3.05087+001	7.56939+000	2.62310+000	1.41481+000	9.14083-001
E	4.35541+002	3.08458+002	2.21910+002	1.60502+002	1.03705+002	3.84783+001	9.53663+000	3.30731+000	1.78480+000	1.15356+000
ESE	1.94576+002	1.55536+002	1.30420+002	9.92641+001	6.60571+001	2.51783+001	6.32909+000	2.20566+000	1.19233+000	7.71305-001
SE	1.25081+002	1.11858+002	1.03068+002	8.03010+001	5.40669+001	2.07960+001	5.24732+000	1.83075+000	9.90057-001	6.40597-001
SSE	1.08496+002	1.16241+002	1.15888+002	9.11983+001	6.15441+001	2.36346+001	5.94277+000	2.06959+000	1.11844+000	7.23403-001

Table E.4. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology - run 4

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.64253+002	1.77098+002	2.19907+002	1.81597+002	1.25654+002	4.93085+001	1.25354+001	4.38159+000	2.37081+000	1.53438+000
SSW	7.91431+001	1.40547+002	1.76630+002	1.46097+002	1.01158+002	3.97165+001	1.01005+001	3.53126+000	1.91094+000	1.23684+000
SW	5.85292+001	9.98949+001	1.23366+002	1.01771+002	7.03880+001	2.76109+001	7.01663+000	2.45182+000	1.32640+000	8.58366-001
WSW	5.76520+001	8.73383+001	9.83438+001	7.90709+001	5.38596+001	2.07926+001	5.22652+000	1.81764+000	9.81452-001	6.34443-001
W	6.80020+001	9.94417+001	1.12236+002	9.05217+001	6.18019+001	2.39239+001	6.02517+000	2.09700+000	1.13262+000	7.32264-001
WNW	4.85773+001	6.27615+001	6.28992+001	4.90969+001	3.28889+001	1.24822+001	3.09862+000	1.07079+001	5.76512-001	3.72021-001
NW	3.73265+001	6.45799+001	7.85034+001	6.42978+001	4.42564+001	1.72674+001	4.37265+000	1.52597+000	8.25187-001	5.33890-001
NNW	7.59846+001	1.29668+002	1.62850+002	1.35014+002	9.36564+001	3.68519+001	9.38526+000	3.28272+000	1.77665+000	1.14997+000
N	9.69127+001	1.72594+002	2.16363+002	1.78714+002	1.23622+002	4.84836+001	1.23216+001	4.30685+000	2.33051+000	1.50838+000
NNE	7.99761+001	1.54000+002	2.01422+002	1.67947+002	1.16775+002	4.60336+001	1.17404+001	4.11053+000	2.22587+000	1.44126+000
NE	5.53466+001	1.27769+002	1.74125+002	1.45911+002	1.01646+002	4.01248+001	1.02438+001	3.58910+000	1.94429+000	1.25929+000
ENE	8.26345+001	1.26212+002	1.41963+002	1.14033+002	7.76207+001	2.99412+001	7.52190+000	2.61532+000	1.41206+000	9.12763-001
E	8.71070+001	1.46274+002	1.73162+002	1.40748+002	9.64321+001	3.74419+001	9.44995+000	3.29311+000	1.77979+000	1.15115+000
ESE	5.12332+001	8.83690+001	1.10095+002	9.10041+001	6.30094+001	2.47429+001	6.29261+000	2.19968+000	1.19021+000	7.70290-001
SE	4.18829+001	7.27870+001	9.12182+001	7.54807+001	5.22871+001	2.05414+001	5.22598+000	1.82725+000	9.88821-001	6.40004-001
SSE	5.16588+001	8.95837+001	1.07814+002	8.79157+001	6.03326+001	2.34615+001	5.92825+000	2.06721+000	1.11760+000	7.22999-001

Table E.5. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology – run 5

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	9.01306+001	1.44619+002	1.71993+002	1.40594+002	9.67810+001	3.78247+001	9.60017+000	3.35415+000	1.81464+000	1.17435+000
SSW	6.59110+001	1.12119+002	1.37001+002	1.12601+002	7.77165+001	3.04273+001	7.73289+000	2.70281+000	1.46250+000	9.46558-001
SW	4.97844+001	8.08329+001	9.61947+001	7.86646+001	5.41655+001	2.11732+001	5.37305+000	1.87679+000	1.01521+000	6.56917-001
WSW	5.04027+001	7.23573+001	7.75106+001	6.14980+001	4.15961+001	1.59673+001	4.00421+000	1.39167+000	7.51301-001	4.85619-001
W	5.54153+001	7.89331+001	8.70185+001	6.97632-001	4.74813+001	1.83348+001	4.61291+000	1.60505+000	8.66832-001	5.60405-001
WNW	3.80989+001	4.88407+001	4.84641+001	3.77158-001	2.52233+001	9.55985+001	2.37181+000	8.19500-001	4.41196-001	2.84696-001
NW	3.01747+001	5.08342+001	6.06505+001	4.94559-001	3.39635+001	1.32277+001	3.34725+000	1.16789+000	6.31516-001	4.08574-001
NNW	6.44209+001	1.04609+002	1.26789+002	1.04267-002	7.20328+001	2.82536+001	7.18631+000	2.51274+000	1.35978+000	8.80100-001
N	9.13483+001	1.47179+002	1.71734+002	1.39456-002	9.56414+001	3.72548+001	9.44178+000	3.29782+000	1.78410+000	1.15460+000
NNE	1.10918+002	1.52952+002	1.68336+002	1.34741-002	9.17598+001	3.55787+001	9.01392+000	3.15037+000	1.70701+000	1.10371+000
NE	9.12596+001	1.39194+002	1.49854+002	1.18912-002	8.05651+001	3.11142+001	7.87349+000	2.75215+000	1.48982+000	9.64591-001
ENE	9.73393+001	1.25563+002	1.20274+002	9.23501+001	6.13494+001	2.31993+001	5.78027+000	2.00529+000	1.08195+000	6.99141-001
E	1.29918+002	1.65254+002	1.53836+002	1.17016+002	7.73614+001	2.91767+001	7.27579+000	2.52726+000	1.36451+000	8.82123-001
ESE	6.46307+001	8.95634+001	9.31275+001	7.35304+001	4.97117+001	1.91545+001	4.83395+000	1.68631+000	9.11860-001	5.89961-001
SE	4.66899+001	6.84342+001	7.49772+001	6.00303+001	4.08845+001	1.58477+001	4.00996+001	1.40004+000	7.57298-001	4.90047-001
SSE	4.95786+001	7.72514+001	8.60284+001	6.88213+001	4.67620+001	1.80409+001	4.54384+000	1.58309+000	8.55637-001	5.53458-001

Table E.6. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology — run 6

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	7.97761+001	1.35518+002	1.68276+002	1.38961+002	9.61520+001	3.77316+001	9.59226+000	3.35285+000	1.81418+000	1.17413+000
SSW	6.05614+001	1.07549+002	1.35160+002	1.11795+002	7.74073+001	3.03916+001	7.72902+000	2.70217+000	1.46228+000	9.46450-001
SW	4.47874+001	7.64410+001	9.44011+001	7.78763+001	5.38619+001	2.11283-001	5.36923+000	1.87617+000	1.01498+000	6.56811-001
WSW	4.41161+001	6.68325+001	7.52541+001	6.05062+001	4.12142+001	1.59108+001	3.99941+000	1.39088+000	7.51021-001	4.85484-001
W	5.20361+001	7.60942+001	8.58849+001	6.92685+001	4.72917+001	1.83069+001	4.61055+000	1.60466+000	8.66694-001	5.60339-001
WNW	3.71721+001	4.80260+001	4.81314+001	3.75696+001	2.51670+001	9.55152+001	2.37111+000	8.19384-001	4.41155-001	2.84676-001
NW	2.85628+001	4.94175+001	6.00719+001	4.92016+001	3.38656+001	1.32132+001	3.34602+000	1.16769+000	6.31445-001	4.08540-001
NNW	5.81445+001	9.92241+001	1.24615+002	1.03315+002	7.16672+001	2.81996+001	7.18173+000	2.51198+000	1.35952+000	8.79972-001
N	7.41590+001	1.32071+002	1.65564+002	1.36754+002	9.45972+001	3.71003+001	9.42865+000	3.29566+000	1.78334+000	1.15423+000
NNE	6.11988+001	1.17843+002	1.54131+002	1.28515+002	8.93576+001	3.52255+001	8.98394+000	3.14544+000	1.70327+000	1.10287+000
NE	4.23520+001	9.77704+001	1.33243+002	1.11653+002	7.77811+001	3.07041+001	7.83871+000	2.74643+000	1.48780+000	9.63619-001
ENE	6.32331+001	9.65792+001	1.08632+002	8.72600+001	5.93965+001	2.29115+001	5.75586+000	2.00128+000	1.08053+000	6.98459-001
E	6.66555+001	1.11931+002	1.32506+002	1.07702+002	7.37912+001	2.85511+001	7.23124+000	2.51994+000	1.36192+000	8.80878-001
ESE	3.92044+001	6.76212+001	8.42460+001	6.96377+001	4.82157+001	1.89336+001	4.81520+000	1.68323+000	9.10769-001	5.89437-001
SE	3.20494+001	5.56977+001	6.98014+001	5.77589+001	4.00108+001	1.57186+001	3.99900+000	1.39824+000	7.56660-001	4.89740-001
SSE	3.95301+001	6.85508+001	8.25008+001	6.72744+001	4.61673+001	1.79531+001	4.53639+000	1.58186+000	8.55203-001	5.53249-001

Table E.7. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology – run 7

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	9.01306+001	1.44619+002	1.71993+002	1.40594+002	9.67810+001	3.78247+001	9.60017+000	3.35415+000	1.81464+000	1.17435+000
SSW	6.59110+001	1.12119+002	1.37001+002	1.12601+002	7.77165+001	3.04372+001	7.73289+000	2.70281+000	1.46250+000	9.46558-001
SW	4.97844+001	8.08329+001	9.61947+001	7.86646+001	5.41655+001	2.11732+001	5.37305+000	1.87679+000	1.01521+000	6.56917-001
WSW	5.04027+001	7.23578+001	7.75106+001	6.14980+001	4.15961+001	1.59673+001	4.00421+000	1.39167+000	7.51301-001	4.85619-001
W	5.54153+001	7.89331+001	8.70185+001	6.97632+001	4.74813+001	1.83348+001	4.61291+000	1.60505+000	8.66832-001	5.60405-001
WNW	3.80989+001	4.88407+001	4.84641+001	3.77158+001	2.52233+001	9.55985+000	2.37181+000	8.19500-001	4.41196-001	2.84696-001
NW	3.01747+001	5.08342+001	6.05505+001	4.94559+001	3.39635+001	1.32277+001	3.34725+000	1.16789+000	6.31516-001	4.08574-001
NNW	6.44209+001	1.04609+002	1.26789+002	1.04267+002	7.20328+001	2.82536+001	7.18631+000	2.51274+000	1.35978+000	8.80100-001
N	9.13483+001	1.47179+002	1.71734+002	1.39466+002	9.56414+001	3.72548+001	9.44178+000	3.29782+000	1.78410+000	1.15460+000
NNE	1.01918+002	1.52952+002	1.68336+002	1.34741+002	9.17498+001	3.55787+001	9.01392+000	3.15037+000	1.70501+000	1.10371+000
NE	9.12596+001	1.39194+002	1.49854+002	1.18912+002	8.05651+001	3.11142+001	7.87349+000	2.75215+000	1.48982+000	9.64591-001
ENE	9.73393+001	1.25563+002	1.20274+002	9.23501+001	6.13494+001	2.31993+001	5.78027+000	2.00529+000	1.08195+000	6.99141-001
E	1.29918+002	1.65254+002	1.53836+002	1.17016+002	7.73614+001	2.91767+001	7.27579+000	2.52726+000	1.36451+000	8.82123-001
ESE	6.46307+001	8.95634+001	9.31265+001	7.35304+001	4.97117+001	1.91545+001	4.83395+000	1.68631+000	9.11860-001	5.89961-001
SE	4.66899+001	6.84342+001	7.49772+001	6.00303+001	4.08845+001	1.58477+001	4.00996+000	1.40004+000	7.57298-001	4.90047-001
SSE	4.95786+001	7.72514+001	8.60284+001	6.88213+001	4.67620+001	1.80409+001	4.54384+000	1.58309+000	8.55637-001	5.53458-001

Table E.8. Atmospheric concentrations ($\mu\text{g}/\text{m}^3$) estimated using the HEM computer code with varying stack parameters and annual meteorology – run 8

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	7.97761+001	1.35518+002	1.68276+002	1.33961+002	9.61520+001	3.77316+001	9.59226+000	3.35285+000	1.81418+000	1.17413+000
SSW	6.05614+001	1.07549+002	1.35160+002	1.11795+002	7.74073+001	3.03916+001	7.72902+000	2.70217+000	1.46228+000	9.46450+001
SW	4.47874+001	7.64410+001	9.44011+001	7.78763+001	5.38619+001	2.11283+001	5.36923+000	1.87617+000	1.01498+000	6.56811+001
WSW	4.41161+001	6.68325+001	7.52541+001	6.05062+001	4.12142+001	1.59108+001	3.99941+000	1.39088+000	7.51021+001	4.85484+001
W	5.20361+001	7.60942+001	8.58849+001	6.92685+001	4.72917+001	1.83069+001	4.61055+000	1.60466+000	8.66694+001	5.60339+001
WNW	3.71721+001	4.80260+001	4.81314+001	3.75696+001	2.51670+001	9.55152+000	2.37111+000	8.19384+001	4.41155+001	2.84676+001
NW	2.85628+001	4.94175+001	6.00719+001	4.92016+001	3.38656+001	1.32132+001	3.34602+000	1.16769+000	6.31445+001	4.08540+001
NNW	5.81445+001	9.92241+001	1.24615+002	1.03315+002	7.16672+001	2.81996+001	7.18173+000	2.51198+000	1.35952+000	8.79972+001
N	7.41590+001	1.32071+002	1.65564+002	1.36754+002	9.45972+001	3.71003+001	9.42865+000	3.29566+000	1.78334+000	1.15423+000
NNE	6.11988+001	1.17843+002	1.54131+002	1.28515+002	8.93576+001	3.52255+001	8.98394+000	3.14544+000	1.70327+000	1.10287+000
NE	4.23520+001	9.77704+001	1.33243+002	1.11653+002	7.77311+001	3.07041+001	7.83871+000	2.74643+000	1.48780+000	9.63619+001
ENE	6.32331+001	9.65792+001	1.08532+002	8.72600+001	5.93965+001	2.29115+001	5.75586+000	2.00128+000	1.08053+000	6.98459+001
E	6.66555+001	1.11931+002	1.32506+002	1.07702+002	7.37912+001	2.86511+001	7.23124+000	2.51994+000	1.36192+000	8.80878+001
ESE	3.92044+001	6.76212+001	8.42460+001	6.96337+001	4.82157+001	1.89336+001	4.81520+000	1.68323+000	9.10769+001	5.89437+001
SE	3.20494+001	5.56977+001	6.98014+001	5.77589+001	4.00108+001	1.57186+001	3.99900+000	1.39824+000	7.56660+001	4.89740+001
SSE	3.95301+001	6.85508+001	8.25008+001	6.72744+001	4.61673+001	1.79531+001	4.53639+000	1.58186+000	8.55203+001	5.53249+001

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Appendix F

POPULATION EXPOSURES (PERSON- $\mu\text{g}/\text{m}^3$) ESTIMATES USING THE
HEM COMPUTER CODE WITH VARYING STACK PARAMETERS
AND ANNUAL METEOROLOGY

Table F.1. Population exposure estimates (person- $\mu\text{g}/\text{m}^3$) using the HEM computer code with varying stack parameters and annual meteorology

RUN	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
1	1	4.36+002	24.	1.06+004
	2	2.50+002	303.	8.82+004
	3	1.00+002	6083.	9.21+005
	4	5.00+001	22154.	2.05+006
	5	2.50+001	69715.	3.68+006
	6	1.00+001	204056.	5.82+006
	7	5.00+000	335781.	6.76+006
	8	2.50+000	602358.	7.70+006
	9	1.00+000	998508.	8.40+006
	10	5.00-001	1035203.	8.42+006
	11	3.72-001	1037315.	8.42+006
2	1	2.00+002	71.	1.57+004
	2	1.00+002	5768.	7.88+005
	3	5.00+001	21726.	1.90+006
	4	2.50+001	66546.	3.47+006
	5	1.00+001	202833.	5.66+006
	6	5.00+000	335781.	6.60+006
	7	2.50+000	602358.	7.54+006
	8	1.00+000	998508.	8.24+006
	9	5.00-001	1035203.	8.27+006
	10	3.72-001	1037315.	8.27+006
3	1	4.36+002	24.	1.06+004
	2	2.50+002	303.	8.82+004
	3	1.00+002	6083.	9.21+005
	4	5.00+001	22154.	2.05+006
	5	2.50+001	69715.	3.68+006
	6	1.00+001	204056.	5.82+006
	7	5.00+000	335781.	6.76+006
	8	2.50+000	602358.	7.70+006
	9	1.00+000	998508.	8.40+006
	10	5.00-001	1035203.	8.42+006
	11	3.72-001	1037315.	8.42+006
4	1	2.20+002	71.	1.57+004
	2	1.00+002	5768.	7.88+005
	3	5.00+001	21726.	1.90+006
	4	2.50+001	66546.	3.47+006
	5	1.00+001	202833.	5.66+006
	6	5.00+000	335781.	6.60+006
	7	2.50+000	602358.	7.54+006
	8	1.00+000	998508.	8.24+006
	9	5.00-001	1035203.	3.27+006
	10	3.72-001	1037315.	8.27+006

Table F.1. (continued)

RUN	Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
5	1	1.72+002	71.	1.23+004
	2	1.00+002	2502.	3.39+005
	3	5.00+001	15127.	1.21+006
	4	2.50+001	45880.	2.26+006
	5	1.00+001	158180.	4.00+006
	6	5.00+000	278279.	4.86+006
	7	2.50+000	472168.	5.55+006
	8	1.00+000	932798.	6.31+006
	9	5.00-001	1031939.	6.38+006
	10	2.85-001	1037315.	6.39+006
6	1	1.68+002	71.	1.20+004
	2	1.00+002	2362.	3.01+005
	3	5.00+001	15078.	1.17+006
	4	2.50+001	44059.	2.17+006
	5	1.00+001	158180.	3.94+006
	6	5.00+000	277434.	4.80+006
	7	2.50+000	472168.	5.49+006
	8	1.00+000	932798.	6.24+006
	9	5.00-001	1031939.	6.32+006
	10	2.85-001	1037315.	6.33+006
7	1	1.72+002	71.	1.23+004
	2	1.00+002	2502.	3.39+005
	3	5.00+001	15127.	1.21+006
	4	2.50+001	45880.	2.26+006
	5	1.00+001	158180.	4.00+006
	6	5.00+000	278279.	4.86+006
	7	2.50+000	472168.	5.55+006
	8	1.00+000	932798.	6.31+006
	9	5.00-001	1031939.	6.38+006
	10	2.85-001	1037315.	6.39+006
8	1	1.68+002	71.	1.20+004
	2	1.00+002	2362.	3.01+005
	3	5.00+001	15078.	1.17+006
	4	2.50+001	44059.	2.17+006
	5	1.00+001	158180.	3.94+006
	6	5.00+000	277434.	4.80+006
	7	2.50+000	472168.	5.49+006
	8	1.00+000	932798.	6.24+006
	9	5.00-001	1031939.	6.32+006
	10	2.85-001	1037315.	6.33+006

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Appendix G

ISCST SENSITIVITY ANALYSIS USING WORST-CASE METEOROLOGY
(ATMOSPHERIC CONCENTRATIONS LISTED IN $\mu\text{g}/\text{m}^3$)

Table G.1. ISCST sensitivity analysis of stack parameters using short-term, worst-case meteorology. Atmospheric concentrations listed in $\mu\text{g}/\text{m}^3$.

Run	Range, km									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
1	130.3	1066.5	1285.6	612.7	256.8	123.9	48.1	22.7	14.4	10.3
2	0.0012	0.256	178.5	379.1	250.0	123.9	48.0	22.7	14.4	10.3
3	0.0001	0.0367	34.1	254.5	245.8	123.9	48.0	22.7	14.4	10.3
4	0.0	0.0	0.0400	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	27.5	555.0	1044.9	544.5	234.4	113.4	43.95	20.8	13.1	9.4
6	0.0003	0.175	156.6	343.0	228.6	113.4	43.95	20.8	13.1	9.4
7	0.00004	0.031	35.1	239.4	225.0	113.3	43.95	20.8	13.1	9.4
8	0.0	0.0	0.074	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Appendix H

COMPARISON OF ATMOSPHERIC CONCENTRATION AND POPULATION
EXPOSURE ESTIMATES CALCULATED USING ONLY THE HEM
COMPUTER CODE TO ESTIMATES FROM THE ISCLT-HEM
COMPUTER CODES

Table H.1. Air concentrations ($\mu\text{g}/\text{m}^3$) using the ISCLT-HEM computer codes — MSD site.

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	8.9124-001	3.8770+000	2.1670+001	3.4420+001	3.9230+001	2.8500+001	1.1490+001	5.0870+000	3.0840+000	2.1560+000
SSW	7.1563-001	3.1110+000	1.7030+001	2.6820+001	3.0510+001	2.2120+001	8.8980+000	3.9340+000	2.3840+000	1.6660+000
SW	4.4737-001	1.8460+000	9.3890+000	1.4640+001	1.6770+001	1.2360+001	5.1220+000	2.3230+000	1.4250+000	1.0020+000
WSW	6.9059-001	2.6470+000	1.2610+001	1.9490+001	2.2120+001	1.6240+001	6.7000+000	3.0130+000	1.8390+000	1.2900+000
W	6.5090-001	2.5070+000	1.2230+001	1.9180+001	2.2020+001	1.6500+001	6.8880+000	3.0960+000	1.8880+000	1.3230+000
WNW	4.6184-001	1.6040+000	7.5530+000	1.1960+001	1.4030+001	1.0960+001	4.7850+000	2.2070+000	1.3600+000	9.5880-001
NW	5.0561-001	1.7070+000	7.9950+000	1.2710+001	1.5170+001	1.2380+001	5.5420+000	2.5870+000	1.6030+000	1.1340+000
NNW	5.2061-001	1.8480+000	8.6640+000	1.3800+001	1.6460+001	1.3690+001	6.3030+000	2.9940+000	1.8690+000	1.3280+000
N	5.6625-001	1.8730+000	7.9690+000	1.2440+001	1.4840+001	1.2400+001	5.7670+000	2.7650+000	1.7330+000	1.2340+000
NNE	3.7474-001	1.2760+000	5.5050+000	8.5560+000	1.0250+001	8.5690+000	3.9350+000	1.8690+000	1.1670+000	8.2880-001
NE	2.8723-001	1.0560+000	4.7250+000	7.3180+000	8.7410+000	7.4350+000	3.4630+000	1.6500+000	1.0310+000	7.3290-001
ENE	5.2255-001	1.7130+000	6.9920+000	1.0520+001	1.2480+001	1.0720+001	5.0760+000	2.4430+000	1.5320+000	1.0920+000
E	4.5941-001	1.6340+000	7.0400+000	1.0500+001	1.2380+001	1.0580+001	4.9800+000	2.3970+000	1.5040+000	1.0730+000
ESE	3.5814-001	1.4195+000	7.0060+000	1.0900+001	1.3060+001	1.1120+001	5.2270+000	2.5210+000	1.5830+000	1.1290+000
SE	5.3967-001	1.9670+000	9.6360+000	1.5380+001	1.8600+001	1.6200+001	7.7980+000	3.7770+000	2.3730+000	1.6930+000
SSE	7.0357-001	2.8480+000	1.5290+001	2.4540+001	2.8840+001	2.2940+001	1.0120+001	4.7020+000	2.9070+000	2.0550+000

Table H.2. Air concentrations ($\mu\text{g}/\text{m}^3$) using the HEM computer codes – MSD site.

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	9.1348+001	1.4718+002	1.7173+002	1.3947+002	9.5641+001	3.7255+001	9.4418+000	3.2978+000	1.7841+000	1.1546+000
SSW	1.0192+002	1.5295+002	1.6834+002	1.3474+002	9.1750+001	3.5579+001	9.0139+000	3.1504+000	1.7050+000	1.1037+000
SW	9.1260+001	1.3919+002	1.4985+002	1.1891+002	8.0565+001	3.1114+001	7.8735+000	2.7521+000	1.4898+000	9.6459-001
WSW	9.7339+001	1.2556+002	1.2027+002	9.2350+001	6.1349+001	2.3199+001	5.7803+000	2.0053+000	1.0819+000	6.9914-001
W	1.2992+002	1.6525+002	1.5384+002	1.1702+002	7.7361+001	2.9177+001	7.2758+000	2.5273+000	1.3645+000	8.8212-001
WNW	6.4631+001	8.9563+001	9.3128+001	7.3530+001	4.9712+001	1.9154+001	4.8339+000	1.6863+000	9.1186-001	5.8996-001
NW	4.6690+001	6.3434+001	7.4977+001	6.0030+001	4.0884+001	1.5848+001	4.0100+000	1.4000+000	7.5730-001	4.9005-001
NNW	4.9579+001	7.7251+001	8.6028+001	6.8821+001	4.6762+001	1.8041+001	4.5438+000	1.5831+000	8.5564-001	5.5346-001
N	9.0131+001	1.4462+002	1.7199+002	1.4059+002	9.6781+001	3.7825+001	9.6002+000	3.3542+000	1.8146+000	1.1744+000
NNE	6.5911+001	1.1212+002	1.3700+002	1.1260+002	7.7717+001	3.0437+001	7.7329+000	2.7028+000	1.4625+000	9.4656-001
NE	4.9784+001	8.0833+001	9.6195+001	7.8665+001	5.4165+001	2.1173+001	5.3730+000	1.8768+000	1.0152+000	6.5692-001
ENE	5.0403+001	7.2358+001	7.7511+001	6.1498+001	4.1596+001	1.5967+001	4.0042+000	1.3917+000	7.5130-001	4.8562-001
E	5.5415+001	7.8933+001	8.7019+001	6.9763+001	4.7481+001	1.8335+001	4.6129+000	1.6050+000	8.6683-001	5.6040-001
ESE	3.8099+001	4.8841+001	4.8464+001	3.7716+001	2.5223+001	9.5599+000	2.3718+000	8.1950-001	4.4120-001	2.8470-001
SE	3.0175+001	5.0834+001	6.0650+001	4.9456+001	3.3964+001	1.3228+001	3.3472+000	1.1679+000	6.3152-001	4.0857-001
SSE	6.4421+001	1.0461+002	1.2679+002	1.0427+002	7.2033+001	2.8254+001	7.1863+000	2.5127+000	1.3598+000	8.8010-001

Table H.3. Population exposures using the air concentrations from ISCLT-HEM-MSD site

Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
1	3.92+001	677.	2.66+004
2	2.50+001	15078.	4.52+005
3	1.00+001	132435.	2.12+006
4	5.00+000	310087.	3.35+006
5	2.50+000	706459.	4.73+006
6	1.00+000	1024506.	5.32+006
7	5.00-001	1037264.	5.33+006
8	2.87-001	1037315.	5.33+006

Table H.4. Population exposures using the air concentrations from HEM-MSD site

Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
1	1.72+002	71.	1.23+004
2	1.00+002	2502.	3.39+005
3	5.00+001	15127.	1.21+006
4	2.50+001	45880.	2.26+006
5	1.00+001	158180.	4.00+006
6	5.00+000	278279.	4.86+006
7	2.50+000	472168.	5.55+006
8	1.00+000	932798.	6.31+006
9	5.00-001	1031939.	6.38+006
10	2.85-001	1037315.	6.39+006

Table H.5. Air concentrations ($\mu\text{g}/\text{m}^3$) using the ISCLT-HEM computer codes - site R18.

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	7.1980+000	2.1230+001	4.1550+001	4.6040+001	4.1400+001	2.4320+001	9.7560+000	4.5410+000	2.8250+000	1.9980+000
SSW	4.1460+000	1.0780+001	1.7010+001	1.7540+001	1.5510+001	9.2470+000	3.8150+000	1.8060+000	1.1310+000	8.0460-001
SW	3.7360+000	9.0660+000	1.2640+001	1.2230+001	1.0540+001	6.4240+000	2.8760+000	1.4450+000	9.2790-001	6.6910-001
WSW	3.6170+000	8.5280+000	1.1900+001	1.1880+001	1.0560+001	6.8540+000	3.4170+000	1.8250+000	1.1990+000	8.7440-001
W	2.8670+000	7.2400+000	1.1300+001	1.1800+001	1.0590+001	6.7230+000	3.2830+000	1.7390+000	1.1390+000	8.2850-001
WNW	1.9710+000	5.9820+000	1.1230+001	1.2180+001	1.0820+001	6.3420+000	2.7580+000	1.3830+000	8.8810-001	6.3910-001
NW	2.0840+000	8.1350+000	1.8110+001	2.0210+001	1.7870+001	1.0080+001	4.1110+000	1.9890+000	1.2600+000	9.0000-001
NNW	2.5500+000	1.3570+001	3.1430+001	3.6100+001	3.2450+001	1.8210+001	7.0820+000	3.3020+000	2.0610+000	1.4590+000
N	3.8480+000	1.2740+001	2.7650+001	3.1730+001	2.8660+001	1.5980+001	6.0590+000	2.7710+000	1.7150+000	1.2080+000
NNE	3.3870+000	9.9100+000	1.8870+001	2.1300+001	1.9360+001	1.0960+001	4.2620+000	1.9760+000	1.2290+000	8.6880-001
NE	3.8990+000	1.1910+001	2.2570+001	2.5460+001	2.3160+001	1.3190+001	5.2900+000	2.5210+000	1.5870+000	1.1290+000
ENE	4.2630+000	1.3910+001	2.7190+001	3.0150+001	2.6890+001	1.5040+001	6.2060+000	3.0500+000	1.9460+000	1.3950+000
E	4.1670+000	1.4520+001	3.0480+001	3.4570+001	3.1350+001	1.8010+001	7.4660+000	3.6420+000	2.3150+000	1.6550+000
ESE	4.3750+000	1.5360+001	3.4050+001	4.0140+001	3.7600+001	2.2620+001	9.3830+000	4.4800+000	2.8160+000	2.0020+000
SE	5.3530+000	1.9090+001	4.4600+001	5.2640+001	4.8840+001	2.8940+001	1.1600+001	5.4140+000	3.3720+000	2.3850+000
SSE	7.8430+000	2.5880+001	5.7220+001	6.5380+001	5.9220+001	3.4380+001	1.3520+001	6.2390+000	3.8690+000	2.7310+000

Table H.6. Air concentrations ($\mu\text{g}/\text{m}^3$) using the HEM computer codes – site R18.

Wind dir from	Distance (km)									
	0.2	0.3	0.5	0.7	1.0	2.0	5.0	10.0	15.0	20.0
S	1.0415+002	2.0636+002	2.7273+002	2.2786+002	1.5861+002	6.2607+001	1.5986+001	5.6003+000	3.0335+000	1.9645+000
SSW	4.5942+001	6.5707+001	7.2791+001	5.8450+001	3.9812+001	1.5378+001	3.8671+000	1.3449+000	7.2613-001	4.6936-001
SW	3.5733+001	4.5855+001	4.7152+001	3.7141+001	2.5021+001	9.5563+000	2.3839+000	8.2588-001	4.4516-001	2.8746-001
WSW	3.7578+001	4.6460+001	4.5578+001	3.5363+001	2.3602+001	8.9231+000	2.2094+000	7.6270-001	4.1048-001	2.6482-001
W	4.3824+001	5.9005+001	6.1447+001	4.8430+001	3.2618+001	1.2449+001	3.1040+000	1.0753+000	5.7967-001	3.7434-001
WNW	1.9887+001	2.9628+001	3.2989+001	2.6450+001	1.7992+001	6.9403+000	1.7446+000	6.0686-001	3.2772-001	2.1187-001
NW	2.3509+001	3.7010+001	4.3021+001	3.4912+001	2.3924+001	9.3041+000	2.3535+000	8.2108-001	4.4397-001	2.8723-001
NNW	3.3183+001	5.9071+001	7.4506+001	6.1706+001	4.2777+001	1.6833+001	4.2920+000	1.5028+000	8.1379-001	5.2694-001
N	5.4539+001	1.1956+002	1.6671+002	1.4106+002	9.8902+001	3.9331+001	1.0093+001	3.5437+000	1.9212+000	1.2448+000
NNE	4.2570+001	8.2468+001	1.0882+002	9.1040+001	6.3442+001	2.5073+001	6.4059+000	2.2443+000	1.2156+000	7.8719-001
NE	4.6380+001	8.5456+001	1.0686+002	8.8049+001	6.0802+001	2.3800+001	6.0410+000	2.1105+000	1.1419+000	7.3900-001
ENE	4.9699+001	7.6251+001	8.6438+001	6.9641+001	4.7500+001	1.8366+001	4.6220+000	1.6082+000	8.6856-001	5.6153-001
E	8.5747+001	1.2777+002	1.4156+002	1.1338+002	7.7021+001	2.9654+001	7.4414+000	2.5861+000	1.3960+000	9.0230-001
ESE	6.7803+001	1.0933+002	1.2574+002	1.0146+002	6.9229+001	2.6774+001	6.7404+000	2.3463+000	1.2675+000	8.1957-001
SE	6.6872+001	1.2653+002	1.6339+002	1.3581+002	9.4266+001	3.7099+001	9.4522+000	3.3080+000	1.7910+000	1.1596+000
SSE	6.8623+001	1.4800+002	2.0416+002	1.7222+002	1.2052+002	4.7823+001	1.2253+001	4.2991+000	2.3301+000	1.5095+000

Table H.7. Population exposures using the air concentrations from ISCLT-HEM-site R18.

Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
1	6.54+001	32.	2.12+003
2	5.00+001	194.	1.16+004
3	2.50+001	3492.	1.15+005
4	1.00+001	26142.	4.70+005
5	5.00+000	54735.	6.78+005
6	2.50+000	249563.	1.30+006
7	1.00+000	801845.	2.33+006
8	6.39-001	849219.	2.37+006

Table H.8. Population exposures using the air concentrations from HEM-site R18.

Level	Concentration	Population	Exposure (person- $\mu\text{g}/\text{m}^3$)
1	2.73+002	18.	4.88+003
2	2.50+002	18.	4.88+003
3	1.00+002	439.	6.81+004
4	5.00+001	1598.	1.44+005
5	2.50+001	5208.	2.84+005
6	1.00+001	29704.	6.92+005
7	5.00+000	50775.	8.29+005
8	2.50+000	138238.	1.14+006
9	1.00+000	554733.	1.74+006
10	5.00-001	794810.	1.93+006
11	2.50-001	849219.	1.95+006
12	2.12-001	849219.	1.95+006

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